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Glass Recycling Facility – Screening Level Air Quality Assessment

Addressee(s):	**5R Solutions Ltd**
Report Reference:	**18.1012.FR1V1**
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Quality Control

Study	Status	Prepared by	Checked by	Authorised by
INTRODUCTION	Final	Northstar Air Quality	M Doyle	G Graham
THE PROPOSAL	Final	Northstar Air Quality	M Doyle	G Graham
LEGISLATION, REGULATION AND GUIDANCE	Final	Northstar Air Quality	M Doyle	G Graham
AIR QUALITY ASSESSMENT	Final	Northstar Air Quality	M Doyle	G Graham
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Report Status

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Year	Job Number	(Draft: Final)	(R*x*)	(V*x*)
18	1012	F	R1	V1
Based upon the above, the specific reference for this version of the report is:				**18.1012.FR1V1**

Final Authority

This report must by regarded as draft until the above study components have been each marked as final, and the document has been signed and dated below.

G Graham **12/09/2017**

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Units Used in the Report

All units presented in the report follow the International System of Units (SI) conventions, unless derived from references using non-SI units. In this report, units formed by the division of SI and non-SI units are expressed as a negative exponent, and do not use the solidus (/) symbol.

For example:

- 5 micrograms per cubic metre of air would be presented as 5 $\mu g \cdot m^{-3}$ and not 5 $\mu g/m^3$
- 7.8 metres per second would be presented as 7.8 $m \cdot s^{-1}$ and not 7.8 m/s

Common Abbreviations

Abbreviation	Term
AHD	Australian height datum
AQIA	Air quality impact assessment
AS/NZS	Australian Standard / New Zealand Standard
EPA	NSW Environmental Protection Authority
GIS	Geographical information system
$mg \cdot m^{-3}$	Milligram per cubic metre of air
$\mu g \cdot m^{-3}$	Microgram per cubic metre of air
OEH	NSW Office of Environment and Heritage
PM	Particulate matter
PM_{10}	Particulate matter with an aerodynamic diameter of 10 micrometres
$PM_{2.5}$	Particulate matter with an aerodynamic diameter of 2.5 micrometres
TSP	Total suspended particulate

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1. INTRODUCTION

5R Solutions Ltd has engaged Northstar Air Quality Pty Ltd (Northstar) to perform a screening level Air Quality Impact assessment (AQIA) for the operation of a proposed glass recycling facility (the Proposal) to be located at 2115-2131 Castlereagh Road, Penrith, NSW 2750.

This AQIA forms part of the Development Application (DA) prepared to accompany the application for the Proposal to Penrith City Council (Council).

This screening level AQIA presents an assessment of the impacts of the proposed operations at the Proposal site related to likely emissions to air from the glass recycling process and the potential impacts upon the receiving environment. The requirements for AQIAs are presented in NSW EPA (2016) *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (NSW EPA, 2016).

1.1 Assessment Requirements

On 9 August 2017, pre-lodgement advice was provided by Council, outlining various requirements for information to support the DA (ref: PL17/0059, dated 9 Aug 2017). Within the advice note under 'Environmental Management Requirements' the following is noted, in relation to air quality:

> "***Air Quality (including Odour)***
>
> *An air quality assessment prepared by a suitably qualified environmental consultant is to take into account all activities on the site that may cause air quality / odour impacts. This assessment is to consider the relevant EPA guidelines and criteria, including the 'Approved Methods for the Modelling and Assessment of Air Pollutants', the 'Assessment and management of odour from stationary sources in NSW' and the Protection of the Environment Operations (Clean Air) Regulation 2001, and the location of nearby workplaces*."

The policies, guidelines and plans which have been referenced during the performance of the AQIA include:

- Protection of the Environment Operations (Clean Air) Regulation 2002.
- Approved Methods for the Modelling and Assessment of Air Quality in NSW (NSW EPA, 2016)
- Approved Methods for the Sampling and Analysis of Air Pollutants in NSW (DEC, 2006).
- Technical Notes and Framework: Assessment and Management of Odour from Stationary Sources in NSW (NSW DEC, 2006).

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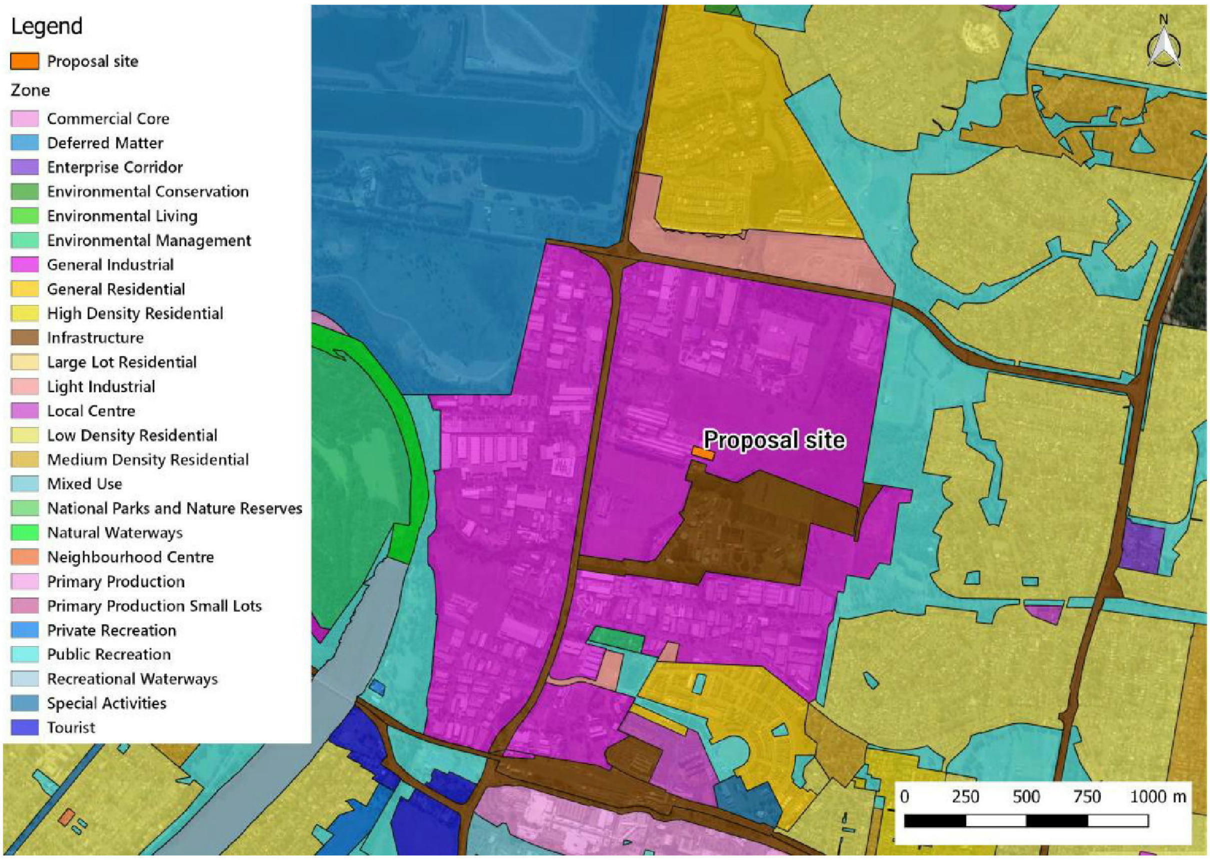
2. THE PROPOSAL

