

January 2018

Ashford Park Quarry

Site Management Plan

This Site Management Plan has been developed for the Ashford Park Quarry, Otaki as required by (1) Condition 10 of Kapiti Coast District Council Land Use Consent RM150184, (2) Condition 6 of Greater Wellington Regional Council Land Use Consent WGN160103 [35062] & (3) Condition 7 of Greater Wellington Regional Council Discharge Permit WGN160103 [35063]





NOTE: THIS PLAN IS SUBJECT TO CHANGE. THE OTAKI QUARRY MANAGER OR KAPITI COAST DISTRICT COUNCIL SHOULD BE CONTACTED TO ENSURE THE LATEST VERSION IS BEING VIEWED.

A COPY OF THIS SITE MANAGEMENT PLAN SHALL BE KEPT ON SITE AND WILL BE AVAILABLE FOR USE BY SITE PERSONNEL AT ALL TIMES.

Revision Record:

Date of Revision	Version	Summary of Revision
May 2016	1	N/A – Version 1
January 2018	2	SMP amended to incorporate new water testing parameters included in new GWRC consent WGN160103 [35062] (previously 33757) and WGN160103 [35063] (previously 33758)



TABLE OF CONTENTS

1		CONTACT DETAILS				
2	COUNCIL CERTIFICATION					
3	CONSENT BACKGROUND					
4	LOCATION					
5	REQUIREMENT FOR SITE MANAGEMENT PLAN					
6	5 SITE MANAGEMENT PLAN AIM					
7		LINES OF RESPONSIBILITY				
	7.1	GBC WINSTONE				
	7.2	2 OTAKI QUARRY STAFF & CONTRACTORS 3				
	7.3	3 TECHNICAL EXPERTS				
8		COMPLAINTS PROCESS				
	8.1	L COMPLAINTS PROCESS 4				
	8.2	2 STAFF TRAINING ON COMPLAINTS 5				
9		CULTURAL MATTERS				
	9.1	MONITORING OF WORKS				
	9.2	2 NATIVE AND OTHER SIGNIFICANT VEGETATION 5				
	9.3	3 ACCIDENTAL DISCOVERY PROTOCOL 5				
10		SITE OPERATIONS				
	10	.1 HOURS OF OPERATION				
		GENERAL RESTRICTIONS				
		SPECIFIC RESTRICTIONS				
	10	.2 EXCAVATION AREA				
	10	.3 DIRECTION AND STAGING				
	10	.4 SETBACK DISTANCES				
	10	.5 DUST MANAGEMENT 8				
	10	.6 VEGETATION TO BE PROTECTED – BOUNDARY PLANTINGS AND ECO-ISLANDS				
	10	.7 VEGETATION TO BE PROTECTED – STAGED EXCAVATION				



	10.8	LIGHTING	. 8
	10.9	CLEANING OF MACHINERY	. 8
	10.10	STOPBANK CROSSING	. 8
	10.11	FENCING REQUIREMENTS	. 9
	10.12	SPILL MANAGEMENT	. 9
	10.13	INTERNAL ROADS AND TRAFFIC MOVEMENTS	. 9
	10.14	TOPSOIL MANAGEMENT	10
	10.15	NOISE BUND CONSTRUCTION	10
	10.16	NOISE	11
	10.17	DUST	11
	10.18	SITE REHABILITATION	11
	10.19	ECO-ISLANDS	12
	10.20	PEST PLANT AND ANIMAL CONTROL PLAN	13
	10.21	PUBLIC ACCESS	13
	10.22	PEST PLAN AND ANIMAL CONTROL PLAN	13
1	1 MAN	IAGEMENT OF DUST	13
	11.1	DUST MANAGEMENT MEASURES	13
	TRA	INING	13
	PRO	CESS FOR REPORTING	14
	GEN	ERAL OPERATIONS	14
	DIST	URBED GROUND / BUND CONSTRUCTION	14
	TRA	NSPORT AND HAULAGE	15
	11.2	REVIEW OF DUST MANAGEMENT MEASURES	15
1	2 MAN	IAGEMENT OF NOISE	16
	12.1	CONSTRUCTION NOISE	16
	12.2	CONSTRUCTION NOISE MANAGEMENT PLAN	16



	OPERATIONAL NOISE	17
13 MO	NITORING & REPORTING	18
13.1	REPORTING SUMMARY TABLE	18
13.2	WATER QUALITY MONITORING	18
13.3	WATER QUALITY LIMITS	21
13.4	ANNUAL WATER QUALITY REPORT	21
13.5	FLOOD PROTECTION	21
GEC	DTECHNICAL REPORT	22
GRC	OUNDWATER / HYDRAULIC PROPERTIES REPORT	22
EXC	AVATION LIMITATION	22
13.6	OTAKI MAORI RACING CLUB	23
13.7	ANNUAL GRAVEL EXTRACTION REPORT	23
13.8	RESTORATION MONITORING REPORT	23
13.9	REPORTING OF COMPLAINTS	24
14 SPIL	L CONTINGENCY	24
14 SPIL 14.1	L CONTINGENCY INVENTORY OF HAZARDOUS SUBSTANCES USED ON SITE	24 24
14 SPIL 14.1 LUB	L CONTINGENCY INVENTORY OF HAZARDOUS SUBSTANCES USED ON SITE BRICANTS AND OILS	24 24 24
14 SPIL 14.1 LUB DIE:	L CONTINGENCY INVENTORY OF HAZARDOUS SUBSTANCES USED ON SITE BRICANTS AND OILS SEL	24 24 24 24
14 SPIL 14.1 LUB DIE: 14.2	L CONTINGENCY INVENTORY OF HAZARDOUS SUBSTANCES USED ON SITE BRICANTS AND OILS SEL SAFETY	24 24 24 24 24
14 SPIL 14.1 LUB DIE 14.2 14.3	L CONTINGENCY INVENTORY OF HAZARDOUS SUBSTANCES USED ON SITE BRICANTS AND OILS SEL SAFETY POTENTIAL SPILL SOURCES AND RISKS	24 24 24 24 24 24
14 SPIL 14.1 LUB DIE: 14.2 14.3 14.4	L CONTINGENCY INVENTORY OF HAZARDOUS SUBSTANCES USED ON SITE BRICANTS AND OILS SEL SAFETY POTENTIAL SPILL SOURCES AND RISKS PREVENTATIVE MEASURES IN PLACE	24 24 24 24 24 24 25
14 SPIL 14.1 LUB DIE: 14.2 14.3 14.4 14.5	L CONTINGENCY INVENTORY OF HAZARDOUS SUBSTANCES USED ON SITE BRICANTS AND OILS SEL SAFETY POTENTIAL SPILL SOURCES AND RISKS PREVENTATIVE MEASURES IN PLACE CATEGORY OF SPILLS	24 24 24 24 24 25 25
14 SPIL 14.1 LUB DIE 14.2 14.3 14.4 14.5 MIN	L CONTINGENCY INVENTORY OF HAZARDOUS SUBSTANCES USED ON SITE BRICANTS AND OILS SEL SAFETY POTENTIAL SPILL SOURCES AND RISKS PREVENTATIVE MEASURES IN PLACE CATEGORY OF SPILLS NOR INCIDENCES	24 24 24 24 24 25 25 26
14 SPIL 14.1 LUB DIES 14.2 14.3 14.4 14.5 MIN SER	L CONTINGENCY INVENTORY OF HAZARDOUS SUBSTANCES USED ON SITE BRICANTS AND OILS SEL SAFETY POTENTIAL SPILL SOURCES AND RISKS PREVENTATIVE MEASURES IN PLACE CATEGORY OF SPILLS NOR INCIDENCES	24 24 24 24 24 25 25 26 26
14 SPIL 14.1 LUB DIES 14.2 14.3 14.4 14.5 MIN SER CRI ⁻	L CONTINGENCY INVENTORY OF HAZARDOUS SUBSTANCES USED ON SITE BRICANTS AND OILS SEL SAFETY POTENTIAL SPILL SOURCES AND RISKS PREVENTATIVE MEASURES IN PLACE CATEGORY OF SPILLS NOR INCIDENCES IOUS INCIDENCES	24 24 24 24 24 25 25 26 26 26



	IMN	ЛЕDIATE RESPONSE (ALL SPILLS) 2	:6		
	SPIL	L RESPONSE PROCEDURE FOR MINOR INCIDENTS 2	27		
	SPIL	L RESPONSE PROCEDURE FOR SERIOUS AND CRITICAL INCIDENTS	27		
	REP	ORTING 2	27		
	POS	T-INCIDENT MONITORING	8		
1	4.7	SPILL RESPONSE EQUIPMENT AVAILABLE ON SITE	28		
	LAN	ID-BASED SPILLS	8		
	WA	TER-BASED SPILLS	8		
1	4.8	EQUIPMENT AND OPERATORS AVAILABLE ELSEWHERE	29		
15	CON	/MUNITY LIAISON GROUP	29		
16	ASH	FORD PARK WEBSITE	0		
17	EME	RGENCY WORKS	0		
18	ASH	FORD PARK – NON-QUARRIED AREAS	0		
19	SITE	MANAGEMENT PLAN REVIEW	0		
APP	ENDI	K A – ASHFORD PARK PLANTING PLAN	12		
APP	ENDI	K B –STAGING PLAN	13		
APP	ENDI	K C – STOPBANK CROSSING PLAN	\$4		
APP	ENDI	K D – LIMIT OF EXCAVATION PLAN	5		
APP	APPENDIX E – REHABILITATION STRATEGY				



1 CONTACT DETAILS

Mark McKenzie [GBC Winstone National Quarries Manager]

- > 027 202 8926
- Mark.McKenzie@gbcwinstone.co.nz

Josua Grobler [GBC Winstone Otaki/Ashford Park Quarry Manager]

- > 027 597 2704
- Josua.Grobler@gbcwinstone.co.nz

GBC Winstone General Contact Details

- > Postal Address: PO Box 17-195, Greenlane, Auckland (Attn: Environmental Manager)
- Phone: 09-525 9004 (Ask for the Environmental Manager)
- Website: www.winstoneaggregates.co.nz

2 COUNCIL CERTIFICATION

This Site Management Plan ("SMP") is submitted for certification by KCDC prior to construction works commencing.

3 CONSENT BACKGROUND

Resource consents were granted by Greater Wellington Regional Council ("GWRC") and Kapiti Coast District Council ("KCDC") for the operation of a gravel quarry at 61-67 Te Roto Road, Otaki ("Ashford Park Quarry"). Those consents are granted as follows:

- 1. On 11 December 2015 by GWRC authorising:
 - a. Construction of a bore at 61-67 Te Roto Road, Otaki ("Ashford Park"), being extraction of gravel which will form a lake once groundwater is intercepted (GWRC Land Use Consent WGN160103 [33757]); and
 - Discharge of sediment at Ashford Park in stormwater runoff to the formed waterbody, created by the gravel extraction activities (GWRC Discharge Permit WGN160103 [33758]).
- 2. On 24 March 2016 by KCDC authorising GBC Winstone to establish a gravel quarry and undertake associated earthworks at Ashford Park, with transportation to and processing of the extracted material at Otaki Quarry (KCDC Land Use Consent RM150184).

In late 2017 GBC made an application under s127 RMA to amend WGN160103 [33757] and WGN160103 [33758]. The purpose of the requested amendments was to strengthen the water quality testing requirements in the regional consents. The new consent numbers are WGN160103 [35062] and WGN160103 [35063].



4 LOCATION



5 REQUIREMENT FOR SITE MANAGEMENT PLAN

This SMP has been prepared in accordance with:

- 1. Condition 10 of KCDC Land Use Consent RM150184 ("KCDC Consent");
- Condition 6 of Greater Wellington Regional Council Land Use Consent WGN160103 [35062] ("GWRC Consent"); and
- 3. Condition 7 of Greater Wellington Regional Council Discharge Permit WGN160103 [35063].

Where appropriate specific conditions in the KCDC and GWRC Land Use Consents are noted in this SMP in *italics*.

6 SITE MANAGEMENT PLAN AIM

It is the aim of the SMP that all works be undertaken in a manner that ensures compliance with all regulatory and consenting requirements. The regulatory and consenting requirements have a common aim which is to avoid, remedy or mitigate adverse effects on the environment including effects on the health of people and ecosystems and amenity effects.

The measures and procedures included in this SMP are particularly focussed on avoiding, remedying or mitigating adverse effects on the residents, occupiers and operations at the following parties:



- 1. The residents of Te Roto Road (and in particular those properties immediately adjacent to the Ashford Park property i.e. 72 Te Roto Rd and 55 Te Roto Road);
- 2. 197 Rahui Road;
- 3. The Otaki Maori Racing Club;
- 4. Nga Hapu o Otaki;
- 5. Users of the Otaki River reserve including both members of the public and the Friends of the Otaki River

7 LINES OF RESPONSIBILITY

7.1 GBC WINSTONE

Overall management of the site is the responsibility of the General Manager of GBC Winstone. Operations on site are to be managed by GBC Winstone, with the Otaki Quarry Manager responsible for the specific operation and management of the quarry, rehabilitation and any associated activities.

GBC Winstone, as the consent holder, has a general responsibility to implement all consent conditions, to abide by this SMP, as well as all other Management Plans relevant to the Ashford Park Site.

This responsibility includes ensuring that all contractors operating on site are familiar with the requirements of these documents and are undertaking their activities in accordance with those requirements.

7.2 OTAKI QUARRY STAFF & CONTRACTORS

Every GBC Winstone employee and contractor at the Otaki Quarry (including Ashford Park) has a duty to avoid, remedy or mitigate any adverse environmental effects arising from an activity carried out by them or on their behalf. This includes, but is not limited to:

- Attending inductions and training relating to managing potential environmental effects such as dust, noise
- Observing and reporting environmental issues such as excessive dust or noise, whether or not these have led to off-site effects when noticed.
- Reporting all incidents relating to environmental issues such as excessive dust or noise
- Ensuring processes for managing environmental issues such as excessive dust or noise are understood and adhered to.

Every GBC Winstone employee has a duty to adopt the best practicable option to ensure that any effects remain within consented levels.

All personnel will be required to be appropriately qualified and/or trained for their particular role. The following systems will be implemented to manage environmental matters on site:

- Inductions;
- Project briefing;



- Job safety and environmental training including site-specific dust and noise issues;
- On the job training; and
- Posters and information leaflets.

Staff training records will be maintained on-site. The records will include:

- Who was trained;
- When the person was trained; and
- General description of training content and whether follow up/refresher courses are required at a later date.

7.3 TECHNICAL EXPERTS

Technical experts will from time to time provide advice and technical expertise on the operation. An understanding of consent conditions and this SMP as well as all other Management Plans relevant to the site, is required.

8 COMPLAINTS PROCESS

[Condition 10(f) "The collection and response to complaints (including provision for staff training to manage complaints), to ensure compliance with Condition 13"]

8.1 COMPLAINTS PROCESS

Complaints can be made using the contact details listed in Section 1 above. Complaints made to GBC Winstone are communicated to KCDC via the annual reporting process.

A permanent record of any complaints received alleging adverse effects from or related to the operation of the Ashford Park Quarry site will be maintained.

This record will include the following:

- 1. The name and address of the complainant, if supplied;
- 2. Date and time of the complaint and alleged event;
- 3. The nature of the complaint and the activity and any adverse effects to which it relates (e.g. noise or dust);
- 4. Weather conditions at the time of the alleged event;
- 5. In the event of a dust complaint, a description of the wind speed and wind direction when the dust that resulted in a complaint was detected by the complainant;
- 6. The most likely source of noise or cause of dust or any other adverse effect detected by the complainant
- 7. Investigations undertaken by GBC Winstone in regards to the complaint and any measures adopted to remedy the effects of the incident/complaint;
- 8. Summary of the response given to the complainant post-investigation; and



9. Where complaints result in the identification of issues requiring remedy the measures put in place to prevent occurrence of a similar incident.

The complaints record will be provided to KCDC annually as part of the monitoring program in this SMP and made available to officers of KCDC on request at any time.

