30th April 2021

Att Stephanie Maguire
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CC: Honourable Meaghan Scanlon Enoch MP
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CC: Honourable Mark Boothman
Minister for Theodore
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Dear Stephanie,

Re: Nucrush Quarry Blast monitoring incorrect locations

and Environmental Authority inadequacies

Further to my letter of 3rd March 2021 and your email dated 13th April 2021.

Firstly, for clarification, references within this document to the DES document 'Model operating conditions - ERA 16 - Extractive and screening activities' (or 'ESR/2015/1666') notes that *"This document provides advice to potential environmental authority holders on the model operating conditions that will be applied to their environmental authority for environmental relevant activity (ERA) 16 operations"* (Attachment A1). Therefore, it is assumed that the current Environmental Authority EPPR00245613 should meet the clear guidelines within this document. And, the proposed EA0002207 should also meet these clear guidelines as the authority holder would expect.

Here is my response to your email.

You said*: "It is important to note that the limits specified in the EP Act and the relevant EA are set to limit potential disturbance experienced from blasting but not eliminate noise and vibration at the closest receptors. Please be assured that the limits imposed on the quarry have always, and continue to be, an order of magnitude below levels that are capable of causing structural damage to buildings and homes"*.

I appreciate there are limits, however, we cannot be sure the *"magnitude below levels that are capable of causing structural damage to buildings and homes"* as the DES are not enforcing monitoring at closest sensitive receptors as required by the Nucrush current approval (by way of their Rezoning agreement). Therefore, there is absolutely no way of knowing if a particular blast caused a potentially structurally damaging ground vibration at, for instance, '24 Wimbledon Way' (one of the closest receptors on the Easter side) if it is not monitored!

It should also be realised that your comment: *"magnitude below levels that are capable of causing structural damage to buildings and homes"* completely ignores the aspect of the health and safety and personal welfare for local residents and also the very real possibility of non-structural damage to homes that many, many, people are reporting that is damaging their homes, maybe not structurally, but it is causing real anxiety and damage to their personal belongings. This cannot be permissible and it's reinforced by the DES requirement within its guidelines for a 1000m separation buffer (and/or 'Blast Exclusion Zone') from blasting quarries of this nature. You cannot simply measure the effect this is having on local residents, their pets and the local wildlife by whether the blast is *"capable of causing structural damage to buildings and homes"*. And, to do so I find highly concerning.

Further, the DES 'Model operating conditions - ERA 16 - Extractive and screening activities' or ESR/2015/1666 (which I believe the Environmental Authority EPPR000245613, and the new one EA0002207, should be based upon) states: *"Blasting noise limits when measured at any **sensitive place** or **commercial place** in accordance with the associated monitoring requirements"* Please note the emphasis on *"**sensitive place** or **commercial place**"* is as per the DES documentation.

Whereas you're Environmental Authorities, grossly inadequately, states: *"must be undertaken at two monitoring locations as determined by this approval or at other relevant location(s) as directed by the administering authority in relation to a complaint"* (Extract from EA0002207 reproduced in Attachment A2. Ditto for EPPR000245613, Attachment A3). It should be noted (despite: *"must be undertaken at two monitoring locations as determined by this approval"*) that no further information on monitoring locations are (negligently in my opinion) specified within the Nucrush environmental authorities, thus, permitting the quarry complete freedom to monitor where it choses and not at the required closest, most affected, *"**sensitive place**"* (e.g. '24 Wimbledon Way' abutting the quarry boundary) or closest *"**commercial place**"* **(**e.g. The Oxenford Water Tower fully encompassed within the quarry boundary) as required by ESR/2015/1666 (See map Attachment A4).

I would, as I have stated to you before, assume the approval was based on the current approval, as per the Rezoning agreement which states, under 'Monitoring of amenity*: "nearest dwelling or other affected building"* (reproduced in Attachment A5). However, the DES seem content to ignore this clear requirement of the current approval (as it is not specified in your clearly inadequate Environmental Authorities).

Further, it is clear from DES 'Model operating conditions - ERA 16 - Extractive and screening activities' that monitoring is required "*at any **sensitive place** or **commercial place**"* and thus to allow the operator to ignore the most sensitive receptors, as the DES Environmental Authorities for the Nucrush

site clearly permits, is, I believe, culpably permitting the DES and the site operator to ignore their clear duty of care to local residents.

Is the Nucrush Environmental Authority (EPPR00245613 or EA0002207) Blast monitoring adequate?

It is also important to note, whilst discussing this, that when 'Emerson Way' received a ground vibration (PPV) of 4.4 mm/s (as shown in Attachment B1) that, depending on the blast epicentre, which unfortunately, and maybe conveniently, is not revealed, that '24 Wimbledon Way' could have received a potentially structurally damaging 17.3 mm/s and similarly the 'Oxenford water Tower', supplying residential homes their freshwater throughout the area could have received an immense 23.9 mm/s. This is way above the 5mm/s limit and way above the 10mm/s notifiable event (that would, I believe, have gone un-notified due to the inadequate Environmental Authority requirements to not monitor at these two highly sensitive receptors).

This is just one of many examples that would, it would seem, have seen these sensitive receptors subjected to far greater ground vibration that the officially recorded levels at e.g. Emerson Way, Dorchester Court, Hensman Park Court, Kopps Road, Pottinger Crescent, Queens Park Circuit, Yallaroi Road, etc. Which are all cases of monitoring at far greater distances than more sensitive receptors are located.

Why is such a variety of monitoring locations permitted/used that are clearly not the most sensitive receptors? (Other than the fact that the Environmental Authorities permit this through their lack of being correctly specified).

Are you ok with the fact that closer sensitive receptors can be receiving such immense ground vibration that will go unmonitored? If you are, I believe, you are clearly failing your duty of care as a DES employee to the local residents of the area that are reliant on your ability to act as the monitoring authority for the Nucrush quarry. It would seem the DES, and you personally, having known about this problem since I first raised it, are failing the local residents, their personal amenity, the safety and welfare of their families and pets, their homes and the local wildlife in the area by allowing this continued, as I see it, abuse of the clear monitoring requirements of their current approval (Attachment A5). And also the clear requirements of DES 'Model operating conditions - ERA 16 - Extractive and screening activities' or ESR/2015/1666.

DES 'Model operating conditions ERA 16-Extractive and Screening activities' or ESR/2015/1666

It would seem this document is the template to which environmental Authorities are based upon.

However, it would seem in the Nucrush quarry case, that these clear requirements have been neglected much to the detriment of local residents and their local environment.

Unfortunately, it would seem, the Nucrush quarry have taken advantage of the lack of detail within the Environmental Authority by using, as I see it, monitoring locations that are clearly not the most sensitive receptors and with no reasons whatsoever for their use given. This is clearly permitting bigger blasts (BIGGER BLASTS = BIGGER PROFITS) that may well be non-compliant at the clear detriment to local residents to go un-notified. This monitoring at locations up to 1.65km away (i.e. Yallaroi Road and Kopps Road), whilst seemingly ignoring locations just 300 metres away is clearly permitted, some might say encouraged by, the clear lack of detail that I believe is required in the Environmental Authority but is sadly omitted.

Sensitive Place

Your email also states: *"The relevant conditions of the EA for the quarry specify that monitoring for noise and vibration must be undertaken at two locations surrounding the quarry during each blast. The EA also requires that each blast be designed so that noise and vibration does not exceed specified limits at a sensitive place. A sensitive place is defined in the EA and includes a residential premises, a school or commercial place"* . However, this is where you and I differ. I regard a sensitive place as the most sensitive place for a particular blast i.e. The closest sensitive place (and as required by the current approval, Attachment A5), whereas it would seem you are quite contend to accept ANY sensitive place of the quarry's choosing e.g Yallaroi Road and Kopps Road at up to 1.65km away from the blast epicentre. One wonders how far the quarry could actually push these limits before you actually decided this maybe not an appropriate place to monitor. Maybe 2km, or 2.5km or 3km? Obviously, as common sense dictates, the closest sensitive receptor is the only appropriate monitoring location unless there is overwhelming evidence to the contrary. There is no such evidence available.

I find this DES complicit monitoring at such far locations highly divisive and is undoubtedly in my eyes masking the true affect that blasting is having on local residents.

The monitoring at these extreme locations obviously yields far more compliant results for a particular blast than would be witnessed at the close, more sensitive, locations thus rendering the monitored results highly questionable.

Therefore, you are unable to accurately predict whether your comment: *"It is important to note that the limits specified in the EP Act and the relevant EA are set to limit potential disturbance experienced from blasting but not eliminate noise and vibration at the closest receptors. Please be assured that the limits imposed on the quarry have always, and continue to be, an order of magnitude below levels that are capable of causing structural damage to buildings and homes"* is or is not correct.

However, I am sure we can agree that the lack of monitoring at the closest, most vulnerable, sensitive receptors results in our not knowing the ground vibration at these closer locations and thus whether any damage sustained (maybe structural) at homes at these closer locations can be attributed to the inadequately monitored blast (aided and abetted by the inadequately specified Environmental Authority).

A lesson in topography, weather and blast design

In your email you attempt to inform me: *"The location of each blast changes as rock is extracted from the quarry. This means the nearest sensitive place may also change from one blast to another. Furthermore, overpressure wave and vibration do not uniformly radiate outward from the blast location. Factors including geology, topography, weather and blast design all influence monitoring results. Therefore, it is not appropriate to specify exact monitoring locations in the EA. Rather, the EA specifies a limit at every sensitive place".* Yes, you are quite correct these are all highly influencing factors that make the blasting a very imprecise science that cannot be accurately predicted (hence the DES requirement for a 1000m separation buffer or 'Blast Exclusion Zone'). However, none of the above factors explains why you permit the quarry to monitor at such obscure locations as Yallaroi Road and Kopps Road at up to 1.65km away from the blast epicentre which are clearly not the most sensitive receptors in the area by any stretch of the imagination.

