Before Independent Hearings Commissioners Appointed by Canterbury Regional Council and Selwyn District Council

In the matter of	The Resource Management Act 1991
And	
In the matter of	Applications by **Fulton Hogan Limited** for all resource consents necessary to establish, operate, maintain and close an aggregate quarry (**Roydon Quarry**) between Curraghs, Dawsons, Maddisons and Jones Roads, Templeton

---

EVIDENCE OF KELVYN MARK JOLLY
ON BEHALF OF FULTON HOGAN LIMITED

DATED: 23 SEPTEMBER 2019

Counsel Acting: **David Caldwell**
Email: David.Caldwell@bridgesidechambers.co.nz
Tel 64 21 221 4113
PO Box 3180 Christchurch 8013

MAY IT PLEASE THE COMMISSIONERS

1. My full name is Kelvyn Mark Jolly. I am the Canterbury Quarries Divisional Manager at Fulton Hogan Limited (**Fulton Hogan**). In that role I am responsible for all quarry operations in Fulton Hogan's quarrying business within Canterbury. I have held this role since March 2019.

2. During my more than 18 years at Fulton Hogan I have been involved in quarrying related activities. I joined Fulton Hogan as a Portable Crushing Foreman in 2001 and stayed in that role until 2008. In that role I was involved in crushing in river sites and pits in the greater Canterbury area for maintenance contracts and major projects. From 2008 to 2014 I was the Pound Road Quarry Manager and responsible for all onsite crushing and cleanfill operations at the Pound Road quarry. While in this role, I was also the Canterbury Quarry Operations Manager and had responsibility for all fixed quarry operations in the Canterbury Area. I held this role until March 2019 when I was appointed the Canterbury Quarry Divisional Manager.

3. Prior to working for Fulton Hogan, I was a supervisor for a landscape products trucking company, running operations for the Canterbury based business of six trucks and screening operations.

4. In my role as Canterbury Quarries Divisional Manager I am responsible for the following aspects of Fulton Hogan's Canterbury quarry business:

   (a) Pricing, tendering and securing work;

   (b) Planning and organising works across all Canterbury quarry sites;

   (c) Leading and championing Fulton Hogan's Values in the Quarrying Division;

   (d) Sub-contractor management;

   (e) Site safety and environmental compliance;

   (f) Quality control of process and projects;

   (g) Financial management for all departments within the Quarrying division;

   (h) Human resources processes and recruitment; and

   (i) Assisting in the operational design planning for new resources.

5. I have a Diploma in Surface Coal Mining Management, Risk Management and Worker Health and Safety Management Systems. I also hold A and B grade Quarry qualifications with a Worksafe Certificate of Competency as an A grade Quarry manager.

6. My experiences over the last 18 years in the Quarrying industry with Fulton Hogan have taught me a wide range of skills and disciplines to manage and maintain large Quarry operations including:

   (a) all facets of crushing operations and stockpiling of materials;

   (b) cleanfill and rehabilitation controls to mitigate adverse effects on the environment and surroundings; and

   (c) management of transport fleets associated with quarry activities.

7. In my management roles at Fulton Hogan I have been involved in multiple set ups of new quarry sites from the greenfield stage to operation, including the development and implementation of quarry management plans. To date I been involved in the consenting processes to establish the Barters Road Quarry and the Roberts Road Quarry and multiple changes to Fulton Hogan's existing resource consents as they need renewing or amending. My role also involves ensuring that Fulton Hogan can, from an operational perspective, comply with all of the conditions of consent which we operate under.

8. A large part of my role as a manager is contractor management and ensuring contractors comply with the conditions of consents that we operate under. In the post-earthquake period in Christchurch, this aspect of my role was of high importance because of the pressure being put on Fulton Hogan quarries to keep up with demand. Despite the demand and urgency for quarry materials, compliance with our consents and sound environmental practice remained at the forefront of Fulton Hogan's priorities.

9. From 2008, my roles placed a significant amount of emphasis on the management of staff and ensuring the compliance of our operations with, together with our current Quarry Managers and staff across all sites within the quarries business. This has seen a consistent approach in the Fulton Hogan Quarrying business within Canterbury in terms of how the operations are delivered and the culture we are trying to build in regards to our social license to operate. The Canterbury quarries team including myself have been instrumental in developing a revised industry code of practice to raise the standard of the quarrying business. I discuss the code of practice in more detail below.

10. I have sound knowledge of the quarrying environment in Canterbury, quarrying processes and operations, and the technical parameters of aggregates used in the quarrying industry.

Scope of evidence

11. My evidence will:

    (a) briefly discuss the recently adopted industry code of practice;

    (b) explain my involvement in the development of the Roydon quarry proposal;

    (c) outline the type, quality and quantity of the aggregate resource at Roydon quarry;

    (d) describe the proposed development, in terms of the processing activities to occur onsite, and timing of the stages of development for the Roydon Quarry;

    (e) explain why Fulton Hogan has sought extended hours for the operation of Roydon Quarry;

    (f) outline how Fulton Hogan will manage the activities at Roydon Quarry consistent with the management plans proposed by the conditions;

    (g) explain how Fulton Hogan will manage:

        (i) staff training and induction to site;

        (ii) the cleanfill which will be brought to Roydon Quarry;

        (iii) maximum extraction depth;

        (iv) dust emissions;

        (v) rehabilitation requirements; and

        (vi) compliance with its commitment regarding open areas of Roydon Quarry.

    (h) provide an overview of the likely quarry truck traffic and outline the specific driver induction and education to be undertaken to help ensure the quarry traffic is safe, efficient and as undisruptive as practical.

12. My evidence is intended to be read in conjunction with that of Craig Stewart and Don Chittock. Mr Stewart provides evidence about Fulton Hogan and its commitment to wellbeing, the Christchurch aggregates market and how Fulton Hogan contributes to meeting society's reliance on aggregate. Mr Chittock explains the community liaison and consultation that Fulton Hogan has undertaken in respect of this proposal.

13. A full description of the proposal for Roydon Quarry is set out in Mr Bligh's evidence. I understand his evidence is an up-to-date description of the proposal. My evidence covers the detail of some of the key operational measures which would typically not be understood by someone unfamiliar with a quarry operation. I am happy to elaborate on any other items

mentioned in Mr Bligh's evidence from an operational perspective if it would assist the Commissioners.

Quarry code of practice working group

14. Fulton Hogan has been instrumental in revising the code of practice for the alluvial quarrying industry in Canterbury with all major industry stakeholders. In my roles as Quarry manager for Fulton Hogan I have been involved in this process.

15. The focus of the Code of Practice (**COP**) is to clearly set a standard of minimum operation for all alluvial quarry operations. The COP covers all aspects of quarrying from the initial site setup, traffic management flows in, out and on the site, water quantity and usage, water quality both onsite and downstream, dust management, clean filling, refuelling, site rehabilitation and other key practices.

16. The intention of the COP is to future proof the way that quarry operators think and operate, to maintain a social license of operation whilst being good citizens in our communities. These intentions reflect Fulton Hogan's values and goals and is why Fulton Hogan committed to the revision and adoption of the code.

17. A copy of the COP is included in **Annexure A.**

Involvement in the development of the Roydon quarry proposal

18. I have been personally involved with the Roydon quarry proposal since its inception, when Fulton Hogan began investigating potential quarry sites. In summary, I have been involved in the site investigations to determine the quality of the resource, the development of the operational and working plans, the formulation of consent conditions, public consultation and accompanying interested parties on site visits to explain the operational and site requirements to establish the Roydon quarry.