GBC Winstone will meet regularly with KCDC to discuss complaints made to either party. These discussions shall include measures to mitigate adverse effects identified in complaints.

8.2 STAFF TRAINING ON COMPLAINTS

GBC Winstone personnel and all contractors operating on site will be made aware of recent complaints and shall be proactive in identifying actual and potential causes of complaints.

Job descriptions and annual training reviews will identify individual staff training requirements in terms of complaints over the previous year. The Otaki Quarry Manager will oversee training, and ensure that it is appropriate. A record of staff training will be maintained and kept at the Otaki Quarry site office.

The Otaki Quarry Manager will ensure that any training provided by contractors to their own staff also meets the requirements with respect to complaints received.

9 CULTURAL MATTERS

9.1 MONITORING OF WORKS

As required by *Condition 41* of the KCDC consent GBC Winstone will inform Ngā Hapū o Ōtaki when works commence at the start of each stage and offer lwi the opportunity to monitor the works associated with the removal of topsoil during the construction of the acoustic bunds and at the start of each new stage. A copy of correspondence outlining the opportunity to lwi will be submitted to the Team Leader Development Control, KCDC.

9.2 NATIVE AND OTHER SIGNIFICANT VEGETATION

As required by *Condition 42* of the KCDC consent all native vegetation (to be removed) will be offered to Ngā Hapū o Ōtaki for cultural purposes prior to being felled, and other vegetation deemed to be significant by Ngā Hapū o Ōtaki is also offered for cultural purposes, prior to removal.

9.3 ACCIDENTAL DISCOVERY PROTOCOL

Condition 40 of the KCDC Consent requires an Accidental Discovery Protocol to be implemented at Ashford Park.

Ashford Park contains no registered or known archaeological remains or features, and no sites have been discovered during the quarrying to date at the adjacent Otaki Quarry. Should archaeological



remains or features be uncovered during quarry operations, the following procedure must be followed;

- a. All works in the immediate vicinity of the site will cease immediately
- b. Immediate steps will be taken to secure the site to ensure the archaeological material is not further disturbed
- c. The consent holder or the consent holder's representative is to contact the Ngā Hapū o Ōtaki and the Area Archaeologist of the Heritage New Zealand (Heritage NZ). In the case of koiwi (human remains) the New Zealand Police must be notified;

Note: Ngā Hapū o Ōtaki and Heritage NZ may choose to jointly appoint/advise a qualified archaeologist who will confirm the nature of the accidental discovery material. Where they choose to do so, they should provide this advice to the consent holder.

- d. Ngā Hapū o Ōtaki and Heritage NZ will jointly appoint/advise a qualified archaeologist who will confirm the nature of the accidental discovery material
- e. If the material is confirmed as being archaeological, the consent holder will ensure an archaeological assessment is carried out by a qualified archaeologist, and if appropriate, an archaeological authority is obtained from Heritage NZ before work resumes (as per the Heritage New Zealand Pouhere Taonga Act 2014)
- f. The consent holder will also consult with Ngā Hapū o Ōtaki on any matters of tikanga (protocol) that are required in relation to the discovery and prior to commencement of any investigation
- g. If koiwi (human remains) are uncovered, in addition to the steps above, the area must be treated with utmost discretion and respect, and the koiwi dealt with according to both law and tikanga, as guided by Ngā Hapū o Ōtaki
- h. Works in the area shall not recommence in the immediate area until authorised by Ngā Hapū o Ōtaki, Heritage New Zealand (and the NZ Police in the case of koiwi) and any other authority with statutory responsibility, to ensure all statutory and cultural requirements are met
- i. All parties will work towards work recommencing in the shortest possible timeframe while ensuring that any archaeological sites discovered are protected until as much information as practicable is gained and a decision regarding their appropriate management is made, including obtaining an archaeological authority under the Heritage New Zealand Pouhere Taonga Act 2014 if necessary. Appropriate management may include recording or removal of archaeological material.

10 SITE OPERATIONS

[KCDC Consent Condition 10(a) requires the SMP to include details on "relevant site operations, the framework and detail of procedures and lines of responsibility for management of effects of the quarry operation, and the methods for communicating the requirements of the SMP to those persons engaged in the activity on the site"]

10.1 HOURS OF OPERATION



The Ashford Park Site will only operate between the hours of 0700 and 1800 Monday to Friday (excluding public holidays) with extraction activities only permitted between the hours of 0730 and 1800 Monday to Friday (excluding public holidays).

Transportation and loading of materials can occur between 0600 and 0700 and between 1800 and 2200 where noise limits in Condition 28 are achieved

There shall be no extraction or transport of extracted materials occurring on Saturdays, Sundays or public holidays. Some maintenance of vehicles and plant and rehabilitation planting on the site may occur on Saturdays.

SPECIFIC RESTRICTIONS

In Stages 1 and 1A no activities associated with the gravel extraction activity shall occur after 1800. This includes both extraction and transport-related activity.

Extraction works in Stage 3 shall be restricted to a start time of 0900 where they are located in close proximity to the area used for daily training and stabling of race horses. This area shall be identified in consultation with the Otaki Maori Racing Club ("OMRC"), with evidence of input from the OMRC in the provided with the stage plan provided to the Council for certification.

The Staging Plan (see **Appendix B**) may be revised to reduce this area as work in the stage progress and/or if remedial actions are implemented as a result of monitoring (see Clause 12.4 below) following consultation with OMRC.

10.2 EXCAVATION AREA

[KCDC Consent Condition 11(a) "The excavation of aggregate shall only be within the excavation area shown on plan titled "Ashford Park Planting Plan RG4" prepared by Boffa Miskell and dated 10 February 2016"]

See Ashford Park Planting Plan at Appendix A.

10.3 DIRECTION AND STAGING

[KCDC Consent Condition 11(b) "The direction of excavation and staging of extraction shall be generally in accordance with the Staging Plan as set out in Figure 5 of Assessment of Landscape and Visual Effects Report dated 16 September 2015"]

See Ashford Park Staging Plan at Appendix B.

10.4 SETBACK DISTANCES

[KCDC Consent Condition 11(c) "The consent holder shall ensure that there are excavation setback distances from the boundaries of the site as shown in Staging Plan, as set out in Figure 5 of Assessment of Landscape and Visual Effects Report dated 16 September 2015"]



See Ashford Park Staging Plan at Appendix B.

10.5 DUST MANAGEMENT

[KCDC Consent Condition 11(d) "Dust management measures and triggers for active dust suppression"]

See Section 11 below.

10.6 VEGETATION TO BE PROTECTED - BOUNDARY PLANTINGS AND ECO-ISLANDS

[KCDC Consent Condition 11(e) "Any areas of vegetation to be protected from works including boundary plantings and the 'islands' of significant vegetation"]

See Ashford Park Planting Plan at Appendix A.

10.7 VEGETATION TO BE PROTECTED – STAGED EXCAVATION

[KCDC Consent Condition 11(f) "Measures to ensure that identified vegetation will be protected prior to the commencement of excavation of each stage"]

For Stages 2-4 the respective Stage Plan prepared during the previous stage will identify all relevant vegetation identified in the Planting Plan (see **Appendix A**). There is no vegetation identified as needing to be protected during Stage 1 although replacement screen planting will be undertaken on the boundary between Ashford Park and 72 Te Roto Road (see area indicated on plan at **Appendix A**) following consultation with the owners of the property.

10.8 LIGHTING

[KCDC Consent Condition 59 "The consent holder shall ensure that security and other lighting to be located so that light does not spill onto adjacent properties"]

No on-site lighting will be installed at Ashford Park. Machinery used onsite including dump trucks will use their headlights.

10.9 CLEANING OF MACHINERY

[GWRC Consent Condition 10(a) "All machinery to be operated on the site (excluding trucks) is thoroughly cleaned of vegetation (e.g. weeds), seeds or contaminants at least 10 metres away from any waterbody, water flow channel or stormwater system, prior to entering the site"]

GBC Winstone will ensure all machinery to be operated on the site (excluding trucks) is thoroughly cleaned in accordance with GWRC Consent Condition 10(a).

10.10 STOPBANK CROSSING



[KCDC Consent Condition 11(g) "The construction and formation of the stopbank crossing shall be in accordance with the Stopbank Crossing Plan, titled "Greater Wellington Regional Council Truck Access Road Over Stopbank – \bar{O} taki River Concept Design – Plan Layout Truck Access" dated 21/07/2015 and prepared by Opus. Note: Any construction and formation of the stopbank crossing is subject to the approval of the Greater Wellington Regional Council"]

Please refer to the Stopbank Crossing Plan at Appendix C.

10.11 FENCING REQUIREMENTS

[KCDC Consent Condition 11(h) "Fencing requirements"]

All areas which are either being actively extracted from, or have previously been extracted from will be fenced off with appropriate warning signs installed along the length of the fenced boundary. An example of the type of signage that may be used is set out below. Gates into working areas will be locked outside of hours of operation.



10.12 SPILL MANAGEMENT

[KCDC Consent Condition 11(i) "Emergency and spill contingency plan including a description of how accidents and spills will be avoided, course of action if something goes wrong, contacts details and how it will be cleaned up, location and type of spill kit"]

See Section 14 below.

10.13 INTERNAL ROADS AND TRAFFIC MOVEMENTS

[KCDC Consent Condition 11(j) "Internal roads and traffic movements including:

i) Regular grading of the main haul road to maintain an even surface



- *ii)* The dump trucks and any loaders working on site shall be fitted with broadband directional reversing beepers as opposed to tonal reversing beepers.
- iii) All noise generating equipment on site will be maintained to a high standard at all times.
- *iv)* Regular training and instruction of operators of machinery to include noise minimisation techniques."]

The main Ashford Park haul road will be regularly graded and inspected for potholes. Broadband directional reversing beepers will be installed on all machinery / vehicles used on the Ashford Park site. All GBC Winstone machinery and vehicles is regularly maintained to a high standard. Regular training is provided to all GBC Winstone operational staff regarding noise minimisation techniques including appropriate loading practices, taking the shortest routes possible and minimising engine revving.

10.14 TOPSOIL MANAGEMENT

[KCDC Consent Condition 11(k) "Provisions for identified topsoil / mulch to be stockpiled and managed during excavation phase to remain viable as a suitable growing medium along completed riparian edges"]

All topsoil not required for bunding purposes will be stockpiled (maximum 3m in height) appropriately on the Ashford Park site for use in the rehabilitation of either Ashford Park itself or if there is an excess, the rehabilitation of the adjacent Otaki Quarry. Good practice for ensuring the long-term biological health of topsoil includes avoiding double handling, fast seeding of stockpiles to avoid erosion and minimising tracking over the soil with heavy machinery.

10.15 NOISE BUND CONSTRUCTION

[KCDC Consent Condition 11(I) "The construction and formation of the noise attenuating bunds on the northern and western boundaries (including the planting, watering and maintenance of the bunds) to ensure compliance with Conditions 22 - 25"]

Bund A (west) and Bund B (east) will be constructed in the locations identified in the Staging Plan at **Appendix B** using earthmoving equipment, the final form of the earth bunds will be shaped with an excavator. Appropriate construction techniques will be employed to ensure topsoil is not unnecessarily compacted (see Clause 9.14 above).

Neither Bund A nor Bund B will be removed until all extraction on the site has been completed.

Both Bund A and Bund B will be seeded as soon as practicable following their construction. On-going weekly assessment of grass growth and ground moisture will be undertaken with the earth bunds being watered as required to supress potential dust until a grass cover has been established. Bund watering methods include using the water cannon on the Otaki Quarry water cart.

Once vegetation is established the bunds will be regularly mowed to give a tidy appearance.

Bund A will be 4 metres high with a slope of 1:2 on both sides. No excavation work can commence in Stages 1A or 1B until the respective bund for each stage has been completed.



Bund B will be 3 metres high with a slope of 1:3. No excavation work can commence in Stages 3 or 4 until Bund B has been completed.

10.16 NOISE

[KCDC Consent Condition 11(m) "The operation of equipment to adopt the best practicable option to reduce noise and to ensure compliance with Conditions 26 - 29"]

See Section 12 below.

10.17 DUST

[KCDC Consent Condition 11(n) "The avoidance of offensive or objectionable dust beyond the boundary of the site, to ensure compliance with Conditions 34 - 36"]

See Section 11 below.

10.18 SITE REHABILITATION

[KCDC Consent Condition 11(o) "Site Rehabilitation to ensure compliance with Conditions 43-48"]

This SMP should be read together with the other management plans for the Ashford Park Quarry i.e.:

- 1. <u>Ashford Park Quarry Rehabilitation Strategy</u> [incorporates <u>Landscape Strategy & Pest Plan and</u> <u>Animal Control Plan</u>] (See **Appendix E**)
- 2. Ashford Park Quarry Planting Plan
- 3. Ashford Park Quarry Detailed Stage 1 Plan [to be prepared prior to excavation in Stage 2]
- 4. Ashford Park Quarry Detailed Stage 2 Plan [to be prepared prior to excavation in Stage 3]
- 5. <u>Ashford Park Quarry Detailed Stage 3 Plan</u> [to be prepared prior to excavation in Stage 4]
- 6. <u>Ashford Park Quarry Detailed Stage 4 Plan</u> [to be prepared prior to completion of Stage 4]
- 7. <u>Ashford Park Ecological Island Plan</u> [to be prepared prior to commencement of Stage 2]

The relationship between these rehabilitation plans is set out below:



ASHFORD PARK REHABILITATION PLAN



10.19 ECO-ISLANDS

[KCDC Consent Condition 11(o) "Creation of the Ecological Islands and protection of areas of significant vegetation to ensure compliance with Conditions 51-56, in consultation with a suitably qualified and experienced ecologist"]

GBC Winstone will prepare, in in consultation with a suitably qualified and experienced ecologist and prior to the commencement of excavation of Stage 2, an Ecological Island Plan to identify:

- a. Fencing and other methods to protect significant vegetation areas (which will form the Ecological Islands) that are to be retained from site works/excavation including, but not limited to the planting of 4m buffer strip;
- b. Formation and timing of creation of the Ecological Islands (to be progressively implemented as a result of excavation and rehabilitation of Stages 2-4);
- c. Species, plant numbers and timing of the Mitigation Planting, (including restorative planting, riparian dry zone, emergent and submerged planting) on the Ecological Islands;
- d. Provision for planting notes and infill planting at years 1, 2 and 3 to ensure Mitigation Planting on the Ecological Islands will become successfully established;
- e. Initial and ongoing provision for weed and pest control for the Ecological Islands and grasslands; and
- f. Provision for future ongoing management of the Ecological Islands once fully established via a QEII Management Plan or similar mechanism.



10.20 PEST PLANT AND ANIMAL CONTROL PLAN

[KCDC Consent Condition 11(p) "The weed and pest animal management programme required under condition 44"]

The Pest Plant and Animal Control Plan will be prepared as part of the over-arching quarry Rehabilitation Strategy (see **Appendix E**).

10.21 PUBLIC ACCESS

[KCDC Consent Condition 6 "The consent holder shall provide a pedestrian/cycle access that is available to the public to a minimum width of 3m along the northern/eastern boundary of the site from Te Roto Road to the property boundary adjacent to of the Ōtaki River Corridor. This pedestrian/cycle access shall be put in place prior to the commencement of excavation on the site, shall be fenced off from the excavation area and shall remain in place until the completion of the Rehabilitation Works required under Conditions 44-48"]

[KCDC Consent Condition 7 "The consent holder shall ensure that the paper road is fenced off from the extraction area at all times. The consent holder shall provide a safe pedestrian crossing point with appropriate warning signs and traffic management at any place the quarry vehicles need to cross the paper road"]

GBC Winstone shall comply with the requirements of KCDC Consent Conditions 6 and 7.

10.22 PEST PLAN AND ANIMAL CONTROL PLAN

[KCDC Consent Condition 11(q) "The weed and pest animal management programme required under condition 44"]

Please refer to the Pest Plan and Animal Control Plan included in the Rehabilitation Strategy (**Appendix E**).