This brings me on to other aspects of the DES requirements of the 'Model operating conditions ERA 16-Extractive and Screening activities'. This states (under 'Associated monitoring requirements'): "*2. Monitoring locations and release points must be situated and maintained in accordance with plan <plan title> attached"*. However, the environmental authority, EPPR00245613, states: *"F11: For the purpose of assessing compliance with conditions (F5) and (F7), blasting noise and vibration must be measured for each blast at the Oxenford quarry site at the monitoring points specified in Schedule H"*. Where 'Schedule H' states: *"… must be undertaken at two monitoring locations as determined by this approval or at other relevant location(s) as directed by the administering authority in relation to a complaint"*. There is no monitoring location plan as seems to be required and the only monitoring location requirements are those listed above. It would seem the highly important *"Blasting noise limits when measured at any **sensitive place** or **commercial place** in accordance with the associated monitoring requirements"* has been overlooked. Thus, permitting the Nucrush quarry to disregard the clear requirement to meet its ground vibration and airblast overpressure limits at *"any **sensitive place** or **commercial place**"* of its choosing. And, it would appear this has been taken to monitor blast results at ANY sensitive place of its choosing (up to 1.65km from the blast epicentre) not at the "most sensitive receptor" as was obviously required by the requirements of the 'Model operating conditions ERA 16-Extractive and Screening activities' and as common sense and the current approval would also dictate.

So yes, I agree: *"The location of each blast changes as rock is extracted from the quarry"* and yes obviously: *"the nearest sensitive place may also change from one blast to another"* and yes: "*Therefore, it is not appropriate to specify exact monitoring locations in the EA. Rather, the EA specifies a limit at every sensitive place".* However, the failure of the DES, by way of its Environmental Authority, to provide a suitable blast monitoring plan and/or specify *"Blasting noise limits when measured at any **sensitive place** or **commercial place** in accordance with the associated monitoring requirements"* means the quarry, despite its clear duty of care, has been given carte blanche to monitor wherever it likes. This has permitted the quarry the ability to monitor where it likes and thus log clearly deflated ground vibration and airblast overpressure blast monitoring results when compared to what would have been observed at the most sensitive receptors that are routinely, and I believe negligently, being ignored.

It would seem, with homes in such close proximity (currently approximately 300 metres and proposals to reduce this to 150 metres) that it is imperative to produce a blast monitoring plan prior to every blast that is undertaken and a clear justification provided as to why monitoring is performed at locations that are not the "most sensitive receptors" as is appears is routinely occurring with no explanation. It goes without saying that with homes in every radial direction that two monitoring locations, as required by the Environmental Authorities are clearly and vastly inadequate.

<u>Two locations or five blast monitoring locations?</u>

You state: *"Although monitoring is required at two locations, the quarry typically monitors at five locations"*. As described above clearly two monitoring locations as officially required is vastly inadequate with homes in every conceivable direction around the quarry well within the required 1000m separation buffer guideline. However, five locations as appears to be the norm, is clearly also highly inadequate if they are in the wrong positions. Without a proper plan of action, highlighting why the monitoring is happening at particular locations the monitoring is effectively worthless and assures the quarry of compliant blasting when in fact blasting may well have been non-compliant at the more sensitive (yet unmonitored) locations. But, the available results, submitted to the DES will only show,

it would seem, compliant blast results at maybe selected sites. Without a clear requirement to monitor at the most sensitive places (as required) the Environmental Authority blast requirements are clearly highly inadequate and potentially highly dangerous for local residents.

You then go on to state: *"These locations have been determined to represent the receiving environment surrounding the quarry for both overpressure and vibration and are amongst the closest sensitive receptors"*. However, there is no evidence to support this. You can try and kid us and yourself maybe that these are: *"amongst the closest sensitive receptors"*. However, we both know since I have been studying these blast monitoring, the monitoring has been more in line with expectations but previous to this the quarry was allowed to monitor where it liked as listed above. e.g. Emerson Way, Dorchester Court, Hensman Park Court, Kopps Road, Pottinger Crescent, Queens Park Circuit, Yallaroi Road, etc. Which are all cases of monitoring at far greater distances than more sensitive receptors are located and it would seem no justification for this provided.

If you would like to furnish me with dates and monitoring locations and blast epicentres (and explanations as to why monitoring locations were chosen) then I will only too pleased to take the information on board. However, until the reasoning can be explained then I will reserve judgement and assume the blast monitoring is to allow bigger blasts (which equals BIGGER PROFITS) much too local residents, their families, their property and the local wildlife's unfortunate detriment.

<u>Claims that monitoring locations used are for Historical reasons</u>

You state it is necessary to monitor historic locations: *"Due to the proximity of sensitive receptors to the quarry, consistency of monitoring at two historic locations is important for the accuracy of noise and vibration predictions in the design of explosive blasting. Monitoring data collected during previous blasts at reference locations is used to predict noise and vibration for future blasts at the nearest sensitive place"*.

So one minute you state it is necessary to monitor at different locations: *"the nearest sensitive place may also change from one blast to another"* and: *"Therefore, it is not appropriate to specify exact monitoring locations in the EA. Rather, the EA specifies a limit at every sensitive place"*. And now it is necessary to have fixed historical locations.

Please note, there is absolutrely no requirement for historical blast monitoring locations in either of the Environmental Authorities (or the Current Approval). It would seem you are contradicting yourself here. But, it is clear, as I said above, to have a blast monitoring plan for each blast and to establish the most sensitive receptors (normally closest unless justification can be provided) and monitor at these sensitive locations to ensure they do not receive a non-compliant blast.

As, the quarry reduces the separation buffer to local homes and as homes are legally built far closer to the quarry (as sanctioned and permitted by the local council) it will be forever necessary for the quarry to reappraise its blast monitoring and blast criteria inline with the forever changing environment.

The statement you make: "*consistency of monitoring at two historic locations is important for the accuracy of noise and vibration predictions in the design of explosive blasting"* is in fact irrelevant with the ever changing scenario the Oxenford quarry faces. Hundreds of perfectly legal homes have been built since the quarry's inception within the 1000m separation buffer meaning the quarry must forever readdress its blasting and blast monitoring to adapt for the changing scenario it is facing. You cannot use historic locations as a reason for monitoring at not the most sensitive receptors as the most

important criteria for any blast is the ground vibration and airblast overpressure that the most sensitive receptors was subjected to not a historical, maybe a 29 year old, monitoring location that is now completely irrelevant as far as sensitive receptors and common sense are concerned.

You claim this historical monitoring: *"is a requirement of the EA and is considered industry best practice"*. It is not a requirement of the EA as far as I can see and it is certainly not *"industrial best practice"* to ignore the most sensitive receptors as has clearly been happening here in Oxenford.

Blast monitoring on 12th February 2021 - Accuracy of results

I was pleased to see parallel monitoring was undertaken during this blast to ensure monitoring was being performed correctly and the equipment was calibrated correctly.

However, I was extremely disheartened to read your statement: *"The results of this monitoring generally showed consistent results between co-located monitors"* on this and you went on to say: "Although variability between results was observed for ground vibration, this variation was within a typical range and was equated to ground conditions as monitors are placed into the soil". The results you sent to me show an extreme mismatch between the DES results and the monitored results (Attachment C1).

I do not consider an under reading of less than 75% of the DES reading (Rosewall Place) to be an insignificant difference. Similarily, Sherman Drive shows less than 72% of the DES results. And lastly, David Street shows only 85% of the DES results.

These are highly significant errors that appear to show the quarry's monitored results are on average 77% lower than the DES findings. Do we assume all the monitored results so far submitted are on average 77% lower than they should be? Are all the blast monittoring resiults, already in questionable monitoring locations, so far submitted all way lower than they should be (Attachment B1). This, may not be such an issue if the 1000 m required separation buffer had been adhered to but with hundreds of homes, at much closer proximities than maybe should have been permitted, this is highly significant and may explain why so many local residents are expressing concern over their families health and welfare from blast dust, their families and pets being scared of the blast and subsequent damage to their homes.

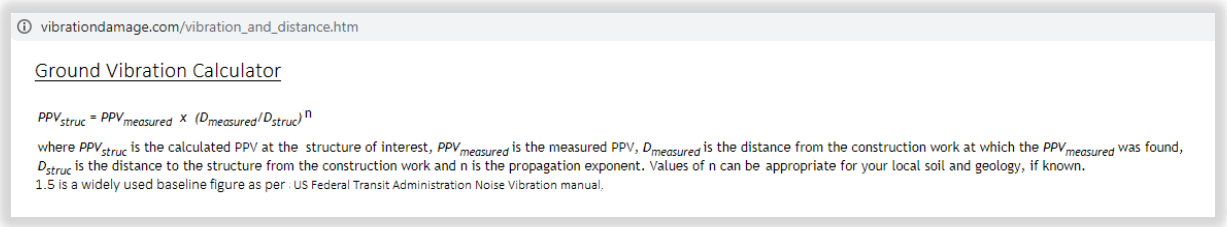
Maybe you should be considering this more carefully instead of merely stating: "Although variability between results was observed for ground vibration, this variation was within a typical range and was equated to ground conditions as monitors are placed into the soil". This maybe an easy, un-factual and non-scientific off the cuff, statement for you to explain away the differences, however, many, many local residents are extremely affected by this blast monitoring and the DES, I believe, having sanctioned these parallel tests should be asking why there are significant difference observed. Are you investigating these significant differences in blast monitored results?

Blast monitoring on 12th February 2021 - Monitored Locations

The EA requirement, as discussed earlier, is to only require monitoring at two monitoring locations. Therefore, it would seem an overkill that on the 12th February there were six monitored locations. I have plotted these monitored locations as shown in Attachment C2. It is therefore completely unbelievable that the closest sensitive receptors just the other side of the hill being blasted i.e '24

Wimbledon Way' (approximately 325 metres) and the 'Oxenford Freshwater tank' (approx. 275 metres) were not monitored. In fact, it would seem they were culpably ignored.

Using a standard ground vibration mathematical formula we can estimate the ground vibration at the nearest dwelling i.e. '24 Wimbledon Way' (as highlighted in Attachment C2):



This produces an estimated ground vibration of 5.1 mm/s at '24 Wimbledon Way' on the 12th February 2021 (based on the Kopps Road published results which are thought to be a comparable terrain and radial tangent from the blast epicentre).

Therefore, for this blast, the highest monitored ground vibration was logged at 2.1 mm/s at Rosewall Place. It is highly likely that the ground vibration witnessed at '24 Wimbledon Way' was above the 5 mm/s limit. However, the failure of both the quarry's monitoring authority and the DES failure to monitor at this more sensitive receptor means the above 5mm/s, that should have triggered the one in five consecutive blasts above the 5 mm/s limit, it would seem, went unrecorded and unchallenged.

Therefore, if a local resident were to complain about their house shaking, their family being scared, or whatever, DES will report it was only a maximum of 1.56 mm/s (official Nucrush result) which is way below acceptable limits. When, in fact, the local resident might have been subjected well over three times this at 5.1 mm/s. And, as said before, the previous 7mm/s in David Street could have been a gargantuan affect in '24 Wimbledon Way' (and Sherman Drive on the same radial but far closer and thus more sensitive than David Street) but we will never know for sure due to the inadequate blast monitoring performed.

It is plainly obvious to see that even providing three times the number of blast monitoring locations (six instead of two) does not ensure it is being monitored correctly as per this particular blast that has resulted in a maximum logged result of 1.56 mm/s at approximately 600 metres. Yet the nearest home (or sensitive receptor at 325 metres) would have been subjected to an estimated 5.1 mm/s or over three times the logged result. This, in my eyes, is highly unscrupulous, and negligent of the DES to permit this clear discrepancy in monitored and logged results.

Are you content to accept this, as I see, clear abuse of the blast monitoring at the Nucrush quarry? It would seem, that on this occasion, whilst providing parallel blast monitoring, you should have been fully aware of the blast epicentre and thus the most sensitive receptors. Therefore, it is unbelievable and very disappointing that these were ignored by both the DES and the operator.

It is also noted that there was no parallel monitoring at the Kopps Road monitoring location. So judging from the other three parallel monitoring we should assume this will be 77% lower than the DES would have recorded. This would produce an amended estimated result at '24 Wimbledon Way' of 6.6 mm/s.

It would therefore seem a reasonable assumption (based on other results provided by DES) that on the 12th February 2021 '24 Wimbledon Way' received a non-complaint blast above 5 mm/s. A believed DES notifiable event and making up one of the occasions where: *"5mm/s for 4 out of 5 consecutive*

blasts" was exceeded as per EPPR00245613 (as shown in Attachment C3). But, it would seem, this requirement was ignored and not notified with the operator only recording a maximum of 1.56 mm/s. This clearly indicates why it is so important to select the correct monitoring locations as clearly did not happen on this occasion (and I have severe doubts happens on many, if any, occasions!).

Subsequent blast on 9th March 2021

It is sad to note, that for the subsequent blast on the 9th March, despite clear evidence that Sherman Drive is a more appropriate location to monitor the blast than David Street (Attachment C1). That the blast was still monitored at David Street (Attachment D1). Clearly the Environmental Authority EPPR000245613 is not fit for purpose by allowing permitting a clearly less sensitive receptor to be monitored over a more sensitive receptor.

The results for this blast are map in Attachment D2.

It is plainly obvious, that now the blast epicentre has moved to the western site of the extractive footprint, the quarry has decided not to monitor the most sensitive receptor i.e. Sherman Drive (at approximately 410 metres) but has instead decide to monitor at the far further location of David Street yet again. This is despite the clear results obtained on the 12th February 2021 showing the closer location was far more susceptible to both ground vibration and airblast overpressure compared to the closer, unobstructed view from Sherman Drive (discussed below).

It is the DES, as monitoring authority, to ensure the quarry is operating in a compliant manner. Without monitoring at the correct locations you are negligently ignoring higher level, maybe non-compliant, results to be routinely ignored at the clear detriment to the health, safety and personal amenity of local residents and the potential damage to their homes (maybe structural). Are you going to continue to allow this seeming abuse of ineffectual Environmental Authorities for the Nucrush site to continue and all the implications that come with it?

David Street or Sherman Drive?

I notice you do not discuss the elephant in the room being the monitoring locations of Sherman Drive and David Street despite our extensive discussions on this in the past.

These two monitoring locations, as you are aware, were both monitored for the blast on the 12th February 2021 and both are on the same radial direction from the blast epicentre, with Sherman Drive being approximately 720 metres from the blast epicentre and David Street being 1000 metres approximately (as stated in your results).

Clearly the results from this blast show both the ground vibration and airblast overpressure where, as predicted, significantly lower at the further location of David Street than the closer location at Sherman Drive (Attachment C1).

Therefore, on at least 104 occasions monitoring has been performed at the less sensitive receptor of David Street than Sherman Drive. This means the higher levels of ground vibration and airblast overpressure that residents of Sherman Drive were subjected to went, negligently in my opinion, unrecorded.

For instance, when David Street recorded a ground vibration of 7 mm/s (as shown in Attachment B1) what was the ground vibration at Sherman Drive? We shall never know for sure, however if we can

establish the blast epicentre then an estimate can be made based on the diminishing ground vibration over distance. However, we can be sure that both the ground vibration and airblast overpressure were far higher for residents in Sherman Drive than they were for David Street and therefore the ground vibraton may well have been above the absolute maximum 10mm/s limit yet it went unrecorded. Truly unblievable that this practice is permitted, maybe even encouraged by the DES?

How to remedy these errors

The top priority, as I see it, is to ensure the quarry is no longer allowed to monitor blasting from inappropriate places as has been clearly happening. And, a suitable blast monitoring plan is adopted for each and every blast to ensure the most sensitive receptors are monitored (as per requirements in 'Model operating conditions ERA 16-Extractive and Screening activities').

Secondly, both the Environmental Authorities (EPPR00245613 and EA0002207) need to be addressed re blast monitoring to increase the number of monitored locations to reflect the effect that a particular blast will have in an area (at the very, very least three to allow triangulation of results, however, given the high number of sensitive receptor in every radial direction, it should be appropriate to the blast location and the sensitive receptors in that particular area). These Nucrush quarry EA's also needs to specify "Nearest dwelling and/or sensitive receptor" (as per the current council approval that is unfortunately ignored). And/or, as per DES 'Model operating conditions ERA 16-Extractive and Screening activities' requirements: *"Blasting noise limits when measured at any **sensitive place** or **commercial place** in accordance with the associated monitoring requirements"* needs to be included within the Environmental Authorities to ensure monitoring is performed as per DES 'Model operating conditions ERA 16-Extractive and Screening activities' requirements at sensitive places and as common sense would dictate.

Thirdly, ensure the 'Associated Monitoring Requirements' of the DES 'Model operating conditions ERA 16-Extractive and Screening activities' are included in the EA's: *"2. Monitoring locations and release points must be situated and maintained in accordance with plan <plan title> attached"*. to ensure a blast monitoring plan is prepared before each and every blast to ensure local residents safety will not be put at risk.

Only then can we assume the blast monitoring is checking the ground vibration and/or airblast overpressure appropriately and can thus ensure each blast limit is monitored correctly and appropriately.

It should also be remembered the Oxenford freshwater tank on the ridge and the highly vulnerable John Muntz Bridge (failed three times in the last ten years) are both sensitive receptors within a couple of hundred metres of blast locations and therefore, although ignored up until now, should also be considered during blast monitoring.

Department of Environment and Science Responsibilities for blast monitoring

I am truly appalled, shocked and saddened by the DES attitude on this blast monitoring issue. Not only did you fail to investigate properly the problems highlighted by residents with clear deep rooted concerns for their health, welfare and safety of their homes, but you, as a department, managed to invent stories to cover up clear monitoring failings despite repeated requests from concerned, effected local residents.

At my meeting on 23rd July, you Stephanie, Dominique, Antoine and three other DES staff members all sought to convince me the monitoring was correct, when in fact it wasn't. Ridiculous statements have emerged such as: "based on rigorous research and investigation, including consultation with technical experts in the field" and "This is due to David Street's higher elevation, when monitoring airblast overpressure and distance from the Coomera River, where water can cause anomalies and riverbed substrata is likely to attenuate vibration' " . Which have turned out to be a complete farce and the underlying unequivocal fact that distance has a major effect on ground vibration (and airblast overpressure) has been proven (Attachment C1), as clear common sense would and should have dictated. This culpable misdirection by DES has ensured that nine months after this meeting local residents are still suffering blast effects that could be clearly above quarry ground vibration and airblast overpressure limits at homes nearer than the monitored locations. However, your inability to act appropriately has ensured this seemingly unscrupulous process has continued unabated.

How are you, on behalf of the DES, the monitoring authority for a quarry of this magnitude, in the middle of a suburban environment when it has become abundantly clear that you do not seem to understand the basics of blast monitoring and its effects on local residents? Or even worse, you have seemed to invent stories to justify the quarry's culpable practices. If this is not your field of expertise, then it is imperative that you employ true experts in the field to ensure the monitoring is performed appropriately as it is crystal clear inadequacies in your environmental authorities are being exploited by the Nucrush quarry, and you, as a department, had absolutely no idea, but were content to trust the quarry, despite the financial incentives to blast ever bigger (BIGGER BLASTS = BIGGER PROFITS). This was despite a multitude of residents whom sought your help but were sadly let down by your department. These residents are no doubt thoroughly disenchanted with your service as I am too.

Rigorous Investigation

Finally you state: *"After reviewing the information available following a thorough and rigorous investigation, the department is satisfied that the monitoring undertaken by the quarry is of a standard which meets requirements and complies with the conditions of the EA. I hope this information has provided you with some further insight into the department's process of regulation and confidence that the matter which you have identified has been thoroughly considered and reviewed. The department continues to assess the monitoring of noise and vibration from blasting and should an issue be identified, enforcement action will be considered in accordance with the department's published Enforcement Guidelines"*.

Yes, I unfortunately have to agree, the monitoring undertaken by the quarry is a standard which meets requirements and complies with the conditions of the EA. However, this just emphasises how incompetent both the current Environmental Authority EPPR000245613, and the proposed Environmental Authority EA0002207 are.

Surely, given the information above (yet again) you are going to address the clear inadequacies of the Environmental Authorities and ensure monitoring is to be performed as per DES 'Model operating conditions ERA 16-Extractive and Screening activities' and common sense would dictate?

It is particularly important, given the unique situation in Oxenford, with hundreds of residential homes within the 1000m separation buffer (starting at within 300 metres of the quarry extractive footprint (and proposals to reduce this to 150 meters and 345 metres from the local school) that the blast monitoring is performed correctly. The current Environmental Authorities for the Nucrush quarry are clearly inadequate in this respect allowing apparent abuse of the monitoring locations.

Environmental Authority - Explosive blasting nuisance

Condition number 'F5' of current Environmental Authority EPPR00245613 states: "Explosive blasting for an ERA must not cause a nuisance at any sensitive place in the opinion of an authorised person" (Attachment E1).

Similarly, condition number 'E4' of proposed Environmental Authority EA0002207 states: "Explosive blasting must not cause a nuisance at any sensitive place in the opinion of an authorised person" (Attachment E2).

Who is this "authorised person"? Is this you Stephanie in your role as 'A/Team Leader Compliance' for the Department of Environment and Science as the monitoring authority?

How many complaints have the DES received from affected residents concerning the blast nuisance at the Oxenford Quarry in the last twelve months? How many complaints were received for the last blast on 16th April 2021?

Given there have been many, many complaints concerning blast nuisance at the Oxenford quarry from affected residents would you say that condition 'F5' of EPPR00245613 i.e. Explosive blasting for an ERA must not cause a nuisance at any sensitive place in the opinion of an authorised person" has been met? What are you, as the compliance officer for the Nucrush Oxenford quarry, doing about this? Or who is this "authorised person" who should be addressing residents very valid and very concerning issues with their health and welfare, their concern for the anxiety and the health and welfare their family and pets are exposed to and the very real and concerning issues with damage to their homes?

It would seem the DES, as the monitoring authority for the Oxenford quarry are clearly failing local residents and have been doing so for a long time. Who is responsible for permitting this abhorrent situation continuing? Is it you Stephanie as compliance officer?

Environmental Authority - Blasting noise limits

You state: *"In December 2019, the department initiated an investigation into community concerns relating to noise and vibration from blasting at the quarry. Since that time, an extensive technical review of monitoring data has been undertaken to determine whether monitoring is conducted in appropriate locations and whether the quarry is complying with conditions specified in their EA. Firstly, an outcome of this review identified a discrepancy between conditions of the EA where the quarry is required to ensure they conduct blasting in accordance with best practice environmental management but imposed less stringent noise and vibration requirements when compared to contemporary blasting criteria. To resolve this inconsistency, the department facilitated an amendment of the EA in August 2020, which aligned the conditions with the current noise standards for blasting as outlined under section 440ZB of the EP Act"*.

However, the amendment to the EA to align with Section 440ZB of the EP Act is a start in the right direction, however it does not implement the clear requirements of the 'Model operating conditions ERA 16-Extractive and screening activities which states: *"Ground vibration peak particle velocity - 5mm/s peak particle velocity for **9 out of 10 consecutive** blasts and not greater than 10 mm/s peak particle velocity at anytime"* (Attachment F1). So why has EA0002207 been granted the highly beneficial *"5mm/second peak particle velocity for **4 out of 5 consecutive blasts** and not greater than 10 mm/second peak particle velocity at any time*" (Attachment F2)? To put this into context, 20% of

the blasts at the Oxenford quarry can exceed the 5mm/s threshold whereas the requirements are for 10%. This, I appreciate is to allow for the inherent errors in estimating blast effects for particular blasts that are not an exact science. However, bearing in mind the hundreds of sensitive receptors (homes) within the 1000m separation buffer and the proposed reduction to just 150 metres from homes, I believe, in this particular case this Environmental Authority should be erring on the side of caution and encouraging the operator to meet the safety requirements and not be permitting double the number of non-compliant blasts over and above the clear requirements in the 'Model Operating Conditions'.

Further, in the 'Model Operating conditions', Section 6.1: 'Additional model operating conditions - blasting' the 'Associated Monitoring requirements 1' states: *"Monitoring must be performed in accordance with the most recent edition of the administering authority's Noise and vibration from Blasting guideline and Noise Measurement Manual and any relevant standard"* (Attachment F1).

The DES 'Noise and Vibration guideline' (ESR/2016/2169) referred to states, for Airblast overpressure*: "… for 9 out of 10 consecutive blasts"*, similarly, Ground vibration peak particle velocity states: *"… for 9 out of 10 consecutive blasts"* (Attachment F3). Clearly the proposed Environmental Authority EA0002207 should match this requirement at the very least.

Blast monitoring errors

Airblast overpressure

It should also be noted the requirements for blast monitoring, as per the DES Noise and Vibration from blasting guidelines (ESR/2016/2169) in section 'Outdoor measurement of airblast overpressure' it states: *"Measurements of airblast overpressure should be undertaken at a location: (c). Exposed to the direction of blasting"* (Attachment G1).

However, it is clear to see from this blast monitoring in David Street on 6th November 2020 the that this did not happen (Attachment G2). Clearly the airblast overpressure monitoring is impeded by a fence, a hedge, a van and a skip.

At the time of this blast, on a virtually identical radial position Sherman Drive, that was a lot closer to the blast epicentre had a clear uninterrupted view towards the blast epicentre (Attachment G3).

Results from the combined monitoring of these sites on the 12th February 2021 (Attachment C1) confirm the airblast overpressure was a lot higher at Sherman Drive with a recorded result of 111.8 dBL (with its uninterrupted view and closer location) than David Street at 106.1 dBL.

How can the DES, as the monitoring Authority justify letting this apparently deceptive practice for recording lower readings at clearly beneficial (if you wish to look more compliant) locations continue?

Ground Vibration

It should be remembered, that common sense and the David Kershaw report (which current approval was based on) says: "The magnitude of ground vibrations depends upon: the minimum distance between the blast and the residence/damageable structure" (reproduced in Attachment G4). Therefore, not only is Sherman Drive a far more suitable location to measure airblast overpressure (due to its unobstructed view), but it is also far more suitable to measure ground vibration due to its physical distance from the blast epicentre. e.g. on the 12th February 2021 blast, Sherman Drive was

approximately 720 metres from blast epicentre compared to David Street's 1000m. This clearly explains why Sherman Drive had the higher level of ground vibration at 1.21 mm/s compared to David Street's 0.70 mm/s (Attachment C1).

Why are you still permitting monitoring at the far less sensitive location in David Street over the far more affected are in Sherman Drive?

I also note that on the 12th February blast there were significant differences between the operators results and he DES results. Why are there such significant differences? Why are the operators results on average 77% of the DES readings? Is the monitoring being carried out as per requirements?

In the 'Noise and vibration from blasting' guidelines it states, under, 'Outdoor measurement of ground vibration': *"The ground-borne vibration transducer (or array) used in the measurement must be attached to a mass of at least 30kg to ensure good coupling with the ground where the blast site and the measurement site cannot be shown to be on the same underlying strata. The mass must be buried so that its uppermost surface is level with the ground surface"* (Attachment G1). The DES have previously advised, as part of the justification for monitoring at David Street over Sherman Drive, that you cannot guarantee it is in the same strata and therefore there would seem a clear requirement to attach a mass of at least 30kg to the ground vibration transducer. This is, as you are aware, not happening, see typical example in David Street in Attachment G2. Is this a contributing factor as to why there is a significant error between monitored results?

Further, in the 'Noise and vibration from blasting' guidelines it states, under, 'Outdoor measurement of ground vibration': *"The ground-borne vibration transducer (or array) must be placed at a distance of not less than the longest dimension of the foundations of a noise-affected building or structure away from such a building or structure and be positioned between that building or structure and the blasting site"* (Attachment G1). So, for example, the David Street monitoring location, what *"noise affected building or structure"* is it actually monitoring? It is alongside 9 David Street. So it cannot be monitoring this as it would need to be *"between that building and the blasting site"*. It could be presumably 18 David Street, but in this case the front garden, or verge on that side of the road would be the most appropriate place to monitor. However, if this is the case, no.11 David Street or 9 or 7 or 14 or 12 etc. would all be more appropriate as they are closer than 18 David Street. Thus, emphasising how illogical the monitoring location is in David Street.

Conclusion

Clearly there are a lot of problems with the blast monitoring here at the Oxenford quarry. And clearly a lot of these problems stem from an inadequate environmental authority allowing the quarry operators to take, what I see as, liberties with blast monitoring.

It is unbelievable that the current approval from back in 1992 realised the significance of distance when monitoring blasting by stating: *"Nearest dwelling or sensitive receptor"*. However, twenty nine years later, the DES was seemingly unaware of the importance to specify the crucial requirement to include a distance criteria. Did the quarry operator have an active part in specifying the Environmental authorities relating to this quarry? It would seem so.

The monitored results, by both the DES and Nucrush, on 12th Feb 2021 both separately confirmed the blast monitoring was incorrect in using David Street (over one hundred times in the past) in preference to the more sensitive receptor of Sherman Drive. I hope DES will rectify the situation and ensure ALL

future blast monitoring is performed with due regard to the *"Nearest dwelling or sensitive receptor"* as would seem appropriate (unless proven otherwise).

Also, I believe it is imperative to state the exact location of the blast monitoring as monitoring at different positions within the street will have a significant effect on the results witnessed i.e. The difference between monitoring at '24 Wimbledon Way' (325 metres approx) as opposed to '1 Wimbledon Way' (725 metres approx) would have had a significant effect on the results logged.

It would appear that on at least 484 occasions the Nucrush quarry have been permitted to monitor blasting that has masked the true ground vibration and airblast overpressure that nearer, more sensitive, homes (who were not monitored) would have been subjected to. In many cases non-compliant blasts at this locations would not have been logged appropriately as they were never monitored. I find this method of blast monitoring unprofessional, unscrupulous and underhand and clearly at the detriment to affected local residents.

I first raised my concerns with blast monitoring over a year ago with DES. Yet a year later Nucrush are still monitoring in the same highly culpable method that is masking the true ground vibration and airblast overpressure that local residents are subjected too. It would seem DES are fully complicit with this.

Surely, now that it has been proven that DES claims that David Street was more appropriate place to monitor blasting than Sherman Drive, were unsubstantiated, and distance plays such a crucial part in blast monitoring, that the future monitoring at the quarry will monitor ALL the closest sensitive receptors (instead of monitoring pseudo random locations at such extreme distances such as 1.65km in the case of Kopps Road and Yallaroi Road as has been culpably happening)?

Also, hopefully, the clear shortcomings in the Environmental Authorities (EPPR00245613 and EA0002207) will be addressed as a matter of urgency?

I await DES confirmation of the steps taken to rectify this ongoing highly worrying, and highly dangerous situation that has been permitted to happen.

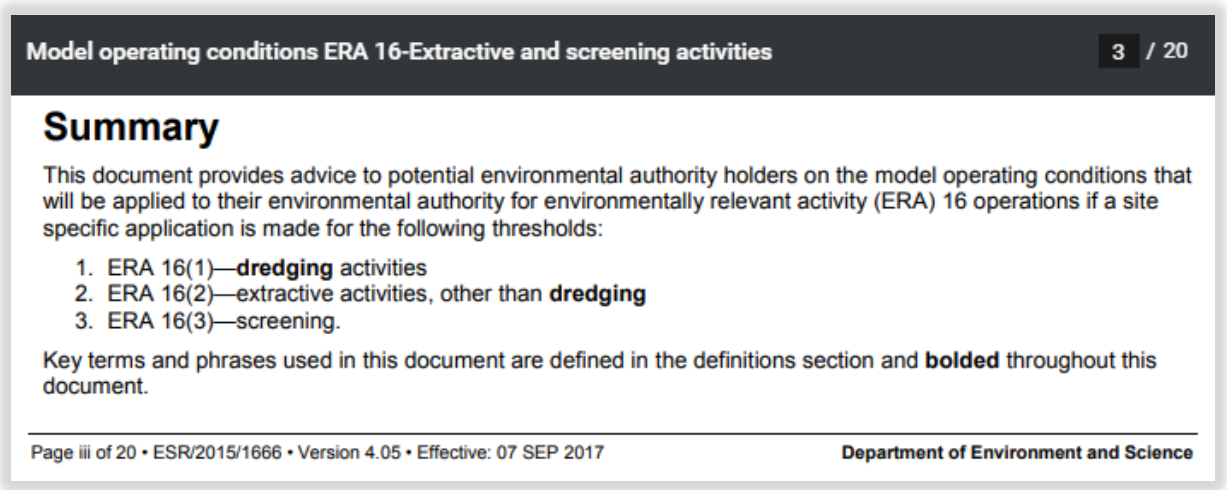
Thank you in anticipation,

Kind regards

Tony Potter

* Disclaimer. Please note my findings are believed correct and are to the best of my ability. However, there may be errors and assumptions I have made that are incorrect. I do not believe this to be the case, but, realise with the vast amounted of submitted data from the applicant, errors and assumptions on my part may occur. Hopefully this is not the case, but please accept my apologises if this is so. Thank you.

Attachment A1 - 'Model operating conditions ERA 16-Extractive and Screening activities'



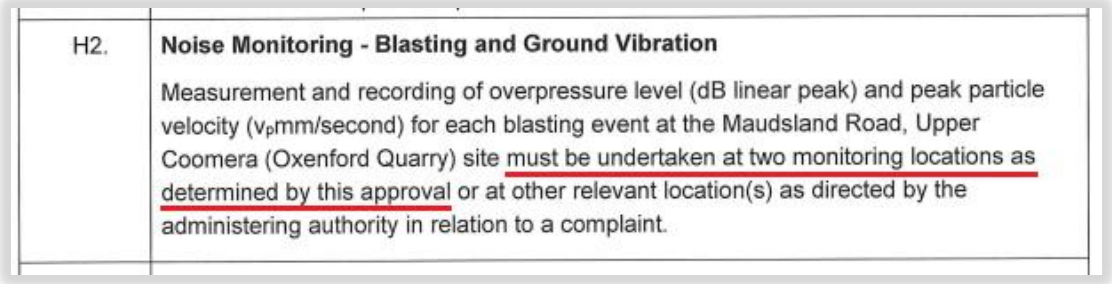
Summary

This document provides advice to potential environmental authority holders on the model operating conditions that will be applied to their environmental authority for environmentally relevant activity (ERA) 16 operations if a site specific application is made for the following thresholds:

1. ERA 16(1)—**dredging** activities
2. ERA 16(2)—extractive activities, other than **dredging**
3. ERA 16(3)—screening.

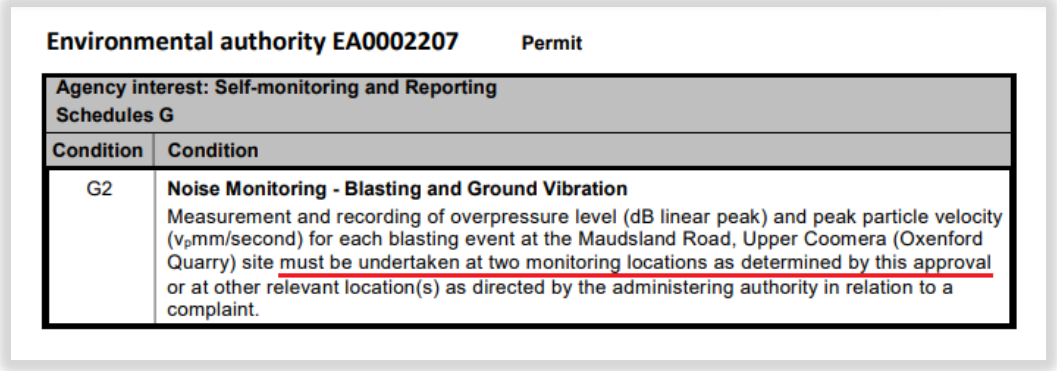
Key terms and phrases used in this document are defined in the definitions section and **bolded** throughout this document.

Attachment A2 - Environmental Authority EPPR00245613 monitoring location requirements



H2.	**Noise Monitoring - Blasting and Ground Vibration** Measurement and recording of overpressure level (dB linear peak) and peak particle velocity ($v_p$mm/second) for each blasting event at the Maudsland Road, Upper Coomera (Oxenford Quarry) site must be undertaken at two monitoring locations as determined by this approval or at other relevant location(s) as directed by the administering authority in relation to a complaint.

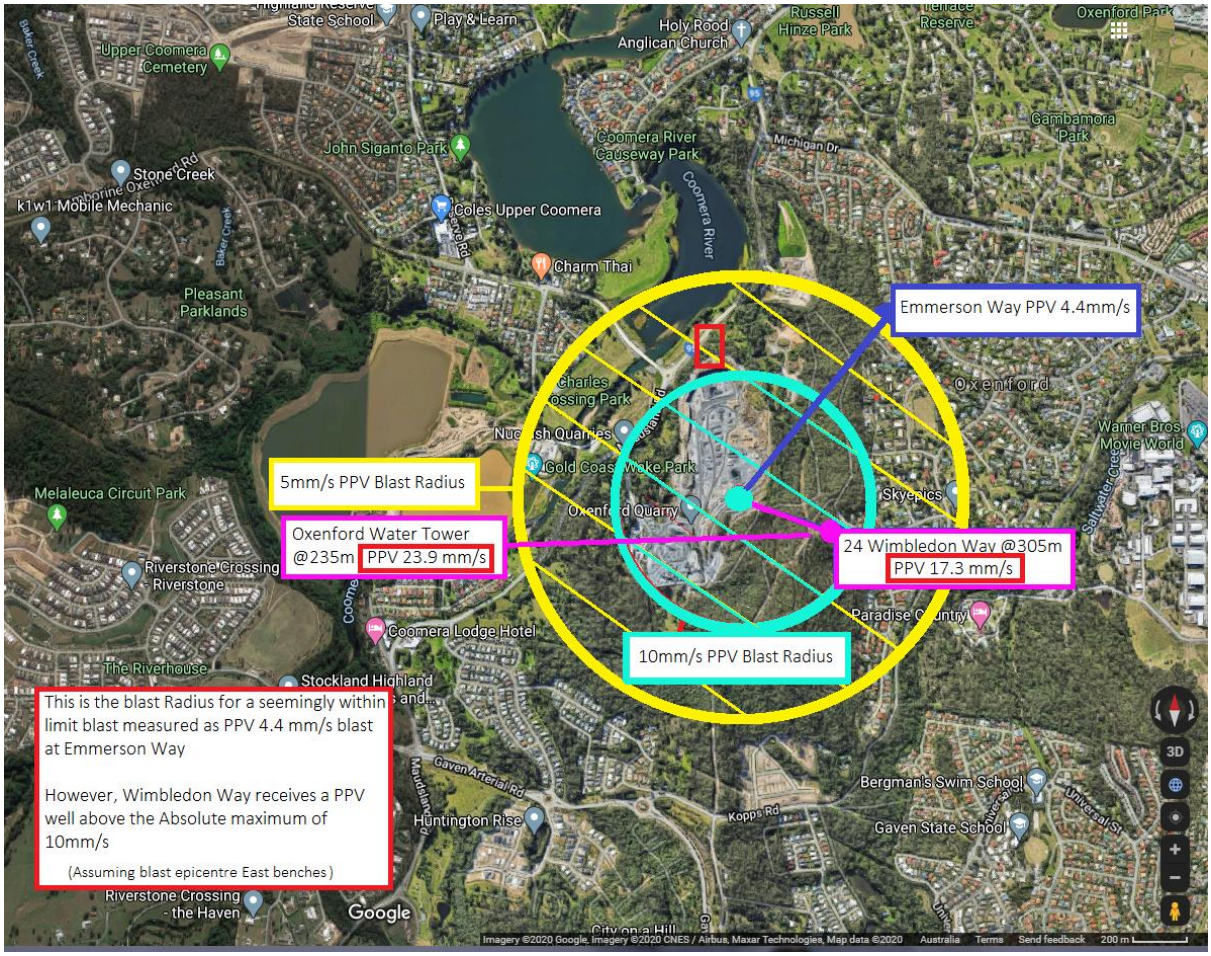
Attachment A3 - Environmental Authority EA0002207 monitoring location requirements



Environmental authority EA0002207 **Permit**

Agency interest: Self-monitoring and Reporting Schedules G	
Condition	**Condition**
G2	**Noise Monitoring - Blasting and Ground Vibration** Measurement and recording of overpressure level (dB linear peak) and peak particle velocity ($v_p$mm/second) for each blasting event at the Maudsland Road, Upper Coomera (Oxenford Quarry) site must be undertaken at two monitoring locations as determined by this approval or at other relevant location(s) as directed by the administering authority in relation to a complaint.

Attachment A4 - Map showing location of '24 Wimbledon Way' and 'Oxenford Water Tower'



Attachment A5 - Current Approval

MONITORING OF AMENITY

30. To ensure ongoing environmental management and to establish adequate operating conditions as the quarry proceeds, the operator of the quarry shall prepare and submit to the Council, at the end of the first, second, fifth and tenth years, a report on environmental management and related matters prepared by a consultant or person whose qualifications and experience are acceptable to the Council. This report will include an assessment of satisfactory performance specifically for the areas of noise, dust control and blasting effects and state whether the quarry operation satisfied the nominated criteria for noise, dust and blasting levels at the nearest dwellings or other affected buildings. The report shall also contain details of progressive revegetation.

Attachment B1 - Previous Blast results (from current development application COM/2019/81)

5.1 Individual Impacts from Oxenford Quarry

The individual historical impacts on nearby sensitive receptors to the Oxenford Quarry are summarised in Table 4 below, for those locations where monitors were located near to residential development, i.e. excluding monitoring conducted inside the quarry property or on undeveloped land.

Table 4. Summary of individual vibration & overpressure impacts of blasting at Nucrush Oxenford Quarry.

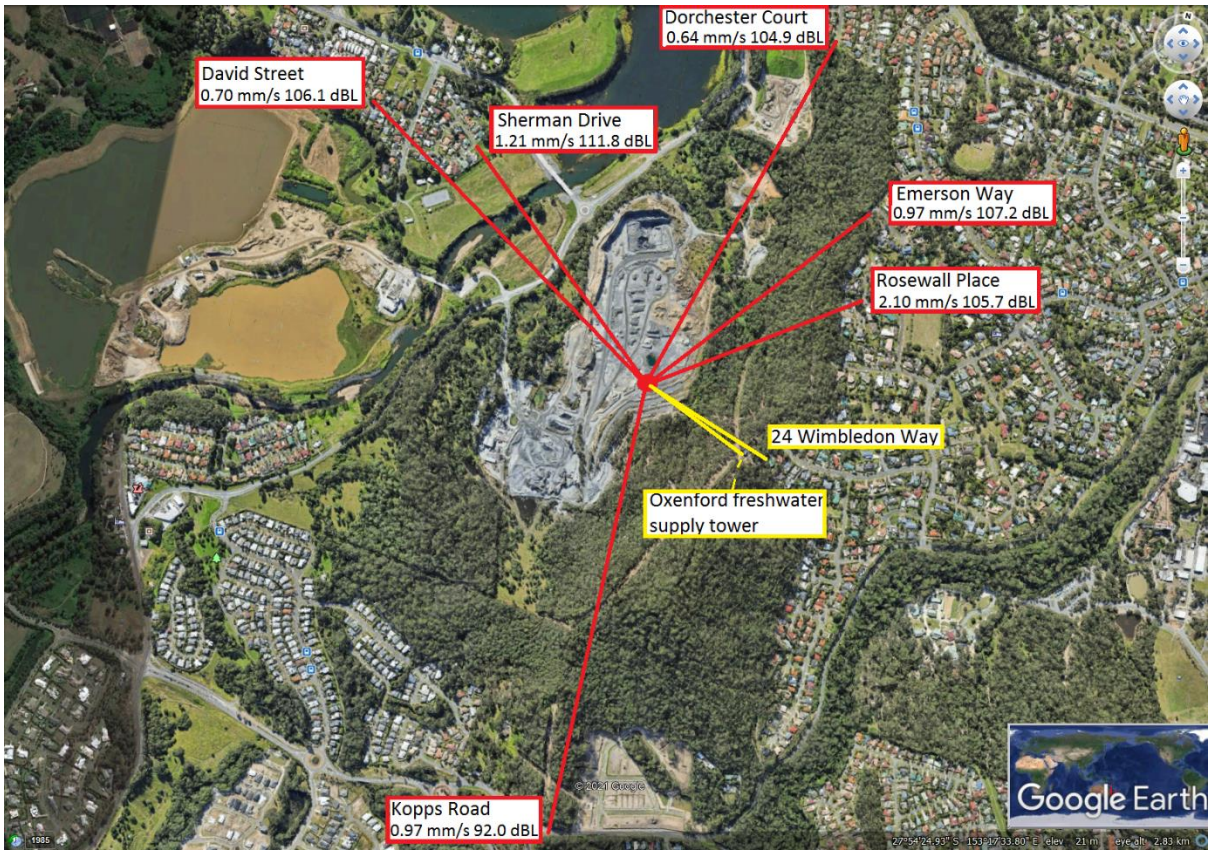
Location	Count	Vibration Impacts			Overpressure Impacts		
		Avg PPV	90% PPV	Max PPV	Avg dBL	90% dBL	Max dBL
Barrs Rd	2	0.7			113.9		
Brittany Court	6	1.0	1.1	1.2	107.7	111.8	111.8
Charlies Crossing	10	1.4	2.9	3.5	109.8	113.4	117.5
Coomera Is.	5	1.7	2.2	2.2	109.9	112.7	113.5
David St	101	1.3	2.0	7.0	107.4	111.7	120.0
Dorchester Court	114	0.8	1.2	2.4	107.4	112.0	118.8
Emerson Way	117	1.1	2.0	4.4	112.2	117.7	127.9
Hensman Court	66	0.9	1.4	2.6	105.2	110.5	117.3
Kopps Rd	53	0.8	1.5	2.7	101.8	109.4	114.1
Platypus Park	4	1.5	2.0	2.2	107.6	108.7	108.9
Pottinger Cres	6	1.1	1.5	1.6	110.3	116.2	119.0
Queens Park Circuit	20	0.9	1.6	2.1	105.0	110.5	112.8
Rosewall Place	65	1.6	2.8	6.6	109.4	115.2	124.3
Sherman Drive	28	1.7	2.3	2.8	111.7	115.8	122.9
White City Drive	14	2.3	3.1	5.1	111.1	117.4	119.5
Wimbledon Way	36	2.4	3.8	5.1	112.4	119.0	120.0
Yallaroi Rd	67	0.8	1.2	2.2	104.6	111.8	115.5

Attachment C1 - DES monitored results compared to Quarry monitoring results for blast on 12th Feb 2021

Location	Monitoring Undertaken on behalf of Nucrush		Monitoring Undertaken on behalf of DES		Approximate Distance to blast (m)
	Vibration (peak particle velocity) (mm/s)	Air blast overpressure level (dB linear peak)	Vibration (peak particle velocity) (mm/s)	Air blast overpressure level (dB linear peak)	
Dorchester Court	0.64	104.9	Not monitored		1042
Emerson Way	0.97	107.2	Not monitored		768
Rosewall Place	1.56	105.7	2.10	104.9	600
Kopps Road	0.97	92.0	Not monitored		1196
David Street	0.60	106.1	0.70	106.0	1000
Sherman Drive	0.87	111.8	1.21	111.2	720

Attachment C2 - Map of monitored results for blast on 12th Feb 2021

(yellow unfortunately not monitored by the closest sensitive receptors)



Attachment C3 - EPPR00245613 Blasting Limits

F5.	**OXENFORD QUARRY** **Explosive blasting nuisance** Explosive blasting for an ERA must not cause a nuisance at any sensitive place in the opinion of an authorised person.
F6.	Explosive blasting shall be carried out within the times specified in Schedule F Table 2.
F7.	Every explosive blast for an ERA shall be designed by a competent person to achieve the criteria specified in Schedule F - Table 2.

Schedule F - Table 2 (Explosive blast design criteria and time limits) *

	Vibration measured at a 'sensitive place'	
	Monday to Friday 9am - 4pm Saturday 9am - 1pm	**Other times and public holidays**
Vibration (peak particle velocity)	5 mm/s for 4 out of 5 consecutive blasts	No blasting to occur
Air blast overpressure level (dB linear peak)	120 dB for 4 out of 5 consecutive blasts	No blasting to occur

* Schedule F Table 2 does not purport to set limits applicable to any particular explosive blast, rather sets design criteria for every explosive blast.

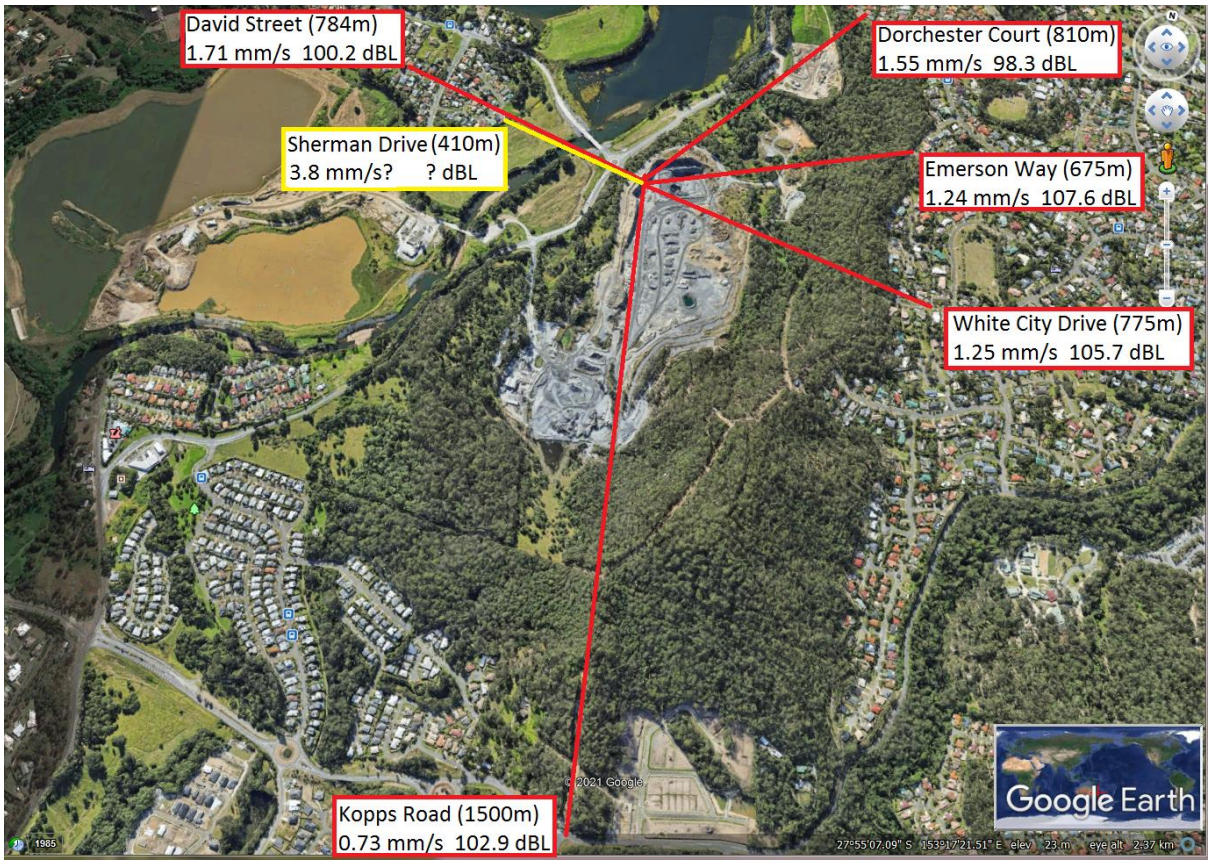
Page 9 of 13 •*Date Granted: 2/02/2018* Department of Environment and Heritage Protection

Attachment D1 - Blast Monitoring Map of monitored results for blast on 12th Feb 2021

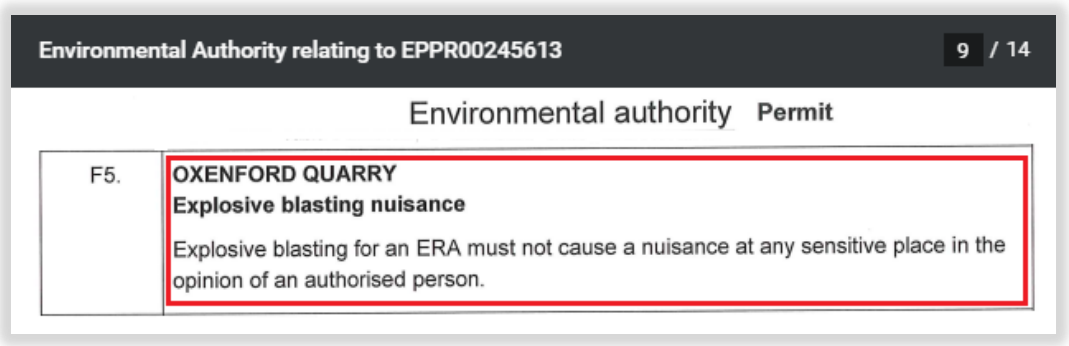
Blast fired at 11.20 am on 09/03/2021

Location	Vibration (peak particle velocity) (mm/s)	Air blast overpressure level (dB linear peak)	Approximate Distance to blast (m)
Dorchester Court	1.55	98.3	810
Emerson Way	1.24	107.6	675
White City Drive	1.25	105.7	775
Kopps Road	0.73	102.9	1500
David Street	1.71	100.2	784

Attachment D2 - Map of monitored results for blast on 9th March 2021



Attachment E1 - Current Environmental Authority EPPR00245613 - Explosive Blasting nuisance conditions

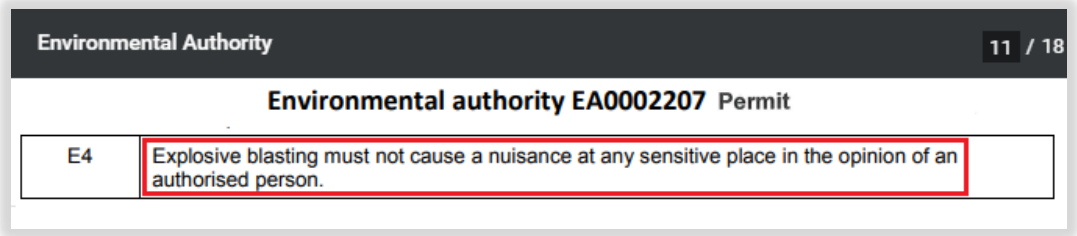


Environmental Authority relating to EPPR00245613 9 / 14

Environmental authority Permit

F5.	**OXENFORD QUARRY** **Explosive blasting nuisance** Explosive blasting for an ERA must not cause a nuisance at any sensitive place in the opinion of an authorised person.

Attachment E2 - Proposed Environmental Authority EA0002207 - Explosive Blasting nuisance conditions

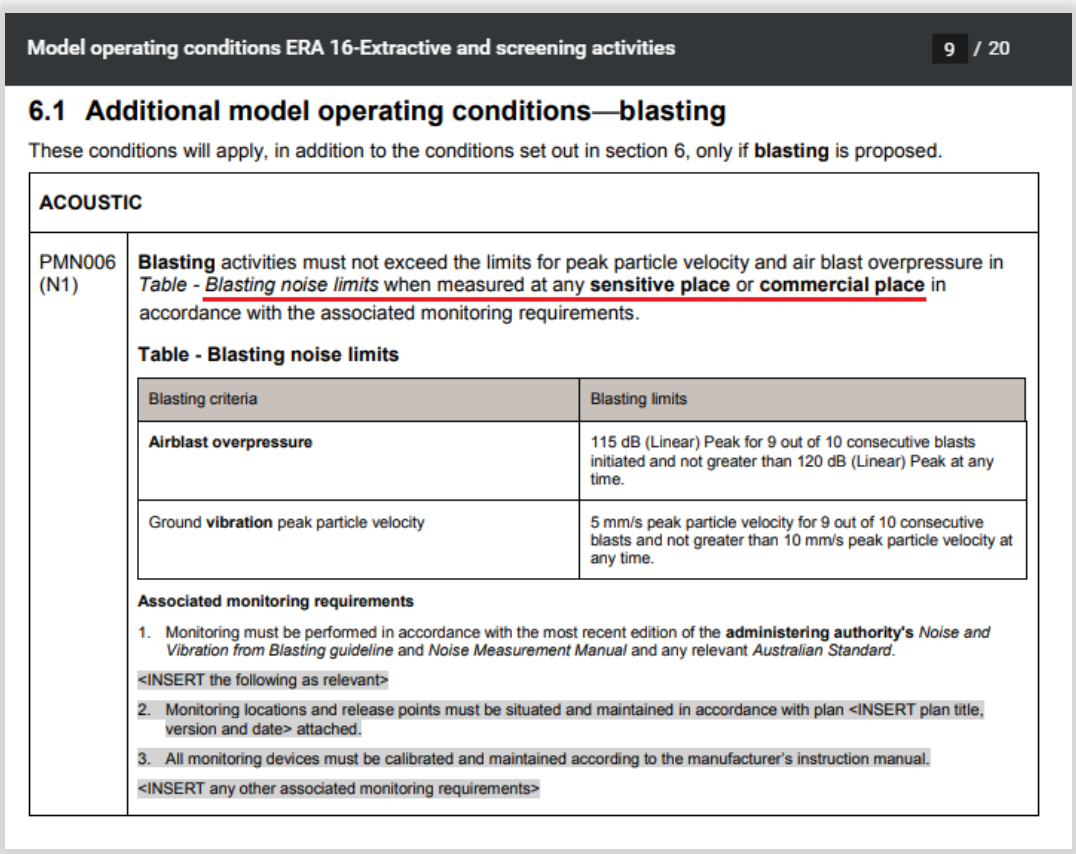


Environmental Authority 11 / 18

Environmental authority EA0002207 Permit

E4	Explosive blasting must not cause a nuisance at any sensitive place in the opinion of an authorised person.

Attachment F1 - 'Model operating conditions ERA 16-Extractive and Screening activities': Blast monitoring



Model operating conditions ERA 16-Extractive and screening activities 9 / 20

6.1 Additional model operating conditions—blasting

These conditions will apply, in addition to the conditions set out in section 6, only if **blasting** is proposed.

ACOUSTIC

PMN006 (N1)

Blasting activities must not exceed the limits for peak particle velocity and air blast overpressure in *Table - Blasting noise limits* when measured at any **sensitive place** or **commercial place** in accordance with the associated monitoring requirements.

Table - Blasting noise limits

Blasting criteria	Blasting limits
Airblast overpressure	115 dB (Linear) Peak for 9 out of 10 consecutive blasts initiated and not greater than 120 dB (Linear) Peak at any time.
Ground **vibration** peak particle velocity	5 mm/s peak particle velocity for 9 out of 10 consecutive blasts and not greater than 10 mm/s peak particle velocity at any time.

Associated monitoring requirements

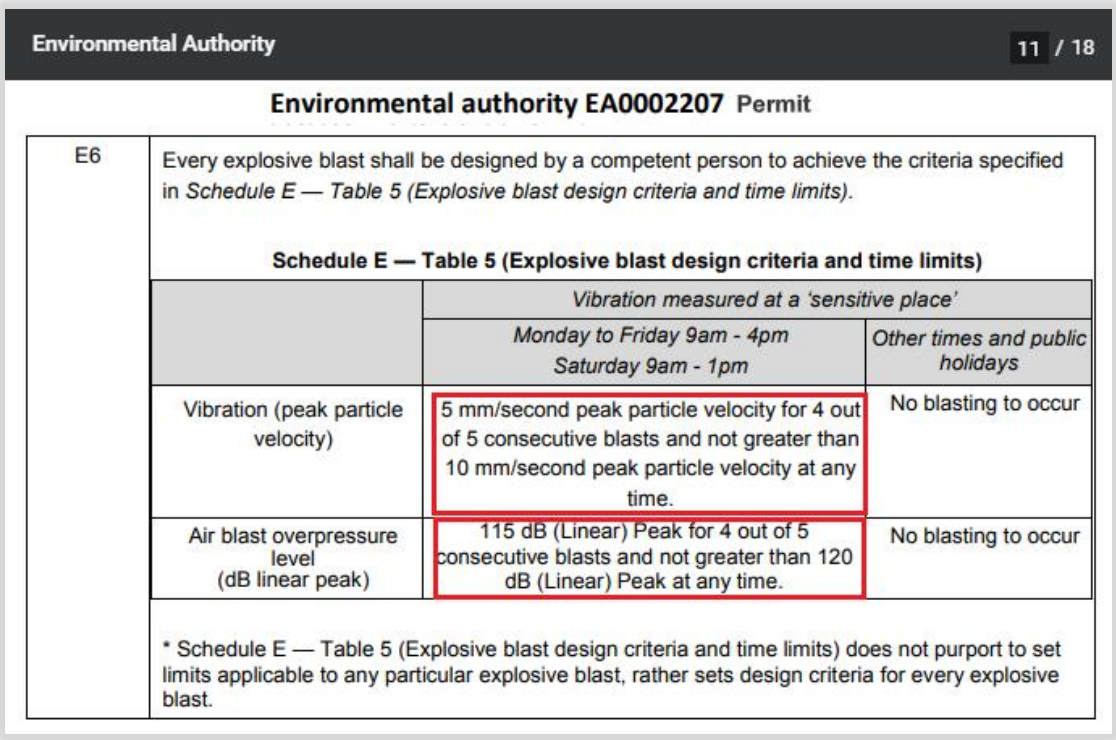
1. Monitoring must be performed in accordance with the most recent edition of the **administering authority's** *Noise and Vibration from Blasting guideline* and *Noise Measurement Manual* and any relevant *Australian Standard*.

<INSERT the following as relevant>

2. Monitoring locations and release points must be situated and maintained in accordance with plan <INSERT plan title, version and date> attached.
3. All monitoring devices must be calibrated and maintained according to the manufacturer's instruction manual.

<INSERT any other associated monitoring requirements>

Attachment F2 - Environmental Authority EA0002207 Blast limits



Environmental Authority 11 / 18

Environmental authority EA0002207 Permit

E6

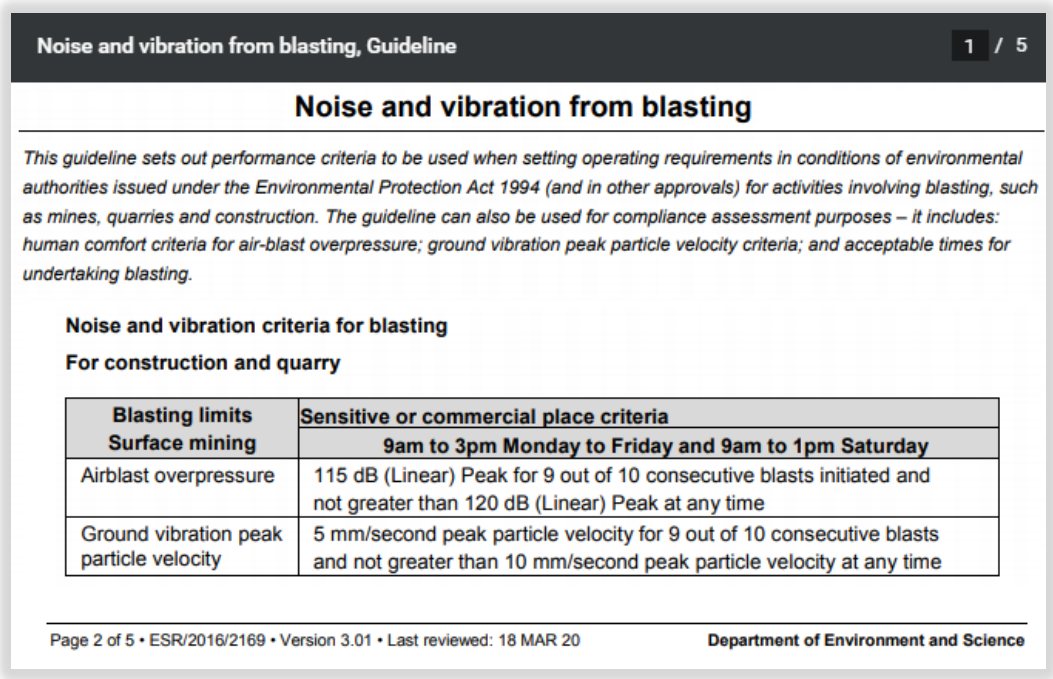
Every explosive blast shall be designed by a competent person to achieve the criteria specified in *Schedule E — Table 5 (Explosive blast design criteria and time limits).*

Schedule E — Table 5 (Explosive blast design criteria and time limits)

	Vibration measured at a 'sensitive place'	
	Monday to Friday 9am - 4pm *Saturday 9am - 1pm*	*Other times and public holidays*
Vibration (peak particle velocity)	5 mm/second peak particle velocity for 4 out of 5 consecutive blasts and not greater than 10 mm/second peak particle velocity at any time.	No blasting to occur
Air blast overpressure level (dB linear peak)	115 dB (Linear) Peak for 4 out of 5 consecutive blasts and not greater than 120 dB (Linear) Peak at any time.	No blasting to occur

* Schedule E — Table 5 (Explosive blast design criteria and time limits) does not purport to set limits applicable to any particular explosive blast, rather sets design criteria for every explosive blast.

Attachment F3 - Administering Authority's Noise and Vibration form Blasting Guideline - '9 out of 10 blasts'



Noise and vibration from blasting

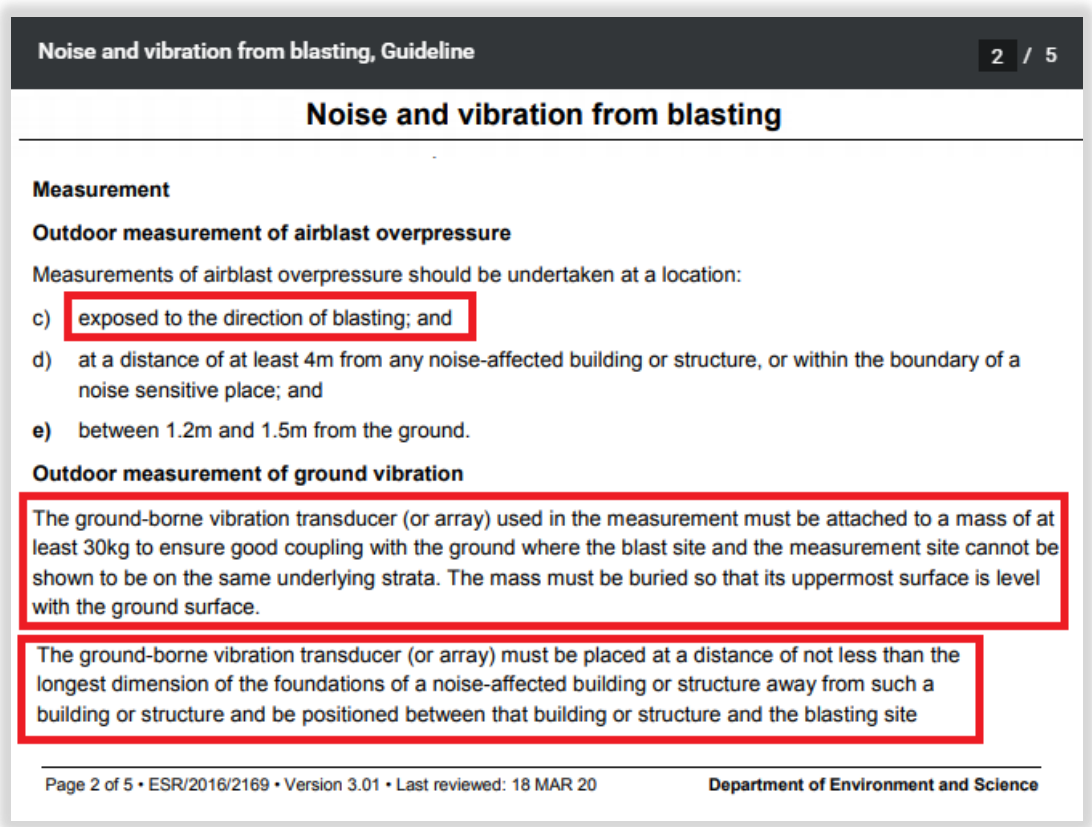
This guideline sets out performance criteria to be used when setting operating requirements in conditions of environmental authorities issued under the Environmental Protection Act 1994 (and in other approvals) for activities involving blasting, such as mines, quarries and construction. The guideline can also be used for compliance assessment purposes – it includes: human comfort criteria for air-blast overpressure; ground vibration peak particle velocity criteria; and acceptable times for undertaking blasting.

Noise and vibration criteria for blasting

For construction and quarry

Blasting limits Surface mining	Sensitive or commercial place criteria 9am to 3pm Monday to Friday and 9am to 1pm Saturday
Airblast overpressure	115 dB (Linear) Peak for 9 out of 10 consecutive blasts initiated and not greater than 120 dB (Linear) Peak at any time
Ground vibration peak particle velocity	5 mm/second peak particle velocity for 9 out of 10 consecutive blasts and not greater than 10 mm/second peak particle velocity at any time

Attachment G1 - DES Noise and Vibratioin guidelines (ESR/2016/2169)



Noise and vibration from blasting

Measurement

Outdoor measurement of airblast overpressure

Measurements of airblast overpressure should be undertaken at a location:

c) exposed to the direction of blasting; and

d) at a distance of at least 4m from any noise-affected building or structure, or within the boundary of a noise sensitive place; and

e) between 1.2m and 1.5m from the ground.

Outdoor measurement of ground vibration

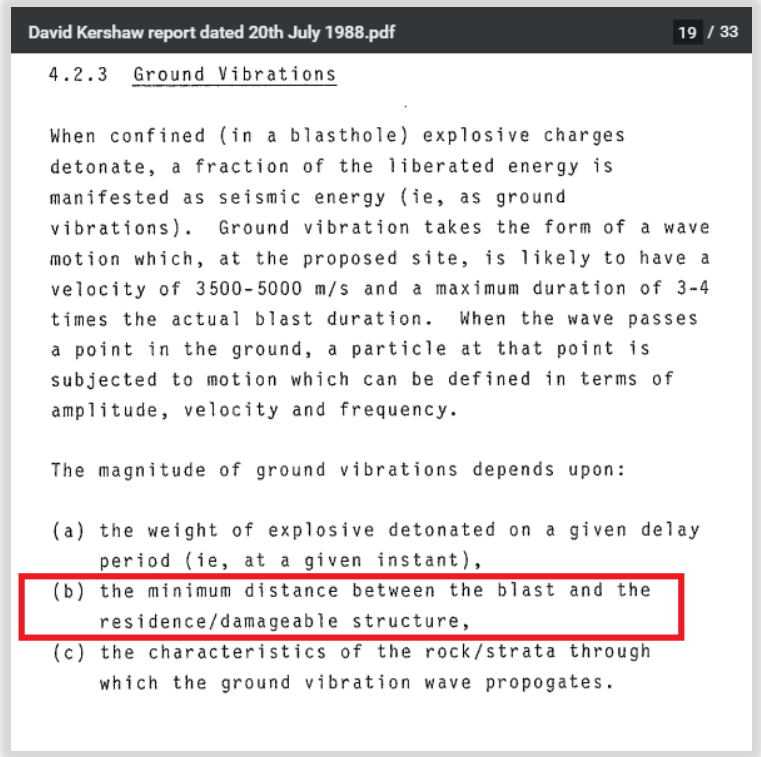
The ground-borne vibration transducer (or array) used in the measurement must be attached to a mass of at least 30kg to ensure good coupling with the ground where the blast site and the measurement site cannot be shown to be on the same underlying strata. The mass must be buried so that its uppermost surface is level with the ground surface.

The ground-borne vibration transducer (or array) must be placed at a distance of not less than the longest dimension of the foundations of a noise-affected building or structure away from such a building or structure and be positioned between that building or structure and the blasting site

Attachment G2 - Obstructed view from the blast monitoring on 6th November 2020 in David Street (approximately 825m from blast epicentre)

Attachment G3 - Clear uninterrupted view from Sherman Drive that was not monitored on 6th November 2020 for the blast monitoring (approx 525 m from blast epicentre)

Attachment G4 - Ground Vibration dependant on distance



David Kershaw report dated 20th July 1988.pdf 19 / 33

4.2.3 Ground Vibrations

When confined (in a blasthole) explosive charges detonate, a fraction of the liberated energy is manifested as seismic energy (ie, as ground vibrations). Ground vibration takes the form of a wave motion which, at the proposed site, is likely to have a velocity of 3500-5000 m/s and a maximum duration of 3-4 times the actual blast duration. When the wave passes a point in the ground, a particle at that point is subjected to motion which can be defined in terms of amplitude, velocity and frequency.

The magnitude of ground vibrations depends upon:

(a) the weight of explosive detonated on a given delay period (ie, at a given instant),
(b) the minimum distance between the blast and the residence/damageable structure,
(c) the characteristics of the rock/strata through which the ground vibration wave propogates.