The following provides a description of the Proposal including the setting, overview and summary of the proposed operation.

2.1. Environmental Setting

The Proposal site is located at 2115-2131 Castlereagh Road, Penrith, NSW 2750 and occupies Lot 2 of Deposited Plan (DP) 787827, and this is illustrated in **Figure 1** The Proposal site is located within the Local Government Area (LGA) of Penrith.

Figure 1 Proposal location



Source: Northstar Air Quality

The site is currently zoned as **IN1 General Industrial**, and is occupied by warehousing (see **Figure 2**). The proposed warehouse is located towards the eastern end of the plot, and the warehousing located to the northern end of the plot is currently occupied by a copper tube manufacturer.

The closest sensitive receptors to the Proposal site are located at a distance of 830 m (to low density residential land uses).

2.2. Specific Operational Details

The actual anticipated annual throughput of the plant is anticipated to be 25,000 $t{\cdot}yr^{-1}$, equating to approximately 100 $t{\cdot}day^{-1}$.

The operational details of the Proposal are outlined in **Table 1**.

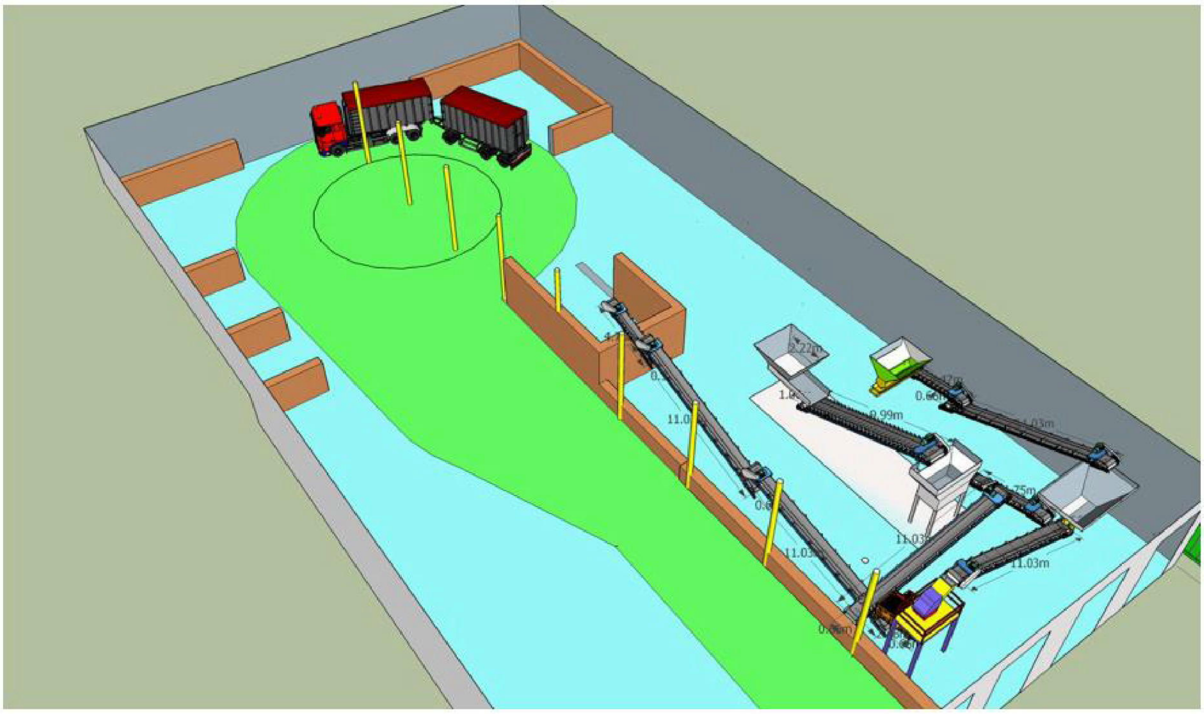
Table 1 Operational details

Operation	Value
Annual throughput	25,000 $t{\cdot}yr^{-1}$
Daily maximum throughput	100 $t{\cdot}day^{-1}$
Warehouse floorspace	2,400 m^2
Operating hours	5 days per week (Mon-Fri) from 05:00 to 20:00 (15 hrs per day)
Significant operations outside	None
Significant operations inside	Glass receival, sorting, processing and manufacturing

2.2.1. Site Layout

The Proposal site is an existing warehouse facility in Penrith, with six (6) current openings. Five (5) of the openings will be permanently sealed with a roller-shutter door operating on the single remaining opening. The roller-shutter door will provide vehicular access into the facility, and will be closed when vehicle access is not required. **Figure 2** presents a stylised view of the internal space, illustrating the access arrangements and locations of plant.