11 MANAGEMENT OF DUST

[KCDC Consent Condition 11(d) "Dust management measures and triggers for active dust suppression" & Condition 11(n) "The avoidance of offensive or objectionable dust beyond the boundary of the site, to ensure compliance with Conditions 34-36"]

11.1 DUST MANAGEMENT MEASURES

TRAINING

• Successful dust management depends on appropriate actions by site personnel in day to day operations at Ashford Park. Training will be provided to staff and contractors during site inductions and regular environmental meetings will provide a forum to discuss:



- On site practices relating to minimising dust emissions
- Procedures for reporting and dealing with dust emissions as they arise.
- Records of staff training are kept at the site office and updated regularly as training proceeds.
- GBC Winstone personnel and all contractors operating on site will be made aware of all potential adverse effects of dust emissions and shall be proactive in identifying actual and potential dust sources.
- Job descriptions and annual training reviews will identify individual staff training requirements in aspects of dust control. The Otaki Quarry Manager will oversee training, and ensure that it is appropriate. A record of staff training will be maintained and kept at the Otaki Quarry site office.
- The Otaki Quarry Manager will ensure that any training provided by contractors to their own staff also meets the requirements with respect to dust control.

PROCESS FOR REPORTING

- All staff are trained to be vigilant in identifying conditions that are either are, or could result in objectionable dust spreading beyond the boundary of the site. Such conditions can include both dry periods and / or the operation of heavy machinery.
- The process following identification of a dust issue, or potential dust issue, is that the site manager (or acting site manager) is immediately advised and he or she then responds accordingly. Options for resolving the dust issue can include:
 - directing the site water cart to the area to dampen down the dust;
 - Stopping on-site activity that is causing the dust issue; and
 - \circ $\;$ Altering on-site processes so that any dust effect is minimised.

GENERAL OPERATIONS

• All crushing and/or processing will occur on the main Otaki Quarry site, not at the Ashford Park site.

DISTURBED GROUND / BUND CONSTRUCTION

- Water and / or dust suppressants can be used on all disturbed surfaces when required.
- A water tanker is available for use at Ashford Park during dry periods.
- Areas of exposed ground will be minimised both during bund construction and during regular quarry operations.
- Mulching, grassing and / or planting of bare areas such as bunds and rehabilitated areas shall be undertaken as soon as reasonably practicable.
- Disturbed areas will be progressively stabilised.
- Construction (excluding the application of mulch, seeding etc) of the bund adjacent to Stages 1A and 1B will not take place when the wind is blowing from the southeast quarter at a speed exceeding 5 metres per second, unless it is raining. A wind speed monitor will be positioned on the Ashford Park site, south-east of Stages 1A and 1B. This position was chosen following



expert advice from Aecom dust experts. The Otaki Quarry Manager and/or the Southern Operations Manager will receive automatic alerts when the above parameters are exceeded and will take action as quickly as practicable.

TRANSPORT AND HAULAGE

- On-site vehicles shall not exceed 30km/h and appropriate signage advising of this will be erected. Drivers that exceed 30km/h are subject to disciplinary action.
- The main haul road will be regularly graded to maintain an even surface with potholes and bumps smoothed over as soon as is reasonably practical. The main haul road surfaces on the Ashford Park site will be covered with metal. Daily inspections of the haul roads will be undertaken to identify any surface deterioration that may result in increased dust generation. Site personnel will be encouraged to immediately report any deterioration of the haul road surface.
- Haul roads will be regularly watered using the water cart during dry periods. In the event the water cart breaks down a replacement will be sourced as soon as practicable.
- Haul routes will be generally restricted to the shortest possible travel distance along defined travel routes.
- When loading material onto trucks, drop heights from excavators shall be minimised as much as practicable to limit dust emissions.
- Dust emissions may be caused by the spillage of material from a truck either on site or once the truck has exited. Spilled material could further act as a source of dust emission if it is crushed by traffic movements. Spillage from trucks will be minimised by not overloading or otherwise incorrectly loading trucks. Any spilled material noted or reported to the quarry within the sealed area of the site or in the general vicinity of the quarry, once the truck has left the site, will be promptly cleaned up.
- Winstone ensures that all its vehicles do not have downward facing exhausts as these may act to raise dust in dry conditions. All GBC Winstone vehicles are regularly maintained to ensure minimum emissions.
- All drivers will be advised to maintain a good following distance between vehicles using the site haul roads to minimise the potential for cumulative dust emissions arising from closely traveling vehicles.

11.2 REVIEW OF DUST MANAGEMENT MEASURES

GBC Winstone's procedures in respect of dust management will be reviewed annually for the duration of the consent. Review parameters will include, but not be limited to:

- Any internal and external audit reports;
- Reports of Council officers;
- Environmental incident reports; and
- Complaints received.



Furthermore, GBC Winstone carries out periodic internal reviews. These are typically undertaken by senior GBC Winstone personnel.

12 MANAGEMENT OF NOISE

[KCDC Consent Condition 11(I) "The construction and formation of the noise attenuating bunds on the northern and western boundaries (including the planting, watering and maintenance of the bunds) to ensure compliance with Conditions 22-25"]

12.1 CONSTRUCTION NOISE

As set out in KCDC *Condition 26* construction noise includes any work required to prepare the site for excavation and rehabilitation works. In particular, activity associated with the removal of trees, construction of bunds, haul road and stopbank crossing and stripping/reinstatement of topsoil shall be considered construction activities.

All construction work on the site shall be designed and conducted to ensure that construction noise from the site does not exceed the noise limits measured and assessed in accordance with the provisions of NZS 6803: 1999 Acoustics- Construction noise (see Table 1 below). If the construction programme indicates that construction works for the stage will occur for longer than 20 weeks then the limits for the whole stage shall be those shown alternatively in brackets for the relevant times.

Table 1: New Zealand Standard NZS 6803: 1999 "Acoustics - Construction Noise" Recommended upper limits for construction work noise received in dwellings in rural areas: Typical term duration

	Weekda	ys (dBA)	Saturda	ys (dBA)	Sundays a Holiday	and Public vs (dBA)
Period	Leq	Lmax	Leq	Lmax	Leq	Lmax
0630-0730	60 (55)	75	45	75	45	75
0730-1800	75 (70)	90 (85)	75 (70)	90 (85)	55	85
1800-2000	70 (65)	85 (80)	45	75	45	75
2000-0630	45	75	45	75	45	75

12.2 CONSTRUCTION NOISE MANAGEMENT PLAN

To comply with the construction noise standards all earth moving equipment will be maintained to an acceptable standard. Any defects in fitted noise suppression will be repaired prior to undertaking further works. Operators of noisy machinery will be instructed in noise mitigation techniques.



Excessive engine revving, excess use of horns or other audible devices will not be tolerated. GBC Winstone vehicles and other mobile machinery (e.g. excavators and loaders) are fitted with broadband reversing alarms which emit white noise and are far quieter than beepers. When loading material onto trucks, drop heights from excavators shall be minimised as much as practicable to limit noise emissions.

All earth moving equipment will be selected to avoid excessively noisy equipment and the number of earth moving machinery used at any one time will be sufficient for the work to be undertaken in a timely and efficient manner.

Where practicable, noisy operations will be carried out at times when noise effects to residents in the vicinity are minimised.

It is noted that construction activities are limited to works required to prepare the site for excavation including the construction of the stopbank crossing, construction of bunds A and B and stripping of topsoil.

The loader and dump trucks working on the site will be fitted with broadband directional reversing beepers.

12.3 OPERATIONAL NOISE

Extraction will not occur on the Ashford Park site if the dragline is operating on the Otaki Processing site. Construction activities on the Ashford Park site will not occur at the same hours as the dragline is operating on the Otaki Processing site.

Noise associated with the extraction activity on the site shall not exceed the following limits measured at any point within the notional boundary (as defined in NZS6801: 2008) of any dwelling existing at the date of commencement of the consent:

Period	Leq
0700-2200	50 dB
2200-0700	45 dB

During all night time hours (10pm - 7am) no noise event shall exceed LAFMax 75 dB.

<u>Note</u>: The identification of hours between 10pm - 6am is purely for when extraordinary works are being undertaken in accordance with KCDC Condition 21 i.e.:

- Emergency works (as defined by the Resource Management Act 1991);
- Dust suppression; and
- Security requirements.



<u>Note</u>: The notional boundary is defined in NZS6801: 2008 as a line 20 metres from any side of a dwelling or the legal boundary where this is closer to the dwelling.

<u>Note</u>: The data measures and units used have been updated to reflect the terminology used in NZS 6801:2008 and NZS 6802:2008

13 MONITORING & REPORTING

13.1 REPORTING SUMMARY TABLE

	REPORT	DUE
1.	Water Quality Monitoring Report	Quarterly
2.	Geotechnical Report	Post-initial cut of face adjacent to stopbank
3.	Groundwater / Hydraulic Properties Report	Within two years of the excavation being completed within the zone closest to the Otaki River, as shown on the plan titled "Crystalls Bend Ōtaki River Ōtaki – Limit of Excavation along site boundaries" drawing no. W15015- 001 dated 20 January 2016
4.	OMRC / Stage 3 Impact Report	Following monitoring of 3 OMRC Races / Trial Days in Stage 3.
5.	Gravel Extraction Report	Annually (1 November)
6.	Annual Water Quality Report	Annually (1 November)
7.	Restoration Monitoring Report	Annually
8.	Complaints Reporting	Annually (as an addendum to the Restoration Monitoring Report)

13.2 WATER QUALITY MONITORING

Intercepting the water table increases the potential of groundwater contamination from activities on the surface of the water (e.g. birds). The intent of water quality consent conditions (see below) is to:

• Monitor the levels of contaminants in the groundwater at the boundary of Ashford Park, downgradient of the lake to determine if the levels of e.coli are low enough to ensure die-off before reaching the closest private bore (72 Te Roto Road)



- Monitor surface water at Ashford Park to determine if any groundwater contamination is due to contamination of the surface water, or if it is from another source (e.g. upstream activities beyond Ashford Park)
- Continue to monitor the effects of the activity on an annual basis as excavations progress.

[GWRC Consent (35062) Conditions 13-15 & (35063) "The consent holder shall take water samples from the following two locations on the same day at intervals not greater than 3 months unless a different frequency is agreed to in writing by the Manager, Environmental Regulation, Wellington Regional Council:

- (a) Groundwater from Bore BN33/0023 (on the boundary of Ashford Park and 72 Te Roto Rd); and
- (b) Surface water from the lake being created by the consent holder's extraction activities at Ashford Park.

The samples shall be analysed for:

- (a) Escherichia coli (cfu/100ml); and
- (b) Total Petroleum Hydrocarbons (g/m3).

These parameters may be amended as agreed with the Manager, Environmental Regulation, Wellington Regional Council.

All samples shall be analysed within two days of collection, and in accordance with the latest edition of "The standard Methods for the Examination of Water and Wastewater" APHA, AWWA, WPCE, or such other standards as may be approved by Wellington Regional Council.

The results of sample analyses shall be forwarded to Wellington Regional Council, the Community Liaison Group and Kapiti Coast District Council within a week of the samples results being received by the consent holder.

Note 1: The results of any water quality analyses can be sent to notifications@gw.govt.nz. Please include the consent reference (WGN160103 [35062] / WGN160103 [35063]) and the name and phone number of a contact person responsible for the results.

Note 2: The basis for Condition 13 is taken from KCDC land use consent RM150184 Condition 61. RM150184 authorises the extraction of gravel, removal of vegetation and earthworks of Ashford Park and was a notified consent, meaning that the conditions of consent incorporate the views of all parties to the hearing.

Condition 14 The consent holder shall ensure all water samples are taken by a suitably trained person, are as per the latest edition of "The standard Methods for the Examination of Water and Wastewater" APHA, AWWA, WPCE and the Ashford Park Water Sampling Plan approved by Wellington Regional Council (September 2017).



Condition 15 The consent holder shall ensure all water samples are taken by a suitably trained person, are as per the latest edition of "The standard Methods for the Examination of Water and Wastewater" APHA, AWWA, WPCE and the Ashford Park Water Sampling Plan approved by Wellington Regional Council (September 2017).

Note: Local rainfall data can be obtained from the closest operational Wellington Regional Council rainfall monitoring site as listed at www.graphs.gw.govt.nz

Note: The results of any water quality analyses and/or monitoring must be sent to notifications@gw.govt.nz. Please include the consent reference (WGN160103) and the name and phone number of a contact person responsible for the results."

[KCDC Consent Condition 58(b) "The consent holder shall ensure that a suitably trained person collects representative water samples in accordance with the latest edition of "The standard Methods for the Examination of Water and Wastewater". Samples shall be taken on the boundary of the Ashford Park site with 72 Te Roto Road with the exact sampling site to be agreed with KCDC. This monitoring requirement shall commence within 6 months of the opening up of surface water at Ashford Park.

The permit holder shall provide the contact details of the person or company who will be undertaking the sampling to KCDC, and advise within 7 days of any change.

The samples shall be analysed for:

- (a) Faecal Coliforms (cfu/100ml); and
- (b) Total Petroleum Hydrocarbons (g/m3).

These parameters may be amended as directed by KCDC.

All samples will be analysed within two days of collection, and in accordance with the latest edition of "The standard Methods for the Examination of Water and Wastewater" APHA, AWWA, WPCE, or such other standards as may be approved by KCDC.

The results of sampling shall be forwarded to Greater Wellington Regional Council, the Community Liaison Group and KCDC within a week of the samples results being received by the consent holder."

Water samples will be collected by a GBC Staff member in accordance with the *Standard Methods for the Examination of Water and Wastewater*, a comprehensive reference covering all aspects of water and wastewater analysis techniques. Standard Methods is used by many New Zealand organisations (e.g. Landcare Research and Hill laboratories) and is a joint publication of the American Public Health Association (APHA), the American Water Works Association (AWWA).

Once collected samples will be packaged in accordance with the above standard and sent to an independent laboratory for testing.



13.3 WATER QUALITY LIMITS

[GWRC Consent (35062) Condition 16 "Should the measured value of E.coli at the groundwater bore BN33/0023 be greater than the alert level (>260cfu/100mL) for Recreational Water Quality and a similar or greater E.coli count is measured in the surface water sample of the excavated lake, then the consent holder shall:

- Immediately advise the Manager, Environmental Regulation, Wellington Regional Council within 48 hours of receipt of the results;
- Immediately begin an investigation into the cause of the elevated E. coli in the groundwater bore and surface water. The investigation is to include, but is not limited to; activities at Ashford Park, rainfall in the past 48 hours, stock access to Ashford Park, additional water quality monitoring;
- Within one month of receipt of the elevated sample results, submit a report to the Manager, Environmental Regulation, Wellington Regional Council on the investigation undertaken, any potential sources of contamination identified, and any remedial measures that shall be undertaken to mitigate any adverse environmental effects.

Note 1: The report and notification must be set to notification@gw.govt.nz. Please include the consent reference (WGN160103 [35062] / WGN160103 [35063]) and the name and phone number of a contact person responsible for the report)."

13.4 ANNUAL WATER QUALITY REPORT

[GWRC Consent (35062) Condition 17 "Should From 2018, the consent holder shall provide an annual report which analyses the water quality sample results as required under condition (13) and assess the results for any trend against all water quality samples taken to date. The trend analysis shall look at any increases or decreases in E.coli and total petroleum hydrocarbon samples, and the relationship between the groundwater and surface water results. The analysis should also consider weather conditions and rainfall at the time of sampling as required by condition (15). The report shall be submitted to the Manager, Environmental Regulation, Wellington Regional Council, by 1 November each year.

Note 1: The report can be submitted with the annual gravel extraction report required by condition (12) of consent WGN160103 [35062] and condition (14) of WGN160103 [35063].

Note 2: The report must be set to notification@gw.govt.nz. Please include the consent reference WGN160103 [35062] / WGN160103 [35063] and the name and phone number of a contact person responsible for the report."

