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Dear **Sarah Davidson**

Subject: Preliminary technical air quality review of the proposed Cromwell Certified Concrete Quarry air discharge consent application.

Scope of Works

Otago Regional Council (**ORC**) has received an application from Cromwell Certified Concrete Limited for an application to discharge contaminants to air from proposed quarry operations at Cromwell Certified Concrete's (**CCC**) Amisfield Quarry. ORC has engaged NZ Air Limited (**NZ Air**) to undertake an independent air quality expert review and critically assess the air quality assessment¹ (hereafter referred to as the **AQA**) provided by the applicant's technical experts, Beca Ltd (**Beca**). ORC has requested an audit of the AQA and its conclusions on potential air quality effects on the following three receptors:

- Clark's property, including dwelling;
- Little's Orchard; and
- The Western Vineyards

Note that as a preliminary review only, a selection of bullet points which identify information gaps or matters which need further attention has been provided. The information presented in this letter is based on a brief desktop review of the application and publicly available information only. No site visit has been undertaken by NZ Air.

¹ Beca report titled: *Amisfield Quarry - Technical Assessment of Potential Effects of Dust Discharges*. Dated 22 October 2020

Brief overview of the Application

The AQA prepared by Beca provides a detailed description of the proposed activity, however for context to this review, the proposed activity involves the following:

- CCC propose to expand its quarry footprint by approximately 8 ha (increasing the total quarry footprint to 27 ha).
- CCC also propose to increase the extraction depth to 30 m below ground level (currently the extraction depth is 15 m).
- The extraction rate is also proposed to increase from ~70,000 m³ per annum to ~200,000 m³ per annum.

Beca has assessed the following proposed site activities which have the potential to discharge nuisance dust:

- Excavation and stripping of overburden;
- Extraction of gravel;
- Overburden stockpiling;
- Raw and finished material stockpiling;
- Loading and unloading of materials;
- Vehicle movements;
- Crushing and screening of gravel; and
- Backfilling of worked areas.

Dust generated from dry exposed areas has also been assessed.

The existing and proposed excavation areas are illustrated in Figures 2-1 and 2-3 of the Beca AQA. The AQA has assessed potential air quality impacts (both nuisance effects from TSP emissions and potential health effects from PM₁₀ and PM_{2.5}) at neighbouring properties (illustrated in Figure 2-5 and tabulated in Table 6-1 in the AQA).

The surrounding land use is dominated by fruit growing activities.

Aspects of the AQA for which further information/assessment should be supplied to ascertain the potential level of off-site effects

In NZ Air's professional opinion, the following aspects of the AQA have not been provided or lack sufficient detail to be able to accurately determine the potential for adverse off-site air quality effects:

- The assessment relies heavily on meteorological data measured at the Fulton Hogan Quarry located approximately 2 km south of the site. NZ Air considers that in the absence of on-site meteorological data, the use of this data is appropriate. However, the assessment does not state the height above ground level at which the wind data has been measured. As measured wind speed generally decreases with height above ground level due to the increase in surface friction effects. It is the industry standard to use wind speed and direction measured at 10 m above ground level for the purposes of assessing the potential effects of wind on the dispersion of dust from quarry emissions. If the Fulton Hogan observations are from a lower height (i.e. 6 m above ground level), then the proportion of wind speeds which are higher than 5 m/s (the critical factor used in the risk assessment

approach adopted by Beca) would be higher. The anemometer height needs to be provided such that the conclusions relating to the potential effects can be verified.

