

Offsets Guidance for the Rotorua Airshed



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Introduction

Purpose and scope

This document provides the level of detail necessary for consistent and equitable offsets for industry discharging into the Rotorua airshed.

This guide has been prepared for use by industry wishing to establish in the Rotorua airshed, and Regional Council staff. The guide may also be used by existing industry in the Rotorua airshed with consents for discharges to air, who are considering increasing their emissions of PM₁₀.

Readers from other jurisdictions should note that burner equivalency values provided in this guide have been derived specifically for Rotorua (with all assumptions noted in Appendix A). Other areas may have longer or shorter heating seasons that are not taken into account in this document. The guide does not include some options for offsetting that may be suitable elsewhere (e.g. offsetting with vehicles emissions).

The use of this guide by parties outside the Rotorua airshed is at their own risk.

Background

Rotorua has the worst winter air quality in the North Island. It regularly exceeds the national environmental standard for particulate matter less than 10 micrometres in diameter (PM₁₀) of 50 micrograms per cubic metre as a 24-hour average. The primary source of air pollution is solid fuel burners for home heating (i.e. domestic fires). However, industry (particularly the Ngāpuna industrial estate) is also a significant source of PM₁₀.

The Rotorua airshed is classified as a polluted airshed under Regulation 17(4) of the Resource Management (National Environmental Standards for Air Quality) Regulations 2004 (the air standards). The standards require offsets for new industry with substantial discharges of PM₁₀ in Rotorua. Additionally, existing industry wishing to increase their consented discharges of PM₁₀ may also be required to offset.

The Ministry for the Environment (the Ministry) has produced a users' guide to the standards. This users' guide is a good first reference but does not address the issues that are specific to Rotorua.

The Ministry recommends that each regional council develops their own guidance document to assist with implementation of the offsets as councils are in the best position to determine how to manage offsets in their own airshed. The Regional Council has opted to develop this guidance document for the following reasons:

- To provide detailed guidance and criteria to industries looking to apply for discharge permits specifically in the Rotorua airshed
- To provide consistency and equity to consent processing.

Document structure

This document is separated into two sections.

Section One sets out the requirements of the Bay of Plenty Regional Council's offsets programme. This is the set of criteria that must be met to ensure compliance with the offsets requirements of the air standards.

Section Two contains a staged process to assist readers to calculate offsets so that they comply with the requirements of section one, and the requirements of the air standards.

The two main users of the document are:

Industry

- To determine the need to offset
- To determine the offsets requirements before applying for consent
- To calculate required offsets and include information in the consent application

Council staff

- To determine if consent applications meet the criteria
- To assist with preparing consent conditions.

Section One

Requirements for offsets in Rotorua



Definitions

1. Offsets

Offsets are mitigation measures that compensate or 'offset' impacts. The intent is that the offset balances the impact so that there is zero overall effect. In this document therefore, an offset is defined as follows¹:

An offset is a PM_{10} emission reduction into one part of the Rotorua airshed to compensate for a PM_{10} emission increase elsewhere into the Rotorua airshed.

PM_{10} offsets are expressed in kilograms per year and calculated using annual mass emission rates (not concentrations).

The requirement for mitigation or compensation arises from the polluted status of the Rotorua airshed. Because the airshed is already overloaded with PM_{10} emissions, the regulations require new sources to be offset so that their overall impact on the airshed is zero. In other words, if industry wants to increase PM_{10} emissions into the airshed, then the same amount of existing PM_{10} emissions must be taken out.

2. PM_{10} sources

Ministry for the Environment policy is that all PM_{10} is created equal, irrespective of source². This is a recommendation of the World Health Organization and recognises that mass-based standards set to protect human health do not differentiate the

¹ Recent policy work has been done by the New Zealand Transport Agency (NZTA) for a Board of Inquiry on defining the word "offset" (Board of Inquiry Transmission Gully Plan Change, 2011 at 60). The definition used in this guidance document is consistent with NZTA policy.

² Ministry for the Environment, 2011 at section 4.10.

chemical composition or physical characteristics of different sources of particulate matter³. The Regional Council uses this same approach in Rotorua.

In practical terms, this means that:

- one kilogram of PM₁₀ from an open fire =
- one kilogram of PM₁₀ from a school boiler =
- one kilogram of PM₁₀ from a timber processing plant

3. Substantial PM₁₀ discharges

A summary of the requirements of Regulation 17(1) as follows:

Offsets apply to new industry seeking consent for substantial PM₁₀ discharges.

Offsets also apply to existing industry seeking increased, substantial PM₁₀ discharges.

Users should note that the above description does not include the word 'significant' (which was used in previous versions of the regulations). Instead, this guidance document refers to 'substantial' discharges of PM₁₀.

Regulation 17 (1) defines substantial discharges of PM₁₀ as follows:

A substantial discharge is any additional discharge that is likely to increase the daily, off-site concentration of PM₁₀ by more than 2.5 µg/m³ in the Rotorua airshed.

It is important to note that Regulation 17(1) is effects-based. This means that even if the PM₁₀ discharge itself is located outside the Rotorua airshed, it is still substantial if it results in an increased PM₁₀ concentration inside the Rotorua airshed (greater than 2.5 µg/m³ as a 24-hour average).

For existing industries looking to increase their discharges, the assessment of whether the discharge is substantial is based on the additional discharge only, not the whole discharge.

4. Same activity

Offsets are not required if the proposed consent is for the same activity on the same site as an existing consent (provided the amount and rate of the discharge is the same or less).

For the purpose of offsets, the "same activity" refers to the discharge of PM₁₀. It does not refer to land-use activities or the industrial process that leads to the discharge. If an industry changes their processes and product without changing the air discharge consent, then no offsets are required.

Requirements

1. General requirements

Offsets must be:

- a. Real – i.e. based on a reduction in actual emissions.

Reason: some boilers or burners may be consented, but not be in use. Offsetting emissions that are not actually occurring does not reduce real emissions and results in a net increase in emissions to the airshed.

- b. Enforceable – the reductions must be practicably enforceable.

Reason: The Regional Council must be able to follow up on whether the offset has taken place.

- c. Permanent – the emissions must be permanently removed.

Reason: The purpose of offsets is to ensure no net increase of emissions in polluted airsheds. Temporary offsets do not serve this purpose.

- d. Located within the Rotorua airshed, or an area where it can be shown that emissions contribute to PM₁₀ concentrations in the Rotorua airshed.

Reason: The purpose of offsets is to ensure no net increase of emissions into the Rotorua airshed.

- e. Surplus – The reductions must be above and beyond any emissions decrease that would otherwise occur or would otherwise be required by the Regional Council.

³ World Health Organization, 2006.

Reason: The Regional Council needs to achieve an overall reduction in emissions to meet its targets under the national standards. The Regional Council has introduced rules to reduce the domestic emissions. Industrial offsets that target these same houses will reduce the effect of the rules and reduce the overall net reduction in emissions.