13.5 FLOOD PROTECTION

[KCDC Consent Conditions 57-58]



GEOTECHNICAL REPORT

During the cutting of the 'face' of the excavation adjacent to the stopbank, an inspection will be undertaken by a suitably qualified geotechnical engineer. GBC Winstone will then prepare a report to Greater Wellington Regional Council and KCDC:

- 1. Confirming that the stratigraphy and material properties are consistent with those used in GBC Winstone's modelling; or
- 2. Any change to the excavation methodology to address local conditions and mitigate any risk or adverse effect.

GROUNDWATER / HYDRAULIC PROPERTIES REPORT

Two vibrating wire piezometers shall be installed at each of two locations evenly spaced between the edge of the proposed excavation and the toe of the stopbank in the zone closest to the Ōtaki River as shown on the plan titled "Crystalls Bend Ōtaki River Ōtaki – Limit of Excavation along site boundaries" drawing no. W15015-001 dated 20 January 2016 (see **Appendix D**). One piezometer shall be located in the shallower medium dense gravels, and one in the deeper dense gravels. These piezometers will be monitored at not more than 30-min intervals during a range of flood events with magnitudes up to at least the mean annual flood as recorded at the Pukehinau gauging station. The data will be reviewed by an appropriately qualified person to confirm that the groundwater conditions and hydraulic properties monitored are consistent with those used in the various seepage and stability models relied upon by GBC Winstone, and that the behaviour of the groundwater during floods is as modelled.

Should conditions be found which are different to those assumed in the modelling, and have the potential to affect stability adversely, additional piezometers will be installed at approximately 200m intervals along the boundary with the Otaki River and remedial measures shall be proposed for approval by the consenting authority.

A report shall be submitted to Greater Wellington Regional Council and the Resource Consents Compliance Manager, KCDC within two years of the excavation being completed within the zone closest to the Otaki River, as shown on the plan titled "Crystalls Bend Ōtaki River Ōtaki – Limit of Excavation along site boundaries" drawing no. W15015-001 dated 20 January 2016, confirming that these groundwater conditions and hydraulic properties are consistent with those used in the modelling, or any change to the excavation methodology to mitigate potentially adverse local conditions.

EXCAVATION LIMITATION

Excavation will not encroach closer than 14.7m to the toe of the existing stopbank (as at January 2016 – see plan at **Appendix D** below).

The maximum slope angle of any excavation adjacent to the Chrystalls Bend Stopbank shall not exceed 45 degrees.



13.6 OTAKI MAORI RACING CLUB

[KCDC Consent Condition 18 "The consent holder shall ensure that all the first three race meetings and/or trial days after Stage Three commences in the area identified in the stage plan as having the potential to have impacts on racing activities are monitored by a suitably qualified and experienced independent person(s) to ensure that the horses are not unduly affected by the quarry operational activities."

[KCDC Consent Condition 19 "The consent holder shall address any matters identified through this monitoring with the Ōtaki Māori Racing Club and implement any necessary measures to address any matters identified by the monitoring prior to the running of the next race meeting and / or trial day. A report outlining the monitoring undertaken, the matters identified, the engagement with the Ōtaki Māori Racing Club and the measures implemented in response shall be provided to the Team Leader Development Control KCDC within one month of the completion of the monitoring."

Prior to the conclusion of Stage 2 GBC Winstone will meet with representatives of OMRC to establish when the first three race meetings taking placing during Stage 3 extraction are planned. GBC Winstone will consult with OMRC on identifying a suitably qualified and experienced independent person(s) to monitor the first three race meetings likely to be affected by Stage 3 operations. Further meetings will be arranged by GBC Winstone to discuss with OMRC any issues arising out of the monitoring undertaken at the first three race meetings taking placing during Stage 3 extraction.

13.7 ANNUAL GRAVEL EXTRACTION REPORT

[GWRC Consent Condition 14 "The consent holder shall provide a report detailing the amount, location and extent of gravel extraction, including plans and cross sections, to the Manager, Environmental Regulation, Wellington Regional Council, by 1 November each year"]

GBC Winstone will comply with the reporting requirement set out in GWRC Consent Condition 14 and in addition make a copy of the report available to KCDC the members of the Community Liaison Group.

13.8 RESTORATION MONITORING REPORT

[KCDC Consent Condition 46 "The consent holder will prepare an annual restoration monitoring report to be submitted to the Resource Consents Compliance Manager (KCDC), as part of the SMP monitoring in Condition 10. The monitoring shall include the following;

- success rates;
- recommendations for replacement of dead plants and implementation of these recommendations;
- remedial action to be implemented where monitoring indicates the specified standards are not being met"]

GBC Winstone will comply with the reporting requirement set out in KCDC Consent Condition 46.



13.9 REPORTING OF COMPLAINTS

[KCDC Consent Condition 14 "A report containing a record of any complaints shall be provided to the Manager Resource Consents Compliance, KCDC and the CLG annually as part of the monitoring programme in SMP and upon request at any time"]

GBC Winstone will keep a record of all complaints made regarding operations at both the Otaki Quarry and Ashford Park. GBC Winstone will comply with the reporting requirement set out in KCDC Consent Condition 14 by sending these records to KCDC and the Community Liaison Group on an annual basis.

14 SPILL CONTINGENCY

[KCDC Consent Condition 11(i) "Emergency and spill contingency plan including a description of how accidents and spills will be avoided, course of action if something goes wrong, contacts details and how it will be cleaned up, location and type of spill kit"]

14.1 INVENTORY OF HAZARDOUS SUBSTANCES USED ON SITE

LUBRICANTS AND OILS

Lubricants and oils are present in on-site equipment including excavators, loaders and dump trucks and are potential environmental contaminants. This includes greases as well as hydraulic, engine, and transmission oils.

DIESEL

Diesel fuel is present in all on-site machinery and is identified as a potential environmental contaminant.

14.2 SAFETY

The safety of people overrides all other considerations. In the event of spillage of flammable or explosive hydrocarbons, all sources of ignition must be shut down and the area checked for flammable vapours before deploying machinery in the area. Operations in conditions that endanger personnel must be suspended until conditions improve.

Personnel involved in a clean-up must be appropriately trained and issued with the appropriate protective clothing and safety equipment.

All actions taken by personnel with regard to procedures within this plan shall be in accordance with GBC Winstone Health and Safety policy.

14.3 POTENTIAL SPILL SOURCES AND RISKS



The presence of diesel and other hazardous substances present on site are considered to have a low potential risk of environmental impact due to spills, as there is generally an opportunity to prevent the spill from getting into open water and ground water. The following are situations where there is potential for a spill of oil onto land:

- Re-fuelling (excavators) and servicing (excavators)
- Rupture (e.g. hydraulic line)
- Vandalism
- Equipment malfunction

Spill procedures set out below have taken into consideration all the different potential spill scenarios. It is not considered necessary to have different spill procedures for each scenario.

14.4 PREVENTATIVE MEASURES IN PLACE

Re-fuelling of the loaders and dump trucks occurs at a bulk diesel storage tank located within the Otaki Quarry site. Excavators will be re-fuelled within the Ashford Park Quarry site. When re-fuelling, the plant operator is required to remain in attendance in accordance with GBC Winstone's standard operating procedure for re-fuelling.

Additional measures to prevent spills include:

- All mobile plant is locked overnight.
- Regular preventative maintenance is carried out on all mobile plant to ensure plant failure is minimised.
- There are weekly checks of all mobile plant, which are signed off by the Otaki quarry manager.
- Plant operators are required to inspect their vehicles daily for any obvious signs of wear and tear.
- Any major equipment failures are reported to the Otaki quarry manager as soon as possible.

Servicing of loaders and dump trucks will generally take place within Otaki Quarry. There may be occasions when mobile plant will be serviced within the Ashford Park Quarry site for example due to breakdowns when it is not possible to move the plant or when it is more practical to service the equipment within Otaki Quarry. At such times appropriate measures must be in place to contain any potential spill from servicing.

14.5 CATEGORY OF SPILLS

There are three categories of spills (or incidents) depending upon whether or not the spill has the potential to cause an adverse environmental effect. An incident is an event which:

- a. results in a non-compliance with regulations or consents, and/or
- b. results in or has the potential to result in a significant adverse environmental effect, and/or
- c. is unpredicted and unplanned (non-conformance) and/or
- d. results in or has the potential to result in legal action or adverse public reaction



MINOR INCIDENCES

Slight leak/spill:

- Generally less than 20 litres of lubricant, oil or diesel spilt and contained on land and
- No significant environmental effect.

SERIOUS INCIDENCES

Minor or localised leak/spill:

- Generally less than 20 litres of lubricant or oil spilt into a watercourse or
- 100 litres of diesel spilt on land or into a watercourse and
- Significant environmental effect but limited to within the site boundary.

CRITICAL INCIDENCES

Major leak/spill:

- Generally greater than 20 litres of lubricant or oil spilt into the into a watercourse or
- More than 100 litres diesel spilt into a watercourse or land and
- Significant environmental effect outside the site boundary.

14.6 SPILL RESPONSE PROCEDURES

The procedures below are intended to cover all spill scenarios and categories identified in previous sections.

IMMEDIATE RESPONSE (ALL SPILLS)

The person who discovers the spill will make an initial assessment of the spill including:

- what has been spilled
- approximate volume or size of the spill
- whether spill has entered a watercourse
- likely source of the spill and
- whether the spill is still occurring

If less than 20 litres has been spilled and spill will not enter a water way then follow Spill Response Procedure for Minor Incidents.

If greater than 20 litres then the Otaki quarry manager should be informed of the spill as soon as possible and staff should follow the General Spill Response Procedure for Serious and Critical Incidents.

The Otaki quarry manager shall make an assessment of the significance of the spill and its potential for adverse environmental effects as soon as possible. The spill shall be categorised in accordance with



the requirements of this SMP and the appropriate action and reporting taken as set out in the Spill Response Procedures.

SPILL RESPONSE PROCEDURE FOR MINOR INCIDENTS

- a. Stop the source of the spill. Shut valves, switch off engines, machinery, block leaks.
- b. Contain the spill. Catch in container, cover with absorbent material, sand, fines. Stop from spreading by surrounding with an absorbent sock.
- c. Commence clean-up of spill immediately to limit soakage to the ground or escape to surface water.
- d. Mop up spill with sand and /or absorbent material in spill response kit and remove contaminated material in secure container.
- e. Excavate contaminated soils and store in a secure location.
- f. Report details of spill to Otaki quarry manager as soon as practical.
- g. Otaki quarry manager is to arrange for appropriate removal off site.

Otaki quarry manager is to record the spill in JobSAFE describing the incident and the action taken to prevent it occurring again. The spill should also be reported in the monthly environmental report.

SPILL RESPONSE PROCEDURE FOR SERIOUS AND CRITICAL INCIDENTS

- a. If the spill is still occurring, try and locate its source, estimate size and likely volume.
- b. If spill source located, take immediate steps to limit any further spillage e.g. shutting down pumps, closing valves or taking whatever action is appropriate (as long as it is safe to do so).
- c. Inform Otaki quarry manager as soon as practicable. The Otaki quarry manager shall make an assessment of the significance of the spill and its potential for adverse environmental effects as soon as possible.
- d. If spill is onto land, contain spill and mop up spill with sand and/or absorbent material from spill response kit and remove contaminated material in secure container.
- e. If the spill is being carried in water, contain it by placing an absorbent sock ahead of the flow.
- f. If possible once the spill is contained, use absorbent pads to skim all spillage from the surface of the water.
- g. Once the spill has been categorised by the Otaki quarry manager the spill shall be reported as set out below.

REPORTING

If the Otaki quarry manager is unsure of the potential for adverse environmental effects then GBC Winstone Senior Management shall be informed of the incident as soon as possible as if the spill is a serious incident.

For all Minor Incidents the Otaki quarry manager should record the spill in JobSAFE and monthly environmental report.



For all Serious Incidents the Otaki quarry manager must report it immediately to the owners of properties immediately neighbouring the Ashford Park site, the GBC Winstone Environment Manager and GBC Winstone Southern Operations Manager.

For all Critical Incidents the Otaki quarry manager must report it immediately to the owners of properties immediately neighbouring the Ashford Park site, Regulatory Authorities (Greater Wellington Regional Council and KCDC), the Resource and Environment Manager and GBC Winstone Southern Operations Manager. GBC Winstone will discuss any required remedial measures with both Greater Wellington Regional Council and KCDC. These actions could include, but not be limited to, regular monitoring of groundwater.

The Otaki quarry manager must investigate the incident and report it in JobSAFE. This record should include the following information:

- a. why the spill occurred
- b. the extent of the spill
- c. the effects on the environment
- d. the measures taken to control and clean up the incident and
- e. actions taken to avoid re-occurrence.

Within two weeks of any Serious or Critical Incident, the GBC Winstone Environment Manager and the Otaki quarry manager are to carry out a debriefing to assess all matters relating to the spill and the responses. The main purpose of the debriefing shall not be to apportion blame but to reduce the risk of a similar spill occurring in the future and establish if any improvements can be made to spill responses.

POST-INCIDENT MONITORING

GBC Winstone will work closely with KCDC following all serious or critical incidents and ensure best practice post-incident monitoring is implemented. This may include regular monitoring of groundwater.

14.7 SPILL RESPONSE EQUIPMENT AVAILABLE ON SITE

LAND-BASED SPILLS

The spill kits for land-based spills (e.g. engine oil or diesel) contain Spill-Sorb, a non-toxic, field proven, industrial absorbent. Spill-Sorb is spread over the affected area as quickly and evenly as possible to a sufficient depth to allow for immediate absorption. After use the absorbent/spill mix can be containerised for removal; either to be incinerated or sent to a land fill. A spill kit will be located on the Ashford Park site at all times. Three further spill kits are available on the adjacent Otaki Quarry site.

WATER-BASED SPILLS



Both Spill Sorb and floating booms will be used to contain any water-based spill (e.g. oil). Spill-Sorb is scattered across the surface of the water to a sufficient depth so as to ensure that full absorption will take place. Spill Sorb floats and the contaminated material will be contained using floating booms before being removed for disposal. The spill kit to be located on the Ashford Park site will contain containment booms.

14.8 EQUIPMENT AND OPERATORS AVAILABLE ELSEWHERE

The Greater Wellington Regional Council has equipment and resources to deal with spills that are considered more significant than GBC Winstone can cope with itself. Greater Wellington's Environmental Protection Team manages pollution via a 24-hour, 7-day incident response service. To report an incident, phone the environmental protection team on 04 384 5708, 06 378 2484 or freephone 0800 496 734.

15 COMMUNITY LIAISON GROUP

[KCDC Consent Condition 62]

The purpose of the Community Liaison Group ("CLG") is to provide input into all management plans and strategies for the site and provide a forum to present monitoring results and updates on project progress. The CLG is to be set up by GBC Winstone (at its cost) and will operate in accordance with the following:

- 1. Meetings shall be held twice annually;
- 2. The CLG Terms of Reference must be provided to the Resource Consents Compliance Manager at KCDC within 6 weeks after the CLG's first meeting;
- 3. The first meeting shall occur at least 15 working days prior to the submission of the Site Management Plan to KCDC for certification;
- 4. Meetings shall be chaired by an independent facilitator who will:
 - a. Provide an indicative agenda;
 - b. Note points of discussion and input to plans;
 - c. No more than 5 working days following each CLG meeting provide minutes of the meeting to all parties for comments; and
 - d. Provide a record of the input provided when plans or strategies are presented for certification.
- 5. Each CLG meeting must have as a minimum:
 - a. Two representatives from Te Roto Road residents and / or submitters on GBC's Ashford Park consent application to KCDC;
 - b. A representative from GBC Winstones;
 - c. A representative from Greater Wellington
 - d. A representative from Ngā Hapū o Ōtaki
 - e. A representative from OMRC; and
 - f. A representative from and Friends of the Otaki River.
- 6. Any plans or strategies to be provided to all parties at least 3 working days prior to the meeting.



