



Three Kings Quarry

Quarry Management Plan

This Quarry Management Plan (QMP) has been developed by Winstone Aggregates (Winstone) in consultation with community representatives and Auckland City Council.

Text Revised July 2007 – Drawings and Appendices Updated and Added – May 2008

QMP number: Issued to: Date of Issue: Issued by:

Preamble

- (a) While quarrying is a permitted activity at the existing Three Kings Quarry site, it was agreed by consent between South Epsom Planning Group Inc. and Winstone Aggregates (referred to as Winstone from herein) and the Auckland City Council (referred to as ACC from herein) that a management plan for the operation of the quarry should be developed by the quarry operator in consultation with the Site Liaison Group (referred to as SLG from herein). This agreement was confirmed by consent order of the Environment Court.
- (b) The SLG was established by Winstone, ACC and representatives of the local community to provide a forum where such matters can be discussed with a view to the resolution of issues raised and to achieve ongoing good relations and mutual trust between the quarry operator and the local community.
- (c) This management plan will address the same matters as required by rule 8.7.4.2 of the City of Auckland - District Plan, Isthmus Section, Operative 1999 (referred to as the District Plan from herein), for a controlled activity application for quarrying on land which was not zoned for quarrying purposes in previous district plans. It will also address procedures for continued consultation and liaison with community interests while also describing the existing quarry operations and any proposed changes to these.
- (d) Winstone will operate its Three Kings Quarry in accordance with this management plan.
- (e) All future owners of the Three Kings Quarry currently owned by Winstone Aggregates will be informed of this QMP and that this site is operated in accordance with this document.

Note - This version of the QMP reflects changes that have occurred since the version September 2001. These changes are to: various aspects of the quarry operation; to the regional consents authorizing activities within the Auckland Regional Council's jurisdiction; and to Winstone's management structure and procedures.

Winstone has also commenced a process of consultation relating to pending applications for the necessary resource consents to commence managed fill and rehabilitation of the quarry site. Should consents be granted a further revision of the QMP will most likely be required to reflect operational and regulatory (consent conditions) changes.

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APPENDIX 1

Winstone Environmental Policy

APPENDIX 2

2.1 Regional Water Permit 12977

2.2 Regional Water Permit 31762

2.3 Regional Air Discharge Permit 21875

2.4 Permit to Discharge to ACC Drainage System

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APPENDIX 3

Indicative Quarry Development if pit dewatered and excavated to 0m RL

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Three Kings Quarry Boundary Planting Proposals

APPENDIX 6

Groundwater Monitoring and Contingency Plan

1. General Introduction

1.1. Background to the QMP

- (a) Quarrying is a permitted activity on the Winstone Three Kings Quarry site. The operator of this quarry together with ACC and representatives of the local community have established the SLG. The purpose of this group is to consult on an ongoing and regular basis about matters associated with the operation of the quarry where they affect the community and are of mutual interest to the representative parties.
- (b) The objective of the SLG is to provide a forum where such matters can be discussed with a view to the resolution of issues raised and to achieve ongoing good relations and mutual trust between the quarry operator and the local community. The background to this QMP is set out in part 8.7.4.1 and 8.7.4.2 of the District Plan, as follows:

“While quarrying at the existing quarry is a permitted activity, a management plan for the operation of the quarry is being developed by the quarry operator in consultation with the Site Liaison Group. The management plan will address the same matters as required by Rule 8.7.4.2 for a controlled activity application for quarrying on land which was not zoned for quarrying purposes in previous district plans.”

“The management plan shall generally address the following matters:

- *Identification of the area to be quarried.*
- *A description of existing site contours.*
- *An indication of final contours and floor levels resulting from excavation including proposals for the co-ordination of final levels with adjacent land.*
- *A general description of the proposed operations and changes to the operations of any existing quarry on adjoining land.*
- *An indication of the areas used for processing, stockpiling and distribution of quarried material.*
- *Details of any Regional Council resource consents for water management.*
- *Effects on Council drainage system.*
- *Proposals to avoid, remedy or mitigate adverse effects of quarrying and to comply with development controls in relation to:*
 - *Traffic;*
 - *Dust;*
 - *Noise;*
 - *Ground vibration.*
- *Proposals including screen planting and mounding to avoid, remedy or mitigate adverse visual effects of quarrying on residential activity.*
- *Proposals for progressive rehabilitation before quarrying ceases.*

- *Rehabilitation objectives and possible techniques and an indication of the range of potential activities which could utilise the quarry when extraction is complete.”*

“In addition to those matters, the management plan will also address procedures for continued consultation and liaison with community interests and it will describe the existing quarrying operations and any proposed changes to these. Changes to the management plan which will change the effects of quarrying beyond the boundary shall only be made after consultation with the Site Liaison Group. The quarry operator has agreed to operate in accordance with this management plan.”

- (c) The purpose of this quarry management plan is to set out objectives and measures to maintain and enhance environmental performance of Winstone’s Three Kings Quarry while avoiding, remedying and mitigating adverse environmental effects. These objectives and measures will be set in accordance with the Company’s Vision of delivering “Economic Growth through Sustainable Practices” and the principles and policies of the Environmental Policy attached in Appendix 1.

1.2. Changes or amendments to the QMP

- (a) Changes to the QMP which will change the effects of quarrying beyond the boundary shall only be made after consultation with the SLG.
- (b) A review of the QMP shall be made every two years by Winstone. Any changes identified from this review that will change the effects of quarrying beyond the boundary shall only be made after consultation with the SLG. Prior to Winstone’s two yearly reviews, Winstone will consider any changes identified by the SLG or a resident(s), after consultation with the SLG.

1.3. Background to the Quarry

- (a) The land that the present quarry is sited on was originally granted by Governor Fitzroy to Thomas Hallimore and Joel Pollack in July 1845. The allotments granted were combined into one and issued in fee simple to William Connelly in May 1884. From this time it passed through other owners until purchased by Winstone Limited on the 1st of November 1922.
- (b) Quarrying has been part of the community at Three Kings, employing some local people and providing for their needs, for as long as the community has been there. Production began in the 19th Century, increasing gradually over the years to about present levels in the 1950s.