19. I have a good understanding of the operational and managerial aspects proposed for Roydon Quarry as well as the concerns which have been expressed by interested parties and submitters throughout the consultation and consent process.

20. I have been involved in regular discussions regarding the conditions of consent proposed by Fulton Hogan for Roydon Quarry since January 2018 and how these can be refined to better meet the needs of the community. In those meetings we discuss the proposed conditions and, in particular whether the conditions can be met and, if so, how compliance can be achieved by Fulton Hogan.

Type, quality and quantity of aggregate resource at Roydon Quarry

21. As discussed above, I was involved in the initial site investigations for the proposed Roydon Quarry site. The investigations, in the form of test pits, were undertaken to determine the quality of the aggregate resource at the site. The results from site investigations show the quality of the resource, the potential end uses of the aggregate product and provide the starting point for the financial analysis and business case for any proposed quarry. The Roydon Quarry site has premium grade material for the production of aggregate products for the construction industry. The aggregate which will be produced from Roydon quarry will be suitable to make good quality topcourse, basecourse and sub-base products suitable for New Zealand Transport Agency (**Agency**) and Christchurch City Council product specifications.

22. The quantity of the resource based on the application as I understand is approximately 30 million tonnes, equating to an expected life of the quarry of more than 40 years. The expected life of the quarry is a function of the total resource, by the per annum rate of extraction, allowing for a gradual increase in the rate of extraction as the quarry develops. It is not operationally possible to begin extracting full annual rates of production until significant development of the site has occurred. Fulton Hogan estimates that it will be three to five years from when it commenced the consent process before Roydon Quarry will be able to be utilised to provide a full range of aggregate products from the quarry gate.

23. The quantity of aggregate produced is expected to exceed the volumes which were produced by Pound Road and will include the production of additional topcourse materials suitable for the Agency's projects.

Processing activities at Roydon Quarry

24. As explained above, Mr Bligh's evidence provides a description of the Roydon Quarry Proposal. Below I expand on what will be involved in site preparation, extraction and processing activities at Roydon Quarry and also the timing of the stages of development.

Site preparation

25. The first stage of preparing the site for excavation will involve the stripping of the soil layers (overburden) above the saleable aggregate, of an area of approximately 6.8 hectares which will form the central processing and stockpiling area (**CPSA**) in the middle of the site. This layer is expected to be approximately 700mm in depth, although it can vary across the site, and will be used in the construction of bunds around the perimeter of the site.

26. The CPSA has been designed so that all fixed processing plant and stockpiling is at least 500 m from the site boundary. It is expected that full establishment of the Central Processing and Storage Area will take approximately 2 to 5 years.

27. This material alone will not be enough for forming all the bunds around the site. Other material from within the site will be required for the completion of the bunding process.

28. The construction of these bunds is expected to take around one to two months, using diggers, trucks and loaders as required. Other machinery such as scrapers or bulldozers may also be used if required. Development of the bunds will take place during favourable weather conditions and as swiftly as possible.

29. The bunds will be sown with grass or otherwise vegetated when the work is completed and, if necessary, water will be applied to create a crust.

30. I have extensive experience in overseeing bund construction and Fulton Hogan staff are very well experienced in this and the establishment of good grass cover. Examples of bunds formed in the more recent past, can be seen at Miners Road, McLeans Island, Roberts and Barters Road.

31. The bunds proposed in the resource consent application are a very similar type to those at our other quarries within Christchurch, being 3 m high, having a 1:3 slope on the external side of the bund, a 1 m flat top and at least an approximately 1:2 gradient on the internal slope. This equates to a minimum width of at least 15 - 16 m.

Setbacks from site boundaries

32. The proposed draft conditions attached to Mr Bligh's evidence specify a minimum bund width of 15 m and a number of planting requirements. This layout is shown in the LVIA prepared by Mr Compton-Moen. Fulton Hogan has a full time site landscaping and gardening unit who establish and maintain plantings around our operational activities in Canterbury.

33. Additionally, it is proposed in the conditions to Mr Bligh's evidence that no extraction will take place within 100 m of any of the existing dwellings at 151 Curraghs Road, or 319 Maddisons Road without relevant written approvals from these properties. It is still proposed to construct the bund along the site boundary. From an operational perspective, straight bunds are much more practical to create and safer to maintain.

34. Establishing the bunds along the boundaries, will also mean that they do not need to be reformed at a later date if the relevant land owner and occupier approvals can be obtained.

35. In terms of processing and stockpiling, it is proposed that all fixed plant and associated stockpiling will occur within the 6.8 ha CPSA area, at least 500 m from any site boundary.

36. Similarly, any mobile processing and associated stockpiling will take place at least 250 m from the site boundaries.

Extraction and processing activities, including the transportation of aggregates to the processing plant

37. Extraction will involve the usual range of quarry machinery. This is addressed in Mr Bligh's evidence at paragraph 64.

38. Extraction will involve a loader working at the quarry face. In the case of this quarry, rather than loading dump trucks, it is proposed to load a conveyor system using a hopper feed bucket as we do at our Miners Road operation. The loader will excavate at the quarry face to bring down gravels and then pick these up and transport and load them into the feed hopper. Extracted resource will be transported by conveyor to fixed plant where it will be fed through the processing plant to produce a range of aggregate products in the CPSA, stockpiled, loaded on a truck and trailer units and sold via the weigh bridge. A similar approach will be taken for processing using the mobile plant.

39. Trucks will be loaded from the CPSA or adjacent to a mobile plant stockpile on the occasions when such plant is operating. I envisage only one mobile plant would be used on site at any one time, and I would expect its use to be limited to no more than 120 days per year. There are unavoidable costs to running additional plant both in terms of fuel, delivery or the equipment and staffing, so it is only required at times of high demand or when it is required during a break down of the fixed plant or to produce a supplementary product range.

40. In terms of the load out of trucks, one pass will generally fill a truck. Another two to three passes will fill a trailer unit as applicable.

41. After the initial extraction, it is expected that the field conveyers will be used exclusively for the conveyance of raw material. Exceptions to this would be in the event of a conveyor break down, or potentially for a short period during a modification or the relocation of the field conveyor.

42. The configuring of the conveyor system is outlined in the following sections of my evidence.

Proposed quarrying sequence and staging

43. Quarrying will be progressive as shown in the Staging Plan included as Figure 1 to Mr Bligh's evidence and in more detail in Figures 1 and 2 attached as **Annexure A** to my evidence.

44. Quarrying outside of the processing area will involve a field conveyor. The approximate location is shown in solid red, initially on the east side of the processing area and extending south to the extent required for prevailing quarrying. It is envisaged to be constructed in three steps. A "pathway" will be excavated ahead of it for its installation, some 100 m long to include for a service/access lane.

45. Quarrying will then involve generally moving southward in the direction of arrow “1” with a mobile telescopic lateral conveyor (red dotted line) on the north side of the quarrying. As the quarrying activity moves south more and more of the quarry floor area north of the mobile lateral becoming available for fill and rehabilitation. Rehabilitation will be progressive in manageable and accessible chunks of different size but service/access lanes must remain until the entire zone 1 is excavated and rehabilitated.

46. The lateral conveyor will separate the quarrying loader movements from the cleanfill and rehabilitation activities. As required, probably twice, the main field conveyor will be extended southward with a 100 m wide strip for it quarried ahead of it each time. Overburden from the area being quarried will be used in fill and rehabilitation to the north side of the lateral conveyor. Relocation of the mobile lateral will be driven by limiting the loader maximum run to about 100 m and the need to rehabilitate excavated areas.