- The AQA has not provided the location(s) of material processing equipment on-site. With the proposed increase in material extraction rates (from 70,000 m³ to 200,00 m³ annum) it is likely that there will be an increase in product processing (crushing and screening) activities. Product processing activities can have an increased risk of off-site effects. Some product processing activities produce dust with higher proportions of fine dust (PM₁₀), i.e. crushing activities. As such dust from product processing can travel further than that generated from other quarry dust sources. As such it is the industry standard to have larger separation distances between product processing plants and off-site receptors. Therefore, NZ Air consider that the location, size, and processing rates of product processing activities on-site need to be provided and more specific detail on the proposed mitigation measures for each type of product processing plant (i.e. fixed or mobile processing plants) should be provided.
- The AQA also does not identify the proposed location of main haul roads, product stockpiling (of particular interest would be any fine products such as crusher dust or sand), or overburden stockpiling, either within the existing quarry or the proposed expansion area. The scale of the activities at each location has also not been provided.
- Beca has commented on the potential effects of respirable crystalline silica (**RCS**) on off-site effects. Beca has relied on monitoring undertaken in the Yaldhurst monitoring study to determine the potential for off-site effects. NZ Air notes that the silica content in aggregates quarried in Canterbury is likely to be lower than that at CCC. Based on geological surveys of rock types in the South Island, there is a higher proportion of quartz rich rock in Central Otago than in Canterbury². NZ Air considers that it would be pertinent to assess the potential increase in RCS emissions which could occur from quarry activities proposed at CCC's Amisfield quarry (particularly product crushing processes which have a higher potential to discharge RSC). This would be particularly relevant should product processing be proposed to occur within close proximity to neighbouring residential receptors (i.e. the Clark residence).
- It is not clear from the information provided in the AQA whether or not aggregate extraction and subsequent rehabilitation will be staged to limit the amount of exposed/or active working areas. Based on the information provided and current aerial imagery it appears that there is a low proportion of the existing quarry footprint which has been rehabilitated. There is an increased risk of nuisance dust emissions if there is a large area of unconsolidated exposed surfaces.
- The AQA correctly identifies that deposited dust can have adverse ecological effects including effects on cropping operations. The existing and proposed quarries are essentially surrounded by cropping activities. The Ministry for The Environment Good Practise Guide for Assessing and Managing Dust (2016) (**MfE GPG Dust**) describes the potential effects on plants and crops in Section 2.2.5 (reproduced below).

² Black, P M. 'South Island Aggregate Inventory – Geological Influences on Materials Properties' March 2014

Plants and crops

Dust deposits can have significant effects on plant life, though mainly at high dust loadings. This can include:

- reduced photosynthesis due to reduced light penetration to the leaves. This can cause reduced growth rates and plant vigour. It can be especially important for horticultural crops, through reductions in fruit setting, fruit size and sugar levels. It can also lead to reduced forestry yields
- increased incidence of plant pests and diseases. Dust deposits can act as a medium for the growth of fungal diseases. In addition, it appears that sucking and chewing insects are not affected by dust deposits to any great extent, whereas their natural predators are affected
- reduced effectiveness of pesticide sprays due to reduced penetration
- rejection and downgrading of produce due to crop blemishing. Once again, this is a particular issue for horticultural crops
- reduced palatability of pasture and associated reduced yields in terms of dairy productions.

Given the extent and proximity of the existing cropping operations to the existing and proposed CCC quarry operations, NZ Air considers that a more detailed assessment of potential cumulative effects on adjacent cropping activities should be provided.

- Beca has proposed that a Dust Management Plan (**DMP**) will be produced and that this plan will supply more detailed mitigation methodology. This should be provided with the application such that it can be reviewed to ensure that suitable management measures are proposed to effectively mitigate dust discharges from the site.

Additional mitigation/design considerations which could be considered to reduce the potential for effects

- NZ Air considers that the applicant should consider limiting aggregate processing and storage to central locations on-site, to increase the separation distances between this dust discharging activity and the nearest off-site receptors.
- The applicant has proposed boundary TSP monitoring and associated concentration trigger levels for increasing dust control measures and stop work conditions. It appears that this TSP monitoring is only applicable to residential receptors which are within 100 m of the site boundary. Based on a review of available aerial imagery, it appears that the Clark residence is the only residence which is within 100 m of the boundary. This would mean that TP monitoring would only be required during a very small portion of the proposed quarry works. It is noted that Environment Canterbury requires quarries to undertake continuous TSP monitoring within 500 m of a residential dwelling. Dependent on the results of the assessment of potential cumulative effects on surrounding crops, it may be appropriate to undertake TSP monitoring on boundaries adjacent to cropping land (potentially only during certain seasons).
- The applications states that water will be used for mitigation '*as required*'. Whilst the application states that there will be sufficient water available to control dust emissions from

dust producing activities on-site, the water application infrastructure/number of watercarts which would be required to apply this amount of water (up to 250,000 l/hr) would be substantial. NZ Air considers that there needs to be more detail on how and when water will be used to control dust emissions from the site. Usually, this information would be supplied within a DMP.