1.4. Geology

- (a) Three Kings Volcano is one of the most complex in the Auckland volcanic field. It was formed about 15,000 to 20,000 years ago.
- (b) Volcanism began with a series of violent explosions which excavated a crater about 200 to 300 metres deep and about 800 metres wide, in the existing landscape of Waitemata Group sandstones and mudstones. The explosions spread ash and tuff over a wide area, at least as far afield as Mt St John, One Tree Hill and Mount Albert, and built up a tuff ring in layers encircling the crater.
- (c) Eruptions then became more passive and lava rose inside the crater to build up a variety of coalescing scoria cone structures from a number of vents. Some more fluid lava flowed into the crater to form a small lava field. Of the large number of cones formed, there were three prominent cones, the highest of which was 135 metres high, giving rise to the name “Three Kings”.
- (d) Quarrying at Three Kings has resulted in two of the three large cones being removed. The remaining cone, 133 metres high, is Te Tatu a Riukiuta (Big King).
- (e) During the main cone-building phase of eruptions there were further explosive eruptions which destroyed the northern part of the tuff ring and possibly parts of earlier cones. Lava erupted from the new vents to discharge showers of fine scoria (lapilli tuff) which were carried northward by the wind to build up the nearby remnant of the tuff ring (Landscape Road) to a much greater height than before. Lava flooded through a breach in the rim formed by the explosions and continued downslope into the Meola Valley. Some flowed beyond Western Springs out into the ancient Waitemata Valley to form Black Reef, extending almost to the present North Shore.
- (f) Later explosive eruptions, to the south and east of the Three Kings crater, also spread some tuff and ash over the area before eruptions ceased.

2. Description of Site and Operations (existing and authorised)

2.1 Quarry Location

- (a) Winstone’s Three Kings Quarry is located at 985-1025 Mt Eden Road, Three Kings, Mt Roskill. See Location Map (Figure 1).

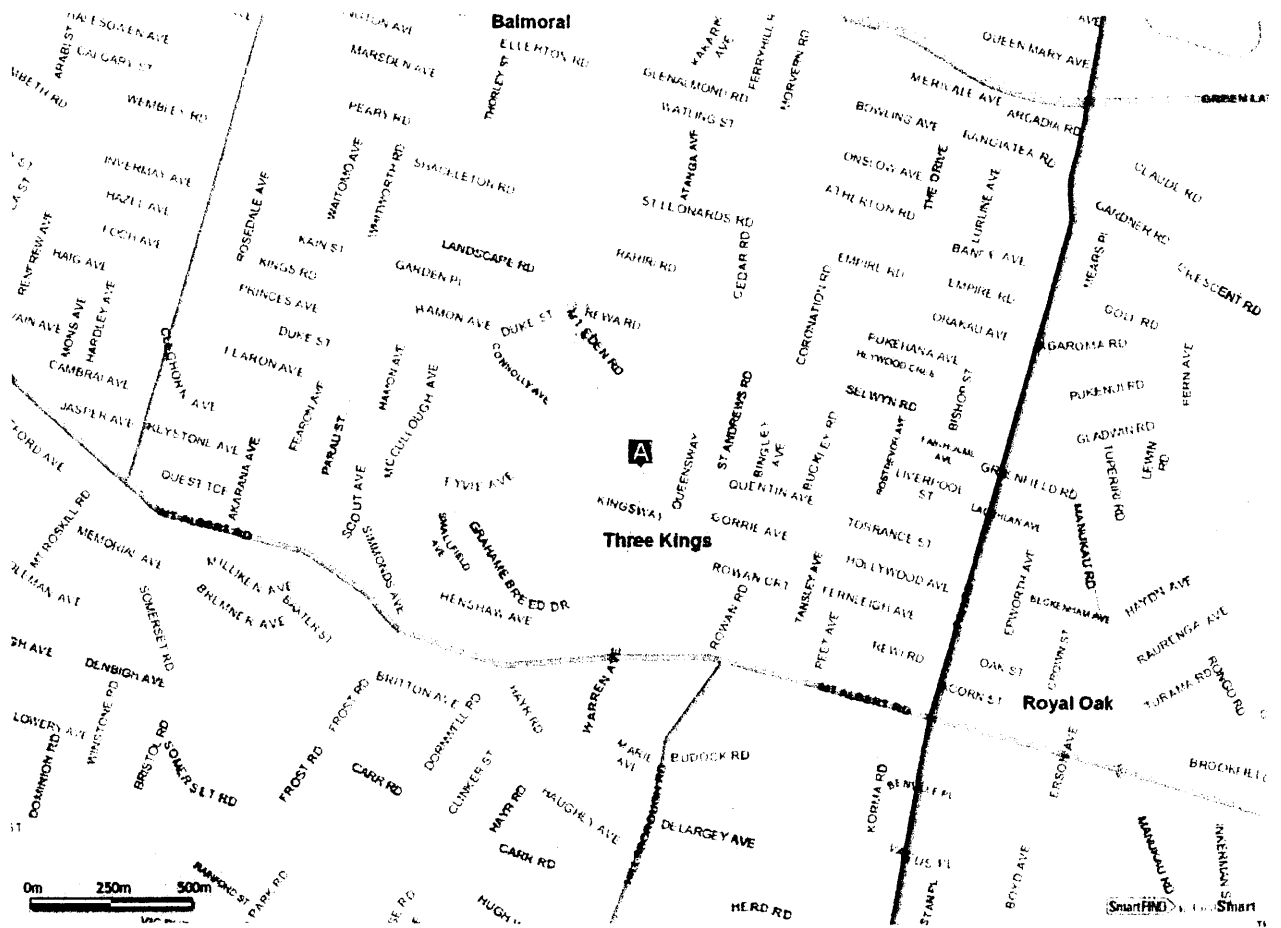


Figure 1 – Location Map

2.2 Adjoining Zonings

(a) The District Plan identifies several different land use zonings associated with land adjoining Winstone’s Three Kings Quarry site. These zonings are indicated on Figure 2. The zones include:

- Residential;
- Open Space Activity (Big King Reserve) and area to the south east;
- Business 4 Zone (medium intensity business activity);
- Business 7 Zone (mineral extraction and processing).