47. I note that the fuel efficiency gains from limiting the loader running distance can be in the order of 150L fuel per day.

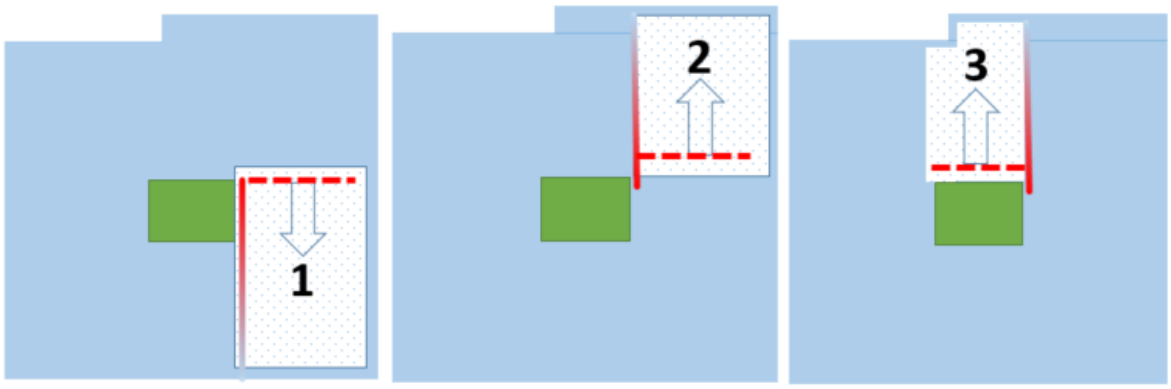

Figure 1: First three-part diagram describing quarrying stages.

48. As zone 1 is a little greater than 20% of the quarry area it may take some 8 to 10 years to complete. After zone 1 is completed a 100 m long pathway for the main conveyor in zone 2 will be excavated and the fixed field conveyor will be relocated there.

49. After zone 2 is complete, zone 3 will continue the progressive anticlockwise quarrying activity, excavation and rehabilitation. Zones 4, 5 and 6 of figure 2 follow the first three zones. The processing plant feed is planned to allow feed in from the west or from the east so after zone 3 the main field conveyor (solid red line) may be relocated to the western size of the central processing area.

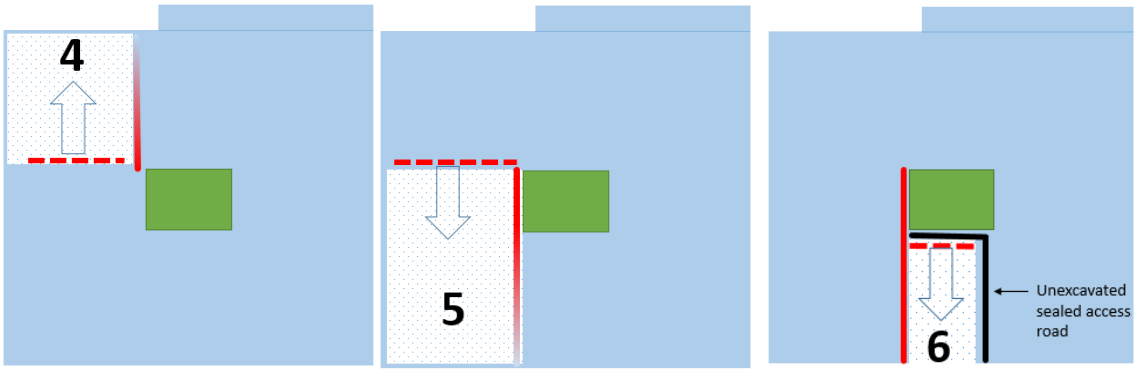

Figure 2: Second three-part diagram describing quarrying stags.

50. After excavation of zone 6 the sealed access road to the processing area will remain. This will be used for:

    (a) decommissioning and removing the processing plant;

    (b) excavation of the approximately two meters remaining beneath the processing area (processing via portable plant);

    (c) final demobilisation and excavation of the access road; and

    (d) final quarry rehabilitation.

Extended hours for the operation of Roydon Quarry

51. Fulton Hogan is seeking extended hours of operation at Roydon Quarry because increasingly our customers are being required to work outside the hours of 6am to 6pm. By way of example, Fulton Hogan has a number of contracts which include clauses that prevent a contractor or anything associated with the contract works from obstructing business accessways during their operating hours. This can severely restrict the hours in which work can be done. For example, a petrol station may be open from 6am to 12pm which only leaves a 6 hour window to undertake works.

52. It is also common for roading contracts for the Agency, CCC and controlled by Christchurch Transport Operations Centre, to include conditions which prevent works from creating any impacts on traffic during heavy flow times on critical traffic routes. This frequently requires work outside the hours of 6am to 6pm. Emergency works also need to be undertaken at short notice, at any time of the day or night.

53. These time constraints are specified to minimise disruption to the network - either roading, port or airport - during their normal operating hours. This is, of course, driven by the community's desire for the least possible disruption to their respective journeys.

54. To meet our customers', and ultimately the community's, need for night operations, quarries are required to load trucks and accept cleanfill outside the hours of 6am to 6pm. Working a slightly longer day is particularly useful during times of peak demand to keep up with supply requirements for large roading projects. Similarly it is efficient to undertake other works if staff are on site.

55. Fulton Hogan will not be undertaking processing activities outside the daytime hours specified within the Selwyn District Plan, as I understand the provisions from the evidence of Mr Farren, Mr Kyle and Mr Bligh. While processing beyond 8 pm was originally proposed, the company has made a decision in response to feedback through the consultation and submission process that this was not considered acceptable to the community at the current time. Even during the evening period of 6 to 8 pm Monday to Saturday it is only proposed to operate the fixed processing plant on up to 150 days of the year and Fulton Hogan has also made the decision not to commence processing on the site prior to 7 am.

56. Between the hours of 8 pm and 6 am it is proposed to only operate trucks on up to 60 nights of the year and movements will be limited to no more than 30 heavy vehicle movements (15 vehicles in and 15 vehicles out) in any one hour.

57. I note provision is made for dust suppression, operation of weighbridge, office activities, site security and light maintenance at all times.

58. While the hours of operation sought by Fulton Hogan may not provide the extensive flexibility that would be of maximum benefit to our customers and the projects they are delivering, the hours of operation have been refined to balance their needs and the needs of Fulton Hogan with the expectations and aspirations of the community.

Management of Roydon Quarry in accordance with management plans

59. A number of management plans have been proposed in the conditions of consent to inform and assist with the operation and management of quarry activities and potential adverse effects. These have been developed as drafts and will be provided to the Council's for certification prior to quarrying commencing. These include:

    (a) Rehabilitation Management Plan;

    (b) Dust Management Plan;

    (c) Cleanfill Management Plan; and

    (d) Landscape Management Plan.

60. Fulton Hogan has also committed to submitting a Noise Management Plan, Spill Management Plan and Stormwater Management Plan.

61. I have read:

(a) the management plans included in the consent application with any revisions that have recently been made; and

(b) the conditions relating to those plans, and the plans to be submitted should the consent be granted, as attached to the evidence of Mr Bligh.