16 ASHFORD PARK WEBSITE

[KCDC Consent Condition 63 - Prior to the commencement of construction, the consent holder shall establish a webpage on their own website or a separate website, the function of which will be to be a portal for all reports, plans and strategies to be available to the CLG and all other interested parties. As a report, plan or strategy is certified, the consent holder shall ensure that it is loaded onto the website/page within the next two working days. The website/page shall be maintained throughout the construction, excavation and rehabilitation stages.]

GBC Winstone will ensure compliance with KCDC Consent Condition 63. The webpage can be viewed at www.winstoneaggregates.co.nz/sites-locations/otaki/.

17 EMERGENCY WORKS

Circumstances may arise whereby it is necessary to carry out operations beyond the normal hours of operation set out in *KCDC Consent Condition 20* (see Clause 9.1 above). These operations are defined as:

- 1. Emergency works (as defined in the Resource Management Act 1991);
- 2. Dust suppression; and
- 3. Security requirements

If any emergency works are to be undertaken, neighbours potentially affected by the noise of these works will be notified by GBC Winstone, whenever practicable, prior to the work commencing.

18 ASHFORD PARK - NON-QUARRIED AREAS

GBC Winstone recognises that significant parts of the Ashford Park property will either not be quarried for many years or alternatively not quarried at all. GBC Winstone is a responsible landowner and will therefore ensure that areas of Ashford Park not being quarried will be maintained to an acceptable rural standard. This will include, but will not be limited to, pest control, effective management any site tenants and the maintenance of fencing.

19 SITE MANAGEMENT PLAN REVIEW

Condition 10(g) of the KCDC consent requires that the SMP include provision for the SMP to be reviewed and revised by a suitably qualified or experienced person to maintain on-going best practice for site operations in terms of avoidance and control of adverse effects.

This SMP will be reviewed annually for the duration of the consent. Review parameters will include, but not be limited to:

- Any internal and external audit reports;
- Reports of Council officers;


- Review of work practices against industry best practice;
- Environmental incident reports; and
- Complaints received.

Furthermore, GBC Winstone carries out periodic internal reviews. These are typically undertaken by senior GBC Winstone personnel.

APPENDIX A – ASHFORD PARK PLANTING PLAN





APPENDIX B – STAGING PLAN





APPENDIX C – STOPBANK CROSSING PLAN





APPENDIX D – LIMIT OF EXCAVATION PLAN





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APPENDIX E - REHABILITATION STRATEGY



Ashford Park Gravel Extraction Rehabilitation Strategy

23 November 2016

Revision Record:

Date of Revision	Version	Summary of Revision
November 2016	1	N/A – Version 1

CONTENTS

1.0	Intro	duction1
1.1	Purp	pose 1
1.2	Bacl	kground 1
2.0	Locat	ion and Context of Extension to Ōtaki Quarry2
2.1	Loca	ation 2
2.2	Land	dscape Context 2
2.3	Land	dscape Policy Context 2
3.0	Facto	ors Influencing Rehabilitation4
3.1	Geo	logy and Soils 4
3.2	Slop	9e 4
3.3	Veg	etation and Ecology 4
3	.3.1	Vegetation
3	.3.2	Aquatic
3	.3.3	Avifauna 5
3	.3.4	Herpetofauna
3	.3.5	Invertebrates
3.4	Clim	nate
3.5	Broa	ad Design Considerations
4.0	Reha	bilitation Objectives8
4.1	Ove	rview
4.2	Obje	ectives
4.3	Wat	er Quality
4.4	Tim	eframes
5.0	Prop	osed Extraction Area and Staged Works10
5.1	Land	dscape Strategy 11
5	.1.1	Riparian Planting
6.0	Reha	bilitation Actions13
6.1	Veg	etation Protection
6.2	Stag	ing of Extraction Works
6.3	Veg	etation and Soil Removal and Stockpiling14
6.4	Ripa	arian Margins - Landform Modification15
6.5	Gro	und Preparation
6.6	Surf	ace Run-off
6.7	Nois	se Bunds

6.8	Island	d Rehabilitation 1	.7
6.9	Ripar	ian Planting1	.9
e	5.9.1	Riparian Wet Zones 2	20
e	5.9.2	Riparian Dry Zones 2	1
6.1	0 Pe	est Control 2	:3
e	5.10.1	Pest animals 2	:3
e	5.10.2	Pest plants 2	24
6.1	1 Ar	nimal habitat rehabilitation 2	4
e	5.11.1	Fish 2	4
e	5.11.2	Freshwater Mussels 2	4
e	5.11.3	Birds 2	25
7.0	Monit	oring and Review2	25
7.1	Moni	toring background 2	25
7.2	Moni	toring programme 2	26
7.3	Meth	10ds 2	:6
8.0	Mana	zement Action Summary2	27

1.0 Introduction

1.1 Purpose

This Rehabilitation Strategy describes the following:

- The location and landscape context of the proposed quarry site;
- General principles of quarry rehabilitation applied to dry and wet extraction; and
- The processes and stages of the proposed rehabilitation works.

The purpose of rehabilitation is to maintain and enhance the significant indigenous vegetation retained as part of 'eco islands', provide rehabilitation planting to mitigate the loss of significant vegetation and ensure the final waterbody form created as a result of the gravel extraction activity will maintain water quality and enable the modified quarried landform to be successfully re-integrated into the Ōtaki floodplain landscape. This will enable natural systems to be established, including native riparian vegetation along waterbody margins to facilitate the ongoing ecological health of the waterbody.

This long-term vision can be expressed as follows:

"To facilitate the successful rehabilitation of the site in a manner that accords with Winstone's Memorandum of Partnership with Nga Hapu O Otaki (see Appendix A) and will retain and enhance native species on islands and thriving native riparian vegetation along waterbody margins to maintain water quality and long term ecological health and successfully reintegrate quarried areas within the Ōtaki floodplain landscape"

1.2 Background

By its very nature, the rehabilitation of extraction activity is a lengthy and sequential process. The nature of site modification is such that there will be a gradual transition across the site. The commencement of each subsequent stage of extraction activity will enable rehabilitation works within each preceding stage to occur. Such rehabilitation must be planned to ensure rehabilitation works undertaken will remain undisturbed and take account of any ongoing operational constraints.

It is difficult to develop a detailed plan for the site up to 20 years in advance of the completion of the project and prior to the end use being established. Notwithstanding this, a key element of the rehabilitation strategy is to ensure suitable site conditions are created, particularly along the margins of the waterbody, including landform modification and planting, which will deliver effective rehabilitation in a sequential and planned manner. Such measures will utilise overburden and associated rehabilitation material to maximise the establishment of native riparian vegetation along the margins of the waterbody and ensure its long term ecological health.

In recognition of the long term sequential nature of the project, the precise nature of rehabilitation to be implemented following extraction activity is best determined at the end of each stage of development and prior to the commencement of each subsequent stage. This enables a process of responding to site conditions and adapting rehabilitation to optimise effective outcomes which best facilitate the future end use of the site. The foundation concepts and general approaches applied will be continually based on widely accepted best practice implemented as each successive stage is rehabilitated.

This document seeks to establish the overriding objectives and approaches required for successful rehabilitation to facilitate the site's future use. The resultant strategy informs the more detailed measures to be employed during the development and sets out the processes and principles to be followed in stage plans prepared following defined areas of extraction. Such rehabilitation will also include pest plant and animal control, planting and protection and enhancement of significant vegetation detailed in separate plans to ensure that the resulting rehabilitation will meet best practice, such as GWRC's 'So you're thinking about a pond' document.

In this document the term 'rehabilitation' is used rather than 'restoration'. Restoration implies returning the quarry to its former condition. The nature of a quarry operation is both destructive and extractive meaning that landform and landmass are removed and cannot be restored to their original form. In relation to the proposed Ashford Park extraction activities, the extraction below the water table will also result in the creation of a new waterbody. Despite this, landforms can be

created that are generally commensurate with broader landscape patterns and they can be engineered so that finished landforms are able to support and sustain ecological values which adapt to and enhance this environment.

2.0 Location and Context of Ashford Park

2.1 Location

The proposed extraction activity is located to the east of the existing Ōtaki Quarry between the Ōtaki River and the Ōtaki Maori Racing Club. The existing site is influenced by its use as a former horse stud farm, known as Ashford Park Stud. This includes horse paddocks enclosed by post and rail fencing with linear and specimen shelter tree planting, shallow water features and small remnants of indigenous forest. Occasional dwellings, auxiliary buildings and stables are also present, some of which have been adapted to accommodate alternate uses with others poorly maintained and contributing to an overall unkempt rural character. Low level grazing continues in some areas with sheep, cattle and horses with rough pasture and scrub in other areas. Most of this existing site character will be transformed during extraction activity.

The Ōtaki River is the most prominent river system in the Kāpiti District with distinct terraces, shifting gravel banks and wetland areas. Flood hazard control strategies influence parts of the river margins together with regenerating areas of riparian vegetation and podocarp forest. The river also supports seasonal habitat for fish and bird species and establishes an ecological corridor between the mountains and the sea passing to the south of the site. The Ōtaki Maori Racing Club is located along the northern boundary of the site and includes an open grass setting enclosed by shelter planting and large grandstands accessed off Te Roto Road. Rural lifestyle properties are also scattered throughout the area to the southeast of the Ōtaki Township and includes several dwellings along Te Roto Road and Rahui Road within the vicinity of the site.

2.2 Landscape Context

The site is part of the broader Ōtaki River floodplain which forms an extensive lowland plain extending between the Tararua foothills and the coast. Along the course of the river there is a sequence of river terraces stepping down to the river and these are a distinctive feature of this landscape.

Landforms throughout this area are typically underlain by marine sandstone, as is typical of all other lowland areas through the District. Here the 'top rocks' and soils are more obviously influenced by alluvial processes along the varying paths of rivers. To the east of SH1, alluvial processes dominate the landscape and are typified by a gradual sloping plain. The wide braided path of the river distinguishes this area and supports alluvial soil together with large grade gravels and distinct river terraces.

Following a significant period of milling (mainly totara), dairy farming, dry stock and intensive horticulture were established and these remain the predominant land use, setting up strong 'lines' in the landscape comprising of fences, shelter belts, irrigation races and drainage channels. The Chrystalls bend CWB extends along the margins of the Ōtaki River in the vicinity of the site and introduces recreation associations along the natural character and amenity values associated with the Ōtaki River.

2.3 Landscape Policy Context

A review of the existing landscape policy context relevant to quarry rehabilitation and within which the proposed impacts of extraction activity has been considered was set out in the Assessment of Landscape and Visual Effects included in Appendix F to the AEE accompanying the resource consent applications. In summary, the following key landscape outcomes are relevant:

- Identify and protect significant indigenous vegetation;
- Preserve natural character and amenity values associated with the Ōtaki River;
- Manage wider potential effects on landscape character within which the site forms a part;
- Manage potential visual effects on the available viewing audience;
- Manage potential effects on the rural character and the quality of the rural environment; and
- Recognise and promote safe cycleways, walkways and bridleways throughout the district including facilitating linkages to important amenities and services.

3.0 Factors Influencing Rehabilitation

Successful rehabilitation requires an understanding of the context and influences within which it will occur. This includes an understanding of the key environmental influences on future rehabilitation. As the site will be progressively rehabilitated, the lessons learned from earlier rehabilitation can be applied to later stages resulting in greater knowledge over time as to the most successful approaches to site rehabilitation.

A brief summary of the key influences relating to Ashford Park is set out below.

3.1 Geology and Soils

The underlying soils are consistent with alluvial gravels and comprise a series of Clayey Silty Gravel and Gravel and cobbles overlaid by topsoil.

3.2 Slope

The existing topography within the wider Ōtaki River floodplain slopes gradually from east to west from approximately 20 metres above sea level (masl) in the site's south-east corner and falling to approximately 15 masl in the site's north-west corner adjacent to Te Roto Road. The fall across the area where gravel extraction is proposed drops by approximately 3 vertical metres to an elevation of approximately 16.5 masl along the western edge of the proposed extraction area. The underlying topography through the site also reveals a series of gentle undulations associated with former river channels. Existing stopbanks associated with flood management of the \overline{O} taki River adjoin the site's southern and south-western boundaries and introduce more linear elements which frame the site with grass bunds typically formed at a slope of 1(V)/3(H).

Gravel extraction will entail removal of topsoil and underlying gravel from the existing flat site with slopes resulting from extraction typically laid back at 30°. The proposed gravel extraction will include a process of benching the margins of the waterbody to facilitate a more gentle sequence of batters suited for riparian vegetation.

3.3 Vegetation and Ecology

The site is a modified agricultural landscape associated with the existing Ashford Farm Stud. Within the vicinity of the site, riparian planting has also been established along the margins of the Ōtaki River in association with flood plain management works.

The agricultural landscape is predominantly pasture enclosed by tree belt along boundaries and scattered tree groups and specimen trees. The taller tree belts comprise mature pine, poplar and macrocarpa with pockets of mature kohekohe and totara located in the central area of the site in the vicinity of existing buildings. The remaining trees along paddock boundaries predominantly comprise exotic shelter and specimen trees as well as areas of groundcover and scrub, including pest plants such as Tradescantia and blackberry along several paddock margins.

Ecological consultants, Wildlands, has undertaken an assessment of the existing vegetation and habitats occurring within the site¹. A summary of the findings set out within the ecological assessment are set out below:

3.3.1 Vegetation

Although the small remnants of indigenous forest comprise locally common species, the remnants do have significant ecological value due to their area and maturity; and the rarity of that combination of species, or vegetation type. No threatened or regionally uncommon species were recorded at the site.

3.3.2 Aquatic

There are no aquatic biodiversity values at the site.

3.3.3 Avifauna

Only common bird species were recorded at the site. Indigenous trees present at the site may provide seasonal habitat for mobile species, such as tui.

3.3.4 Herpetofauna

Remnant populations of non-threatened indigenous species could be present including common skink and various gecko species.

3.3.5 Invertebrates

No threatened or unusual species have been recorded from the site with existing habitats unlikely to support a high diversity of indigenous invertebrate species.

3.4 Climate

The predominant winds recorded in this area of the Kāpiti Coast are from the north-west and north-east with frequent winds also occurring from the south and south-east². A wind rose illustrating wind direction for Otaki is included as **Figure 1**: Wind Direction for Otaki (*source: http://www.windfinder.com/windstatistics/otaki*). The flat nature of the site surrounded by established shelter belts will likely reduce the effect of wind along the boundaries of the site with the potential for wind to build up across a larger open body of water.

The recent range of temperatures in the Kāpiti Coast range between 22° and -2°C in winter and 30° and 4°C in summer with rainfall slightly higher in autumn whilst remaining fairly consistent throughout the year (see **Figure 2**).

¹ Wildlands Consultants (2015) Ecological Assessment of a Proposed Gravel Quarry at Ōtaki.

² http://www.windfinder.com/windstatistics/otaki accessed 08/01/16

Ashford Park Gravel Extraction | Rehabilitation Strategy



Figure 1: Wind Direction for Otaki (source: http://www.windfinder.com/windstatistics/otaki)



The shade of the bar indicates the year or historical average.

Temperature: The data for the historical average is the average maximum and average minimum temperature for the month recorded over the past 10 years (where available). The data for the most recent period and the year previous is the highest maximum and lowest minimum recorded for the month. Rainfall: The total rainfall that fell during the month

Figure 2: Average Kapiti - Horowhenua Temperature and Rainfall (source: Metservice)

3.5 Broad Design Considerations

There are numerous issues associated with the design of the resulting water body which must be addressed if it is to remain in good ecological 'health'. Such issues are outlined in **Table 1** below with the key design considerations identified for each. Ultimately, the maintenance of good water quality is critical for such activities to successfully (and safely) occur. Ecological considerations should therefore play a primary role in determining the final water body design and in deciding which activities are ultimately compatible without undermining its fundamental health.

Table 1: Surmising common issues faced in designing a waterbody and design considerations taking these issues into account.