- The applicant should consider stipulating minimum separation distances of product processing plants from the site boundaries/sensitive receptors.
- The applicant should consider undertaking staged material excavation and rehabilitation activities to reduce the amount of exposed unconsolidated surfaces. Stipulating a maximum area for active works will also reduce the potential for dust emissions during dry windy conditions. It is common (and good practice) for quarries to undertake staged extraction and progressive backfilling and rehabilitation. Limiting active working/exposed unconsolidated areas to ~2 ha is common. It appears that the majority of the existing 19 ha quarry is exposed and there is very limited rehabilitation which has occurred on-site.
- The proposed weather station should be installed in accordance with AS/NZ 3580.14:2004.
- The applicant could consider providing a larger setback distance between off-site receptors and the proposed boundary bund/excavation area.
- The applicant could consider automated sprinkler systems on the on-site haul roads if these are not already present/proposed.
- The applicant could consider installing a spray bar to wet down the surface of uncovered loads entering and exiting the site.
- The applicant could consider installing a wheel wash on the site exit to limit tracking of material off-site.
- The proposed boundary bunds should be constructed during winter months where the soil moisture content is higher and evapotranspiration rates are lower. Detail on how the boundary bunds will be vegetated and how vegetation of these bunds will be maintained should also be considered.
- The Beca AQA correctly states in Section 4.9 that shelterbelts reduce the potential for dust discharges beyond the site boundary. Whilst NZ Air accepts that there may be limitations to providing planting on the site boundaries, it is considered that this should be investigated further. Boundary planting is considered good practise in the quarry industry. It is noted that there is some boundary planting around the existing quarry. Infill planting along these existing boundaries should be considered as a minimum.

Potential for adverse air quality effects

In summary, the technical assessment of potential air quality effects provided in support of the air discharge consent lacks detail on a number of aspects. Further assessment is required to accurately define the potential for adverse air quality effects.

This site is unique in that it is almost entirely surrounded by cropping activities which are likely to be sensitive to deposited dust. In many instances the separation distances between these cropping activities and the site boundary are small (less than 100 m). As such there are sensitive activities downwind during nearly all wind directions. NZ Air suspects that there will be a higher proportion of windspeeds above 5 m/s at the site that that presented in the report. The site is exposed and there is little established planting (particularly in the immediate vicinity of the proposed expansion area). The local topography is likely to 'funnel' wind in a north/south orientation. In similar topographies strong up valley or down valley winds are common. As such there is a higher potential for off-site adverse effects to occur.

NZ Air is not qualified to comment on the potential for adverse effects on crop growth and yields which may occur should there be an increase in dust deposition on the adjacent cropping activities, but it is considered that without stringent dust mitigation measures, the potential for an increase in dust deposition on these immediately adjacent cropping activities is likely.

Whilst ORC has not received any dust related complaints relating to the historic operations, two complaints were received in October and November 2020. These complaints included photos and video of dust discharges from the existing activity. It is noted that these complaints were made after adjoining residents became aware of the application for consents. Nonetheless the NZ Air has viewed the video supplied. The visible dust emissions (which are alleged to be emitted from the existing operation) are substantive and not consistent with emissions which would be expected from a quarry which is implementing industry standard dust mitigation measures. Note that NZ Air has not been able to verify whether or not this video evidence is in fact video of dust emissions from the CCC quarry or not.

The proposed increase in scale of the operations will require a measured increase in mitigation, particularly if CCC intend to leave all or most of the area proposed to be quarried 'open' and not progressively rehabilitate excavated areas.