62. Management Plans have been included in Fulton Hogan's quarry consents for a number of years now. The plans inform how Fulton Hogan's quarries, and the activities associated with them, are operated and managed. They form an integral part of day to day operations and in the case of rehabilitation management plans, for example, the long term management of a site. Fulton Hogan is experienced in developing and implementing management plans and has prepared rehabilitation management plans for all of our Christchurch sites. Compliance with management plans, like all other consent and environmental compliance, is taken extremely seriously by Fulton Hogan at the Board, Executive, managerial and employee level.

63. In summary, Fulton Hogan has a number of tools at its disposal to ensure compliance as appropriate, including:

(a) Staff induction and regular training (as discussed below);

(b) Maintaining copies of all relevant consent documents onsite in the Control Room, including all training records for staff at Roydon Quarry;

(c) Daily pre-start meetings to discuss all onsite activity;

(d) Regular site inspections by senior management staff;

(e) Mobile alerts to the Quarry Manager in the event any trigger points provided for in the resource consents occur; and

(f) Quarterly environmental meetings with Fulton Hogan Environmental advisers and the Quarry Management team. In these meetings, we discuss:

(i) dust and water quality results and compliance with consents at all our Canterbury sites;

(ii) monitoring and review of background controls for environmental standards and consideration of trends in our Canterbury quarries. For example, ground water levels.

(iii) whether any action is required and, if so, how that will be implemented.

64. I expand on how Fulton Hogan will meet the extraction depth, cleanfill, dust, rehabilitation and specific transportation requirements proposed in the resource consent applications below.

65. Based on my experience, I am confident that Fulton Hogan can implement and comply with the various management plans proposed for Roydon Quarry.

How Fulton Hogan will manage potential effects and comply with commitments made by Fulton Hogan

66. Fulton Hogan has made a number of commitments as to how we will manage potential effects from Roydon Quarry which are reflected in the proposed conditions of consent. As explained above, I have been involved in regular discussions about the proposed conditions of consent. Below I explain how Fulton Hogan will manage the Roydon Quarry to ensure the conditions of consent, including relevant management plans, are meet.

Staff induction and regular training

67. All Fulton Hogan staff who will be onsite at Roydon Quarry must first undergo a site specific induction, which will include revision of all key operational plans and requirements. All contractors visiting the site will also be required to undergo site specific induction. The purpose of induction is to ensure all persons on site are aware of the operational requirements of the quarry and to ensure compliance with Fulton Hogan's resource consents.

68. Fulton Hogan also require all staff to undertake an initial training session called Environwise. Staff training is then undertaken on a regular basis.

Cleanfill

69. I have read the evidence of Eric van Nieuwkerk which details the requirements for managing cleanfill to avoid groundwater contamination. Fulton Hogan currently accepts cleanfill at some of its quarries, including Pound Road. Based on our current practices, I am confident that the cleanfill which is received at Fulton Hogan will meet the definition of "cleanfill" as set out in the Land and Water Regional Plan and Mr van Nieuwkerk's evidence.

70. Currently, the cleanfill received at Fulton Hogan's quarries is inert fill such as soils, gravels and clays generally from site excavations or subdivision development, and roading construction materials including asphalt and concrete. Cleanfill is an integral part of development and roading upgrades and a quarry is the correct receptor for cleanfill. The truck bringing the cleanfill to the quarry generally takes a load of gravel from the quarry back to the job they have come from. Receiving these materials works well for the quarries due to the fact that the material is used as part of quarry rehabilitation.

71. Fulton Hogan will ensure, as it does for its current cleanfill operations, that the material being received meets the definition of cleanfill in the LWRP by inspecting every load of cleanfill delivered to the quarry on its arrival and then again before the load is pushed over the cleanfill deposition area. Fulton Hogan's will follow the approach below for received cleanfill at Roydon Quarry.

72. In the first instance when the truck arrives at the quarry weighbridge the operator can see the load on the truck via a CCTV system. The operator then needs to decide if the load is compliant or non-compliant, given they can only see the top of the load. If there are obvious signs of non-compliant material on the truck then the load would be rejected and the truck would leave the site fully loaded.

73. If the weighbridge operator deems the load to be compliant then they will make inquiries of the contractor and record relevant information regarding the type, amount and location of where the material has come from at the time the load arrives at the weighbridge. This is recorded and held by Fulton Hogan.

74. The truck then unloads in the cleanfill deposition area where the load is inspected again by a machine operator who has a view of the whole load. At this point, if the load is determined to be compliant, the machine operator will then push it up to the desired height in the deposition area. If for any reason the load was identified as non-compliant at this stage, then the contractor would be contacted to return to the site and remove the load from the site at their own expense.

75. Determining the percentage of vegetative matter per load is again done by visual inspection. In the first instance the operator can only see the top of the load as it comes across the weighbridge but generally this view will reflect the rest of the load. The operator will then determine from what they can see if it is 2% or less by volume per load - a load is deemed to comply with this threshold if there is only a bit of vegetative matter scattered through and well mixed up in the load, making it barely visible. Otherwise, the load will be rejected and must be removed from the site by the contractor and taken to another facility for disposal.

<u>How compliance is achieved with the maximum extraction depth</u>

76. Conditions are proposed, as attached to Mr Bligh's evidence, which limit extraction to a depth of 1 m above the highest recorded groundwater level at the site.

77. The conditions require a range of monitoring measures to ensure this depth is complied with including establishing site datums and surveying levels, and regular monitoring of water levels. Fulton Hogan is well versed with this condition as it applies across all of our sites within Christchurch.

78. In addition to these measures, Fulton Hogan is considering ways to use new technologies with GPS data for Roydon Quarry. Based on our experience with this condition, I am confident we can comply with this condition.

Dust emissions

79. Mr Cudmore has set out in detail the dust mitigation measures to be applied to the site.

80. To implement the Dust Management Plan (**DMP**) and the relevant standard operating procedures, Fulton Hogan will install a standard structure for reporting and responsibilities. At the top of the structure will be the Quarry Manager (**QM**) who will be given overall responsibility for and authority to ensure different areas of the overall operation are effectively employing standard dust management procedures required the DMP and as necessary to avoid any adverse dust effects off site. The QM will be supported by a core team of staff who are themselves responsible for managing key parts of the overall quarry operation including the relevant elements of the DMP. This team includes individuals responsible for overseeing the following:

(a) management of site roads (seal & graveled) including vehicle monitoring and management;

(b) processing plant operation/ product storage and loadout;

(c) excavation working areas and conveyor operation;

(d) clean filling, overburden removal, bunding and rehabilitation;

(e) site dust water suppression, supply and stormwater management; and

(f) environmental monitoring (water, air, noise) equipment operation/maintenance/calibration, data management and responses

81. Fulton Hogan will ensure that all operational staff working in the quarry are given training with respect to the DMP and the relevant standard operating procedures that implement the DMP on a daily basis. This training will be the responsibility of the Quarry Manager to organise and co-ordinate with the site environmental advisor and their management team. Training will be targeted to staff working in and around these different parts of the operation as well as staff assigned to the operation and reporting of all real time environmental monitoring equipment.

82. Staff will be expected to, as part of their overall duties to:

(a) keep records of all dust mitigation related actions within a log book; and

(b) complete dust management procedures successfully as defined in Standard Operation Procedures (**SOP**);

83. Finally, Fulton Hogan will undertake periodic internal audits of all dust control mechanisms and monitoring systems and compliance with SOP to ensure the system is working effectively and provide recommendations for ongoing improvements to the DMP and related SOP.