2. Offset amount

PM₁₀ offsets are expressed in kilograms per year and calculated using annual mass emission rates (not concentrations). Required offsets must be calculated based on the maximum consented discharge rate in kilograms per year (implementation guidance provided in Section Two).

Reason: The Regional Council has granted, or is being asked to grant, consent for this amount and so it is reasonable to assume that it may occur in practice.

3. Responsibility for offsets

- a. Offsets must be sourced and implemented by:
 - i. New industry seeking consent for substantial PM₁₀ discharges
 - ii. Existing industry seeking increased, substantial PM₁₀ discharges

This applies to industry located within the Rotorua airshed, and industry outside the Rotorua airshed where the PM₁₀ discharges from that industry are likely to impact on the Rotorua airshed.

Reason: New emissions of PM₁₀ in an already polluted airshed will increase the problem. Offsets allow industry to set up or continue operating in Rotorua provided that overall pollution is not made worse.

4. Offsets for existing industry

- a. Existing industries that substantially increase their PM₁₀ discharges need to provide offsets for only for the additional discharge, not the whole discharge. This needs to occur only if the *additional* discharge is substantial enough to trigger the requirement to offset (see Section 3).

For example, an existing industry emitting 1,000 kilograms per year of PM₁₀ wishes to expand their plant and get a new consent. Their expansion will increase their emissions by only 100 kilograms of PM₁₀ per year. Their total offset is only 100 kilograms of PM₁₀ per year. Dispersion modelling shows that the additional 100 kilograms will increase the off-site concentration in the Rotorua airshed by more than 2.5 micrograms per cubic metre. They must therefore offset the increased 100 kilograms, but not the original 1,000 kilograms.

Reason: The intent of Regulation 17 is that existing emitters are not penalised by the regulation, therefore only any additional discharges need to be offset.

- b. For clarity, offsets are not required if the amount and rate of PM₁₀ discharge to be expressly allowed by the proposed consent are the same as or less than under the existing consent. In other words, existing activities that have not increased their emissions are not subject to any requirements to offset, even if they have substantial PM₁₀ discharges.

Reason: Existing emissions have already been allocated and accounted for in polluted airsheds.

5. Offsets for industry outside the airshed

Industries located outside the Rotorua Airshed with new or increased discharges that trigger the 2.5 micrograms threshold need to provide offsets only for the proportion of the discharge that will enter the airshed.

Reason: Offsets are only required for the “amount likely to be discharged into the relevant airshed”.

6. Timing of offsets

- a. Any offsets required under the standards must be effective before any emission from the proposed activity occurs.

In practice, there is usually a significant period of delay between granting consent and construction and commissioning of new plant.

Reason: Regulation 17(3)(b) of the air standards requires that offsets occur within one year of the consent being granted and be effective for the duration of consent. The Regional Council further requires that the offsets are in place before the consented discharge commences. This is to ensure that there is no ‘overlap’ where consented discharges increase the overall PM₁₀ load into the Rotorua airshed.

7. Scaling factor

A scaling factor is required for all offsets in the Rotorua airshed to account for fugitive sources of PM₁₀ as follows:

- a. A scaling factor of 1.2 for consented, quantified discharges of PM₁₀ for industry in the Ngāpuna industrial estate. This area is shown in Appendix C for guidance purposes only. The final decision as to whether an industry is located in the Ngāpuna industrial estate will be made by the Regional Council.

Reason: This scaling factor makes some provision for fugitive sources that cannot be readily quantified and potential secondary particulate formation. Fugitive emissions from industry are the primary source of exceedances of the national environmental standard for PM₁₀ in Ngāpuna.

- b. A scaling factor of 1.1 for consented quantified discharges of PM₁₀ for sites in other parts of the Rotorua airshed.

Reason: This scaling factor makes small provision for fugitive sources and potential secondary particulate formation⁴.

- c. Applicants may apply to the Regional Council to have these scaling factors reduced to 1.0. To do so the applicant must:
 - i. employ best available technology and emissions control; and
 - ii. employ best practice fugitive emissions control; and
 - iii. have emissions that are not combustion related (i.e. no oxides of nitrogen or sulphur).

Reason: Scaling factors are an attempt to compensate, in part, for fugitive emissions that cannot be readily quantified and emissions of precursors. If industry has no fugitive emissions or emissions of precursors then scaling factors need not be used.

8. Sources of offsets

- a. The following sources are suitable for offsets in the Rotorua airshed:

- i. School boilers (wood, coal or mixture)⁵
- ii. Consented activities with quantifiable discharges of PM₁₀ (e.g. 8 MW wood-fired boiler, discharging 6 kilograms per hour of PM₁₀, operating 8,000 hours per year)
- iii. Permitted activities with quantifiable discharges of PM₁₀ (e.g. 1 MW wood waste boiler, discharging 1 kilogram per hour of PM₁₀, operating 6,000 hours per year)
- iv. Residential sources within the Rotorua airshed (quantified in Appendix A):
 - Open fires (wood, coal or mixture) – only available as an offset source prior to 1 May 2015
 - Multi-fuel burners (wood, coal or mixture)
 - Wood-fired burners
 - Coal-fired burners
 - ‘Chip’ burners

The above list is not exhaustive. Other sources may be suitable for consideration as offsets. Applicants may apply to the Regional Council for consideration of additional appropriate sources for inclusion as offsets

Reason: These sources are permanent, quantifiable sources of emissions.

- e. For clarity, the following sources are not suitable for offsets in the Rotorua airshed:

- i. Mobile sources
- ii. Natural sources
- iii. Outdoor burning of any kind – the Regional Council considers this activity is likely to have substantial discharges of PM₁₀. These discharges cannot be quantified therefore this activity is not able to be included in the Rotorua offsets programme
- iv. Fugitive sources (e.g. wind-blown dust from commercial sites and agricultural areas)
- v. Consented and permitted activities with non-quantified discharges of PM₁₀ (e.g. fugitive dust from industrial sites)
- vi. Oil and/or gas fired burners (domestic, commercial, industrial)

⁴ This guidance document assumes that all emissions are combustion related. This is a reasonable assumption for existing industry, and likely future industry, in the Rotorua airshed. It may not be applicable to other airsheds.

⁵ The Rotorua hospital boilers are gas fired and not suitable for consideration as offsets.

- vii. Geothermal burners and boilers (domestic, commercial, industrial)

Reason: These sources are too small, difficult to quantify, operated intermittently and/or transient in nature to be suitable for consideration as offsets. Oil, gas, and geothermal boilers do not produce emissions to be offset.

9. Domestic offsets

If an industry chooses to offset their emissions with domestic sources:

- a. It is highly recommended that only zero PM₁₀ emission appliances (heat pumps, gas heaters) are used to replace domestic sources (burners) in the Rotorua offsets programme. Heat pumps and gas heaters should be Energy Star rated and sized in accordance with the EECA calculator to ensure efficient replacement heating ⁶.