Potential effects on Clark's property and dwelling

NZ Air considers that the potential effects on this property are elevated by the fact that there will be/may be quarrying/dust producing activities on three sides of the property which could occur simultaneously. This means that this property could be downwind from dust emitting activities during most wind directions. This increases the frequency and duration of potential dust nuisance effects. The distance between the Clark residence and the nearest proposed extraction area (80 m) is small. Without very stringent dust mitigation measures during works this close to a residential dwelling, there is a high potential for dust discharges to generate nuisance effects on this residence (note that during the Yaldhurst monitoring program there were three exceedances of the MfE PM₁₀ nuisance trigger threshold at a monitoring location 80 m from the Yaldhurst quarry zone³). NZ Air considers that the most effective mitigation to preventing nuisance dust effects on this residence would be to apply a larger buffer distance between this receptor and on-site activities.

In the AQA additional mitigation is proposed (in Section 7.3) when working within 200 m of the Clark residence. This includes windspeed and TSP trigger levels which include stop work conditions. NZ Air consider that these monitoring triggers are appropriate, but there is a lack in the detail of what '*additional dust control methods*' will be for the '*alert*' triggers.

NZ Air consider that the prevalence of windspeeds above 5 m/s needs to be confirmed by knowing the height of the anemometer at Fulton Hogan. If the measurements are not at 10 m above ground level then there will be a higher proportion of windspeeds above 5 m/s and hence the risk category (calculated using the IAQM risk assessment approach) may change, leading to a higher potential for effects on this property/residence.

Potential effects on Little's Orchard

As discussed earlier, NZ Air considers that the potential effects of dust deposition on neighbouring cropping activities needs to be more thoroughly assessed. As such it is not possible to ascertain the full extent of the potential effects on these properties. However, it is noted that there may be

³ It is noted that the Yaldhurst quarry zone is a much larger operation than that proposed by CCC, this information is supplied for context only.

instances where the Little's orchards could be downwind when dust producing activities are being undertaken on both the existing and proposed quarry, which could lead to cumulative effects.

Potential effects on the western vineyards

NZ Air considers that there is a reduced potential for adverse effects on the vineyards due west of the existing and proposed CCC quarries. This is primarily due to the fact that these vineyards are further from the majority of the proposed dust producing activities, and have a low percentage of time when they are downwind from the quarry activities i.e. there is a low percentage of easterly winds. Notwithstanding this, it is still important for the applicant to undertake a high level of dust mitigation, this will include preventing material tracking off-site (the site entrance is directly opposite these vineyards).

It is however noted that there is a vineyard southwest of the existing quarry (on the eastern side of State Highway 6) which is approximately 45 m from the existing quarry boundary (at its closest point). It does not appear that Beca has assessed this cropping activity in the AQA. Parts of this vineyard would be downwind during north easterly winds (which are a dominant wind direction and have a higher proportion of winds above 5 m/s). As such Beca should assess the potential for adverse effects on this receptor.

Summary

In NZ Air's opinion, CCC need to undertake a high level of dust mitigation to ensure that nuisance, ecological, or health based air quality effects do not occur off-site. This is a function of the size and scale of the proposed quarry in conjunction with the small separation distances between the air discharging activities and the nearest sensitive receptors. There is a lack of detail on what these mitigation measures will be and how they will be implemented by site staff on-site (which would usually be presented in a DMP). As such an accurate determination on the potential for adverse effects is not possible.

There are additional design considerations and industry standard mitigation measures that the applicant should consider to reduce the potential for effect.

There is further assessment and detail which is required to accurately determine the potential for off-site effects. However, based on the information supplied, NZ Air considers that there is an elevated potential for adverse off-site effects at the Clark property and residence, the Little orchards, and potentially at the vineyard due southwest of the existing quarry. CCC will need to implement stringent industry standard mitigation measures (including those recommended in this letter) to ensure that the potential for adverse effects to occur beyond the boundary of the site is low.

Closure

If you have any questions about this review, please contact Donovan Van Kekem on 021 329 970.

Yours Sincerely,

Donovan Van Kekem

Managing Director