Figure 2 Proposal site layout (from Jackson Environment & Planning 2017)



Source: Jackson Environment & Planning 2017, Fig 3.9

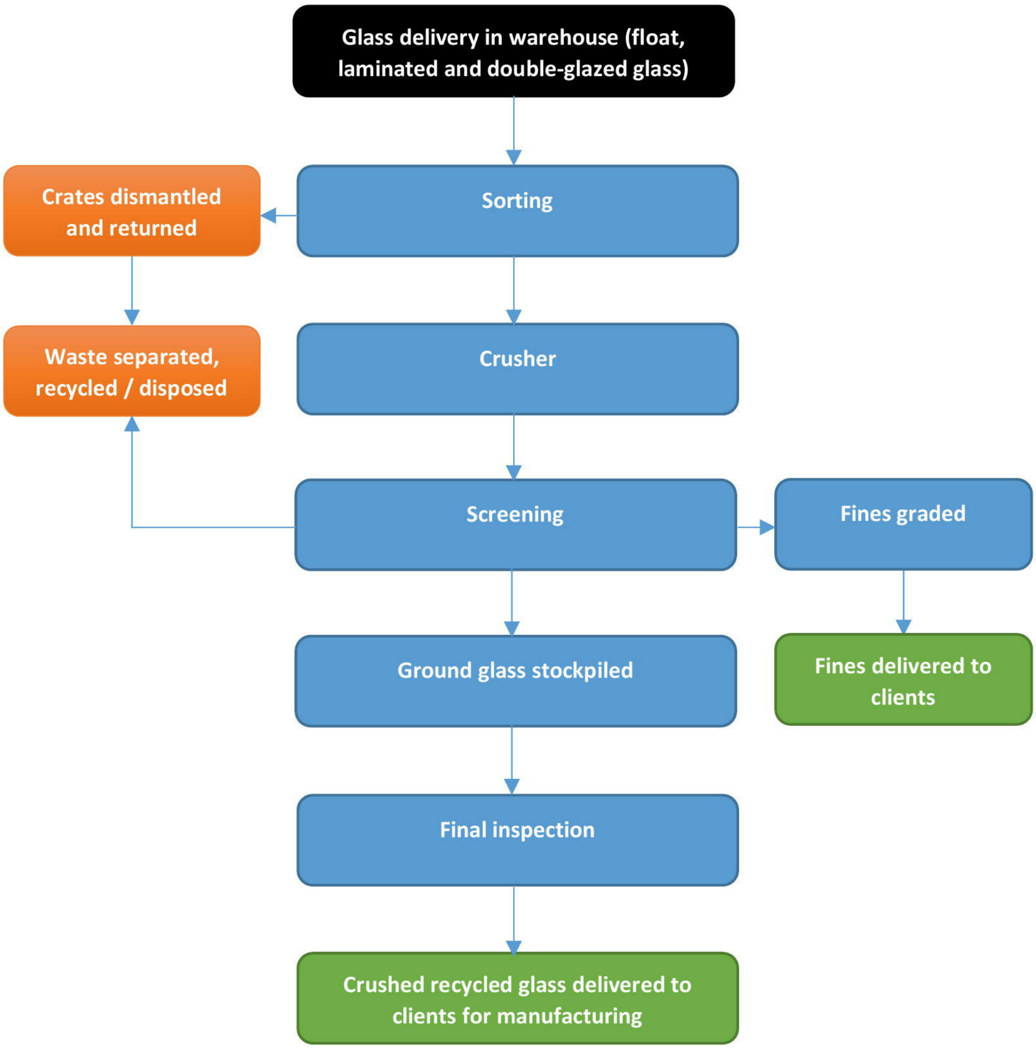
The upgrade of a fully sealed internal access within the Proposal site to provide all weather access has been completed, and the site does not contain any unsurfaced roads.

2.2.2. Site Operation

The following process description is taken verbatim from Jackson Environmental and Planning (2017) *Project Summary for Pre-lodgement Advice Meeting – 5R Solutions Limited – Proposed Glass Recycling Facility* (Jackson Environment & Planning 2017):

> *5R Solutions' objective is to produce a high-quality product adapted to the industrial requirements of its clients, ensuring that all steps are taken to encourage and support the achievement of common goals aligned to 'best practice' recycling of flat glass. Flat glass falls into three categories; float, laminate and double glazed. 5R Solutions has an integrated process able to process all three types for reuse as shown in* [**Figure 3**].
>
> *A step by step description of the process is provided below:*
>
> - *Step 1: Glass is received into plant, delivery either by our own gantry trucks or sub-contract trucks.*
> - *Step 2: Upon arrival at 5R Solutions, paperwork is audited and gross weight confirmed via certified trade approved weighbridge docket or on board Loadrite scale. Finalised documents are scanned into a quality assured filing system.*
> - *Step 3: Prior to processing, the type of glass is confirmed and the glass is transferred to appropriate holding bunkers.*
> - *Step 4: The float glass is fed into dedicated crushing system after which it is transitioned through a vibratory screen sorting system. The sorting system isolates specific grades of glass based on size. Contamination and unsuitable product is removed during the process.*
> - *Step 5: Double glazed and laminate materials are sorted for gross contaminants prior to feeding through the crusher that separates out the plastic films and other contaminants. Material is then run through a screening and dust extraction process that conveys the glass and plastic into separate streams.*
> - *Step 6: After separation, the glass produced is incorporated into bulk stock destined for delivery to either new bottle or fibreglass insulation manufacture.*
> - *Step 7: The plastic film, which constitutes less than 5% of the overall weight of a windscreen, enters the plant's waste stream and is transferred to an approved landfill after separation. It should be noted that research is currently in progress to process the plastic so that it is suitable for recycling and reuse.*