Rehabilitation requirements

84. As discussed earlier in my evidence, Fulton Hogan is proposing to only have 5 ha of extraction area open at any one time, and 5 ha being actively cleanfilled and progressively rehabilitated. In practical terms, this will equate to around 1-2 ha of area being cleanfilled at any one time with the remaining area being progressively rehabilitated.

85. The site's final use is unlikely to be determined until sometime in the future, however Fulton Hogan propose to restore the site to a standard that leaves it available for a variety of activities.

86. As noted above a draft Quarry Rehabilitation Plan (**QRP**) has been prepared and included with the resource consent applications. I understand the Plan is in line with the requirements of the Christchurch District Plan and the CCC Rehabilitation Plan Guidance document.

87. The approach taken to developing the QRP and the format of this document is consistent with the QRPs developed for our sites in Christchurch so we are familiar with working to such plans and implementing the measures proposed.

Compliance with open areas

88. The active open area for the site has been reduced from 40 ha plus rehabilitation areas, to 26 ha including these areas. This area is broken down as follows:

Table 1: Approximate make-up of the open area proposed.

Purpose	**Area (ha)**
Central processing area, its fixed plant, stockpiles, portable plant, buildings and maintenance facilities	7
Excavation in process	5
Fill and rehabilitation in process	5
Site roads – unsealed	5
Field conveyor, service lanes	4
Total active area (max.)	**26**

* This area excludes the sealed access road(s) into the site and any site buildings.

89. We have spent a considerable amount of time determining the smallest operational area Fulton Hogan can deliver on this site and this is reflected in the restrictions proposed by the resource consents. Based on my experience across our other Christchurch sites, I consider we operate within these areas and do so safely and efficiently.

Quarry truck traffic

90. Fulton Hogan has made a number of commitments through the consent process regarding quarry traffic. These are discussed in the evidence of Andrew Metherell and Tim Kelly and summarised in Don Chittock's evidence.

91. One of the common concerns for many in the community was the prospect of a greater number of trucks travelling through the Templeton township and the number of trucks at night together with the routes these trucks may use.

92. These concerns were expressed by those living in Templeton but also by the wider community who live on local roads within close proximity to the site. While the company's expert advice was that quarry trucks can safely operate in the township, the company has been cognisant of the fact that the community feels very strongly about these issues.

93. Fulton Hogan is therefore proposing that any truck movements through the Templeton township will be restricted to those visits and deliveries involving projects in Templeton only. There are also other restrictions on traffic movements.

94. Fulton Hogan will control trucks movements, to avoid to the Templeton urban area unless a delivery is in the area, by:

    (a) a site induction which will include a section on truck route options to and from the site and specifically address the requirement not to travel through the Templeton urban area unless a delivery is in that immediate vicinity;

    (b) requiring any non-Fulton Hogan controlled truck drivers accessing the site to sign on to a code of practice committing to the same; and

    (c) displaying a prominent sign inside the quarry gate reminding drivers not to travel through Templeton unless a delivery is in that immediate vicinity.

95. Commercial management calculations by Fulton Hogan indicate that there will be between 3 to 4 percent of inter-site traffic volumes, which accounts for stock transfer. Materials would be backloaded by the trucks returning from delivering Roydon Quarry material.

96. Additionally, trucks accessing the site at night will be restricted in their routes by the conditions. In practical terms, this will require all trucks travelling at night to travel to and from the State Highway and then along Jones Road, without travelling along local roads.

97. Based on analysis undertaken prior to and during the consent process, Fulton Hogan knows that the majority of trucks will not need to travel through the Templeton urban area. The analysis undertaken by Stantec for Fulton Hogan predicts that approximately 3 to 5 heavy traffic movements per day will occur on Jones Road towards Templeton. This level of traffic is only predicted to occur at times where there are local destinations requiring the quarried material.

98. Commercial management calculations by Fulton Hogan indicate that there will be between 3 to 4 percent of inter-site traffic volumes, which accounts for stock transfer. Materials would be backloaded by the trucks returning from delivering Roydon Quarry material.

Management and monitoring of truck driver behaviour

99. The behaviour of drivers using Roydon Quarry is immensely important to Fulton Hogan, stemming from a culture of safety and responsibility within the company. Poor driving practices not only erode this culture but reflect adversely on the company and will not be tolerated.

100. A number of measures are used within the company to influence driver behaviour and further measures are proposed. These measures include education through an induction process and monitoring of actual driver behaviour using GPS tracking and public feedback.

101. In terms of driver inductions, all quarry truck drivers both internal and external, will be required to attend an induction specific to Roydon Quarry. The induction covers the minimum requirements of operating at the quarry and the expected behaviours of the drivers on the local road network as they access the quarry. Records are kept of drivers that have been inducted.

102. The induction is designed to highlight specific areas of the local road network and the driving practices expected. The induction also educates drivers about vulnerable road users likely to be encountered on any local roads, this includes etiquette around non-motorised road users such as cyclists, pedestrians and horses. In the case of Roydon quarry, it will also specify the requirement not to use Jones Road through the urban section of Templeton unless the delivery is in the immediate vicinity of Templeton. There will also be a prominent sign inside the quarry gate reminding drivers not to travel through Templeton unless a delivery is in that immediate vicinity.

103. Requests or requirements are frequently included in the induction process and then supported by signs at Fulton Hogan's quarries to reinforce the point. In general, in my experience, such requests or requirements are followed. I am confident the induction process and installed signs, when combined with the other methodologies to influence driver behaviour and travel patterns

will ensure the commitments made by Fulton Hogan regarding truck traffic through the Templeton urban area are met.

104. Internal driver behaviour is monitored via in-vehicle GPS tracking systems. All of Fulton Hogan's trucks have this equipment. Some of our aggregate cartage fleet are also equipped with continuous video recording devices. These devices allow real-time review of current driver behaviour and are an invaluable source of information when investigating any complaints.

105. To give maximum effect to our commitment to not use local roads at night, we have also committed to only having Fulton Hogan owned or contracted trucks access the site during the 60 nights per year night time movements are proposed.

106. Any truck drivers operating vehicles not controlled by Fulton Hogan will be required to read, commit a code of practice committing to not traveling through the Templeton urban area unless there is a delivery in the immediate vicinity of Templeton. Feedback on external driver behaviour currently relies on public feedback.

Conclusion

107. This is a greenfield site of real significance to Fulton Hogan and its people. Being a greenfield site enables Fulton Hogan to ensure the operation of this quarry is beyond best practice. There have been significant resources applied through the consultation and planning stage to ensure we can operate as a state-of-the-art quarry. The controls and technology available and being used on this site far exceed what was available previously.

Dated 23 September 2019

Kelvyn Jolly
Quarry Manager, Fulton Hogan

Annexure A

Quarry Code of Practice

Revision No.: Version 5.4

Date of Issue: May 2019

Copy No. 1

Approval

Prepared By:	Stu Edwards	
	Position: Environmental Advisor	Date:
Reviewed By:		
	Position:	Date:
Approved By:		

	Position:	Date:

Contents

1. Executive Summary

Regulatory authorities are being demanded to address community concerns regarding quarrying activities and their effects, especially in the Greater Christchurch region. As a collective, the quarry industry hopes to collaborate with relevant authorities to form sustainable solutions to these concerns; the industry has come together to create a Quarrying Code of Practice to standardise best practice principles. This creates a concise understanding of quarry principles and provides sustainable mitigation strategies for quarries to adopt, to ensure positive outcomes are reached.