2.3 Adjoining land uses

2.3.1 To the north

(a) On the northern boundary of the Winstone quarry site an old quarry (formerly referred to as Hunter’s quarry) has been rehabilitated by filling and developed.

The activities that take place on this area include residential, service commercial and light industrial business.

Residential comprises low rise apartments and townhouses. Businesses established have included a ceramic tile centre and a furniture manufacturer/retailer.

2.3.2 To the east

- (a) To the east of the Winstone quarry site the land use activity is predominantly residential. Mt Eden Road separates the eastern boundary of the quarry from this residential activity as shown on Figure 2.
- (b) The Three Kings Primary School is located to the south east of the quarry, on the corner of Mt Albert Road and Mount Eden Road. The Carlson School of Cerebral Palsy, the Carlson Kindergarten and the Ranfurly War Veterans Home are also located in this vicinity.

2.3.3 To the south and west

- (a) To the south and west of the quarry (excluding Big King Reserve) is public reserve land administered by ACC (see Figure 2).
- (b) Part of the reserve land is zoned Business 7 (see Figure 2) which allows for the potential extraction of the mineral resources. Quarrying activity has taken place in the past and this is reflected in the much altered landscape which now exists.

A resource consent for a controlled activity and a corresponding Management Plan, addressing issues outlined in Clause 8.7.4.2 of the District Plan, would be required before quarrying could take place on the Council administered reserve land.

Any quarrying of the land requires resource consent and also Reserves Act procedures. Currently this land is not being quarried.

- (c) Part of the reserve land, ie to the southeast corner of the quarry is in the Open Space Zone as shown in Figure 2.
- (d) There is residential activity beyond the reserve land to the southwest along Smallfield Avenue and Barrister Avenue and also to the west along Fyvie Avenue. The Council administered reserves land currently buffers the residential activity in these areas.
- (e) Beyond the reserve land to the south are the following facilities:
 - the Three Kings Shopping Plaza;
 - the Fickling Centre;

- the Community Centre;
- the Community library;
- the Citizens Advice Bureau;
- Metrowater offices;
- playing fields and

(f) A water treatment plant is located in the south east corner of the Winstone owned land, fronting onto Mt Eden Road.

2.3.4 To the north west

(a) To the north west of the quarry there is the Big King Reserve. This is an Open Space Activity Area for use by the public of Auckland.



Figure 2 - Zonings

2.4 Winstone site layout plan

- (a) This site plan (see Figure 3) shows the quarry layout at the date noted on the plan. It includes the current locations of buildings, internal roads, and stock pile areas, as well as the mobile processing plant. The mobile processing plant is relocated from time to time, and its location on the pit floor is selected in relation to the position of the quarry faces at the time, as well as in relation to noise considerations. The plan also shows the location of the water treatment plant on Mt Eden Road that is designed to treat groundwater abstracted from beneath the quarry floor.[Note: ACC has decided, and directed Metrowater accordingly, that the treatment plant will only be operated as emergency back-up in the event of alternative municipal supply being unavailable.]



Figure 3 - Site Plan
Winstone Aggregates
Three Kings Quarry
Approximate Scale 1:50,000



Figure 3

2.5 General description of operations

- (a) The purpose of the quarry operation is to extract the rock (in this case mostly scoria) from the ground and process it for use as building, construction and roading aggregates. The process of transforming rock from the ground into aggregate products comprises firstly the loosening and fragmenting of rock from the ground with the use of explosives and/or heavy machinery. The rock is then excavated by heavy machinery and either stockpiled or transported to a mobile processing plant for further crushing and screening into various sizes and grades.
- (b) The methods used in future quarry operations on the site are likely to remain generally similar to those used at present. However it is expected that specific machinery and methods of extraction will vary as technology develops, machinery is renewed, and quarrying techniques are reviewed.

2.5.1 Rock extraction

- (a) Raw material is generally excavated from the working areas by heavy machinery; however layers and irregular masses of harder basalt rock are present amongst the predominant scoria material. The basalt rock requires drilling and blasting, ripping or rock breaking to remove it from the face and reduce it to a manageable size. Blasting techniques are described in greater detail in section 7.4.3. The extracted rock is then either processed in the same way as the scoria or (as required by customer demand) sold in large pieces.

2.5.2 Loading and transport to operating plants

- (a) After excavation or blasting, the fragmented rock is either loaded directly from the face or floor into the crusher of a mobile crushing and screening plant located on the pit floor, or loaded into dump truck(s) and transported to the mobile processing plant. Loading is carried out by hydraulic excavator(s) and/or loader(s). Some rock extracted does not require further processing because it is a directly saleable product. This product is generally either taken directly to stockpile or loaded out.

2.5.3 Crushing and screening

- (a) Rock from the quarry face is generally too large for most products and is reduced by crushing. The material is also sorted into sizes by screening to separate for further crushing and screening into the various products required.

2.5.4 Stockpiling

- (a) Products discharge from the processing plant at various points, according to the plant settings and the desired product characteristics. These are transported by truck, loader or conveyor to the stockpile area ready for sale.
- (b) Some unprocessed rock and materials processed within the quarry are stockpiled on the quarry floor or on benches, awaiting sale.

2.5.5 Loading and transport

- (a) Road trucks are weighed at the weighbridge immediately after entering the site via the main gateway. They then drive to the appropriate stockpiles, where they are loaded, before returning to the weighbridge and main entrance to transport the products off site.
- (b) The stockpiling area is generally a focus of busy activity. As well as vehicles unloading into the stockpiles, there is usually a steady stream of trucks collecting loads for delivery.