Reason: Compared with all other home heating options, heat pumps and gas heaters offer the largest PM₁₀ reductions as well as being the cheapest to purchase and maintain. Geothermal energy is also suitable but only available in certain areas of the airshed, and is generally expensive to set up.

- b. Where domestic burners are replaced with zero emission appliances, the burners must be removed in accordance with the definition of “remove or removed” in the Rotorua Air Quality Control Bylaw which currently states:

“remove or removed” in relation to the removal of solid fuel burners (the appliance) means the complete physical removal (taking out, taking away or cause to be no longer present) of an appliance from the dwelling house. In the case of an open fire, means the removal of the firebricks and other masonry or construction from the fireplace, rendering the open fire inoperable.

Reason: Removal of the burner or open fire is required to ensure that the offset is permanent.

- c. An industry may opt to replace old burners with new burners. This option is not recommended as it requires more old burners to be converted to take into account the emissions from the new burners, and a higher overall cost.
- d. Where domestic burners are replaced with new burners, the burners must be replaced in accordance with the definition of “replace or replaced” in the Rotorua Air Quality Control Bylaw which currently states:

“Replace or replaced” in relation to the replacement of solid fuel burners (the appliance) means:

The complete physical removal of an appliance from the dwelling house and its replacement with a new appliances authorised by this Bylaw, or

In the case of an open fire, the removal of the firebricks and other masonry or constructions from the fireplace, rendering the open fire inoperable, and the insertion of an authorised appliance into the space created, or

The placement of a new authorised appliance in the same room as an open fire, provided that open fire is rendered inoperable.



Clarification

1. Trading and banking offsets

- a. Once offsets are established, they are a requirement of consent and cannot be transferred or traded or ‘banked’ as emission reduction credits.
- b. The applicant similarly should not make any claims to be environmentally friendly or ‘green’ as a result of purchasing offsets to enable entry into a polluted airshed.

⁶ <http://www.energywise.govt.nz/how-to-be-energy-efficient/your-house/heater-sizing-calculator>

- c. In the event of industry surrendering a consent (i.e. closing down), the offsets revert to the ownership of the Regional Council.

These offsets are effectively 'lost' to the programme and cannot be claimed by any other party.

Reason: The Regional Council has responsibility for ensuring that the Rotorua airshed achieves the national environmental standard for PM₁₀. Banking, trading or transferring offsets does not fit with the purpose. They are, therefore, the appropriate agency to claim any surrendered offsets.

- d. The Regional Council will not take responsibility for any existing maintenance, servicing or replacement contracts for appliances installed as part of the industry's offsets (e.g. heat pumps installed in private homes).

2. Resource consent term

- a. The recommended term for consents issued under the offsets programme is a maximum of 10 years.

Reason: Ten years is around the lifetime of a well maintained heat pump. After this time, the homeowner may potentially replace the heat pump with a domestic burner. Any shorter does not provide sufficient certainty for industry.

The Regional Council anticipates that the Rotorua airshed will be compliant (as required) by 2020 with full compliance (i.e. five years continuous compliance) demonstrated in 2026. Offsets will no longer be needed.

3. Waiting List

Any industry intending to set up or increase emissions will need to source potential offsets which may include domestic households. It's recommended that industries compile a list of houses that may want to participate in the offsets programme. Suggestions for prioritisation are:

1. Houses within 2 km of the industry requiring offset.

Reason: From a technical point of view, the emission being 'taken out' should be located in close proximity to the emission being 'put in'. People living closest to the new industry are likely to be the most adversely affected (in an already degraded airshed).

In practice, this may be difficult and the backstop position is simply that the offset occur within the Rotorua airshed. The Rotorua airshed is defined in Figure 1.

2. Vulnerable members of the community. This includes low-income residents (i.e. community card holders) and residents with poor health (e.g. asthma, diabetes)

Reason: This is simply good social policy because vulnerable members of the community are more likely to be adversely affected by air pollution.

It is also recommended that the list includes the following information:

- Individual offset appliance to be removed (e.g. open fire – wood)
- Individual offset amount (e.g. 28 kg/year PM₁₀)
- Address (e.g. 1125 Arawa Street, Rotorua)
- Signed, witnessed statement by the home owner:
 - that the open fire/burner to be removed is currently used regularly for heating purposes; and
 - that they will endeavour to take care of, and avoid any damage to, a new appliance provided under the offsets programme.

Exclusions

Offsets for emissions are not required if:

- i. The activity does not require a consent
- ii. For new activities, the proposed discharge to be expressly allowed by the proposed consent is not likely to increase the daily, off-site maximum concentration of PM₁₀ by more than 2.5 µg/m³ in the Rotorua airshed
- iii. For existing activities, the amount and rate of PM₁₀ discharge to be expressly allowed by the proposed consent are the same as or less than under the existing consent

Reasons: Regulation 17 only applies to industries that require consent (i.e. discretionary activities under the Regional Air Plan). Permitted activities do not need consent and therefore are not required to offset PM₁₀ discharges.

Regulation 17(1) only applies to new industries seeking consent that are likely to increase the increase the daily, off-site maximum concentration of PM₁₀ by more than 2.5 µg/m³ in the Rotorua airshed.

Regulation 17(2)(b) further provides that offsets are not required if the amount and rate of PM₁₀ discharge to be expressly allowed by the proposed consent are the same as or less than under the existing consent. In other words, existing activities that have not increased their emissions are not subject to any requirements to offset, even if they have substantial PM₁₀ discharges.

Exceptions

- a. Industries may demonstrate that the regulations do not apply and offsets are not mandatory in their case. It is the responsibility of the industry to prove that they do not have to comply with the national air standards.
To do this the industry will need to demonstrate that the proposed activity is not likely to increase the daily, off-site maximum concentration of PM₁₀ by more than 2.5 µg/m³ in the Rotorua airshed.
- b. Applicants wishing to demonstrate that offsets are not needed are must satisfy the following criteria:
 - i. Preparation of an assessment of PM₁₀ discharges from the proposed activity into the Rotorua airshed
 - ii. Representative emissions data based on referenced, clear and repeatable emissions calculations or test data. If using data from another existing plant for a new build, the applicant will need to show that the data is representative of the proposed plant
 - iii. Independently peer reviewed atmospheric dispersion modelling in accordance with the Good Practice Guide for Atmospheric Dispersion Modelling. The Regional Council can arrange for peer review on request, alternatively the applicant may arrange it themselves.
 - iv. Modelling of discharges at maximum operation (i.e. maximum consented discharge rate, not actual operation)
 - v. Modelling to use a minimum of one full year of meteorological data for the Rotorua airshed
 - vi. The proposed activity employs best available technology and emissions control
 - vii. An assessment of the likely impact of fugitive emissions, even if only qualitatively
 - viii. Uncertainties, and likely variation in emissions estimates, must be quantified and documented
 - ix. Monitoring only (i.e. without modelling) to demonstrate compliance with the 'substantial' criterion is not acceptable
 - x. Dilution (i.e. increasing the stack height, exit velocity or buoyancy), to reduce downwind emissions below the 'substantial' criterion, is not permitted

In assessing maximum predicted ground-level concentrations of PM₁₀, the Regional Council will make the following deviations from the requirements of the Good Practice Guide for Modelling⁷ (for the following reasons):

- The maximum predicted ground-level PM₁₀ concentration within the Rotorua airshed will be presented to one decimal place to enable direct comparison with the "substantial" criterion of 2.5 µg/m³ (as a 24-hour average)⁸
- Inherent model uncertainties will be largely ignored. This is to enable a practical application of the 'substantial' criterion

Reason: It is possible that an industry classified by the Regional Council as having substantial PM₁₀ discharges is not, in fact, likely to increase the daily, off-site concentration of PM₁₀ by more than 2.5 µg/m³ in the Rotorua airshed. In such cases, the regulations would not apply and offsets would not be mandatory.