Concerns over dust, air quality, water quality, vehicle movements, amenity value reduction, landscape modification expectations, and potential effects on property values are pertinent to communities near quarries and proposed quarries. The application of an industry code will create certainty for communities and local authorities alike, to ensure agreed, safe and accountable quarry practices are being carried out.

The code addresses wider community concerns by promoting good practice in quarry management, which avoids or minimises adverse environmental effects as far as practicable. It will also assist in forming conditions of consent and serve as a guide in the development of regulatory documents, such as District and Regional Plans. Lastly, it will provide information to users, showing the demand that exists for aggregates and the need to conserve quarry operations for the future.

The industry has access to experts who specialise in mitigation strategies to reduce quarrying's environmental effects, with extensive experience in quarries. The industry will work collaboratively with regulatory authorities in addressing them effectively and to a high standard. This will benefit each party—authorities,

industry and communities—by providing confidence in quarry activities and their environmental effects.

2. Background

The sources of rock and aggregate supplies for civil engineering and infrastructure projects vary from hard rock quarrying, to land-based alluvial deposits, to the harvesting of river-based alluvium. Each of these broad material sources have unique environmental effects, alongside additional effects common across all activities.

As urban and lifestyle land use encroaches further into rural zones, reverse sensitivity issues have come to the fore. Issues such as nuisance dust, vehicle movements on roads, effects on the landscape, air quality and potential effects on property values have now become highly relevant to the semi-rural residential community. It is clear that improving the environmental impact and meeting community effect expectations of quarrying requires an industry-wide approach. The application of best practice will increase costs to the industry, but if it is applied by all industry participants, it will create a level playing field for operators and provide some certainty for the future of the industry.

3. Purpose of the code

The development of a Code of Practice provides a framework for responsible management and good practice, which will be implemented in all quarries throughout the Greater Christchurch region. These proposed practices will assist in avoiding and reducing adverse effects from quarrying operations as far as practicable.

The code creates a strong collaboration between quarries and quarry operators, to ensure all activities undertaken are completed in ways which minimise adverse effects. This will help to create a concise understanding of quarry practices and provide sustainable mitigation strategies quarries can adopt, to ensure positive outcomes are achieved. (The code will only address land-based extraction and will not apply to any river-based extraction).

The code has been developed in collaboration between quarry operators of the Greater Christchurch region. The Greater Christchurch region is defined by drawing a line around Christchurch City, which takes in the communities within the "commuter belt" of Selwyn and Waimakariri Districts. This includes the urban area of Christchurch Central, the Lyttleton Harbour, the area of Selwyn District north of

the Selwyn River and east of Kirwee, and Waimakariri District south of the Ashley River and east of Swannanoa. The boundaries are flexible, recognising that communities of interest and issues extend beyond arbitrary boundaries.

This code will enable quarrying to be undertaken in a manner which addresses both environmental effects and wider community concerns. The collaboration and adoption of this code demonstrates the industry is responsive to the communities in which it operates and is actively managing and reducing its environmental footprint. The code will act as a guide to understand the ways in which compliance can be achieved and, in some circumstances, improved upon. The code will assist users, regulatory authorities, communities, quarry customers, and other vital stakeholders to understand appropriate practices in quarry management and how they can be implemented to achieve overall success and sustainability.

The main objectives of the code are to:

- Promote good practice in quarry management, which avoids or minimises adverse environmental effects as far as practicable;
- Assist in forming conditions of consent and serve as a guide in the development of regulatory documents, such as District and Regional Plans; and
- Provide information to users to allow a better understanding of the demand that exists for aggregates within Canterbury.

4. Key issues to be addressed

Key issues to be addressed are perceived "pain points" of quarrying within the Canterbury region. Dust, water quality, amenity change, traffic and relationships with the community are all well-known issues, however, cleanfill and its water quality effects, as well as rehabilitation, have also been addressed in the code.

All quarry operators have experienced challenges to operate their quarries in a way which the community perceives as being responsible. The industry is judged by its poorest performer. This perception can result in an unfair cost burden taken up by operators to address community concerns, even by those who take a proactive and socially responsible approach. Thus, it is important to bring those at the lower end of the scale in line with those who use better practice.

By developing this code, a standard can be applied to all quarries within the greater Canterbury region thus ensuring all operators are proactive and socially responsible.

5. The operating environment

Land-based quarrying can be split into broad stages:

- Establishment, including consenting;
- Operation; and
- Remediation.

While there is a considerable overlap between stages, there are specific environmental effects at each stage which need to be identified and agreement sought on sustainable practices.

Consent conditions for any specific quarrying activity are the minimum mitigation required to meet community expectations. Typically, consent conditions will include groundwater and air quality effect mitigation, amenity value and traffic movement conditions, as well as remediation of the exhausted quarry.

Following the establishment of the quarry, the extraction of rock presents the greatest challenge to meeting community expectations for acceptable adverse environmental effects. Consent conditions will also often limit traffic movements, hours of operation, maximum dust discharges, and depth of excavation to protect groundwater quality. Contentious consent applications and failure to effectively manage these effects can result in punitive enforcement actions or even a consent review or cancelation. As the industry has experienced in Canterbury, consent condition compliance does not necessarily placate community concerns over the effects of rock extraction in their community.

While being compliant with consent conditions is a minimum expectation, often additional effect mitigation is required to provide assurance to the local community that quarry owners are good corporate citizens. The more specific amenity value effects which are generated during this stage of the activity include noise, visual landscape changes, and hours of operation. These effects are, to an extent, controlled by District Plan rules through zoning regulations. Softening the visual impact of the quarry site will have the biggest benefit for local residents—the quarry site is less intrusive and by design will blend in more with the local landscape.

At the conception stage of the quarry, a remediation plan needs to be scoped as remediation decisions will inform quarry establishment and operational plans, however, it is unlikely the exhausted quarry will be able to be remediated to its original land form.

6. Code of Practice framework

The principles outlined in this Code of Practice go beyond consent conditions by setting minimum expectations to demonstrate responsible quarrying and a commitment to continuous improvement for the community. Each principle within the code has been ranked from zero to four based on level of applicability, as demonstrated in Table 1. The document has been constructed with the view that regulators could use these rankings as an "industry consensus" of best practice principles in alluvial quarrying. It is anticipated that each quarry will adapt and augment the final form document to fit their own circumstances.

Rank	Proposed best practice guides
0	Delete or not applicable.
1	Minimum that all alluvial extraction operators must achieve.
2	Best practice activity: all quarry operators should be either at this level or working toward these BP activities.
3	Long term goals: activities that are aspirational but achievable by all Quarry operators in the short to medium term (an estimated 5-10 years).
4	Where the industry needs to be in the long term to be sustainable and viable.

Table 1. *Ranking system for proposed best practices in alluvial quarrying.*

6.1. Remediation and mitigation of visual amenity effects

The remediation of the quarry is the action by which the extracted areas are returned to either private productive purpose or to a community asset. Any future land use may need a zone change if commercial, industrial or residential land use is anticipated. The broad outline of the remediated site should have been formulated during the establishment phase of the quarry operation.

The options for remediated land use may be restricted by the type of material that was used for the backfilling of the quarry and the reduced depth to groundwater limiting the types of agriculture, or other activities, which can be used on the land.
The remediated landform design will be informed by some of the following factors:

- Regional limitations: the local climate, soil types, land use zoning and biodiversity will strongly influence the remediated landscape;
- As a minimum requirement, return the extracted site to a state which has a similar, pre-extraction, productive and biodiversity profile;
- Remediation may be a commercial or industrial development consistent with the local authority zoning for the site;
- A long-term objective is to use the site remediation to create some biodiversity havens in the exhausted quarry.