Common Issues	Key Design Considerations

Ashford Park Gravel Extraction | Rehabilitation Strategy

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Common Issues	Key Design Considerations
Safety (drowning risk & water quality)	Edge treatment, depth, vegetation/objects in water,
	contaminants & water quality factors
Weed infestations	Nutrient levels, imported plant pests, exotic/native plant
	balance, animal communities
Animal levels (fish, birds etc.).	Linked to habitat type & quality, public accessibility to
	habitat, nutrient & oxygen levels, animal numbers
Algal blooms	Marginal vegetation, light, oxygen, nutrient levels, water
	temperature & clarity
Insect infestations	Edge treatment/vegetation, water temperature & quality,
	predator species
Excessive sediment / sludge build-up	Flooding, vegetation, nutrient levels, erosion & run-off
Insufficient holding capacity / water source	Availability of groundwater recharge, extent of waterbody
	level fluctuations.
Waterfowl Pests	Discouraging destructive swans and geese by having less
	pasture along waterbody margins.
Nutrient status (low)	Buffering adjacent land use, planting and controlling pest
	species.

4.0 Rehabilitation Objectives

4.1 Overview

This document will influence the development of detailed plans which will outline the final form of the site following rehabilitation. Within this framework, staged plans will be used to specify rehabilitation procedures, maintenance of indigenous vegetation cover and monitoring to be undertaken as the quarrying activity proceeds. Rehabilitation works will be planned incrementally following each stage of extraction activity whilst responding to site conditions and ongoing extraction activity. On this basis the rehabilitation plan has a timeframe measured in decades with landform modification and revegetation undertaken following each stage of extraction works. Initial rehabilitation activity will be well advanced by the time the last stages of the quarry have been completed.

Because each quarry site is different, every rehabilitation programme requires adaptation in response to results achieved; that is, progressively refining details. This means that rehabilitation programmes usually include techniques to identify the most successful methods and approaches specific to that site to ensure I rehabilitation is optimised, both in terms of reducing time frames to achieve a successful outcome and reducing implementation costs. The strategy recommends one particular approach but it also describes how this could be refined or for other approaches to be adopted based on regular monitoring of results and outcomes. This enables the most efficient and effective measures to be used. This process of 'adaptive rehabilitation' is important because it improves certainty of anticipated outcome as experience from previous stages is acquired and re-applied to the site. Revegetation measures for each area will also vary according to the specific riparian context, exposure and substrate.

4.2 Objectives

The proposed Rehabilitation Strategy will work in an integrated way with the proposed extraction activity over the duration of the quarrying. Rehabilitation works are integral to the operation of the quarry and will be implemented at the completion of each stage of extraction activity. It is, therefore, important that a sequential staging plan is adopted which can be adhered to over the duration of the works. Whilst timing of stage completion can adapt to fluctuations in demand, the sequence of extraction activity forms the basis upon which rehabilitation processes will occur.

The overriding rehabilitation principles as identified with the landscape strategy are set out below:

- Identify, protect and maintain core areas of significant vegetation and associated habitat in the long term;
- Design and manage the final waterbody form to maintain water quality and ecological health;
- Adopt a sequential staged extraction process which allows for progressive rehabilitation across the site;
- Monitoring and controlling pest plants and pest animal during operation and rehabilitation works;
- Create scalloped shorelines along the margins of the waterbody to improve habitat diversity with planting appropriate to the surrounding natural environment;
- Include a combination of edge treatments including vegetation, gravel beaches and hard edges that enhance amenity values and visual interest and provide protection from wave action;

- Ensure large areas of the waterbody are at least 3 metres deep to prevent the water getting too hot in summer;
- Identify, stockpile and manage overburden and top soil during each stage of extraction for subsequent use in rehabilitation of each stage;
- Form planted edges as gentle slopes to accommodate a sequence of native riparian vegetation in accordance with ecological recommendations (Wildlands, 2015); and
- Establish native riparian vegetation to achieve a minimum of 80% canopy cover after 5 years following completion of extraction activity (not restricting structures and activities associated with the waterbody's future use, such as jetties, boat ramps etc.)

4.3 Water Quality

. . . .

The enclosed nature of water with input from clean water from the river filtered by the gravel within the waterbody means water quality cannot be maintained without a corresponding healthy ecosystem. An ecologically healthy (or oligotrophic) waterbody has clear cool water, low nutrient levels and large leaved aquatic plants.

An unhealthy waterbody usually contains cloudy or dark coloured water with high nutrient levels (mainly nitrogen and/or phosphate) and excessive algal growth. Algae subsequently dies and decomposes in a process which consumes oxygen. This leaves the waterbody in an anoxic (or eutrophic) state which is lethal to aquatic life and cannot easily be reversed.

To prevent this eutrophic state from occurring, nutrient levels within the waterbody need to be kept low; the waterbody needs to be kept cool and aquatic plants need to become established. There are a number of preventative measures that can be taken to ensure a healthy ecosystem is established and water quality is maintained (see **Table 2**).

Causes of Eutrophication	Preventative measures
Water body heating up speeding up algae growth	Depth of at least 3m in parts to prevent the waterbody from warming which increases bacteria growth.
	Manage mowing, stock, fertiliser and compost near waterbody margins.
	Promote edge stability by having low gradient along waterbody margins
Nutrient laden sediment inputs via surface run-off	Drainage from stockpiled topsoil needs to travel away from the created waterbody.
	Planting initially tough, low fertility nursery plants which do not need rich topsoil for survival.
	Rehabilitation planting initially concentrated on lower slopes to trap and filter out sediment and take up nutrients.
Ill functioning ecosystem with poor nutrient flow	Create irregular waterbody margins, increasing the amount of submerged/emerged vegetation up-taking nutrients from the water.
Nutrients concentrated within warmer top layer of waterbody which are then utilised with algae growth.	Promote stirring of the water (mixing and dilution of nutrients) with prevailing SE wind, by leaving gaps of taller vegetation on the SE and NW corners of the site.
Invasion of pest fish, through flooding of site and illegal introduction, which input faecal matter stir up bottom sediment and feed on riparian vegetation.	Yearly monitoring of pest fish species for the first 3 years following extraction completion.
Invasion of pest plants.	Yearly monitoring of pest plant species during establishment.
Waterfowl (largely swans and geese) colonising the waterbody inputting nutrient rich faecal matter.	Densely plant margins to encourage indigenous waterfowl and limit grass to deter problem game birds.

Table 2 Showing preventative measures that can be taken to ensure a healthy ecosystem is established and water quality is maintained

4.4 Timeframes

A key objective of the Rehabilitation Strategy is to ensure that rehabilitation works will occur sequentially in response to extraction works. Extraction will create a waterbody which increases in scale throughout the extraction period. The dynamics of ecological regeneration are largely influenced by the following:

- Riparian context;
- Erosion;
- Soils and micro-topography;
- Pest plants
- Pest animals
- Wind and wave action

The time frames required to achieve an effective cover of native vegetation following extraction activity must allow for:

- Discouraging key pest-plant and pest animal species and control those that occur.
- Overburden placement to create benches and riparian margins with suitable substrates for plant establishment;
- Creating and /or adding soil forming materials and/or organic soils to create suitable material for planting or natural regeneration;
- Planting appropriate riparian species and 'nursery' plants to facilitate revegetation of the waterbody margin; and

The goal for rehabilitation is to ensure a minimum of 80% of canopy cover is established in areas identified established as native riparian vegetation after 5 years following completion of extraction activity within the site.

5.0 Proposed Extraction Area and Staged Works

The full extent of the Proposed Extraction Area addressed within the Rehabilitation Strategy is illustrated in **Figure 3**. Extraction activity results in a waterbody being formed below the existing water table and a sequence of riparian margins relative to the final waterbody level formed within the site.



Figure 3: Proposed Stages of the extraction area within the rehabilitation strategy.

Stages 1A and 1B of the extraction commences within the western area of the site and encompasses the creation of a 4 metre high noise bund running parallel with part of the western boundary. Stage 2 continues along the southern boundary towards the south-eastern corner and includes extraction along the southern edge of the proposed eastern island containing remnant native vegetation. During Stage 3, extraction continues parallel with the eastern and northern boundary and completion of the northern edge of the eastern most island containing remnant vegetation. Extraction culminates within the central area of the site during stage 4 and includes the completion of islands of remnant vegetation and removal of a temporary haul road connecting with the existing gravel processing plant.

5.1 Landscape Strategy

The Landscape Strategy has been prepared in response to recommendations set out within the landscape and ecological assessments. This includes retaining and enhancing two separate islands of native vegetation within the waterbody and reinforcing an enclosure of screen vegetation around parts of the site boundary. The overall landscape strategy is illustrated below in **Figure 4**.



Figure 4: The overall landscape strategy for waterbody rehabilitation following quarry extraction.

Key Components of the Rehabilitation Strategy include:



Island Native Remnants

Two separate islands containing remnant kohekohe / totara forest which comprise of a total area of 0.82 hectares will be retained with the centre area of the waterbody.



Island Restoration Planting

In addition to the retention of remnant kohekohe and totara forest a total of 7,960m3 of restoration planting is proposed as part of ecological mitigation to compensate for vegetation loss in association with remnant vegetation retained on islands.



Riparian Vegetation

Riparian vegetation requires a sequence of planting along the margins of the waterbody to ensure the long term ecological health of the waterbody.

5.1.1 Riparian Planting

The treatment of riparian areas forms a key component of the rehabilitation strategy to ensure the long term ecological health of the waterbody. The riparian edge can be further divided into a sequence of wet and dry areas forming three integrated components as summarised below:

Riparian Dry Zone:

Riparian dry zones occupy the upper band of planting established along waterbody margins which are rarely inundated with water. The width of planting in these areas varied according to the distance between the water table and the existing ground level.

Emergent Zone

The emergent zone occurs above the water table along the margins of the waterbody edge of the water table and will partly be inundated with water. Water levels will fluctuate and planting will allow for this

Submerged Zone

The submerged zone occurs below the water table along the margins of the waterbody up to a depth of approximately 3 metres.

As happens naturally in ecological plant systems, between each zone will be an area of species overlap (called an ecotone), where the zones will blend with a gradual decrease of species from one zone, with a gradual increase of species of the next.

In accordance with the staged process of extraction, rehabilitation enables a sequence of rehabilitation to commence following the completion of each stage. **Table 3** below provides an estimate of the riparian area (taking into account topography) as a guide to the exposed surfaces that will form the overall focus of this Rehabilitation Strategy.

Stage	Riparian Dry Zone	Riparian Wet Zone	
		Emergent	Submerged
1	4,584m ²	2,214m ²	4,334m ²
2	12,638m ²	3,451m ²	6,920m ²
3	9,667m²	2,929m ²	5,904m ²
4	6,582m²	2,398m ²	5,170m ²
Total	3.3 ha	1.1 ha	2.2 ha

 Table 3: Indicative areas of riparian vegetation to be established within each stage.

6.0 Rehabilitation Actions

6.1 Vegetation Protection

Remnants of native vegetation provide a vital role in biodiversity and ecological function, also providing shelter and habitat for birds which may encourage further natural seed dispersal. The protection of islands of significant vegetation also forms an integral component within this environment. Prior to the commencement of operations in each stage, the extent of quarry activities will be clearly understood and should include marking on the ground and fencing to prevent accidental removal.

Action:

1. Prior to commencement of extraction works in each stage, ensure that the limits of vegetation clearance are clearly known and understood to prevent vehicle access and unintended vegetation clearance or damage outside approved clearance areas.

6.2 Staging of Extraction Works

Rehabilitation planning that is integrated with extraction sequences will ensure that rehabilitation can commence in areas where extraction activity has concluded as early as possible to ensure the areas of significant vegetation to be retained are maintained and enhanced and the ecological health of the waterbody is maintained. It also ensures that rehabilitation effort is not wasted on areas which will be disturbed again later.

In accordance with consent conditions, before excavation within each stage is completed and before commencing of each subsequent stage of extraction activity (where applicable), a detailed Staged Rehabilitation Plan shall be prepared for the stage that has been extracted in accordance with the overall Rehabilitation Strategy to ensure the operation facilitates a progressive staged rehabilitation process. The detailed Stage Plan shall identify the following:

- a. The final form of permanent lake margins to accommodate revegetation for that Stage;
- b. timing of the proposed rehabilitation works taking into account operational constraints/requirements (for example, continued use of the haul roads and bunds) and how this will be achieved;
- c. The volume of overburden and topsoil necessary to create permanent lake margins;
- d. Species, plant numbers and timing of planting to occur;
- e. Ongoing maintenance of planted areas to ensure establishment; and
- f. Any work necessary to facilitate future recreation access through the site.

Action:

2. Ensure extraction activity adopts a sequential approach to rehabilitation that avoids or mitigates future disturbance of completed areas.

6.3 Vegetation and Soil Removal and Stockpiling

Vegetation and soil removal/stockpiling should occur sequentially at the start of each stage of extraction. Vegetation that is stripped from the site should be re-used in rehabilitation with excess removed from the site, with the exception of the larger native logs to be reserved and offered to Nga Hapū-o-Ōtaki. Larger trees should be stored whole with native branches carried to the forest remnants to facilitate protection of lizards. Chipped material should be stockpiled and applied as mulch to planted areas. The top 200 mm of topsoil forming the pre-quarried ground surface should be kept separate from the underlying overburden materials and subsoil, part of which should be retained for use in rehabilitation³. This is important for the successful re-use of the top layers as rehabilitation growth media for establishing effective vegetation cover. Inadequate identification of clean soil resources not only risks good soil becoming mixed with spoil or contaminated materials, thereby restricting or preventing its re-use, but may also result in the need to import soil, logs or mulch for planting and rehabilitation works and increase the cost of the project.

Topsoil stockpiles need to be in suitable locations within the quarry where they will not be subject to compaction by machinery. Such material also contains a higher level of nutrients which must be stored in an area or manner which prevents nutrient laden sediment run off from entering the waterbody and subsequently affecting water quality. Topsoil stockpiles should generally be no higher than 1.5 metres height (to prevent anoxic conditions forming within the stockpile core which depletes nutrient and beneficial microbial activity levels). Stockpiles should also be grassed to stabilise and reduce dust. The process of rehabilitation needs to ensure that any topsoil is stored for as short as time as possible to prevent deterioration. This will entail a coordinated programme of stripping, storage and re-spreading as required.

In addition to top layer and mulched vegetation there are un-saleable or low value quarry by-products such as overburden, grit and sludge, which can be used in the preparation of benching along the margins of the waterbody during rehabilitation. During extraction, a sufficient volume of overburden required for rehabilitation will need to be stockpiled to enable landform modification at the end of each stage of extraction. Internal stockpiles not to exceed 5 metres in height and be sited to minimise visibility from surrounding areas.

It is important that sufficient material is retained on site to facilitate rehabilitation at the completion of each stage. At the completion of Stage 4, material stockpiled in noise bunds can support subsequent landform modification along waterbody margins.

 ³ With the exception of material from contaminated areas to be removed from the Site in accordance with consent conditions.
 Ashford Park Gravel Extraction | Rehabilitation Strategy

Action:

- 3. Store the larger native logs to be offered to Nga Hapū-o-Ōtaki. Lay branches from native trees in the forest remnants and chip and stockpile mulch for re-use as rehabilitation. Remove remaining areas of vegetation from the site.
- 4. Where practicable, separate the top 200 mm of surface soils from subsoil and underlying overburden and store separately.
- 5. Store topsoil material in such a way where nutrient laden sediment from stockpiles will not enter waterbody through surface runoff.
- 6. Ensure sufficient substrate and topsoil material is stored during operation to undertake landform modification as part of rehabilitation within completed areas.
- 7. Locate all stockpiled material within the site to minimise visibility from external areas and establish grass during operation to stabilise and minimise dust.

6.4 Riparian Margins - Landform Modification

Landform modification is part of the overall operation and will be implemented progressively as each stage of extraction activity is completed. Whilst the end use of the site is yet to be established, the final landform modification must ensure it enables native riparian vegetation which sustains a healthy ecosystem which enables native riparian vegetation to be self-sustaining and provide diverse habitat for native animals as well as support a range of future end uses.

The steep waterbody margins created following extraction are a limiting factor to successful establishment of healthy riparian habitats. Through the process of rehabilitation the slope gradients will be reduced by benching resulting in a relatively gently sloping edge which is capable of supporting a sequence of vegetation communities (see **Figure 4**). The lower bench to be formed at an average gradient of 1:8 and accommodate a variation in water depth up to 1.5 metres. This should typically allow for approximately 1/3 emergent and 2/3 submerged areas in response to the final water level. Above this, the remaining 'dry' waterbody margin should be formed at a gradient no steeper than 1:3 to reduce erosion and facilitate effective revegetation of dry tolerant low fertility species.





In addition to forming gentler benching along the margins of the waterbody, the design of the edge needs to include irregular shaped convoluted margins, and shallows of differing depths (see **Figure 6**). Varying humps and hollows along benches will also promote the establishment of a richer diversity of habitats along the margins. These areas can be further enriched by creating small gravel banks and placing large exotic trees felled in the initial stages of land clearance (where possible) at points along the banks margins. This increases the diversity and extent of habitat available to edge plants and to future fauna (birds and insects). Planting should not restrict margins and structures which support complementary end uses of the site.



Figure 6: Showing irregular convoluted waterbody margins which increase diversity and extent of habitat available.

Action:

8. Ensure that the final landform will facilitate a sequence of native riparian vegetation communities and diverse range of physical habitats, both above (terrestrial) and below (aquatic) the waterbody.

6.5 Ground Preparation

Ground preparation is a key element of successful rehabilitation to achieve landform stability and support riparian planting which complements future uses within the site. With good planning, most material can be sourced from the site and does not need to rely on imported material. Observations and results through subsequent stages of rehabilitation will enable the best approach to be developed and refined.

The layering of a suitable substrate and growing medium needs to be determined for each of the delineated vegetation community zones relative to the water's edge (riparian dry zone, emergent and submerged) as well as the planting surrounding the remnant native vegetation on the islands (shown in **Figure 5**). The growing medium used will dictate the type of planting to be established. The substrate should be stabilised as each section of waterbody benching is completed to reduce erosion and runoff depositing sediment into the waterbody. Coarse aggregates, overburden and surface soils to be applied to waterbody margins as part of the rehabilitation process.

Use of topsoils sourced from within the site for rehabilitation purposes are expected to generate a high germination rate of exotic pasture and other species, at least initially. Some exotic weed species which are common along riparian areas including tree lupin (Lupines arboreus) are also likely to establish in some areas. However if managed correctly, this can be beneficial to rehabilitation goals in providing an initial nursery environment which improves the survival of desired mid-seral native vegetation. The presence of pest plants such as buddleia (*Buddleja davidii*), climbing asparagus (*Asparagus scandens*) and Banana passionfruit will need to be eradicated.

In the short term, hydroseeding or other alternatives such as straw mulch and grass seeding may also need to be employed to help stabilise lake margins, reduce runoff and erosion, bind soils to prevent dust problems and inhibit invasion by some pest plants. Providing suitable environmental conditions prevail, hydroseeding needs to be carried out very soon after completion of preparatory works and before batter slopes dry out. Coordinating the hydroseeding with creation of benches is important to ensure that this is completed during an appropriate planting season. Summer months should be avoided as hydroseeding is unlikely to be affective during dry periods.

This Rehabilitation Strategy seeks to make use of site sourced soil at Ashford Park in two key ways:

1. Establish stable benching along the margins of the waterbody; and

2. Support a sequence of fast-growing, dense native riparian vegetation which achieves 80% canopy cover in 5 years following completion of extraction.

Action:

9. Using available substrate, establish stable benching and slopes along waterbody margins following extraction activity.

6.6 Surface Run-off

Surface run-off needs to be considered within the final waterbody form to prevent scouring and erosion across benches and down slope faces and causing damage to rehabilitation works. Erosion and scouring of rehabilitated landforms may disrupt stable post-quarrying environments, affecting plant establishment and safety along lake margins in future years. Drainage paths incorporated within the margins of the waterbody must prevent nutrient laden sediment deposition into the waterbody and instead identify flow paths which allow the slow release of water filtered through dense riparian vegetation.

Action:

10. Ensure surface run-off is included as part of the landform modification process to prevent scouring and erosion of adjacent vegetation and rehabilitated landforms and run-off from catchment area does not carry sediment laden water into the waterbody body.

6.7 Noise Bunds

During the initial stages of operation, noise mitigation bunds up to 4 metres will be constructed along parts of the western and northern boundaries from material extracted from within the site. Such areas should use clearly differentiate between soil types used so that material can be appropriately reused in subsequent rehabilitation at the completion of stage 4 in combination with a functional benefit throughout the operational period. To stabilise noise bunds and to reduce dust during extraction noise bunds should be grassed immediately following their establishment and mown during operation.

Action:

11. Noise bunds to be grassed immediately following establishment to stabilise and minimise dust during extraction activity and maintain viability for subsequent reuse in rehabilitation works.

6.8 Island Rehabilitation

Two areas of remnant native vegetation will be retained within the centre of the site. The protection of this vegetation is necessary as these areas gradually become islands contained within a larger waterbody as extraction activity progresses. The retention and enhancement of islands of native vegetation forms a key mitigation measure and will help reinforce significant ecological values within the site. This work is to be detailed in a separate Ecological Island Plan required as suggested in the draft consent conditions.

Pest plants on the forest islands will also be controlled and all planted sites will be fenced from grazing stock prior to the creation of islands. Together with the pest animal control described in Section 7.0 these actions will result in the regeneration of a natural, indigenous seedling population, understory, sub-canopy and canopy with a diverse array of species. Without the threats posed by pests, these forest islands will thrive, providing enhanced habitat for indigenous birds and insects. In turn this will enhance connectivity for the forest remnants along the Ōtaki River riparian area.

Planting to restore the forest tree species that will be lost during extraction will be undertaken in canopy gaps and within an eight metre wide buffer strip around the margins of the islands (see **Figure 4**). This is proposed to occur throughout the gravel extraction operation and includes riparian margins formed during Stages 2, 3 and 4. Once completed, this will enable planting an area of 4,920 m² on the western island and 3,040 m² on the eastern island. Plants to include eco-sourced kohekohe, tītoki, and tōtara together with a mix of other species that commonly occur in similar forest remnants (see **Table 4**).

Revegetation planting is quite different to what would be carried out under a 'normal' horticultural planting regime; in principle it is more akin to forestry planting. In addition, each site will have unique features and combinations of soil, slope,

moisture, sun and wind. On all areas that are planted as part of island enhancement, the following practices to be adopted:

- Planting needs to be well planned so that the appropriate vegetation communities are planted at the right time. Usually a two year lead time is required to enable sufficient quantities of appropriate locally sourced plant species to be propagated;
- Species will be sourced from local plant populations to ensure that they are ecologically compatible and suitable for the environs (i.e eco-sourced);
- All plants will be suitably acclimatised to local conditions prior to planting. If plants are propagated outside the Wellington district this may involve bringing them to a suitable holding area or nursery several months before they are planted;
- Small grade plants will be used (i.e. up to PB3 or 1L grade) because they will acclimatise and establish more readily than larger grades;
- Areas to be planted may need to be spot sprayed with a contact herbicide or openings to reduce local competition for light and resources as part of site preparation prior to any planting works;
- If necessary plants will receive locally applied fertiliser (e.g. fertiliser tab and be marked with a stake to facilitate identification in the future;
- Where planting sites are devoid of any woody vegetation, plants are densely planted (i.e. 1.0 m centres) with the objective of attaining 'canopy closure' as quickly as possible (i.e. the sooner plants coalesce from pest plants and other unwanted plants). Where planting sites are within established native nurse crops, plantings are at low density (i.e 3.0 m centres) using key pioneer species, given that survival rates are typically much greater than open ground plantings; and
- Plants are generally planted in a coherent pattern that is easy to locate in the future during follow up maintenance work and so that the level of plant survival can be easily determined.

On an exposed site, maintenance work will initially involve replacing dead plants ('blanking') and cutting back / removing unwanted and competing species. Infill planting may also be required at years 1, 2 and 3 to ensure mitigation planting becomes established. Where planting is undertaken, maintenance will be programmed and costed for at least the first three years after planting; after that plants will likely be well established and self-sustaining. An appropriate mechanism is also required to ensure the islands re protected in the longer term such as a QEII covenant (or similar).

Restoration plant species proposed in association with island enhancement, as identified in Wildlands Assessment⁴, are listed in **Table 4**. All of these species are present within the surrounding landscape and can be sourced locally from naturally occurring populations to provide material for propagation.

Scientific Name	Common Name
Alectryon excelsus	Tītoki
Beilschmedia tawa	Tawa
Brachyglottis repanda	Rangiora
Coprosma areolata	Thin leaved coprosma
Coprosma crassifolia	
Coprosma rhamnoides	
Coprosma rotundifolia	
Dicksonia squarrosa	Whekī
Dodonea voscosa	Akeake
Doxysylum spectabilie	Kohekohe
Elaeocarpus dentatus	Hinau

 Table 4 Plant Selection for Restoration Planting (Wildlands, 2015)

18

⁴ Wildlands (July 2015), Ecological Assessment of a Proposed Gravel Extraction at Otaki.

Geniostoma ligustrifolium	Hangehange
Hedycarya arborea	Porokaiwhiri, pigeonwood
Knightia excelsa	Rewarewa
Lophomyrtus bullata	Ramarama
Lophomyrtus obcordata	Rōhutu
Melicope ternata	Wharangi
Melicope simplex	Poataniwha
Melicytus ramiflorus	Māhoe
Microlaena stipoides	Bush rice grass
Myoporum laetum	Ngaio
Myrsine australis	Māpou
Neomyrtus pedunculata	Rōhutu
Nestegis lanceolata	White maire
Nestegis montana	Narrow leaved maire
Olearia rani var. colorata	Heketara
Pennantia corymbosa	Kaikomako
Piper excelsum	Kawakawa
Pittosporum eugenoides	Tarata, lemonwood
Pittosporum tenuifolium	Kōhūhū, black matipo
Podocarpus totara	Tōtara
Pseudopanax crassifolius	Horoeka
Streblus heterophyllus	Tūrepo, small leaved milk tree

Action:

- 12. Island rehabilitation should be detailed in a separate plan which includes specifications associated with vegetation protection, landform modification, planting as well as a monitoring and maintenance programme.
- 13. Facilitate provision for future ongoing protection of the Ecological Islands once fully established.

6.9 Riparian Planting

Riparian vegetation is required around the islands of native vegetation and around the perimeter of the created waterbody. The goal for rehabilitating these areas is to ensure native riparian vegetation achieves a minimum of 80% canopy cover after 5 years following completion of gravel extraction within the site. As set out in the long term vision, the purpose of revegetation is: *"To facilitate the successful rehabilitation of quarried areas in a manner that will retain and enhance native species on islands and thriving native riparian vegetation along waterbody margins to maintain water quality and long term ecological health"*. This will also enable the extracted area to become re-integrate into the surrounding restored areas of the Ōtaki floodplain.

The key drivers for revegetation design can be summarised as follows:

- To maintain water quality within the waterbody body to ensure a healthy (in function and structure) native ecological system;
- To plant appropriate eco-sourced species suited to site conditions; and
- To assimilate the quarried site within the larger Ōtaki floodplain landscape.

The Rehabilitation Strategy provides a framework for refining rehabilitation works and plant schedules over time and requires that planting plans be adapted for each subsequent stage of rehabilitation (as they become available). This allows knowledge to be gathered and applied throughout the rehabilitation process so that ground preparation and planting can be refined to deliver the most effective outcome. This also and allows managers to accurately predict the future performance of native vegetation cover being established to achieve as full coverage on the site as feasible.

Riparian planting is required to encourage consistent, fast and high quality native vegetation cover over the rehabilitated waterbody margins. The approach taken should allow for one planting event per stage to establish pioneer species suited to the riparian habitat and followed by infill planting comprising of early seral plant species advancing towards a suitable

climax community. The management of pest plants and pest animals during operation forms a key element to enhance the success of planting.

During the initial stages of rehabilitation, there is scope to test differing site preparation treatments to optimise the adaptive management process throughout rehabilitation works. Following ground preparation outlined in Section 6.5, different soil conditions can also be tested to ensure a higher degree of plant survival. The restoration plantings nearby of the Otaki River margins and the oxbow at Chrystalls Bend and the success and growth rates of those plantings are also a useful tool to illustrate what planting methods and species have been successfully adopted within nearby restored areas.

6.9.1 Riparian Wet Zones

Riparian wet zones occupy the lower margins of the waterbody and include both seasonally and permanently inundated wetland areas. Planting within the riparian wet zone is required to respond to the final level of the waterbody and will comprise predominantly of sedges and rushes followed by enrichment planting. Plant species which are appropriate to the riparian wet zone areas are set out in **Table 5**, separated into emergent (above the water line) and submerged (below the water line) areas.

The nature of quarrying activity below the water table will mean that the resultant waterbody will experience significant periods of turbidity during adjoining extraction activity. This will result in a dynamic turbid environment within which light frequently cannot penetrate below the water surface. Planting undertaken within riparian wet zones, including areas permanently inundated, should therefore extend no deeper than the ability for plants to remain above the water surface and gain enough light to survive. True aquatic plants which are entirely submerged can only be added after stage 4 works are complete and sediment has settled out of the water column.

The establishment of riparian wet zone planting will require a suitable growing medium which accommodates plants whilst preventing nutrients being lost and deposited within the waterbody. Within submerged areas, this may require containers or cages accommodating initial areas of planting to enable it to become established. In addition, erosion along the edge of the waterbody, particularly the south western margin facing the predominant wind, will need structures such as fallen trees, or boulders in place to prevent waves from eroding the bank preventing plant establishment. Testing the effectiveness of these structures needs to be included during the early stages of rehabilitation and adapted throughout the rehabilitation process.

Planting within the riparian wet zone should generally be undertaken in mid-late summer when the waterbody level is likely at its lowest level under the supervision of a suitably qualified ecologist or landscape architect. Plants will then have time to establish before becoming increasingly inundated during the following autumn / winter period. Over time, planting which is undertaken within the emergent area and extending into the margins of the submerged zones is expected to colonise the submerged shelf, therefore limiting the need to undertake subsequent infill planting in these areas.

Planting needs to be well planned so that the appropriate vegetation communities are planted at the right time. Usually a two year lead time is required to enable sufficient quantities of appropriate locally sourced plant species to be propagated. The following practice should be followed:

- Species to be sourced from local plant populations to ensure that they are ecologically compatible and suitable for the environs (i.e eco-sourced);
- All plants to be suitably acclimatised to local conditions prior to planting. If plants are propagated outside the Wellington Ecological District this may involve bringing them to a suitable holding area or nursery several months for hardening off and acclimatising before they are planted. Any holding area will need to ensure that wetland plants remain in a moist environment which prevents potential damage from drying out during transportation and prior to planting;
- Small grade plants will generally be used (i.e. up to PB3 or 1litre grade) because they will acclimatise and establish more readily than larger grades;
- Plants should be densely planted (i.e. 0.75 m centres) with the objective of attaining 'canopy closure' as quickly as possible (i.e. the sooner plants coalesce to exclude weeds); and

Plants are generally planted in a coherent pattern that is easy to locate in the future during follow up maintenance work and so that the level of plant survival can be easily determined; and

Planting established within the wet zone should be selected from the following list:

 Table 5: Plant Selection for Wet Zone Areas

Scientific Name	Common Name	Emergent	Submerged
Austroderia toetoe	Toetoe	?	
Carex buchananii	Buchanans sedge	?	
Carex lessoniana	Spreading swamp sedge	?	
Carex maorica	Maōri sedge	?	?
Carex secta	Pūrei	?	?
Carex virgata	Pūkio	?	?
Eleocharis acuta	Sharp spike sedge		?
Eleocharis gracilis	Slender spike sedge		?
Eleocharis sphacelata	Kutakuta		?
Isolepis prolifera		?	
Juncus australis	Leafless rush, wīwī	?	
Juncus pallidus	Giant rush	?	
Juncus planifolius	Grass leaved rush	?	
Juncus sarophorus	Fan-flowered rush	?	
Luzula picta var. picta		?	
Machaerina tenax		?	
Melicytus ramiflorus	Māhoe	?	
Phormium tenax	Swamp flax	?	?
Schoenoplectus tabernaemontani	Kuāwa		?
Schoenus maschalinus	Dwarf bog rush	?	?
Sparganium subglobosum	Mārū		?
Typha orientalis	Raupō		?
Coprosma robusta	Karumu	?	
Coprosma tenuicaulis	Swamp coprosma	?	

6.9.2 Riparian Dry Zones

The upper margins of the waterbody require dry tolerant species recognising that these riparian areas are rarely inundated with water. In addition, each site will have distinctive attributes and combinations of soil, slope, moisture, sun and wind which will influence growing conditions. It is also functionally important that erosion and runoff is minimised in this area to prevent excessive nutrients being deposited along margins and within the waterbody. This may initially require hydroseeding to bind more nutrient rich topsoils where employed.

During the initial stages of rehabilitation, a combination of passive rehabilitation entailing direct seeding and active rehabilitation applying direct planting are recommended. This will help inform optimum plant establishment across the site during subsequent stages.

6.9.2.1 Direct seeding

Passive rehabilitation generally takes longer to establish than more active planting methods, however given the long term sequential process through which rehabilitation will occur, this can provide a relatively cheap and effective supplement to hand planting techniques. Understanding the process and timeframes associated with passive rehabilitation will also provide a useful baseline to measure against alternate more intensive methods of revegetation.

The process of direct seeding requires initial ground preparation as set out in Section 6.5. Seed should be dispersed across scarified bare ground and can include layering. Species employed should typically comprise hardy, dry tolerant species which naturally establish in recently disturbed nutrient deficient soils. Manuka branches can also be used to support a microclimate that limits competing plant growth. As with any planting project, usually a two year lead time is required to enable sufficient quantities of appropriate locally sourced seed to be made available as identified in **Table 6**.

Once seeding is undertaken, management will be necessary during establishment in order to ensure a trajectory to the desired endpoint (native vegetation community of 80% cover in 5 years after extraction completion) is achieved. Pasture grasses and other agricultural weeds will likely establish rapidly and before any of the desirable native riparian vegetation and sometimes is not conducive to the establishment of native plants. During establishment, native seedlings will need to be identified and released to enable native vegetation to become established. Ecological weeds and animal pests will also need to be managed during establishment in accordance with a pest plant and animal plan. A person with proven ecological/horticultural expertise will be required to oversee this work.

Direct seeding should be timed to occur within autumn or spring planting seasons and follow the initial scarification of the ground to ensure a micro-habitat is present for a diversity of seedlings and spores to establish. Annual monitoring and maintenance will be necessary following seeding to prevent competing plants suppressing the establishment of desirable species. As noted above this is likely to require additional management compared with direct planting methods. Direct planting may be required in areas which direct seeding results in limited success.

6.9.2.2 Direct planting

Direct planting can provide more rapid establishment of revegetation and limit management. Planting needs to occur within a suitable growing minimum which should include a minimum of 300mm topsoil following ground preparation as identified in Section 6.6. Compared with direct seeding techniques, the use of more nutrient rich soils should be followed by hydroseeding with grass or similar alternative to bind soils and minimise runoff entering the waterbody.

Areas to be planted should be spot sprayed with a contact herbicide to reduce local competition for light from other colonising nursery species as part of site preparation prior to planting. Small grade plants should be used (i.e. up to PB3 or 1litre grade) because they will acclimatise and establish more readily than larger grades. Plants should also receive locally applied fertiliser (e.g. fertiliser tab or slow-release granules) and the areas of planting marked on site with painted stakes to facilitate identification for future maintenance. Plants should be densely planted (i.e. 1.0 m centres) with the objective of attaining 'canopy closure' as quickly as possible (i.e. the sooner plants coalesce to exclude weeds).

Areas of planting need to be well planned so that the right vegetation communities are planted at the right time (generally from the beginning of June to the end of August). Appropriate species can be drawn from **Table 6** below:

Scientific Name	Common Name	Suitable for Direct Seeding
Coprosma areolata	Thin leaved coprosma	
Coprosma crassifolia		
Coprosma repens	Taupata	
Coprosma rhamnoides		?
Coprosma rotundifolia		
Dodonea voscosa	Akeake	
Doxysylum spectabilie	Kohekohe	
Elaeocarpus dentatus	Hinau	
Geniostoma ligustrifolium	Hangehange	
Hedycarya arborea	Porokaiwhiri, pigeonwood	
Knightia excelsa	Rewarewa	
Leptospermum scoparium	Manuka	?
Lophomyrtus bullata	Ramarama	
Lophomyrtus obcordata	Rōhutu	
Melicope ternata	Wharangi	
Melicope simplex	Poataniwha	
Melicytus ramiflorus	Māhoe	
Metrosideros robusta	Northern Rata	
Microlaena stipoides	Bush rice grass	
Myoporum laetum	Ngaio	
Myrsine australis	Māpou	
Neomyrtus pedunculata	Rōhutu	

Table 6: Plant Selection for Riparian Dry Zone (Wildlands, 2015)

Scientific Name	Common Name	Suitable for Direct Seeding
Nestegis cunninghamii	Black Maire	
Nestegis lanceolata	White maire	
Nestegis montana	Narrow leaved maire	
Olearia rani var. colorata	Heketara	?
Ozothamnus leptophyllus	Tauhini	?
Pennantia corymbosa	Kaikomako	
Piper excelsum	Kawakawa	
Pittosporum eugenoides	Tarata, lemonwood	
Pittosporum tenuifolium	Kōhūhū, black matipo	?
Podocarpus totara	Tōtara	
Pseudopanax crassifolius	Horoeka	
Streblus heterophyllus	Tūrepo, small leaved milk tree	

Action:

- 14. Apply a combination of passive and active revegetation technique to optimise rehabilitation outcomes.
- 15. Monitor rehabilitation to inform future rehabilitation, including planting programmes.

6.10 Pest Control

All revegetation work requires some maintenance; plants will most likely need to be 'released' from competing unwanted species, particularly those that are considered ecological weeds, such as invasive woody weeds, smothering grasses or climbing vines. Pest animals can also compromise the success of rehabilitation works, such as animals identified as problems within the current Ashford Park site including rats (Rattus spp.), brushtail possums, mice, mustelids and hedgehogs (Wildlands, 2015). Once established, the creation of a large waterbody also introduces potential for waterfowl and fish species to disrupt a functioning ecosystem and may need to be considered as part of the future management of the site as its future use is established.

6.10.1 Pest animals

Given the creation of two vegetated islands within a created waterbody, it is highly practicable to effectively control and eradicate mammalian predators. This will result in greatly enhanced habitat for forest birds such as kereru and tui, and also wetland birds such as bittern and crake, once riparian habitat is established along their periphery.

Guiding principles for pest animal control and eradication were identified within the Ecological Assessment supporting the application⁵. This recommends that the pest animal control and eradication plan will include but not be limited to the following:

- a. Details of the suitably qualified and experienced person(s) who will be implementing the plan;
- b. Design for a survey for pest animals using standard protocols which may include, but not be limited to, chew tags, traps and tracking tunnels;
- c. Recommendations arising from the survey including which species will be controlled and to what level, and which can be eradicated;
- d. Details of methods for the control and eradication of pest animals;
- e. Timeframes associated with the control and eradication programme;
- f. Details of any post-control monitoring to confirm control levels; and
- g. Details of likely reinvasion scenarios and recommendations for any on-going monitoring or control.

The implementation of the pest animal and eradication control plan may require several years of repeat control before pest animal numbers reach recommended levels. Protection of islands of remnant native vegetation with reinforcement

⁵ Ibid, Appendix 8

Ashford Park Gravel Extraction | Rehabilitation Strategy

planting provide a key element of mitigation. Pest management undertaken in relation to the islands may also need to be detailed in a future management plan once established to ensure ongoing protection.

Monitoring and control of pest animals within the riparian margins will also need to occur where pest animals (such as rabbits or geese) are causing damage to the riparian plantings. Mammalian predator control on these areas will also help to alleviate invasion by swimming to the forest islands.

6.10.2 Pest plants

During the establishment of native riparian vegetation, management of pest plants will form a key element of work to ensure the objective of achieving a successful canopy cover. This will entail releasing plants from competing pioneer species during plant establishment alongside eradication of ecological weeds to be controlled under statutory documents (e.g. Regional Pest Management Strategy).

For direct planting of fast growing species, releasing may only be necessary in the first year or establishment, but slower growing species and direct seeding may require releasing for up to 3 years. Where direct seeding is used, management should also recognise that native seeds may take some time to germinate when the right conditions prevail and often not during the first year.

In addition to active weed management, mulching involves spreading loose, readily permeable material, such as wet straw and sawdust around newly planted shrubs to protect the roots and trap moisture. Mulching should only be done when soil is moist. This can control weed growth as well as reducing loss of moisture from soil helping to keep shrubs alive during a dry summer or drought.

Action:

- 16. Prepare a pest animal eradication and control plan prior to commencing extraction activity.
- 17. Release native planting from competing pioneer species during establishment to enhance the success of native riparian vegetation.
- 18. Control the establishment of ecological weeds during rehabilitation works.

6.11 Animal habitat rehabilitation

When excavation has ceased and rehabilitation of the area is near complete, some faunal species introductions can be made, either as additional enhancement, or as an adaptive management tool to issues that may arise from rehabilitation (if required). Given that the waterbody has been newly created and lacking in competitive pest species this is an ideal opportunity to easily introduce native fauna, thereby creating an intact and functioning ecosystem. This will also depend on the end use of the site and may need DoC and MPI permits.

6.11.1 Fish

In addition to tadpole of species, native fish will feed off the insect population which will develop within the riparian vegetation. Banded Kokopu, and common bully are two species which may be suitable for relocation into the created waterbody once riparian vegetation is established.

Native eel species, will with time colonise the waterbody, during floods and the wet winter months, travelling overland from nearby waterways.

6.11.2 Freshwater Mussels

Another species found naturally within New Zealand freshwater waterbody systems are the New Zealand freshwater mussel or Kakahi – Echyridella menziesi. Kakahi are filter feeders and are now classified as threatened. The mussel has a
parasitic larval stage in which they live on the gills of a galaxid fish. This reliance means that kakahi must be introduced with established populations of native galaxids. Such introduction should be considered in consultation with DoC and MPI.

6.11.3 Birds

Birds are expected to colonise themselves within the rehabilitated area once habitat is established and pest animals controlled. Investigation into encouraging colonisation of specific birds may be achieved by creating desired habitat by growing bird food plants and creating shingle banks, for example creating unvegetated shingle banks on the leeward side of the islands for banded dotterel, raupo swards for bittern laying logs at the shoreline and semi submerged large trees as shag roosts.

Action:

19. Investigate animal habitat restoration and introductions as integral component of rehabilitation and long term ecological health.

7.0 Monitoring and Review

7.1 Monitoring background

On-going annual monitoring will be essential so that:

- Trends can be recognised early and optimised (e.g. recognising more favourable micro-sites or the most successful plant species for revegetation);
- Pest problems (plant and animal) can be dealt to when signs are first observed (e.g. pulled seedlings while still young); and
- The effects of changeable climatic conditions can be managed (e.g. delaying planting in drought years).

During establishment, monitoring should consider key aspects of the project to ensure successful rehabilitation outcomes. This shall encompass erosion, water quality, and pest management

Monitoring and appropriate management responses will form part of the rehabilitation documentation. Whilst some management measures need to be in place at the outset, for others monitoring will be required to decide what action needs to be taken and when during the establishment. This may be simply a matter of refining the rehabilitation method used or it may require more significant alteration of the method and timing of subsequent rehabilitation works. Site management will be tailored to progress from year to year. Monitoring programme must be simple, concise, easily repeatable and where possible able to be carried out by suitably trained staff and volunteers.

During establishment, monitoring inspection would result in an annual report that covers:

- Identification of successes of past and previous year;
- Identification of deficiencies or inadequacies including water quality, pest plants and animals;
- Identification of erosion resulting from wave action within the waterbody;
- Identification of opportunities to remedy identified issues; and
- The programme for the coming year.

Comprehensive record keeping will be important and allow the accumulation of knowledge. This will result in increased efficiency and reduced costs over the life of the rehabilitation project. Progress photographs, including aerial photography and photographs taken from key vantage points looking towards the site can be a valuable monitoring tool.

7.2 Monitoring programme

Monitoring and associated site management will include the following:

- Extent of areas rehabilitated;
- Observations of finished landform stability, including erosion along lake margins and small-scale slumping that may affect revegetation success.
- If monitoring of plant growth shows patchy plant survival or slower than anticipated growth rates, monitoring of soil fertility to inform needs for fertilisers;
- Signs of animal pest damage to revegetation areas as a trigger for undertaking pest control;
- Incidence and persistence of invasive plant pests, particularly those required to be controlled under statutory documents (e.g. Regional Pest Management Strategy) or those deemed to present a risk of to the success of revegetation areas; and
- Survival and growth rates of planted trees and shrubs to direct infilling planting and future planting programmes towards species most likely to survive.

7.3 Methods

A monitoring programme will be developed in more detail for each stage of extraction activity. Monitoring methodologies are likely to include such methods as:

- Walk-over observations of features with checklists;
- Permanent photo-points or aerial photographs to track visual progress towards rehabilitation objectives; and
- Water quality sampling and laboratory analysis to assess temperature and nutrient composition.

8.0 Management Action Summary

- Prior to commencement of extraction works in each stage, ensure that the limits of vegetation clearance are clearly known and understood to prevent vehicle access and unintended vegetation clearance or damage outside approved clearance areas.
- 2. Ensure extraction activity adopts a sequential approach to rehabilitation that avoids or mitigates future disturbance of completed areas.
- Store the larger native logs to be offered to Nga Hapū-o-Ōtaki. Lay branches from native trees in the forest remnants and chip and stockpile mulch for re-use as rehabilitation. Remove remaining areas of vegetation from the site.
- 4. Where practicable, separate the top 200 mm of surface soils and mulched vegetation from subsoil and underlying overburden and store separately.
- 5. Store topsoil material in such a way where nutrient laden sediment from stockpiles will not enter waterbody through surface runoff.
- 6. Ensure sufficient substrate and topsoil material is stored during operation to undertake landform modification as part of rehabilitation within completed areas.
- 7. Locate all stockpiled material within the site to minimise visibility from external areas and establish grass or suitable alternative during operation to stabilise and minimise dust.
- 8. Ensure that the final landform will facilitate a sequence of native riparian vegetation communities and diverse range of physical habitats, both above (terrestrial) and below (aquatic) the waterbody.
- 9. Using available substrate, establish stable benching and slopes along waterbody margins following extraction activity.
- 10. Ensure surface run-off is included as part of the landform modification process to prevent scouring and erosion of adjacent vegetation and rehabilitated landforms and run-off from catchment area does not carry sediment laden water into the waterbody body.
- 11. Noise bunds to be grassed immediately following establishment to stabilise and minimise dust during extraction activity and maintain viability for subsequent reuse in rehabilitation works.
- 12. Island enhancement should be detailed in a separate plan which includes specifications associated with vegetation protection, landform modification, planting as well as a monitoring and maintenance programme.
- 13. Facilitate provision for future ongoing protection of the Ecological Islands once fully established.
- 14. Apply a combination of passive and active revegetation technique to optimise rehabilitation outcomes.
- 15. Monitor rehabilitation to inform future rehabilitation, including planting programmes.
- 16. Prepare a pest animal eradication and control plan prior to commencing extraction activity.
- 17. Release native planting from competing pioneer species during establishment to enhance the success of native riparian vegetation.
- 18. Control the establishment of ecological weeds during rehabilitation works.
- 19. Investigate animal habitat restoration and introductions as integral component of rehabilitation and long term ecological health.

APPENDIX 1 - Memorandum of Partnership with Nga Hapu O Otaki

Ashford Park Gravel Extraction | Rehabilitation Strategy