3. Resource Consents

3.1 Planning context

- (a) Use of the quarry is primarily governed by the provisions of the Resource Management Act 1991. Activities in the quarry which are not permitted activities or existing uses require resource consents in terms of the District Plan and any relevant Regional Plans of the Auckland Regional Council (ARC).
- (b) At a national level the Resource Management Act 1991 deals with the management of natural and physical resources and establishes a hierarchy of plans and policy statements.
- (c) At a regional level the Regional Policy Statement considers issues of significance to the region and provides policies for the management of land, sea and air resources. The Auckland Regional Policy Statement contains a section on minerals. This section has two objectives:
 - 1. *To avoid, remedy or mitigate the adverse effects on the environment of mineral prospecting, exploration, extraction, processing and transportation.*
 - 2. *To ensure that mineral extraction activities and mineral deposits which are presently or potentially valuable for development in the Region are not unnecessarily compromised, and the region's need for rock material continues to be met.*
- (d) Regional Plans can be prepared for particular natural resources, however it is not mandatory for Regional Councils to produce these plans, except for the Regional

Coastal Plan. Currently the ARC's Proposed Air, Land Water Plan and Sediment Control Plan are the Regional Plans directly relevant to the Quarry's operation.

- (e) At a territorial level District Plans deal with land use issues and the effects of activities on the environment. The District Plan contains objectives, policies and rules that control land use activities in the Auckland area. In particular the Business 7 Zone sections of the Plan relate specifically to activities on the site. Quarrying in the Business 7 Zone is currently a permitted activity on the Winstone Three Kings Quarry site and no land use consent is necessary for quarrying.
- (f) There shall be no new quarry excavation or extraction within 20m of any public road or adjoining property boundary unless authorised by ACC in terms of Section 354 of the Local Government Act 1974.
- (g) The District Plan recommends 15m yard boundaries for the quarry site adjoining Mt Eden Road and the Open Space Activity Zone. Winstone acknowledges these yards as operational constraints for the quarry however there are already existing buildings, structures and activities located within the 15m yard that are permitted. These include:
- the staff amenities and offices;
 - the buildings near the quarry entrance;
 - the water treatment plant on Mt Eden Road.
- Other structures include:
- noise and visual bunds on Mt Eden Road;
 - fencing.
- (h) On boundaries where a yard is required, the District Plan provides for a landscaped area with a minimum width of 3m except where it is necessary to provide vehicle access points. The Winstone Site Layout Plan (Figure 3) shows the location of these existing buildings and structures. The report titled "Three Kings Quarry Boundary Planting Proposals" (see Appendix 5) also shows the location of planting and bunds.
- (i) ACC also prepared and adopted a planting plan for its reserve land where it borders the quarry which complements the "Three Kings Quarry Boundary Planting Proposals" prepared for Winstone. Work to plant these boundaries in accordance with this plan commenced circa 2000.

3.2 Resource Consents from ARC and ACC

- (a) The management of effects on the environment of dewatering and water take activities which are authorized by ARC consents is not a matter listed in rule 8.7.4.2 of the District Plan for inclusion in this QMP. However the rule requires details of these consents to be provided and copies are attached in Appendix 2.

- (b) Similarly, while the consent from ACC for the water treatment plant is not part of this QMP, it is included as background information [Note: ACC has decided, and directed Metrowater accordingly, that the treatment plant will only be operated as emergency back-up in the event of alternative municipal supply being unavailable.]
- (c) However, while the management of effects on the environment in relation to air quality is controlled by ARC consent, it is also a matter listed in rule 8.7.4.2 of the District Plan. [Historical Note: when the September 2001 QMP was drafted, air quality was authorized by ACC Permit No. 53, although an application had been made to ARC to renew it. Subsequently, and pursuant to the Resource Management Act, consent was granted and the management of dust emissions is addressed in s7 of this QMP]
- (d) All relevant ACC and ARC resource consents and permits are copied and attached to this QMP in Appendix 2.

4. Consultation Protocol

4.1 The Three Kings Quarry Site Liaison Group (SLG)

- (a) Winstone, together with the ACC and representatives of the local community have established the SLG . The purpose of this group is to consult on an ongoing and regular basis about matters associated with the operation of the quarry where they affect the community and are of mutual interest to the representative parties.

4.1.1 Frequency of meetings

- (a) The SLG will meet as necessary and no less frequently than every three months unless all representative parties agree that there is no need for a meeting. If meetings are to be held less frequently than three monthly as proposed in the QMP, then the proposed date of the next meeting should be tabled at the SLG meeting.

4.1.2 Location and time of meetings

- (a) Meetings will be held at a location agreed to by the majority of representatives of the parties involved in the SLG.
- (b) The time of the meetings will be agreed to by the majority of representatives of the parties involved in the Site Liaison Group.

4.1.3 Notification of meeting

- (a) Any proposed meeting shall be notified in the public notices section of the “Central Leader” newspaper or an equivalent local paper, by Winstone, at least two weeks prior to the meeting date. Any person who has attended recent meetings of the SLG will also be sent written notice of the coming meeting.

4.1.4 Meeting protocol

- (a) Meetings shall be conducted in an orderly and respectful manner that is consistent with the objective to provide a forum where matters can be discussed with the intent to resolve issues raised and to achieve ongoing good relations and mutual trust between Winstone and the local community.
- (b) Administration and servicing of meetings will be the responsibility of Winstone.
- (c) Winstone will consult with other SLG parties prior to appointing an independent chairperson for the SLG meetings.