Figure 1: *An example of remediated quarry land at Peacock Springs, established by Isaac Construction founders Sir Neil and Lady Diana Isaac.*

Amenity value is, broadly, the natural or physical qualities and characteristics of an area which contribute to people's appreciation of its pleasantness, aesthetic coherence, and cultural and recreational attributes.
Site bunds are a normal condition of consent and are designed to both shield the visual aspects of the quarry, as well as provide dust and noise mitigation for off-site receptors, adding amenity value. As a rule, the bunds are vegetated with grasses and opportunist flora (weeds). The visual impact of the bunds can be softened considerably by planting with trees and shrubs of varying heights and densities; depending on the life span of the quarry, exotics or native plants should be chosen. Any vegetation that breaks up a laminar wind flow over the bunds will contribute to the reduction potential dust nuisance effects from the quarrying activity.

Figure 2: *An example of a quarry bund from the roadside, planted with natives.*

The following principles address remediation and amenity:

Minimum Practice

a)	Remediation is consistent with the land zoning.

b)	As a minimum return the extracted site to a state that has a similar, pre-extraction, productive and biodiversity profile.
c)	Involve the community in the landscape design of any land which will be returned as a community asset.

Best Practice

a)	Vegetate with grasses and actively control weed establishment.
b)	Strip over the autumn, winter and spring months exposing the expected immediate extraction volume. During this period, the overburden is damp, and the stockpiled stripping can be effectively stabilized with grass before the spring equinox wind pattern becomes established.

Long term Goals

a)	Use the site remediation to create some biodiversity havens in the exhausted quarry: restore what has been lost partly by the operation of the quarry.
b)	Plant with shrubs and trees of varying heights to further soften the bund outline.
c)	Dependant on the expected life of the quarry, the use of native planning would add to regional biodiversity and community values.

Table 2. *Best practice guide for rehabilitation and mitigation of visual amenity effects.*

6.2. Topsoil and overburden management

Topsoil and overburden removed prior to excavation provides a valuable resource for future rehabilitation of each quarry site. This material will be used as either a finishing layer for rehabilitation or as fill-in material. An assessment of the depth of topsoil and overburden should be made separately and on stripping, layered separately, such that the soil structure can be regenerated on remediation of the site. Therefore, it is important that during the removal and storage of topsoil, losses through erosion, poor handling and storage are minimised.

The following principles address topsoil and overburden management:

Minimum Practice

a)	Topsoil material is stored in stockpiles or as part of the site bunds for rehabilitation use.
b)	Minimise topsoil handling.
c)	Locate stockpiles as close as possible to areas of future use.

Table 3: *Best practice guide for topsoil and overburden management.*

6.3. Traffic management

Traffic movements to and from quarry sites are limited by rules and regulations within the purview of the relevant territorial authority District or City Plan, conditions of resource consents and existing use rights.

From the local communities' perspective, the increase in traffic movements and truck numbers has a major effect on their amenity values and perception of safety. The noise, vibration and spillage of material on roadways can be a source of nuisance to nearby residents.

In order to create sustainable traffic movements and mitigate environmental effects, the following are recommended:

	Minimum Practice
a)	Quarry fleet vehicles should be well maintained to minimise noise and exhaust emissions.
b)	Staff should be appropriately trained on how to load road trucks to minimise spillage.

	Best Practice
a)	Staff are/will be appropriately trained in energy management strategies that are applicable to traffic movements. This includes reducing idling and speed, increasing knowledge on technique such as gear changes, smooth acceleration and reading the road ahead.
b)	Staff should be appropriately trained on how to load road trucks to minimise spillage.

Table 4: *Best practice guide for traffic management.*

6.4. Water quality

Quarrying activity itself is unlikely to have an adverse effect on ground and surface water quality; it is the discharges from the quarry that are of most concern—uncontrolled cleanfill deposition poses potential risk to groundwater quality.

For hard rock quarries, sediment discharges from stormwater or springs on site will need to be controlled by using standard stormwater management practices, such as retention ponds or even flocculation if clay soils are prevalent. This may also be relevant to alluvial rock extraction at ground level.

As a rule, alluvial rock quarrying and some hard rock quarries are operated below the local surface level and are not normally at risk from stormwater and spring discharges. In these types of quarries, the requirement to remediate the exhausted quarry is usually a condition of consent and presents the greatest risk to groundwater quality.

The storage and use of Hazardous substances (diesel, petrol and oil) is permitted under both Regional and District Plans. Care still needs to be applied in the use and storage of these substances, as they have the potential to also affect water quality. Fuel spills from refuelling on the quarry floor present the greatest risk to ground water contamination. In all situations, a dedicated refuelling site should be established on unquarried land providing maximum separation between a potential discharge point and groundwater.

The following principles address water quality:

	Minimum Practice
a)	At least 1 metre of separation must be maintained between the quarry floor and the agreed separation to groundwater or if not available, the interpolated groundwater height. The consent may prescribe a maximum excavation depth; if this is higher than the 1m separation to groundwater then the prescribed excavation depth must not be exceeded.
b)	Vehicles do not operate in exposed ponded groundwater.
c)	Haul roads in the quarry should be maintained to a serviceable standard.
d)	Portable, tracked or fixed plant refuelling in the quarry needs to be carried using drip trays positioned such that no fuel spill can discharge to the quarry floor.
e)	All refuelling must be undertaken under continuous supervision. (Operator/Driver)
	Best Practice
f)	Groundwater monitoring bores are drilled and screened between the lowest recorded and to 1 m above the highest recorded groundwater level for the locale and groundwater depth recorded automatically.
	Long term Goals
g)	A minimum of one up gradient and two down gradient bores need to be installed for both water quality testing and ground water depth reporting. The bores should have data loggers installed to record, at least daily, groundwater depth measurements.
h)	Haul roads in the quarry should be maintained to a serviceable standard preferably built up to 0.5m above the quarry floor; this will help keep vehicles out of pooled surface water, the haul roads dry and reduce dust tracking from the site.
i)	Loader drivers (extraction) have real time access to quarry depth information. The cost of this technology can be off set against quarterly or biannual depth surveys and the potential cost of backfilling large areas of quarry floor.
j)	Survey the quarry depth annually, measured to an accuracy of ±50mm.

Table 5: *Best practice guide for the management of water quality.*

6.5. Cleanfill

The main issue with cleanfill delivered to quarries is the uncertain providence of the delivery. Quarry operators must be conscious of their vicarious liability for any load accepted into their quarry if the cleanfill load does not conform to the definition of

cleanfill. The only defence available is if the operator took all reasonable steps to confirm the material was not cleanfill. A signed agreement with a supplier is unlikely to protect operators from an enforcement action.