Figure 3 Process flow diagram of 5R Solution's approach to receival, sorting, processing and recycling of glass



Source: Jackson Environment & Planning

2.2.3. Waste Delivery Profile

Data provided by 5R Solutions provides an indication of the anticipated glass waste deliveries. Based upon an upper threshold processing rate of 25,000 $t{\cdot}yr^{-1}$, the following is estimated:

Table 2 Estimated vehicle movements (by type and total one-way, two-way)

Vehicle Type	Vehicles in (number)	Vehicles out (number)	Total one-way (number)	Total two-way (number)
12 t tipper trucks	938	2,083	3,021	6,042
8 t skip trucks	1,719	0	1,719	3,438
Totals	**2,657**	**2,083**	**4,740**	**9,480**

Based upon on estimated 9,480 vehicle movements per year and a 50-week annual operating period, this equates to a weekly estimated traffic flow of 190 vehicles per week., and assuming 5 working days per week this equates to 38 vehicles per working day.

2.2.4. Process Emission Control

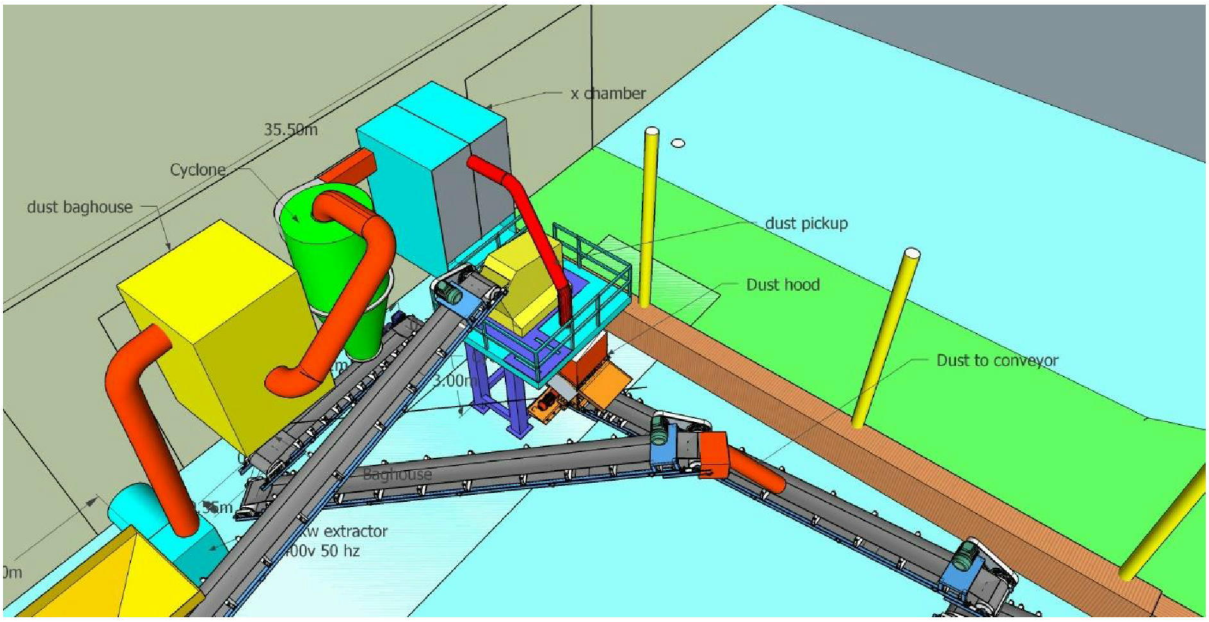
The crushing of glass has the potential to generate particulates, and to handle the particulates generated by the process a 'dust handling system' will be operated.

Dust from the glass infeed will be controlled through a water misting system, which will be carried with the uncrushed glass materials to the crushing and screening system. The water mists will be balanced to apply water at an approximate rate of 2%(w/w).

At the crushers and screens a dust handling system will be operated. This will include the operation of a number of local exhaust ventilation (LEV) extraction hoods at points in the process that would generate particulates (the crushers and screens) at a design air handling rate of rate 16,000 cubic metres of air per hour ($m^3{\cdot}hr^{-1}$), equating to 4.4 cubic metres of air per second ($m^3{\cdot}s^{-1}$).