5. Future Quarry Development

5.1 Quarry development

- (a) Development at the quarry depends on a number of factors. The state of the market (demand) is a significant variable outside Winstone’s control. It dictates the level of sales and production activity, which may at times be limited by process plant capacity. A topographical site plan indicating how the quarry pit might look in the future if existing consents were exercised fully, can be found in Appendix 3. Quarrying below the water table involves the pumping of water from beneath the pit. The resource consent that permits this dewatering activity contains a number of conditions that control how this activity is to take place. The consent was subject to statutory review in 2003 and amended conditions confirmed in 2005. A copy of this consent can be found in Appendix 2 (Permit number 12977).
- (b) The plan in Appendix 3 indicates what the pit would look like should extraction continue down to RL0 (or sea level at mean high water spring). This plan is intended

to illustrate in a schematic way how development may occur should quarrying continue to RLO.

- (c) Drilling to date has indicated the possibility that there will be an increase in the proportion of basalt to scoria as the pit deepens.
- (d) Re-vegetation of worked areas will be carried out as soon as practicably possible after quarrying. This will limit dust sources and help to minimise the visual effects of the quarry.
- (e) As the pit develops there will be a need to relocate the mobile processing plant and other facilities to access the available resource. Generally relocation of plant will be to areas within the pit where the noise, visual and dust effects of the operation are minimised.
- (f) In the event that taonga or objects of potential archaeological significance are uncovered during the excavation, quarrying shall cease in that particular area of the site and tangata whenua and ACC's Heritage Manager consulted with regard to the discovery. All other requirements as set out in the Historic Places Act 1993 will be adhered to.
- (g) Should development plans change in a way that may result in an increase in the scale and intensity of environmental effects beyond the site boundary, then these changes will not be incorporated into the quarry management plan without prior consultation with the SLG.

6. General environmental objective for quarry management

To manage the extraction and processing of a valuable aggregate resource while avoiding, remedying or mitigating adverse effects on the environment and enhancing environmental performance wherever practicable.

6.1 Explanation

- (a) The continued and efficient extraction of aggregate resources in the Isthmus is identified in the District Plan as an important resource issue. At the same time, Winstone has an obligation to ensure that the environment is not detrimentally affected by the continued operation of the quarry.
- (b) Parts 3 and 4 of Winstone's Environmental Policy (see Appendix 1) call for management to continuously improve activities and to lift standards and performance. This focus on improvement will lead to enhanced environmental performance in the future. An example of this type of improvement was the introduction of dust suppression measures such as sprinklers and the ongoing re-vegetation of worked areas. A current example is the company's request to review the Air Quality Management Plan and replace the Hi-Vol TSP samplers with state of the art, "real" time monitoring.

6.2 Measures to achieve the general environmental objective

6.2.1 Resource management framework

- (a) To achieve the general environmental objective Winstone will operate within the bounds of the legislative framework for resource management in New Zealand as summarised in section 3.1 above.

6.2.2 Management measures

- (a) Winstone's management measures to implement this general environmental objective are outside the scope of any particular rules for a permitted activity, conditions of permits, licenses or resource consents, but measures are provided here to give an insight into Winstone's current management practices and to indicate how Winstone intends to manage this quarry. It can be expected that these management measures will change over time as Winstone strives to achieve continuous improvement in environmental performance.
- (b) The current management measures and procedures reflect the growth of environmental responsibility within Winstone. They are explained in sections 6.2.3 - 6.2.5 below. The company recognises the effects it's operations may have on the environment and is continually searching for ways in which these effects can be avoided, remedied or mitigated.

6.2.3 Environmental policy

- (a) Winstone's Environmental Policy (see Appendix 1) sets out the overall goals for the company's environmental performance. The environmental policy is used in the following ways to make staff and visitors on site aware of the importance of good environmental performance.
 - displayed to personnel on site
 - displayed to the public in reception areas
 - referred to when setting annual objectives and targets

6.2.4 Environmental management system

- (a) Winstone Aggregates has in place an Environmental Management System (EMS) that is based upon the framework established by ISO 14001- Environmental Management Systems - Specification with Guidance for Use.
- (b) The EMS is a tool that ensures accountability for environmental performance, providing a management framework that encourages openness and environmental improvement at all operational sites.

- (c) Winstone's Environmental Management Manual (EMM) documents the EMS and ensures that the Environmental Policy is implemented at operational sites. The Manual covers such things as:
- legal requirements that each site must adhere to;
 - setting environmental targets and objectives for individual quarries;
 - procedures for management of effects on the environment;
 - management structure and responsibilities;
 - record keeping of each quarry's environmental effects;
 - communication including environmental reporting and information sharing;
 - review of the EMS and Environmental Policy.
- (d) Site Environmental Manuals (SEMs) are kept at each site and contain environmental diaries that are used to record the results of compliance monitoring, complaints, objectives and targets. The sites are required to report all incidents (non-compliance, non-conformance, complaints) to senior management as they occur, ensuring the appropriate actions are taken. The Environmental Coordinator prepares a monthly summary report for the General Manager who in turn is required to report to Fletcher Building Corporate management on environmental performance.
- (e) The EMM and the site SEM are available for inspection by the public at the quarry, only after prior arrangement with the Quarry Manager.
- (f) Records of all verbal and written complaints will be maintained in the site SEM. The SEM will be available for inspection at the site by members of the public and ACC following prior arrangement with the quarry manager. The records will be kept for no less than five years and will include:
- name and details of complainant;
 - description of complaint;
 - any follow-up action.
- (g) Site inspections by senior management and specialist internal assessments and audits are made regularly for each quarry site. The purpose of these inspections is to reinforce the importance of good environmental performance and continual improvement.

6.2.5 Quarry design

- (a) To achieve the general environmental objective Winstone will design the quarry in a way that maximises the extraction of the aggregate resource within the property boundary after due consideration of relevant factors, including resource consents, district and regional plans and geotechnical constraints.
- (b) The operation of the quarry is regulated under the Health and Safety in Employment (HSE) Act 1992 and more specifically the Mining Administration

Regulations 1996. These regulations are administered by The Ministry of Labour through Occupational Safety and Health (OSH).