⁷ Ministry for the Environment.

⁸ The Guide requires rounding to the nearest full figure.

Section Two

Offsets implementation for Rotorua

This section provides guidance to implementing offsets for Rotorua.

There are five stages of implementation:	Stage 1	Determine the need to offset
	Stage 2	Calculate the required offset (new emissions in)
	Stage 3	Apply the scaling factor
	Stage 4	Calculate the emission reduction (existing emissions out)
	Stage 5	Resource consent application

A summary of this process is presented on pages 19 and 20.

Stage 1: Determine the need to offset

- Offsets are required for:
 - any new industry that requires a resource consent under the Regional Air Plan for a substantial discharge of PM₁₀
 - any existing consented industry with increased, substantial PM₁₀ discharges
- A substantial discharge of PM₁₀ is any additional discharge that is likely to increase the daily, off-site concentration of PM₁₀ by more than 2.5 µg/m³ in the Rotorua airshed, regardless of where the source is located. This is determined by emissions modelling.
- Any new activity that does not require a resource consent, regardless of whether the discharge is substantial or not, does not need to provide offsets.
- Existing industries that are not looking to increase their discharges, do not need to offset when applying for replacement resource consents.
- The lists below set out activities that are generally considered to be a source of substantial discharges of PM₁₀ and for clarity those sources generally not considered to be a source of substantial discharges

These lists are not exhaustive and are provided for guidance only. It is at the Regional Council's discretion to determine if an activity needs a resource consent, is considered to be a substantial source of PM₁₀, and requires offsets.

Industries generally considered to be a source of substantial discharges of PM₁₀ that require offset are as follows:

- Aluminium smelters
- Asphalt or bitumen manufacture or processing
- Combustion sources greater than 5 MW burning coal or untreated wood
- Commercial distilling operations but not limited to petroleum refining
- Commercial foundries and metallurgical processing
- Commercial glass making
- Enclosed incineration
- Galvanising of steel
- Milk powder or milk based powder manufacture
- Commercial kraft and chemical pulping or reconstituted wood panel manufacture
- Pyrolysis or gasification of carbonaceous material
- Rubber manufacture

- Steel mills
- Synthetic fertiliser manufacture

Reason: These activities are classified as discretionary under the Regional Air Plan and require a resource consent due to substantial emissions of PM₁₀.

6. For clarity, industries that are generally not considered a substantial source of PM₁₀ are as follows:

- Animal rendering and by-product processing plants
- Commercial breweries
- Commercial fellmongering
- Industrial resin or glue manufacture
- Intensive farming
- Commercial paint manufacture
- Processing of radioactive substances
- Spray painting with di-isocyanates
- Refuse transfer stations
- Commercial composting
- Woolscourers and dag crushing plants

Reason: These activities are discretionary or controlled under the Regional Air Plan but are typically consented for purposes of odour or other toxics control and do not have substantial discharges of PM₁₀.

7. Regulation 17 (1) defines substantial discharges of PM₁₀ as any discharge that is likely to increase the daily, off-site concentration of PM₁₀ by more than 2.5 µg/m³ in the Rotorua airshed.

Stage 2: Calculate the required offset (additional emissions)

For industries that are required to offset emissions under Regulation 17, this section provides guidance and technical detail on how to calculate the proposed discharges into the airshed.

This section applies only to industries with substantial PM₁₀ discharges that require a resource consent under the Regional Air Plan. This includes new industry and existing consented industry wishing to increase PM₁₀ discharges.

1. Only quantified discharges require offsetting. Fugitive sources that cannot be quantified and secondary particulates will be taken into consideration using a scaling factor.

Reason: This is one of the most practical ways in which offsets can be managed.

2. In the absence of evidence to the contrary, total suspended particulate (TSP) will be assumed to be 100% PM₁₀.

Reason: New industrial plant, and changes to existing plant, should have the best available technology and emissions control and easily meet an emission concentration of 50 mg/m³ (or less). At this level all TSP is likely to be PM₁₀.

3. Required offsets must be calculated based on the maximum consented discharge rate in kilograms per year of the additional discharge.

- Calculation of additional emissions should be based on the maximum hours of operation and emission rates being applied for under the consent. They do not include emissions from construction and commissioning.

Reason: Industrial emissions to air are often assessed, and consented, at a higher rate than actually occurs in practice. The Regional Council is being asked to grant consent for this amount and so it is reasonable to assume that it may occur in practice. A case study example is provided in Appendix D.

4. For industries outside the Rotorua Airshed, calculate the proportion of additional emissions that will enter the airshed. This is determined using emissions modelling which will need to be independently peer reviewed in accordance with the Good Practice Guide for Atmospheric Dispersion Modelling.

Stage 3: Apply the scaling factor

1. As detailed in Section One, the Regional Council requires scaling factors to be applied to required offsets for the Rotorua airshed. These are:
 - A scaling factor of 1.2 for consented, quantified discharges of PM₁₀ for industry in the Ngāpuna industrial estate
 - A scaling factor of 1.1 for consented quantified discharges of PM₁₀ for sites in other parts of the Rotorua airshed
2. Applicants may apply to the Regional Council to have these scaling factors reduced to 1.0. To do so the applicant must:
 - employ best available technology and emissions control
 - employ best practice fugitive emissions control
 - have emissions that are not combustion related (i.e. no oxides of nitrogen or sulphur)

Reason: Scaling factors are an attempt to compensate, in part, for fugitive emissions that cannot be readily quantified and emissions of precursors. If industry has no fugitive emissions or emissions of precursors then scaling factors need not be used.

Examples of best practice fugitive emissions control include:

- all stockpiles being housed
 - site fully sealed
 - conveyor belt transfer points covered with minimised drop heights
 - wheel wash for all trucks exiting site
 - all loads covered, etc
3. Emissions of precursors do not count in determining the potential to emit of a stationary source.

Reason: These are accounted for through the use of scaling factors. Requiring them to be included in the emissions offset requirement would be doubling up.