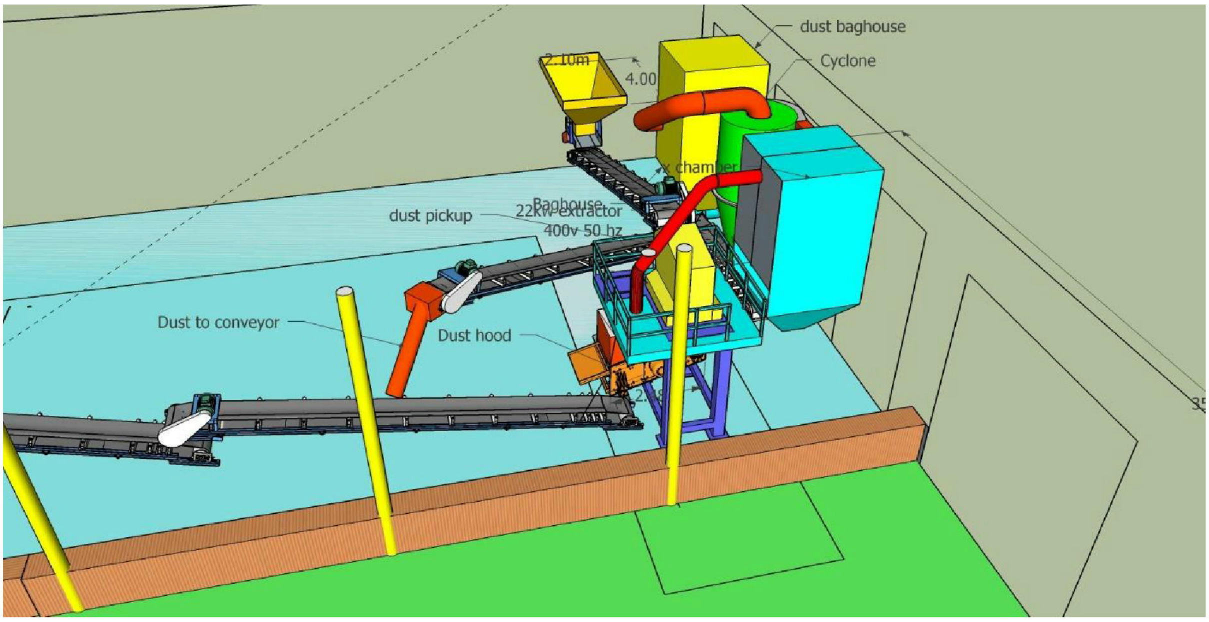
Stylised illustrations showing the proposed operation and configuration of the processes and APC are presented in **Figure 4**, **Figure 5**, and **Figure 6** below:

Figure 4 Proposed dust extraction and air pollution control system (view 1)



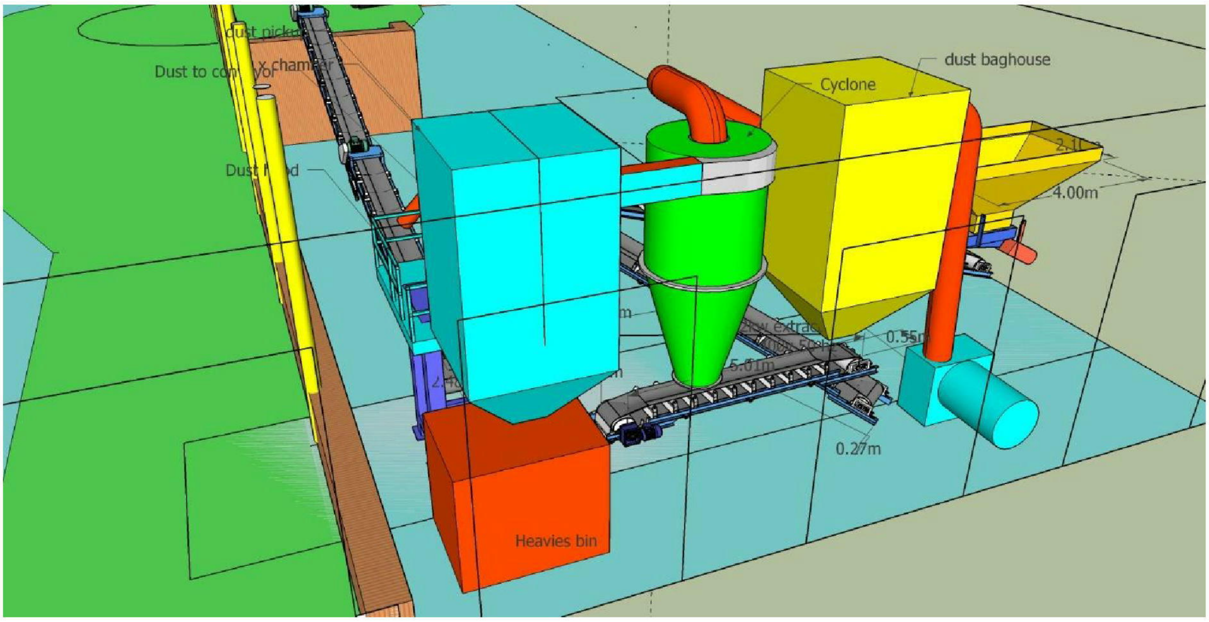
Source: 5R Solutions

Figure 5 Proposed dust extraction and air pollution control system (view 2)



Source: 5R Solutions

Figure 6 Proposed dust extraction and air pollution control system (view 3)



Source: 5R Solutions

The air is extracted from the crushers and screens and is ducted to an air pollution control (APC) system fitted with:

- a gravitational settling chamber (to remove "heavies" and larger abrasive materials that may damage other APC components), and shown in light blue in **Figure 4**, **Figure 5**, and **Figure 6**.
- a cyclone separator (to remove intermediate sized particulates), and shown in light green in **Figure 4**, **Figure 5**, and **Figure 6**; and
- a fabric filter "bag house" (to remove the finer materials), and shown in yellow in **Figure 4**, **Figure 5**, and **Figure 6**.

The recovered usable material from the APC components will be transferred into residual bins for periodic removal and disposal. The treated extracted air will be discharged from the dust handling system horizontally through a sidewall vent, and not recirculated within the warehouse air space.

2.3. Identified Potential for Emissions to Air

The proposed glass recycling facility will only accept and process glass waste. The crushing and screening of glass has the potential to generate particulates, and therefore the air quality assessment needs to consider the potential emission of particulates.

The Proposal is not able to process any putrescible matter, and will not receive bottle glass, and therefore it is reasonable to conclude that the process will not represent a source of odour. Odour has therefore not been considered further in this assessment.

The delivery of glass waste materials is by a mixture of 8 t skip trucks and 12 t trucks. **Figure 2** shows the indicative route of vehicles within the warehouse to deliver the glass for processing. Correspondingly, the potential for vehicle exhaust emissions needs to be considered.

Assessment of the potential impacts upon local air quality resulting from those activities is presented in **Section 4**.