A cleanfill management plan must form part of the quarry's remediation and operation plan, among the following principles:

	Minimum Practice
a)	A Cleanfill Management Plan must form part of the Quarry's remediation and operation plan. The Cleanfill Management Plant must include the following acceptance criteria for deposition:
i.	Procedures for inspection of deposited material and processes by which rejected material is handled.
ii.	How relationships with cleanfill suppliers are formalised: A minimum of a signed contract with cleanfill suppliers confirming acceptance of the cleanfill criteria and providing background information on the types of documentation that may be available for the contractors to confirm the quality of the cleanfill being transported.
iii.	Internal auditing procedures for material supplied and accepted as cleanfill: confirming the location of the source material is not potentially contaminated and inspection of any documentation that is available with respect to the source site.
iv.	Recording and ensuring test data for any material received as cleanfill is available for compliance audit inspection.
b)	Cleanfill must be deposited short of the cleanfill face and inspected before pushing into the quarry void.
	Best Practice
c)	Quarry operators must record the truck and trailer plate numbers and the source address of the material. Only deliveries from known contamination free site should be routinely accepted for disposal.
d)	Any cleanfill from potentially contaminated sites has SQEP certification that the material is suitable for disposal as cleanfill.
	Long term Goals
e)	Cleanfill from a potentially contaminated site should have a PSI and or a DSI supports a decision that the material is suitable for cleanfil disposal.
f)	Use Leaching potential (Acidified SPLP or TCLP testing) to confirm that the test leachate contaminant concentration is less than 20x the 2008 NZ Drinking water, water quality standard MAV or aesthetic GV or subsequent standard revisions.

Table 6: *Best practice guide for cleanfill.*

6.6. Dust management

The management of dust emissions from quarrying activities is the biggest challenge for quarry operators to meet community expectations. Outside visual amenity effects, dust discharges beyond the site boundary create a nuisance issue for local residents and the wider community as a whole and can result in chronic health effects.

.

The extraction process itself, either by blasting or the excavation of alluvial shingles, releases dust from fines in the rock matrix. In many cases, if the source material is damp—as is the case with the extraction of alluvial shingles—dust generation is minimal. Even when freshly extracted material is stockpiled, dust generation is still likely to be minimal after wind erosion of the surface material.

The processing of the extracted material, either by screening and/or crushing, will generate dust; the finer the product produced, the more dust potential. Stockpiles of fine processed material, sand products, crusher dust etc., are at greatest risk for dust generation—the risk being inversely proportional to the product diameter. The greatest risk is when there is a worked face on the product stockpile.

Areas which have been stripped in advance of extraction are particularly at risk for dust discharges in more extreme weather events, as effective control of large open areas of exposed land is problematic. Any quarry must have sufficient water available to use for effective dust mitigation.

To address dust issues, it is recommended:

	Minimum Practice
a)	Any proposed and existing quarry must have sufficient water available to use for effective dust mitigation.
b)	Loading out of product should only be carried out when the potential for dust discharges are minimal or effectively controlled
c)	Every extraction and processing site must have dust suppression equipment available for deployment or use when required: Water carts equipped with a water cannon for dust suppression of quarry floor, haul roads and material stockpiles and sprinkler/ jets on crushing and screening plant for dust suppression
d)	Set up dust monitoring that can be used to isolate the quarry's contribution to dust discharge off-site. Ideally, the dust monitoring sites should be on the lee side of bunds and be able to give up wind and downwind measurements. The results can be used to validate dust mitigation measures.
e)	Limit the quarry floor area. The extraction is planned such that progressive remediation can be carried out without affecting extraction efficiency: cleanfill and grass/vegetate the remediated area as the quarry face extends
f)	Limit all vehicle movements (including loaders) as defined in a site-specific traffic management plan. This will limit the area that has the potential to generate nuisance dust and creates a smaller area to apply dust control mitigation
g)	Seal haul roads into and out of the quarry; the seal should be at least 100 metres and be regularly swept or washed down. A length of ballast, if available, greater than 30 metres before the seal will minimise the dust discharge to the sealed haul road.

h)	Limit vehicle speeds on the unsealed quarry floor to less than 20 km/hr; speeds on clean sealed haul roads can be higher. Increasing vehicle speed is directly related to increases in dust discharges.
i)	Ensure appropriate staff have access to site relevant meteorological data. Wind speed and direction, at a minimum hourly average with wind gust speed, is available for decision making purposes.
j)	The last task in the quarry each day, in the high-risk season October to May, is to run the water cart or run dust suppression measures, over all the dust risk areas of the quarry.
	Best Practice
k)	Any area that has been stripped in advance of extraction must be stabilised and traffic excluded until extraction is commenced.
l)	High dust risk product stockpiles are located in the quarry such that the risk to off-site sensitive receptors is eliminated, avoided or effectively mitigated
m)	Seal haul roads into and out of the quarry; the seal should be greater than 100 metres and be regularly swept or washed down A length of clean washed stone, if available, greater than 30 metres before the seal will minimise the dust discharge to the sealed haul road.
n)	Set wind speed trigger points for dust suppression to be initiated, making pragmatic decisions on continuing to operate if dust discharges beyond the site boundary are likely to cause a potential nuisance effect.
o)	If high dust risk product needs to be loaded out, then use a constructed safe area; an area where dust discharges will be effectively controlled. The loading of the truck will cause a short-term dust issue, of concern is the continued dust emissions from the worked stockpile face.
	Long term Goals
p)	Containing high-risk products within buildings. The buildings are designed to prevent low-pressure areas developing in the lee of building sucking dust into the air.
q)	Use covers or fogging jets mounted upwind above the stockpile to control dust discharges from processing plant.

Table 7: *Best practice guide for dust management.*

6.7. Community Engagement

Community engagement is very important to any proposed quarry project (either existing site expansion or greenfield) and must be initiated well before any plans are drawn up and the consent application is lodged.
Listening to the concerns of the local community is good practice and helps the applicant to understand and focus on the issues that are of greatest concern to the community. This engagement allows the applicant to understand these before lodgement and in some cases respond to, or address them in application preparation.

Nothing can be assumed and the “No Quarry” stance or “Not in my back yard” is generally the place from which these concerns will come.
Those against quarrying are always concerned with their health, their home and their environment.
Engaging directly with residents in the community is a very important aspect (but this must be in a planned and controlled manner) and allowing the community to question the quarry project concept through every aspect such as; wind, air quality, water, traffic, rehabilitation, land values, etc. is critical.
Learning’s from these discussions need to be integrated into the conceptual design of the quarry and the terms of the application.
Best practice might see the establishment of a Community Advisory Group (CAG) to meet over a period of months prior to lodgement of the consent which will also greatly inform the applicant of issues, thoughts, processes and potential solutions. This group needs to be across a wide section of the community and each voice needs to be heard – an independent facilitator is a good option to consider in running these meetings.
Engagement is a continual process, not a “tick box” solution. It has no time frame and each voice at any stage adds value to the overall outcome.
Quarrying has become a top of mind subject and is open to a great deal of media scrutiny. Everyone today has fast access to “social media”. It is important to have a very carefully managed media campaign running alongside the engagement process. Staying close to the community plays a huge part in this.
Clear, consistent, open and honest messaging must be undertaken from the outset. There can be no hidden agendas.
Step 1: Engage from the outset
Step 2: Listen to concerns
Step 3: Act on concerns (where possible)
Step 4: Think and rethink the application
Step 5: Stay engaged
Step 6: Continue to listen
Step 7: Continue to act
Step 8: Post the application being lodged, stay engaged
Step 9: Throughout submission period, stay engaged
Step 10: Do not stop listening
Step 11: Keep adapting to concerns
Step 12: Post the consent being approved, stay engaged

7. Conclusions

This Code of Practice sets a standardised baseline of how operations should be carried out which provides certainty for authorities, industry and communities. This will achieve positive outcomes for communities and the environment, as well as securing the future growth of the quarrying industry and supply of much needed aggregates and sand.
The future viability of the industry depends on being able to demonstrate to the community that quarry operators are good corporate citizens, they are responsive to community concerns and do care about the environment the industry operates in.