4. Scaling factors apply only to determination of the discharge being “put-in”. Scaling factors do not apply to industrial sources of discharges being “taken-out”.

Reason: Scaling factors are an attempt to compensate for non-quantifiable fugitive sources and emissions of precursors. They aim to introduce some conservatism into the offsets regime. Applying scaling factors to industrial discharges being “taken-out” would be contradictory to this conservative approach.

Stage 4: Calculate the emission reduction (existing emissions out)

This section provides technical detail on how to calculate the discharges being “taken-out” of the airshed to provide the required offset. The most attractive offsets, from a cost point of view, are larger point sources such as small to medium sized boilers. The Regional Council anticipates, however, that these will be quickly exhausted and the focus of the offsets programme will be on domestic retrofits.

1. Domestic sources

Table 1 provides emissions factors for offsets from domestic sources. For each tonne per year of PM₁₀ discharged, the table provides the equivalent number of burners that need to be removed. The derivation of these factors is detailed in Appendix A.

Replacement heat pumps and gas heaters should be Energy Star rated and sized in accordance with the EECA calculator⁹.

Applicants should use the factors in Table 1 to calculate how many replacement appliances are necessary to offset the PM₁₀ to be “put-in”. These figures are only relevant if zero emission appliances (heat pumps, gas heaters, geothermal heaters) are used to replace burners.

If an industry chooses to replace old fires with new burners, they will need to account for the additional emissions going back into the airshed from these new burners, and provide suitable calculations as evidence that these additional emissions have been accounted for.

A worked example calculating the required number of replacement appliances is provided in Appendix D.

⁹ <http://www.energywise.govt.nz/how-to-be-energy-efficient/your-house/heater-sizing-calculator>

Table 1: Emission factors for domestic sources

Source	PM ₁₀ Emission Factor	Annual Fuel Use	PM ₁₀ Annual Emission	No. burners to equal 1 t/yr PM ₁₀
	g/kg*	t/yr	kg/yr	
Open fires (wood)	12	2.4	28	35
Pre-2005 wood burners	11	1.1	12	87
Post-2005 (NES compliant) burners	3.7	1.0	3.7	270
Multi-fuel burners (wood)	11	1.5	17	61
Multi-fuel burners (coal)	19	1.1	21	48
Pellet burners	1.4	1.0	1.3	742

*Wet weight

If burners are used as replacement appliances, the number of appliances that need to be replaced will roughly double. The cost of each conversion will also increase significantly as burners are significantly more expensive to purchase and install than heat pumps.

For this reason, the Regional Council highly recommends that heat pumps (or other zero emission appliances) are used to replace domestic sources.

Domestic sources used as offsets must be removed or replaced in accordance with the definitions of “replace or replaced” and “remove or removed” in the Rotorua Air Quality Control Bylaw which currently states:

“replace or replaced” in relation to the replacement of solid fuel burners (the appliance) means:

- a. *the complete physical removal of an appliance from the dwelling house and its replacement with a new [authorised appliance] or*
- b. *in the case of an open fire, the removal of the firebricks and other masonry or construction from the fireplace, rendering the open fire inoperable, and the insertion of an authorised appliance into the space created, or*
- c. *the placement of a new authorised appliance in the same room as an open fire, provided that open fire is rendered inoperable.*

“remove or removed” in relation to the removal of solid fuel burners (the appliance) means the complete physical removal (taking out, taking away or cause to be no longer present) of an appliance from the dwelling house. In the case of an open fire, means the removal of the firebricks and other masonry or construction from the fireplace, rendering the open fire inoperable.

Reason: Replacement or removal of the non-complying burner or open fire is required to ensure that the offset is permanent.

Open fires are only available for offset until 1 May 2015. After this date their use is prohibited under the Rotorua Air Quality Control Bylaw¹⁰ and the offsets become surplus.

Location

The responsibility for sourcing houses that wish to be included in the offsets programme is the responsibility of the industry applying for resource consent. Location of houses for inclusion should be prioritised as follows:

1. Houses within two kilometres of the industry requiring offset.

Reason: From a technical point of view, the emission being ‘taken out’ should be located in close proximity to the emission being ‘put in’. People living closest to the new industry are likely to be the most adversely affected (in an already degraded airshed).

In practice, this may be difficult and the backstop position is simply that the offset occur within the Rotorua airshed. The Rotorua airshed is defined in Figure 1.

2. Vulnerable members of the community. This includes low-income residents (i.e. community card holders) and residents with poor health (e.g. asthma, diabetes).

¹⁰ Rotorua District Council, December 2010

Reason: This is simply good social policy because vulnerable members of the community are more likely to be adversely affected by air pollution.

2. Commercial sources

There is now only one coal fired school boiler left in Rotorua that may be a potential offset source¹¹. Details are provided in Table 2.

Table 2: Emissions for (coal) school boilers in Rotorua

School	PM ₁₀ Annual Emission kg/yr
Rotorua Lakes High School	109

(PM₁₀ Annual Emission¹²)

Table 2 shows the maximum emissions available from the coal boiler at Rotorua Lakes High School. The replacement appliance may also produce emissions. These emissions need to be considered when calculating the offset.

Other commercial boilers may be available (e.g. hotels, light industry). Typically these are small units with emissions that have not been quantified. Where emissions (being taken out) are not quantified, applicants should calculate emissions using the US EPA emission factor clearinghouse, <http://www.epa.gov/ttnchie1/ap42/>

An example calculation is provided in Appendix D.

Location

The location of industrial/commercial offsets is not typically a matter of choice. In the unlikely event of several industrial emission sources being considered as potential offsets and all other things being equal, then the source closest to the new industry (i.e. what is being put in) should take priority.

3. Industrial

Existing industry is likely to be a highly cost-effective source of offsets. Applicants sourcing offsets from existing industry may use:

- Fuel switching. For example, switching from a fuel with high PM₁₀ discharges (like coal) to a fuel with low PM₁₀ discharges (like natural gas)¹³
- Cleaner technology. For example switching from fossil fuel combustion to electricity
- Retrofitting abatement technology. For example installing baghouses
- Shutdown or production curtailment. For example shutting down an existing plant or reducing production (and henceforth reducing associated PM₁₀ discharges)

In such cases, the new industry wishing to enter the polluted airshed, 'buys out' part of, or all, emissions from an industry already in the airshed

Consented industrial emissions typically include both quantified (e.g. stack discharge) and non-quantified emissions (e.g. fugitive sources). Quantifiable emissions can be calculated from monitoring or operation data. In the absence of these, emissions may be calculated using the US EPA emission factor clearinghouse, <http://www.epa.gov/ttnchie1/ap42/>

Fugitive emissions cannot be used as a source of offsets because they typically cannot be quantified with enough certainty.

Stage 5: Resource consent application

Applicants applying for resource consents to discharge substantial emissions of PM₁₀ into the Rotorua airshed still need to meet the requirements of Section 88 of the Resource Management Act which includes the preparation of an assessment of environmental effects.