3. LEGISLATION, REGULATION AND GUIDANCE

3.1. Federal Air Quality Standards

3.1.1 National Environment Protection (Ambient Air Quality) Measure

The *National Environment Protection (Ambient Air Quality) Measure* (Ambient Air Quality NEPM) was promulgated in July 1998 and established ambient air quality standards for six key pollutants across Australia, and provides a standard method for monitoring and reporting on air quality. Air quality standards and performance monitoring goals for the six key air pollutants include:

- Carbon monoxide (CO);
- Lead (Pb);
- Nitrogen dioxide (NO_2);
- Particles (particulate matter with an aerodynamic equivalent diameter of 10 microns (µm) or less (PM_{10});
- Photochemical oxidants, as ozone (O_3); and,
- Sulphur dioxide (SO_2).

The Ambient Air Quality NEPM was varied in July 2003 to include advisory reporting standards for fine particulate matter with an aerodynamic equivalent diameter of 2.5 microns (µm) or less ($PM_{2.5}$) and in February 2016 (NEPC, 2016), introducing varied standards for PM_{10} and $PM_{2.5}$. The air quality standards and goals as set out in the (revised) Ambient Air Quality NEPM for the pollutants considered within this assessment are presented in **Table 3**.

Table 3 National Environment Protection (Ambient Air Quality) Measure standards and goals

Pollutant	Averaging period	Criterion	Allowable exceedances per year
Particulates (as PM_{10})	1 day	50 $\mu g \cdot m^{-3}$	None
	1 year	25 $\mu g \cdot m^{-3}$	None
Particulates (as $PM_{2.5}$)	1 day	25 $\mu g \cdot m^{-3}$	None
	1 year	8 $\mu g \cdot m^{-3}$	None

3.1.2 National Clean Air Agreement

The National Clean Air Agreement (NCAA) was agreed by Australia's Environment Ministers on 15 December 2015. The NCAA establishes a framework and work plans for the development and implementation of various policies aimed at improving air quality across Australia.

Regarding air quality standards with relevance to this report, the Initial Work Plan sets an objective to vary the Ambient Air Quality NEPM regarding PM_{10} and $PM_{2.5}$ standards.

Of relevance to the standards adopted as the relevant benchmarks for the performance of the project, the previous standards were augmented by an annual average PM_{10} concentration standard of 25 µg·m^{-3}, and the advisory reporting standards for $PM_{2.5}$ considered as standards. It is further likely that the 24-hour average PM_{10} concentration standard will be made more stringent from the current value of 50 µg·m^{-3} in time, although it is currently not possible to determine the revised standard for that metric.

3.2 NSW Air Quality Standards

3.2.1 Ambient Air Quality Standards

State air quality guidelines adopted by the NSW EPA are published in the *'Approved Methods for the Modelling and Assessment of Air Quality in NSW'* (the Approved Methods (NSW EPA, 2016)) which has been consulted during the preparation of this assessment report.

The Approved Methods lists the statutory methods that are to be used to model and assess emissions of criteria air pollutants from stationary sources in NSW. Section 7.1 of the Approved Methods clearly outlines the impact assessment criteria for the project. The criteria listed in the Approved Methods are derived from a range of sources (including NHMRC, NEPC, DoE and WHO).

The criteria specified in the Approved Methods are the defining ambient air quality criteria for NSW. The standards adopted to protect members of the community from health impacts in NSW are presented in **Table 4**.

Table 4 NSW EPA air quality standards and goals

Pollutant	Averaging period	Criterion µg·m^{-3} (a)		Notes
Particulates (as PM_{10})	24 hours	50		Numerically equivalent to the AAQ NEPM(b) standards and goals.
	1 year	25		
Particulates (as $PM_{2.5}$)	24 hours	25		
	1 year	8		
Particulates (as TSP)	1 year	90		
Pollutant	**Averaging period**	**g·m^{-2}·month^{-1}**	**g·m^{-2}·month^{-1}**	**Notes**
Deposited dust	1 year	2(c)	4(d)	Assessed as insoluble solids as defined by AS 3580.10.1

Notes: (a): micrograms per cubic metre of air
(b): National Environment Protection (Ambient Air Quality) Measure
(c): Maximum increase in deposited dust level
(d): Maximum total deposited dust level

3.3 Safework Australia

The potential effects of crystalline silica upon human health are well established Australian Institute of Occupational Hygienists (2009) *AIOH Position Paper - Respirable Crystalline Silica and Occupational Health Issues* (AIOH, 2009)[1], Occupational Safety and Health Administration (2002) *Crystalline Silica factsheet* (OSHA 2002)[2], World Health Organisation (2000) *Concise International Chemical Assessment Document 24 – Crystalline Silica, Quartz* (WHO 2000)[3].

For clarity, the process operated by 5R Solutions will not process crystalline silica.

Safework Australia (2013) *Workplace Exposure Standards for Airborne Contaminants* (Safework Australia 2013)[4] provides work place standards for a range of air pollutants, including respirable amorphous silica. This standard is set as 2 mg·m^{-3} (<1% crystalline silica) as an 8-hour workplace exposure rate and it is a legal requirement for the facility operator to evaluate this risk.

3.4 Vehicle Exhaust Emissions

The operation of vehicles (delivery and despatch vehicles) in the enclosed warehouse creates the potential for the accumulation of vehicle exhaust emissions.

To account for this risk, reference has been made to AS 1668.2 *The use of ventilation and airconditioning in buildings – Part 2: mechanical ventilation in buildings*, which provides design requirements to manage the potential for the build-up of vehicle exhaust emissions in enclosed spaces (such as car parks, but equally applying to the warehouse).