7. Environmental effects

- (a) Quarrying has the potential to have a range of adverse environmental effects. This section identifies these effects and sets out the relevant environmental standards that the quarry has to achieve and the measures and methods for how it will achieve these standards.

7.1 Noise

7.1.1 Noise effects

- (a) Noise is generated by a number of different activities carried out at the quarry including: drilling; rock breaking; crushing; extraction; trucks; machinery and blasting. If noise is not controlled at the quarry there is the potential for noise to cause a nuisance to people who live near the quarry.
- (b) It is important to note that blast vibration and noise generated by blasting (air blast overpressure) are treated as separate effects from general noise within the provisions of the District Plan. The different noise effects will also be treated separately within this management plan. Noise and vibration from blasting are dealt within section 7.3.

7.2 Noise objective:

To avoid, remedy or mitigate adverse effects of noise generated by on-site activity on the residents of dwellings and on business activities in the vicinity of the quarry.

7.2.1 Explanation of objective

Excessive noise of sufficient intensity, or the duration or continuity of noise can be detrimental to public health and to the amenity of adjacent land. The noise objective is a statement of intent by Winstone to keep noise levels from the quarry's activities at or below an acceptable level and to provide the community with an assurance on the level of noise that they can expect from the quarry's operations. The measure for achieving this objective is set out in the Business 7 Zone noise level controls of the District Plan.

7.2.2. Noise performance standards

(The standards taken directly from the District Plan provisions are shown in italics below.)

- (a) *The L10 noise level and maximum level (L. Max) arising from any activity (except blasting) measured within any residentially zoned property shall not exceed the following limits.*

	<i>TIMES</i>	<i>dB A LEVEL</i>
<i>(i) Within any residentially zoned site</i>	<i>Monday to Saturday 7:00 am to 10:00 pm</i>	<i>L10 55 dBA</i>
	<i>Sunday and Public Holidays 9:00 am to 6:00 pm</i>	<i>L10 55 dBA</i>
	<i>At all other times</i>	<i>L10 45 dBA L Max 75 dBA</i>

- (b) *In addition, the L10 noise level measured on the boundary of any business zone, other than Business 7, shall not at any time exceed 70 dBA.*
- (c) *The noise levels shall be measured and assessed in accordance with the requirements of New Zealand Standard NZS 6801: 1991 “Measurement of Sound” and New Zealand Standard NZS 6802: 1991 “Assessment of Environmental Sound”. Noise shall be measured with a sound level meter complying at least with International Standard IEC 641 (1979): Sound Level Meters, Type 1.*
- (d) Any construction work on site, will be carried out as provided for within the General Provisions of the District Plan, Part 4A.1 that is, in compliance with the New Zealand Standard for Construction Noise NZS 6803: 1999.
- (e) Any noise produced from emergency construction work, which is defined as “construction work which is required without delay in order to protect people or avoid damage to property” is allowed for within the General Provisions of the District Plan, Part 4A1, D, d. Winstone shall keep a record of the day, time, and duration of any construction work.

7.2.3 Measures to implement noise objective

To comply with the District Plan and to keep noise to a acceptable level Winstone implements a range of operational practices that include the following measures.

- (a) Managing the time and location of particularly noisy operations around the site to ensure compliance with the performance standards.

- (b) Predictive computer noise modeling of the quarry operation. Modelling has been carried out and has provided quarry management with a good understanding of how specific activities in different parts of the site influence the noise environment off site. This model will be recalibrated with monitoring data from time to time, and continue to be used as a predictive tool to assist in the management of site activities.
- (c) Winstone has a preference to avoid any general quarry operations (eg extraction and processing) on Sundays, public holidays and beyond 8pm at night. Winstone undertakes to manage the quarry in a manner that avoids the need to carry out general quarry operations outside the following hours:

Monday –Saturday	7 am - 8 pm
Sunday and Public Holidays	9 am - 6 pm.

Circumstances may arise whereby it is necessary to carry out general quarry operations beyond the hours stated above. Such circumstances could include:

- mechanical breakdown;
- unusual customer demand or
- safety and emergency work is required.

Except where safety or emergency work makes it impractical, the noise levels in clause 7.2.2. of this management plan shall be complied with.

- (d) The dispatch of aggregates will be restricted to no later than 8 pm unless for emergency or special circumstances.
- (e) All processing plant, excluding conveyors will be contained within the protective panels and bodywork of the machinery as manufactured to minimise the noise levels measured at the boundary of the quarry.
- (f) Machinery will be regularly maintained to ensure that noise is kept to a practicable minimum.
- (g) All quarry vehicles will have appropriate sound arrestors fitted to ensure that operations comply with performance standards.
- (h) Bunds have been constructed where appropriate and practicable on quarry boundaries to reduce the effects of noise beyond the boundary of the quarry.
- (i) When it is necessary to carry out short term construction work, as defined within the general provisions of the District Plan, Part 4A.1, Winstone will notify neighbours who may be potentially affected by the noise from the work. This work will be carried out in compliance with the New Zealand Standard for Construction Noise as allowed for in the General Provisions of the District Plan.

- (j) If any emergency construction work is to be undertaken, neighbours potentially affected by the noise of these works will be notified by Winstone, whenever practicable, prior to the work commencing. Winstone will compile a database of residents potentially affected by the noise and telephone them prior to work commencing.
- (k) When assessing the purchase or arranging for the contracting of any new large machinery (eg drilling rig), Winstone undertakes that noise level performance will always be a primary management consideration.
- (l) Managing the arrival and departure of all trucks associated with the quarry as much as practicable.
- (m) To ensure that the noise performance standards set in the District Plan are met, monitoring will be carried out using appropriate equipment, methods and personnel. The noise monitoring regime will include:
 - Monitoring on two representative occasions per year at the two noise monitoring locations identified on Figure 2;
 - Monitoring shall be carried out following the receipt of a direct complaint to site management regarding noise, if in the opinion of the site manager, monitoring is considered appropriate;
 - Monitoring on up to two occasions per year by an independent noise expert (as agreed to by Winstone) at the two monitoring locations identified on Figure 2, without Winstone's prior knowledge and at Winstone's expense. This monitoring shall be initiated by a request from a designated community representative to an appropriate ACC staff member. The results of this random monitoring shall be forwarded to all parties;
 - Prior to any change in the quarry operations occurring that could result in greater noise effects beyond the boundary, a reassessment of the noise from quarry operations shall be carried out, if the changes have not already been predicted or modeled.