¹¹ Selwyn Heights, Lynmore, Aorangi, Western Heights High School, Sunset Primary, Malfroy School all converted from coal. Personal comm. Peter Friar, Solid Energy, 14 December 2011. As an aside, in 2006, Rotorua Girls High School converted their 1 MW coal boiler to wood pellets in 2006 for a cost of \$10K (<http://www.eeca.govt.nz/sites/all/files/rotorua-girls-high-school-case-study-nov-2006.pdf>). This resulted in a reduction of 60% in PM10 emissions and eliminated all sulphur dioxide emissions.

¹² Environment Bay of Plenty, 2006

¹³ NB: Whilst natural gas has very low PM₁₀ emissions, these must still be calculated for the overall offset. Refer worked example in Appendix D.

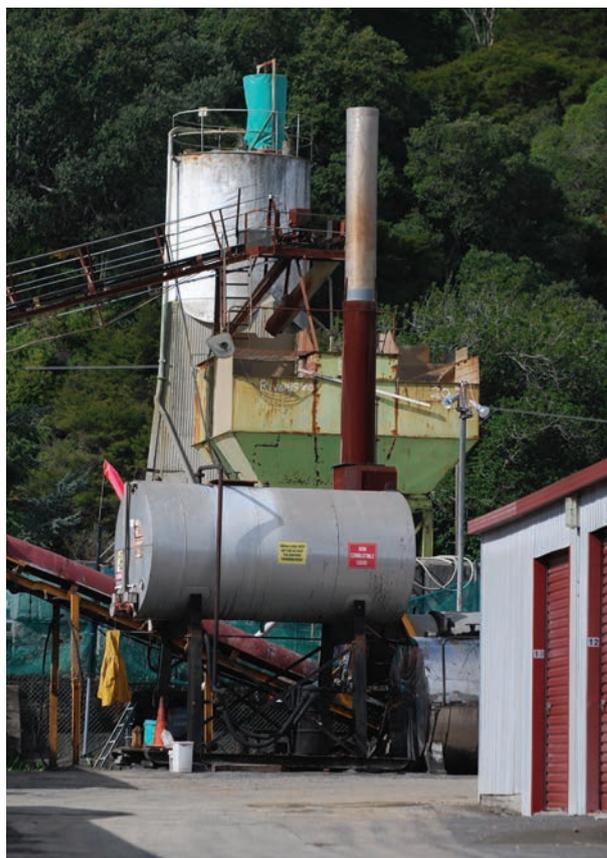
Additional information is required by the Regional Council as a part of the resource consent process to assess whether the requirement to offset has been met by the applicant.

1. Information on required offsets (new emissions in)

Resource consent applications must provide the following information on new emissions:

- a. A list of all emission sources, classified as major or minor based on their potential to emit:
 - Major sources are plant or equipment with substantial discharges of PM_{10}
 - Minor sources are those that do not have substantial discharges of PM_{10} . A site may have only minor emission sources that taken collectively, have substantial discharges of PM_{10}
- b. Referenced, clear and repeatable emissions calculations of the additional emissions (with supporting documentation).
- c. The calculation procedures that the applicant proposes to use to convert the operational and/or emissions monitoring data to monthly and annual emissions based on a 12-month rolling total for each month.

In most cases this will be a simple multiplication process for hourly/weekly operational data.



2. Information on emission reductions (emissions out)

Resource consent applications must provide the following information on the offset sources.

- a. Details of PM_{10} emissions being taken out:
 - Individual emission source being removed (e.g. open fire – wood, 1 MW coal fired boiler, etc)
 - Individual offset amount (e.g. 28 kg/year PM_{10})
- b. Details of replacement unit (as applicable):
 - Individual offset appliance being installed (e.g. 4.7 kW Toshiba heat pump, 1 MW pellet fired boiler)
 - Supplier name and contact details (e.g. Acme Heat Pump Services, Acme Boilers)
- c. Location/Certification of PM_{10} emissions being taken out:
 - Address (e.g. Residence at 1125 Arawa Street, Rotorua)
 - Date of offset (e.g. 2 February 2013)
 - Signed, witnessed statement by the home owner/site operator stating that the emission source being removed was being used regularly prior to the offset

Applicants wishing to achieve offsets through shutdown or curtailment of existing industry production should also demonstrate the following:

- The reductions are surplus (i.e. they weren't going to occur anyway), permanent, quantifiable and enforceable by the Regional Council; and
- The offsets will take effect before the discharge in the resource consent is activated and remain in effect for the duration of consent (Regulation 17(3)(b))

Stage 1 Determine the need to offset

There are different offset requirements depending on whether you are an existing consented industry or new industry in or near the Rotorua airshed. If either of the situations below apply to you, you must provide offsets.

New Industry if:

- You need a resource consent to discharge PM₁₀ (check the requirements of the Regional Air Plan); and
- Your PM₁₀ emissions are substantial - likely to increase the daily off-site concentration of PM₁₀ by more than 2.5 µg/m³ in the Rotorua airshed (determined by modelling)

then you need to provide offsets

OR

Existing Industry if:

- You hold a current resource consent to discharge PM₁₀; and
- You are increasing your PM₁₀ emissions; and
- Your PM₁₀ emissions are substantial - likely to increase the daily off-site concentration of PM₁₀ by more than 2.5 µg/m³ in the Rotorua airshed (determined by modelling)

then you need to provide offsets

Offsets required

If offsets are required, follow stages 2-5

Exclusions

No offsets are required for:

- Discharges of other contaminants (only emissions of PM₁₀ require offset)
- Discharges of PM₁₀ that do not require a resource consent (even if it is substantial)

Exclusions

No offsets are required for:

- Discharges of other contaminants (only emissions of PM₁₀ require offset)
- Emissions of PM₁₀ at the same amount and rate as the existing consent

Stage 2 Calculate your emissions

Calculate the annual mass emission rate in kilograms – Baseline emissions:

- Include quantifiable sources of PM₁₀ only (e.g. boilers)
- All total suspended particulate is assumed to be 100% PM₁₀
- For existing sites, use the maximum consented discharge rate (determined on a single, consecutive 12 month period)
- For new sites, baseline emissions should be based on the maximum hours of operation and emission rates as applied for under the consent

In certain circumstances, existing sites may apply to have their baseline emissions reduced by reviewing their consent (see Section Two, Stage 2)

Stage 3 Apply a scaling factor

Apply the scaling factor:

- If your activity is located in the Ngāpuna industrial estate, your scaling factor is 1.2
- If your activity is located anywhere else in or near the Rotorua airshed, your scaling factor is 1.1
- Multiply your annual mass emission rate as calculated in Stage 2 by the scaling factor. That is the total amount that you have to offset

In certain circumstances you may apply to the Regional Council to have your scaling factor reduced (see Section Two, Stage 3)

Stage 4 Calculate emissions out

Domestic sources:

- Use the table to calculate how many of each appliance you need to replace – the best value are open fires, multifuel burners, and pre-2005 wood burners
- If you are replacing old burners with new burners, you need to provide additional calculations to account for the emissions going back into the airshed from the new burners
- Locate homeowners that are willing to swap their old burners – you may need to consider contracts and other legal issues

Burners must be swapped by the time your consent takes effect

Commercial sources:

- Converting Rotorua Lakes High School may provide up to 109 kg/year of emission offsets. If you use this source as an offset source, you need to take into account the emissions from the appliance that replaces the coal boiler
- Light industrial sources may also be available. If you use these, you need to quantify the discharge. The Regional Council recommends the US EPA emission factor clearinghouse to calculate emissions

All emissions sources must be replaced by the time your consent takes effect

Stage 5 Apply for a resource consent

You need to apply for a resource consent following the usual Section 88 procedures, including the preparation of an assessment of environmental effects.

In addition to those procedures, those applicants required to offset PM₁₀ emissions also need to provide the following additional information.

Information required for emissions in:

- A list of all emission sources
- Calculations of your baseline emissions
- Calculation procedures to convert monitoring data to monthly and annual emissions data

Information required for emissions out:

- Details of PM₁₀ sources being removed
- Details of replacement appliances
- Location of PM₁₀ emissions being taken out

All offsets must be real, enforceable, permanent, surplus, and inside (or have effects inside) the Rotorua airshed

Glossary

Background air quality – is the state of air quality without the source under consideration and includes natural sources (such as sea salt, or wind-blown dust).

Best available technology and emissions control – decided on a case-by-case basis taking into account energy, environmental and economic impacts by Bay of Plenty Regional Council. Typically at least equal to the standards for Grade 6 plant in Schedules 2, 3 and 4 of the Protection of the Environment Operations (Clean Air) Regulations 2010¹⁴.

Fugitive PM₁₀ emissions – dust emissions from open sources (e.g. unpaved roads, heavy construction, tilling of fields).

Offset – a counterbalance of compensatory measure. As used in this document, an offset is a PM₁₀ emission reduction in one part of the Rotorua airshed to compensate for a PM₁₀ emission increase elsewhere in the Rotorua airshed (i.e. that which is taken out, to compensate that which is put in). PM₁₀ offsets are expressed in kilograms per year.

Plant PM₁₀ limits – annual emission limit in kilograms or tonnes per year expressed as a 12-month average, rolled monthly.

PM₁₀ – particulate matter less than 10 micrometres in diameter.

PM_{2.5} – particulate matter less than 2.5 micrometres in diameter.

Precursors – are pollutants that react downwind to form other pollutants.

Scaling factors – multiplication factors used when calculating offsets (to provide for uncertainty, fugitive emissions, secondary particulate formation and/or the existing degraded state of air quality).

Substantial discharges of PM₁₀ – any discharge that is likely to increase the daily, off-site maximum ground-level concentration of PM₁₀ by more than 2.5 $\mu\text{g}/\text{m}^3$ (as a 24-hour average) in the Rotorua airshed.

¹⁴ <http://www.legislation.nsw.gov.au/>

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Appendix A

Quantifying Rotorua Domestic Offset Sources

Assumptions and references for the emission factors and annual fuel used in Table 1 (Section Two) are provided below.

Applicants may assume that chip burners are the same as multi-fuel burners (wood). Similarly, coal fired burners are assumed to have the same emissions as multi-fuel burners (coal).

Source references for domestic fire emission factors

There has been considerable research in New Zealand on real-life emissions from domestic fires. The most recent publication is an Auckland Regional Council publication - *Estimation of Domestic Fire Emissions in 2006* (Auckland Regional Council, 2010). This publication discusses the evolution of test data to date and nominates emissions factors for use in the Auckland air emissions inventory.

The Bay of Plenty Regional Council has selected emission factors from the following references for use in Rotorua:

Open fires (wood) – 12 g/kg

- Environment Canterbury, 2008. *Inventory of Emissions to Air in Christchurch, 2006*. Prepared by John Smithson for Environment Canterbury. Environment Canterbury Report U07/17 - most recently published inventory
- Based on review by Houck and Eagle in 2006, converted to wet wood weight assuming 20 per cent wood moisture content (divided by 1.2)¹⁵.
- Also selected by Auckland Regional Council

Pre-2005 wood burners – 11 g/kg

- Based on 95 tests on 12 burners
- Environment Waikato, 2006. *Real Life Emissions Testing of Pre 1994 Wood burners in New Zealand*. Prepared by Emily Wilton and Jeff Smith for Environment Waikato. Environment Waikato Technical Report 2006/05

Post-2005 (NES compliant) wood burners – 3.7 g/kg

- Average of two emission factors:
 - 3.6 +/- 1.0 g/kg wet weight (60 tests on 9 wood burners, MfE)

- 3.7 +/- 0.7 g/kg wet weight (120 tests on 18 wood burners, ARC)
- Ministry for the Environment, 2007. *Real Life Emissions Testing of Wood burners in Tokoroa*. Prepared by Colleen Kelly, Suri Mues and Wayne Webley for the Ministry for the Environment. Warm Homes Technical Report
- Auckland Regional Council, 2010. *Estimation of Domestic Fire Emissions 2006*. Prepared by Jayne Metcalfe for Auckland Regional Council. Auckland Regional Council Technical Report No. 2010/056

Multi-fuel burners (wood) – 11 g/kg

- Environment Canterbury, 2008 – most recently published inventory, no other data available
- Also selected by Auckland Regional Council

Multi-fuel burners (coal) – 19 g/kg

- Environment Canterbury, 2008 – most recently published inventory, no other data available
- Also selected by Auckland Regional Council

Pellet burners – 1.4 g/kg

- Average of 1.4 g/kg for 3 burners, or average of 3.9 g/kg for 4 burners including 1 faulty
- Assume no faulty burners
- Ministry for the Environment, 2007. *Real Life Emissions Testing of Wood burners in Tokoroa*. Prepared by Colleen Kelly, Suri Mues and Wayne Webley for the Ministry for the Environment. Warm Homes Technical Report
- Also selected by Auckland Regional Council and Environment Canterbury in their respective inventories

Assumptions for fuel use

The 2006 *Rotorua Domestic Heating Survey* (Environment Bay of Plenty, 2006) informed, where practicable, fuel use assumptions. This report estimates an average wood consumption of about 1 tonne for the entire heating season. In reality, wood and coal use will vary depending on the burner type, its age and the use of supplementary heating (if any).

The Bay of Plenty Regional Council has made a number of assumptions about annual fuel use for each burner type in Rotorua as detailed below. When combined (i.e. multiplied by burner type and then by number of burners) these gave an overall average fuel use of 1.2 tonnes per year. This is slightly higher than the 2006 Rotorua Domestic Heating Survey estimated average fuel use of 1 tonne per year.

¹⁵ *Control Analysis and Documentation for Residential Wood Combustion in the MANE-VU Region, Technical Memorandum 4 (Final Report)*. Prepared by JE Houck and BN Eagle for Mid-Atlantic Regional Air Management Association Inc.

Open fires (wood) – 2.4 tonnes/year

- Annual heating demand of 2150 kWh¹⁶
- 3.5 kWh per kg wood¹⁷
- 13% efficiency for open fires¹⁸
- 50% supplementary electrical heating

Pre-2005 wood burners – 1.1 tonnes/year

- Annual heating demand of 2150 kWh¹⁹
- 3.5 kWh per kg wood²⁰
- 40% efficiency²¹
- 30% supplementary electrical heating

Post-2005 (NES compliant) wood burners – 1 tonne/year

Multi-fuel burners (coal) – 1.5 tonnes/year

Multi-fuel burners (wood) – 1.1 tonnes/year

- Rotorua Domestic Heating Survey, 2006.

Pellet burners – 0.9 tonnes/year

- Average fuel use 1.25 kg/hr (Auckland domestic emissions prediction model)
- Assumed operating 5 hrs a day
- 154 days a year (Rotorua Domestic Heating Survey)

¹⁶ HEEP 10 2006, BRANZ report, page 118 Table 65 for annual space heating energy from solid fuel.

¹⁷ HEEP 9 2005, BRANZ page 47

¹⁸ Ibid, page 48

¹⁹ HEEP 10 2006, BRANZ report, page 118 Table 65 for annual space heating energy from solid fuel.

²⁰ HEEP 9 2005, BRANZ page 47

²¹ Efficiencies inferred from HEEP 9 2005, BRANZ pages 47 and 48 - pot bellied stoves 35%, free standing 60 to 70 % and in wall fires assumed lower efficiency

Appendix B

Offsets Registry

Register

The Regional Council will create and maintain a register of all offsets enacted under the programme. Details of each are described below.

This offsets register will detail all offsets enacted under the programme (both domestic, commercial and industrial). This will include the following information:

PM₁₀ Emissions being put in:

- Offset Consent details (i.e. industry requiring offset)
 - Consent number
 - Consent holders name
 - Total PM₁₀ (in kg/yr requiring offset)

PM₁₀ Emissions being taken out:

- Individual emission source being removed (e.g. open fire – wood, 1 MW coal fired boiler, etc)
- Individual offset amount (e.g. 28 kg/year PM₁₀)

Replaced with:

- Individual offset appliance being installed (e.g. 4.7 kW Toshiba heat pump)
- Supplier name and contact details (e.g. Acme Heat Pump Services)
- Contract number for annual inspection and maintenance

Location/Certification

- Address (e.g. 55 Moses Road, Ngapuna)
- Date of offset (e.g. 2 February 2013)
- Signed, witnessed statement by the home owner/site operator:
 - that the emission source being removed was being used regularly prior to the offset; and
 - that they will endeavour to take care of, and avoid any damage to, the appliance being installed.

Offset contracted duration (e.g. 5 years)

Appendix C

Ngāpuna Industrial Estate

This map in Figure 2 has been provided for guidance purposes only. The final decision as to whether an industry has an impact on the air quality in Ngāpuna will be made by the Regional Council.



Figure 2: Ngāpuna Industrial Estate

Appendix D

Case Study Example: Acme Timber



Stage 1: Determine the need to offset

An existing plant, Acme Timber, wishes to add a wood-fired boiler to raise more steam for increased kiln production at their site in Rotorua. The current wood-fired boiler is rated at 7.5 MW and consented to run at 100% maximum continuous rating (MCR) for 8,000 hours per year.

Any existing industry that:

- Holds a current resource consent to discharge PM_{10}
- Substantially increases their PM_{10} emissions must provide offsets.

Acme Timber fits these criteria so needs to progress through stages 2-5.

Stage 2: Calculate the required offset

New boiler:

Acme does not need to provide offsets for the existing boiler, but will need to offset emissions from the new boiler. The new boiler will be 5.5 MW and consented to run at 80% MCR for 8,000 hours of operation. At this rate, the new boiler will emit 4,400 kg of PM_{10} per year.

Stage 3: Apply the scaling factor

Acme propose to install the best available technology and emissions control for the new boiler (also outside the Ngāpuna industrial estate) thus attracting a scaling factor of 1.1. Acme must therefore offset the new boiler:

$$4,400 \times \text{scaling factor } 1.1 = 4,840 \text{ kg of } PM_{10} \text{ per year}$$

Stage 4: Calculate the emission reduction

Option A: Domestic fires to heat pumps

Under this option, Acme propose to meet the required offsets through retrofitting domestic open fires with heat pumps.

Using their waiting list, Acme source the following domestic offsets within a 2 km radius of their site:

- 410 pre-2005 wood burners

Using the emission factors in Table 1 (page 14), Acme calculates these will provide the following offsets:

- Pre-2005 woodburners: 410 @ 12 kg of PM₁₀ per year = 4,920 kg of PM₁₀ per year.

The required offset is 4,840 kg and Acme proposes to remove 4,920 kg per year.

This is 80 kg of PM₁₀ emissions per year more than the required offset, indicating that there will be more emissions “taken-out” than “put-in”. This means that the Regional Council are not constrained by the regulations from granting consent.

Option B: Domestic fires to a combination of heat pumps and new woodburners

Under this option, Acme propose to meet the required offsets through retrofitting domestic open fires with a combination of heat pumps and post-2005 NES compliant woodburners.

Using their waiting list, Acme source the following domestic offsets within a 2 km radius of their site:

- 500 pre-2005 woodburners – 200 (40%) opt to replace with a heat pump, 300 (60%) choose replacement woodburners

Using the emission factors in Table 1 (page 14), Acme calculates these will provide the following offsets:

Emissions out

- Pre-2005 woodburners: 500 @ 12 kg of PM₁₀ per year = 7,500 kg of PM₁₀ per year

Total emissions out = 6,000 kg of PM₁₀ emissions removed per year

Emissions in

- Total replacement woodburners: 300
- Post-2005 woodburners: 300 @ 3.7 kg of PM₁₀ per year = 1,110 kg of PM₁₀ per year

Net emissions out

- 6,000 – 1,110 = 4,890 kg of PM10 per year.

The required offset is 4,840 kg and Acme proposes to remove 4,890 kg per year.

This is 50 kg of PM₁₀ emissions per year more than the required offset, indicating that there will be more emissions “taken-out” than “put-in”. This means that the Regional Council are not constrained by the regulations from granting consent.

Option C: Commercial boiler

Users are recommended to engage a professional air quality consultant to assist with combustion and/or emissions calculations for commercial/industrial offsets.

Stage 5: Apply for a resource consent

Provide all information required by Section 88 of the Resource Management Act and the additional offsets information as set out in Section Two, Stage 5.



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