[1] https://www.aioh.org.au/documents/item/10
[2] https://www.osha.gov/OshDoc/data_General_Facts/crystalline-factsheet.pdf
[3] http://www.who.int/ipcs/publications/cicad/en/cicad24.pdf
[4] https://www.safeworkaustralia.gov.au/system/files/documents/1705/workplace-exposure-standards-airborne-contaminants-v2.pdf

4. AIR QUALITY ASSESSMENT

4.1. Material Processing

The processing of glass within the warehouse has the potential to cause emissions of particulate matter as described in **Section 2.3**. This section outlines the estimation of emissions from those processes, and determines a level of risk of the exhaust of those emissions to the ambient environment.

4.1.1. Australian Department of the Environment and Energy

The Department of Environment and Energy (DEE) publishes a range of National Pollutant Inventory (NPI) Emission Estimation Technique Manuals (EETM), which are commonly used in Australia to estimate emissions in air quality assessments.

The NPI Emission Estimation Technique Manual for Glass and Glass Fibre manufacturing (version 2) (2004) in regard to emissions of particulate from glass manufacturing, raw materials handing makes reference to the NPI EETM Mining (2014) emission factor for loading and conveying, reproduced in **Table 5**.

Table 5 NPI emission factors

Operation / Activity	TSP Equation ($kg{\cdot}t^{-1}$)	PM10 Equation ($kg{\cdot}t^{-1}$)
Misc transfer points (including conveying)	$EF_{TSP} = 0.74 \times 0.0016 \times \frac{(U/2.2)^{1.3}}{(M/2)^{1.4}}$	$EF_{PM10} = 0.35 \times 0.0016 \times \frac{(U/2.2)^{1.3}}{(M/2)^{1.4}}$

Where: U = mean wind speed ($m{\cdot}s^{-1}$)

M = moisture content (%)

The NPI EETM Fugitive Emissions Table 9 'Default PM_{10} Collection Efficiency Values for Pollution Control Equipment' provides the following estimates for particulate control efficiencies for various APC technologies, as presented in **Table 6**.

Table 6 NPI air pollution control efficiencies

Control Equipment	Low efficiency	Medium efficiency	High efficiency
Gravity collector	3.7%	4.8%	6%
Centrifugal collector (cyclone)	50%	85%	95%
Fabric filter (bag house)	99.5%		
Dust suppression by water sprays	90%		
Dust suppression by wetting agents	90%		

4.1.2. US Environment Protection Agency

The United States Environment Protection Agency (US EPA) AP 42, *Fifth Edition Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources, Chapter 11.15 Glass Manufacturing* makes the following statements in regard to emissions and controls:

> *The main pollutant emitted by the batch plant is particulates in the form of dust. This can be controlled with 99 to 100 percent efficiency by enclosing all possible dust sources and using baghouses or cloth filters. Another way to control dust emissions, also with an efficiency approaching 100 percent, is to treat the batch to reduce the amount of fine particles present, by presintering, briquetting, pelletizing, or liquid alkali treatment.*
>
> *The melting furnace contributes over 99 percent of the total emissions from a glass plant, both particulates and gaseous pollutants…*

AP 42 Table 11.15-1 presents a range of emission factors for a range of glass manufacturing process, including those from material preparation (including magnetic separator, crusher, material receiving hopper, screw conveyor to the material storage bins). Given the fact that those processes include crushing, the handling of raw materials is considered to include the activities to be performed by 5R Solutions. It is noted that the emission factor rating is "B" which is described as:

> *Above average. Factor is developed from A- or B-rated test data from a "reasonable number" of facilities. Although no specific bias is evident, it is not clear if the facilities tested represent a random sample of the industry. As with an A rating, the source category population is sufficiently specific to minimize variability.*

With respect to particulates from raw material handing (including crushing), the emission estimation factor is presented in **Table 7**.

Table 7 AP-42 Particulate emission factors for glass manufacturing

Process	Particulate (kg·tonne^{-1})
Raw materials handling (all types of glass)	Neg

In regard to the stated 'negligible" emission rate the following is noted:

> *Not separated into types of glass produced, since batch preparation is the same for all types. Particulate emissions are negligible because almost all plants utilize some form of control (i. e., baghouses, scrubbers, centrifugal collectors).*

4.1.3. Estimation of Emissions

Based on the above, the following represents the various emission estimations for the proposed 5R Solutions glass processes.

Table 8 Estimated TSP and PM_{10} emission rates (per tonne)

Data source	Uncontrolled ($kg \cdot t^{-1}$)		Conditions	Controlled ($kg \cdot t^{-1}$)				Assumptions
	TSP	PM_{10}		TSP (lo Eff)	TSP (hi Eff)	PM_{10} (lo Eff)	PM_{10} (hi Eff)	
NPI	0.009085	0.004297	$U = 5\ m.s^{-1}$ M = 1%	2.19E-06	2.13E-07	1.03E-06	1.01E-07	APC efficiencies in **Table 6** (low efficiencies used)
US EPA AP 42	nd	nd	nd	0	0	0	0	Assumes operation of suitable APC

Note: U= wind speed, M = moisture content

The estimation of emission rates using the NPI emission factors has sequentially used the low efficiency estimates presented in **Table 6** and the high efficiency estimates. The estimation of emissions using the US EPA emission factors (negligible) assume that there is operation of suitable APC. Essentially, the two techniques, whilst different in approach, both agree the same conclusion of a low rate of emissions.

Based upon the assumptions in **Table 1**, and using the estimated emission rates using the NPI emission factors presented in **Table 8**, the estimated emission rates as presented in **Table 9** have been derived. Similar to **Table 8**, these sequentially assume low abatement efficiencies and high abatement efficiencies generating an estimated range of emission concentrations post APV.

Table 9 Estimated TSP and PM_{10} emission rates

Pollutant	APC Efficiency	Emission ($kg \cdot t^{-1}$)	Throughput [(a)] ($t \cdot hr^{-1}$)	Extraction rate[(b)] ($m^3 \cdot hr^{-1}$)	Concentration [(c)] ($\mu g \cdot m^{-3}$)
TSP	low	2.19E-06	11.76	16,000[(a)]	1.608
	high	2.13E-07	11.76	16,000	0.157
PM_{10}	low	1.03E-06	11.76	16,000	0.761
	high	1.01E-07	11.76	16000	0.074

Notes: (a) at assumed 100 $t \cdot hr^{-1}$ processing rate
(b) refer **Section 2.2.4**
(c) at point of emission

For clarity, the emission concentration presented in **Table 9** can be directly compared to the air quality criteria outlined in **Section 3**. These concentrations are predicted at the point of emission, and due to the effects of dilution and dispersion, would be many orders of magnitude lower upon reaching the nearest sensitive receptor locations, at a distance of 830 m from the Proposal site.

The maximum calculated emission concentrations of 1.608 $\mu g \cdot m^{-3}$ (TSP) and 0.761 $\mu g \cdot m^{-3}$ (PM_{10}) (both low efficiency APC) are associated with a 1 hour particulate concentration. As described in **Section 3**, the air quality criteria relevant to these pollutants are 24-hour and annual average. It is further noted that the emission rates are applicable over the 8.5 hour operating period, with a zero emission rate over the remaining 15.5 hours of the day.

The air pollutant concentrations which might be experienced at the nearest sensitive receptors at these averaging periods as a result of the emission is therefore considered to be insignificant, when combined with the previously discussed effects of dispersion and dilution. The inclusion of the APC system as described is considered to be best practice.

No further assessment of the ambient air quality impacts from the Proposal are warranted, and have essentially be screened from further examination. For clarity, given the minimal impacts (even at the point of emission), no dispersion modelling has been performed.

4.2. Vehicle Movements

The movements of vehicles within the building requires an assessment of the ventilation which may be required to remove emissions to ensure health and amenity are maintained. The requirements of Australian Standard / New Zealand Standard (AS/NZS) 1668.2-2012 *The use of ventilation and airconditioning in buildings, Part 2: Mechanical ventilation in buildings* have been reviewed and outlined below as they relate to the Proposal.

4.2.1. AS/NZS 1668.2-2012

AS/NZS 1668.2-2012 contains relevant requirements relating to the operation of vehicles within enclosures. Section 4 of AS/NZS 1668.2-2012 identifies that loading docks are covered by these requirements, and as such section 4.5.2 (loading docks) states:

> *"Loading docks, in which the rear of the docked vehicle may be located at a distance greater than 10 m from the vehicle entrance opening in an external wall, shall be ventilated by an exhaust system. The airflow rate while the dock is in use shall be not less than 1500 L/s per vehicle docking space with a minimum of 3000 L/s"*

The layout presented in **Figure 2** indicates that vehicles may be operational at distances >10 m from the external entrance and therefore a minimum ventilation rate of 3,000 $L{\cdot}s^{-1}$ would be required. Vehicle access within the building will be strictly limited to one truck at any time, with that vehicle leaving the warehouse prior to the next being admitted access. Further the loader will not be operated within the building during any time that a truck is within the building.

AS/NZS 1668.2-2012 also provides additional requirements relating to the air pressure within the area ventilated and the air pressure of the area served by the ventilation system shall be less than that of adjacent areas not served by the system (clause 3.7.2).

The air exhausted from the area is also required to be replenished by outdoor air, transfer air or make-up air of an acceptable quality from an adjacent area (clause 3.8.1). A specific make-up supply may not be required although this would be confirmed by a ventilation systems engineer.

The discharge of exhaust air is required to be performed in accordance with clause 3.10.2 of AS/NZS 1668.2-2012. Specifically, the discharges are required to be located such that the effects of wind and adjacent structures do not cause the exhaust flow rate to be reduced. The discharge is also required to be at a distance of >6 m from other air intakes, natural ventilation devices or the site boundary.

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5. CONCLUSION

5R Solutions Ltd has engaged Northstar Air Quality Pty Ltd (Northstar) to perform a screening level Air Quality Impact assessment (AQIA) for the operation of a proposed glass recycling facility (the Proposal) to be located at 2115-2131 Castlereagh Road, Penrith, NSW 2750.

The assessment has considered the potential daily throughput of the Proposal and calculated emissions of Total Suspended Particulate (TSP) and Particulate Matter with an aerodynamic diameter <10 µm (PM_{10}) using Australian specific (National Pollutant Inventory) and US EPA emission factors. The control measures to be implemented as part of the Proposal have been used to calculate the emission of TSP and PM_{10} from the building at the Proposal site. The inclusion of material wetting, a gravitational settling chamber, a cyclone separator and a fabric filter "bag house" represent best practice dust control and are shown to result in a combined control efficiency of between 99.97% and 99.99%.

At the point of emission, the TSP and PM_{10} concentrations are calculated to be a maximum (assuming the lower end of the control efficiency spectrum for the installed equipment) of 1.608 $\mu g \cdot m^{-3}$ and 0.761 $\mu g \cdot m^{-3}$, respectively. Given that the closest residential receptor locations are situated at distances in excess of 830 m from the Proposal site, the effects of dilution and dispersion of that emission would result in insignificant impacts at those locations, especially when taking into consideration that the calculated concentration at the point of emission is related a 1-hour average rather than the 24-hour or annual averages which represent the air quality criteria.

An assessment of the requirement for local ventilation as a result of vehicles using the facility (for receipt and despatch of materials) has also been performed. This assessment indicates that a local exhaust system operating at a rate of not less than 3,000 $L \cdot s^{-1}$ is required to ensure than health an amenity of building users is not compromised.

It is concluded that the Proposal will operate in accordance with best practice resulting in the emission of quantities of particulate matter that would be insignificant once they are dispersed, diluted and reach the nearest sensitive receptor locations. As such, the Proposal should not be refused on the grounds of air quality.

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6. REFERENCES

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