7.3 Ground vibration, air overpressure, air blast noise and flyrock from blasting

7.3.1 Effects of blasting

- (a) The nature of the rock resource at the quarry is predominantly scoria that can generally be extracted without the need for blasting. Blasting is however used in the quarry as a means of fragmenting the less predominant and harder basalt rock prior to processing. As the quarry deepens it is anticipated that relatively more basalt rock may be encountered.
- (b) Blasting causes vibration and air overpressure (air blast noise). These effects have the potential to have a "startling effect" on people, especially when people are not expecting the blast. Ground vibration and air overpressure from

blasting also have the potential, if not controlled, to adversely affect building structures and / or adversely affect the amenity value of residential land in the vicinity of the quarry.

- (c) If good blasting practice is not utilised, the potential for the discharge of fly rock is also increased. Flyrock is a potential risk to human health and also has the potential to cause damage to property.

7.4 Vibration, air overpressure (air blast noise) & flyrock objective

To avoid, remedy, or mitigate adverse effects of vibration and air overpressure (blast noise) and flyrock from blasting, on people and neighbouring buildings.

7.4.1 Explanation of objective

- (a) It is necessary to manage the use of explosives to control effects such as vibration, air overpressure and flyrock. This vibration and air over pressure and flyrock objective is a statement of intent by Winstone to keep the effects of vibration, air overpressure to an acceptable level and to avoid flyrock beyond the quarry boundary. The objective provides an assurance to the community that the effects of blasting are being controlled. The measure for achieving this objective is set out in the performance standards below and within the District Plan Business 7 zone controls for “Noise and Vibration Arising from Blasting”.

7.4.2. Blasting performance Standards

(The standards taken directly from the District Plan provisions are shown in italics below.)

- (a) Any blasting carried out at the quarry will comply with the controls set out in the District Plan, section 8.8.2.7, Noise and Vibration arising from Blasting. The controls in the plan include the following provisions:
- (b) *Blasting activities shall be so controlled as to ensure that any ground vibration as the result of any blasting will not adversely affect the structural stability of any building (that is not connected with the site) or cause a reduction in its utility value....*
- (c) *Ninety five percent of the blasts undertaken (measured over any twenty blasts on the foundation of any building outside the Business 7 zone) shall produce peak particle velocities not exceeding 5mm/s and one hundred percent of the blasts undertaken shall not exceed 10mm/s irrespective of the frequency of the blast measured.*
- (d) *Peak particle velocity means the maximum particle velocity in any of the three mutually perpendicular directions. The units are millimetres per second (mm/s).*

- (e) *The noise created by the use of explosives shall either not exceed a peak overall sound pressure level of 128dB (i.e. a peak over pressure of 0.05kPa) or alternatively the noise shall not exceed a peak sound level of 122dBC. The measurement shall be made in either case at any point at the boundary of the Business 7 zone or at locations agreed to by all representatives of the SLG.*
- (f) An explanation in the District Plan states that *“vibration monitoring does not necessarily have to be undertaken on the foundation of adjacent buildings provided that the quarry operator can safely extrapolate the measurements taken from the chosen monitoring point to the foundations of adjacent buildings and be assured that the limits of Rule 8.8.2.8 (a) or, as appropriate Rule 8.8.2.8 (e) are not exceeded.”*

7.4.3 *Measures to implement vibration, air overpressure and flyrock objective*

The potential effects of ground vibration, air overpressure and flyrock will be controlled by the use of good operating practice to meet the controls set out in the District Plan for the Business 7 zone. Winstone implements a range of operational practices to achieve this objective that include the following.

- (a) Blasting times will be between 9:00 am – 12.30pm Monday to Friday and will be restricted to two times per day except where necessary for emergency or safety reasons. The two times for blasting during the day will be set at approximately 10:15 am and 12:15 pm.
- (b) A siren will be used to alert people in the vicinity to reduce the startling effect of unexpected ground vibration and air overpressure that may be associated with blasting. This siren should be generally audible at least to neighbouring properties, the Three Kings School, Carlson School and the Three Kings shopping centre. The regime for the use of the siren will be:
- Five minutes prior to a blast a siren will be sounded continuously for 40 seconds to let people know of an impending blast;
 - Twenty seconds prior to and until the blast is detonated a siren will be sounded continuously.
 - After the blast has been fired and the blast area has been declared safe (usually 5 –10 minutes following the blast) a siren will be sounded three times in quick short succession.
- (c) Signs or notices that describe what the siren blasts mean and the timing of the subsequent blast will be placed in prominent places around the Three Kings Community such as:
- On Mt Eden Road;
 - In the Mt Roskill Community House;
 - In the Plunket rooms and
 - Around the vicinity of the Three Kings shopping centre.

- Mt Roskill Library
- Advertised in the Central Leader

The size of the signs shall be agreed between representatives of all parties to the SLG.

- (d) Records will be maintained for each blast including:
- the time of the blast;
 - location of the blast;
 - weather conditions;
 - total charge weight;
 - maximum instantaneous charge.
- (e) Winstone will undertake monitoring of all blasts by reliable and appropriate methods to ensure the set limits for vibration and air overpressure are not exceeded.
- (f) Monitored blast records shall be made available to ACC on request and will also be available for public viewing at the quarry office with prior approval from the site manager.
- (g) Each blast will be designed and supervised by an appropriately qualified person as specified by OSH mining regulations.
- (h) Each blast will be designed taking into account:
- general geological conditions;
 - cavities and fissures;
 - distance to the boundary;
 - maximum instantaneous charge;
 - direction of initiation;
 - orientation of the face;
 - weather conditions.

All the factors above, individually or in conjunction with each other can influence the level of effects produced by any one blast. Ensuring that all these factors are taken into consideration when designing a blast will reduce the potential risks associated with ground vibration, air overpressure and flyrock.

- (i) The effects of air overpressure are controlled by:
- use of good quality stemming material;
 - maintenance of correct stemming height;
 - maintenance of adequate burden on all free faces;
 - optimisation of drill patterns to reflect good geometrical design;
 - optimisation of the delay sequence to maintain adequate relief;
 - minimisation of secondary blasting;

- close examination of the face for weak seams and clay bands where explosive products may vent freely to air.

By initially utilising the appropriate design factors above and maintaining a corresponding record of representative blast monitoring, an improved understanding of design parameters for specific quarry areas can be gained. This will help to ensure that blasting effects are kept to a practicable minimum.

7.5 Traffic

The effects of traffic on public roads outside the quarry site are generally beyond the control of Winstone and outside the scope of the District Plan rules. Winstone will however take any practicable steps to reduce the effects of traffic directly related to the quarry operation. These effects are associated with noise, dust, safety and congestion.

7.6 Traffic objective

To minimise the adverse effects of traffic, directly generated by quarrying activity, on the environment, where practicable.

7.6.1 Explanation of traffic objective

- (a) This objective is a statement of intent by Winstone to avoid, remedy or mitigate, adverse effects associated with quarry traffic. Performance standards associated with achieving this traffic objective are inclusive in those standards dealing with the specific effects of noise and dust. The traffic objective is an assurance to the community that Winstone will control the effects of traffic within its site and where practicable outside the quarry site.

7.6.2 Measures to implement the traffic objective

- (a) The opening of the quarry for dispatch will be restricted to the following hours:

Monday to Saturday	7:00am to 8:00pm
Sundays and Public Holidays	9:00am to 6:00pm

(Note: Gates may be opened to customers earlier than 7am to reduce the effects of customer queues on Mt Eden Road however these customers will not be dispatched from the quarry until after 7am.)

- (b) To help reduce queuing and congestion on Mt Eden Road outside the quarry customers will be informed of the opening and dispatch hours and requested not to queue at the gate prior to the quarry opening.

- (c) The current entrances and exits are shown on the site layout plan (see Figure 3).
- (d) All Winstone owned and operated vehicles will be regularly maintained and checked to ensure that appropriate noise suppression devices are installed and operating effectively.
- (e) Customers will be informed of the need to maintain their vehicle noise suppression devices so noise generated by their vehicles is kept to the practicable minimum level. Any customer whose vehicle quarry management considers excessively noisy, or generates any public complaint(s) of excessive noise emissions due to lack of maintenance will be warned that they will be refused service on any subsequent visit(s) until the problem is rectified, or the vehicle has proof of current compliance with the relevant Ministry of Transport requirements.
- (f) Winstone loader drivers will be appropriately trained to help ensure that customers trucks are loaded securely. All trucks leaving the quarry with loads of quarry products will be checked for insecure loads. This will also help reduce the risk of quarry products being spilled on public roads. It is however ultimately the responsibility of the individual truck drivers to make sure their load is secure before they drive on a public road.
- (g) In dry weather conditions all Winstone owned and operated vehicles carrying aggregate product will have load covers in place before exiting the site. A sign will also be displayed on site, which requests drivers of customer vehicles carrying aggregate product in dry weather conditions to have load covers in place before exiting the site. [Note: Placing of load covers in wet conditions creates a potential Health and Safety hazard for drivers.]
- (h) A wheel wash will be used to spray truck wheels as they leave the quarry site. This will help reduce the risk of dust being carried onto public roads by trucks.

7.7 Dust

Dust can be generated by a variety of different activities that are carried out at the quarry site including: drilling; rock breaking; crushing; extraction; trucks; machinery and blasting.

7.8 *Dust objective*

To avoid, remedy or mitigate adverse nuisance or amenity effects of dust from quarry operations beyond the boundaries of the quarry site.

7.8.1 *Explanation of dust objective*

Given the close proximity of the quarry to residential development there is potential for fugitive dust, especially in the drier months of the year, to detrimentally affect the amenity of these residential sites. This dust objective is intended to ensure that emissions of dust from the quarry are controlled at levels that do not cause a nuisance to the quarry's residential neighbours and to provide the community with an assurance that dust emissions will be minimized and in any event will meet the appropriate performance standards. The performance standards to achieve this objective are incorporated in the District Plan provisions for the Business 7 zone and within the conditions of the ARC's discharge to air permit (Permit Number 21875 – see copy at Appendix 2) for the quarry.

7.8.2 *Performance standards*

- (a) The permit No. 21875 issued by the ARC (see Appendix 2) sets controls on the emission of dust from the quarry. The consent contains a number of limit, process, monitoring, and logging and reporting conditions for controlling dust emissions.
- (b) The operation of the quarry shall not exceed the following:
 - An extraction rate of 100 tonne per hour
 - Crushing and screening rates of 200 tonne per hour
 - A total storage capacity of 20,000 m³
- (c) The permit requires that an Air Quality Management Plan be maintained which accurately records all management, monitoring and operation procedures necessary to comply with conditions of the permit.
- (d) That is the permit authorises the discharge of contaminants to air from the quarry's activities and processes, but subject to the emissions being at the minimum practicable level. The measures undertaken to ensure compliance with the consent conditions are contained in the following section.

7.8.3 *Measures to implement dust objective*

- (a) The vegetation on all earth bunds around the quarry will be maintained.
- (b) Drilling equipment shall be fitted with a dust extraction system.
- (c) Measures to reduce the generation of dust during blasting include: