22 July 2022

Assessment of air emissions: Proposed Service Station, Monbulk Road, Mt Evelyn, VIC

1.0 Background

to provide an assessment of potential emissions from a new service station to be constructed at 41 Monbulk Road, Mount Evelyn, Victoria (the site).

The site to be redeveloped as a service station is shown in the following figures (i.e., **Figures 1** and **2**).

The site has been used for retail purposes that include gardening supplies and supply of produce

The layout of the new service station is shown in **Figure 3**.

Monbulk Road runs approximately north/south so the layout figure has been placed to show this roadway in that configuration.

The site is not yet a service station, so it is not possible to monitor potential emissions from the proposed service station. This assessment has been undertaken using publicly available information about service station emissions and the provided site layout figure (i.e. **Figure 3**) to determine where sensitive land uses may be present.

Figure 1: Aerial view of the site and surrounds from Google Maps

Figure 2: Street view from June 2021 (Google Maps)

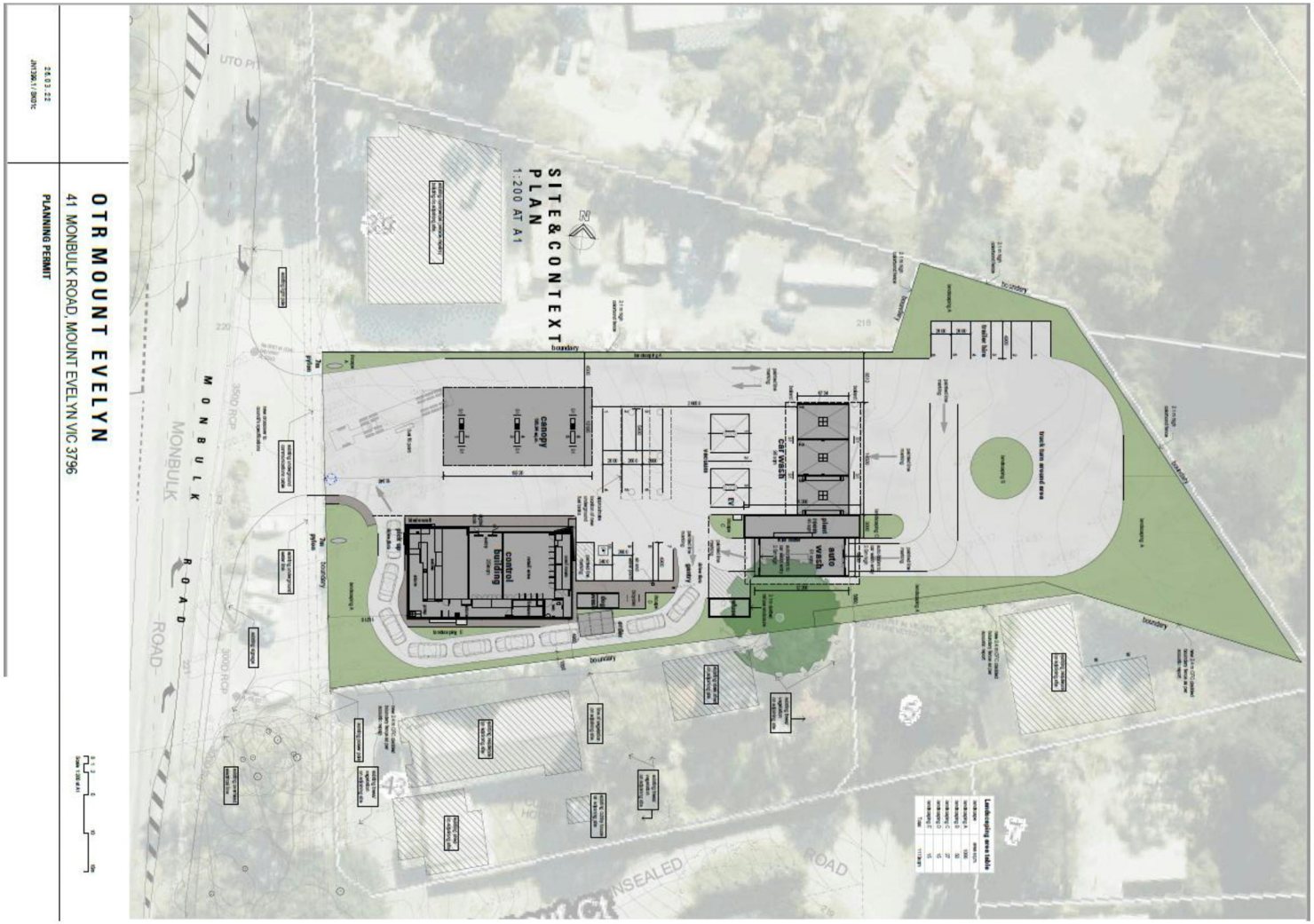

Figure 3: Proposed site layout for new development

2.0 Objectives

The key objective of the work proposed in this letter is to provide a qualitative discussion about the potential for emissions from the development.

3.0 Methodology

In general, the approach taken for the assessment of emissions from a proposed new service station and any related health impacts from vapour emissions will be in accordance with guidelines/protocols endorsed by Australian regulators, including:

- enHealth Environmental Health Risk Assessment, Guidelines for Assessing Human Health Risks from Environmental Hazards (enHealth 2012a)
- enHealth Australian Exposure Factor Guide (enHealth 2012b)
- National Environmental Protection Measure including:
  - Ambient Air Quality (NEPC 2021)
  - Air Toxics (NEPC 2011)
- Guideline for Assessing and Minimising Air Pollution in Victoria (EPA Victoria 2022), where relevant.

Additional guidance may be sought from other sources as required and where in line with Australian policy.

4.0 Site information

The site is located at 41 Monbulk Road, Mount Evelyn, VIC. The site is zoned IN3Z – i.e. industrial zoning 3.

The requirements for consideration of such a development application include that a use for such a site must not adversely affect the amenity of the neighbourhood including through airborne emissions and odours (as well as other matters addressed elsewhere). This zoning requires that the development application include information about the likely effects of airborne emissions, if any. It also requires discussion of potential effects due to noise, emissions to land or water, traffic and light spill/glare. These matters have been/will be addressed in other documents.

This letter report addresses only information in regard to airborne emissions.

Surrounding uses and zonings are outlined in **Table 1**.

Table 1: Surrounding land uses

Direction	Description
North	Car repair facility (Zoning IN3Z) with a primary school further to the north (Zoning PUZ2)
South	Low density residential properties (Zoning LDRZ)
East	Parkland/open space surrounding Little Stringybark Creek (Zoning PPRZ)
West	Monbulk Road and vegetated verges (Zoning TRZ2) with low density residential properties further to the west (Zoning LDRZ)

The closest sensitive land use is the residential properties located to the south of the site of interest. Other sensitive land uses are the residential properties to the west of the Monbulk Road and the school to the north of the site but these are further from the proposed development. These other locations are around 100 m from the site while the residential properties to the south of the site are immediately adjacent to the site (as shown on **Figure 3**).

5.0 Characteristics of proposed layout

Figure 3 shows the proposed layout of the development.

Characteristics of this plan that are important to consider in relation to airborne emissions include:

- Location of bowsers – to the north of the site closest to the car repair facility which would have airborne emissions that are similar in nature.
- Location of retail building – this building is to be constructed immediately to the south of the bowsers in between the bowsers and the residential properties to the south of the site.
- Location of carwash – within the centre of the site with a vegetated zone to the south of the carwash which is located next to garden areas for the 2 residential properties to the south.
- Drive through facility which is proposed to be used for coffee and heated foods only (i.e. no cooking of food or provision of fast food). The drive through lane is to be located to the south of the retail building.
- The bowsers and other infrastructure for the supply of fuel is proposed to comply with the VR1 standards.
- Truck turnaround area at the back of the site (i.e. to the east) which will be surrounded by landscaped areas.
- The underground fuel storage tanks will be located immediately to the east of the bowsers – i.e. closer to the car repair facility.
- The area to the south of the underground storage tanks will be an extension of the retail building with parking bays, filling point for air and fuel, bicycle racks and a dog wash area.
- Site is approximately 35 m wide and more than 100 m deep.
- Southern edge of the bowser area will be approximately 14-15 m from the northern boundary – i.e. at least 20 m from the southern boundary of the site.

6.0 Airborne emissions at service stations and available controls

6.1 General

Petrol and diesel contain volatile chemicals some of which are odorous.

When filling a vehicle at a service station some of these chemicals may be emitted to the air at the service station which can then be blown around the local area. This is what a person can smell when they are filling their vehicle. It is noted that the odour that a person can note when standing next to their vehicle during filling is usually not discernible by the time the person walks to the retail building to make payment for their fuel.

It is this potential for airborne emissions immediately adjacent to the bowsers and when refilling the underground storage tanks that means a development application for a new service station must consider such emissions.

6.2 Control of airborne emissions

Controlling such emissions has been addressed by governments in Australia by the introduction of vapour recovery standards requiring equipment to be fitted at such premises to capture vapours.

Stage 1 vapour recovery involves equipment that allows capturing vapours from inside the underground storage tanks which get displaced as these tanks get refilled with liquid fuel – as shown here in the following figure (**Figure 4**).

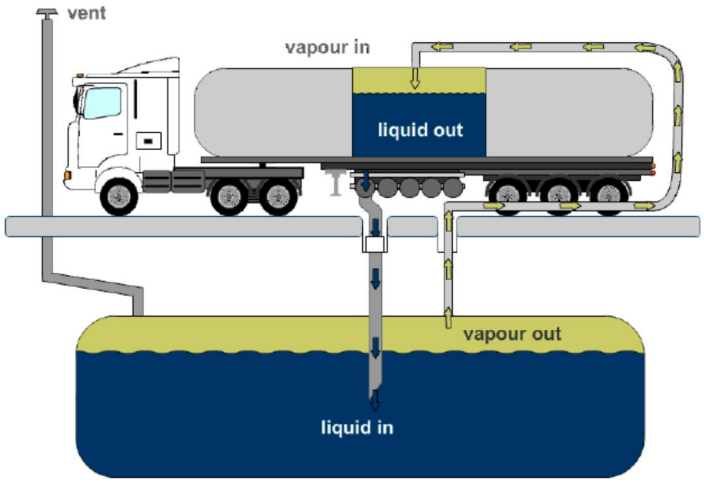

Figure 4: Stage 1 vapour recovery (NSW EPA 2017)

Stage 1 vapour recovery is a normal requirement in Victoria for new or upgraded service stations as outlined in the EPA Victoria guidance document for underground petroleum storage systems (EPA Victoria 2015). This is because vapour recovery during refilling of underground tanks provides a significant reduction in vapours from a service station site.

In some heavily urbanized areas, the use of Stage 2 vapour recovery may be required. This includes equipment that allows the collection of vapours during filling of individual vehicles. The vapours are collected via the fuel delivery system and placed into the underground storage tank as shown in the following figure (**Figure 5**).

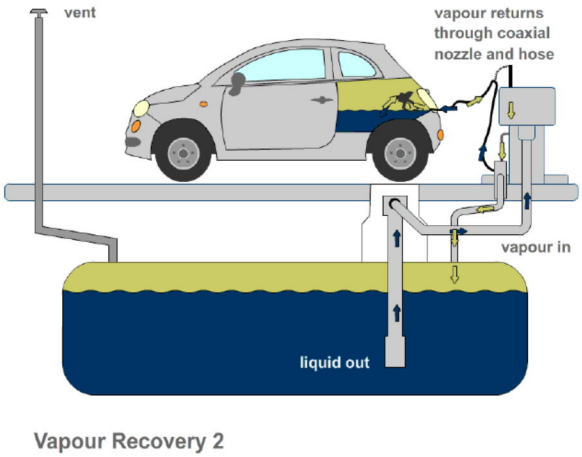

Figure 5: Stage 2 vapour recovery (NSW EPA 2017)

This level of control is not normally necessary for service stations in Victoria, especially those in less urbanised areas.

6.3 Other background matters

There are a range of other matters which are relevant for consideration in this assessment including:

- the same chemicals are emitted from vehicles when refueling at a service station as are emitted during vehicle travel and when vehicles are parked (to a small extent)
- petrol is considerably more volatile than diesel fuel so supplying both types of fuel rather than just petrol at a service station site will mean a lower level of emissions overall
- emissions from a service station must be considered in the context of the existing air quality particularly if the premises are located on a busy road
- service stations are workplaces so must be operated in a fashion that ensures employees have a safe environment in which to work including appropriate air quality
- emissions at the bowsers must be considered sufficiently low, given that the general public is allowed to use them without any requirement for protective equipment
- it is in the interest of a service station operator to reduce loss of vapours to the atmosphere at their site as it impacts on the volume available to sell (i.e., the more vapours evaporate, less fuel available in the tanks for sale).

7.0 Potential for airborne emissions at this site

To consider the potential for airborne emissions at this site, publicly available data about the levels of fuel related chemicals present in air at service station sites have been considered as well as the proposed site layout for this service station.

In particular, it is noted that the bowsers at this site are to be located at least 20-25 m from the closest house.

Whenever chemicals may be present in air immediately adjacent to a source, the concentrations of such chemicals will be significantly reduced as the air next to the source moves away from the source and mixes with the rest of the atmosphere.

In this case, if it is assumed a measured concentration from air next to a bowser (as discussed below) is relevant for the air immediately around the bowser – say 1-2 m^3 (i.e. box of air 1 m wide x 1 m long x 2 m high), then the dilution into the neighbouring box of air that is 5 m wide and long away from the bowser in a single direction would be of the order of 25 fold (i.e. the air from around the bowser mixes into a box of air 5 m wide x 5 m long x 2 m high). It is noted that the box of air next to the bowser is likely to mix with air in all directions and is likely to mix into air in a box more than 2 m high, given the way winds blow air around.

Using the same approach to consider dilution for air movement further away from the bowser, the concentration in the next box of air adjacent to the first (i.e., 5 m x 5 m x 2 m box) would be reduced by another 25 fold when it mixes into that next box of similar size. This will give a total dilution of air from around the bowser to a distance of around 10 m from the bowser of more than 600 fold.

Such dilution will continue as air moves further and further away from the original source – i.e., the bowsers.

In this case, dilution at around 10 m has been considered to allow this assessment to be conservative – the actual distance from the bowsers to the closest house is around 25 m.

A range of studies have been undertaken to measure concentrations of relevant fuel derived chemicals in air at service stations and these have been considered by regulators when considering requirements for new facilities.

In one study from Japan, concentrations of various fuel related chemicals were around 50-150 $\mu g/m^3$ (depending on the chemical) near the bowsers during spring weather and around 20-50 $\mu g/m^3$ (depending on the chemical) near the bowsers during winter weather (Shinohara et al. 2019). These concentrations would reduce by 600 fold at around 10 m from the bowsers giving concentrations below 1 $\mu g/m^3$.

Concentrations below 1 µg/m^3 are below relevant national and state guidelines for fuel related chemicals assuming a person is exposed all day every day – i.e., for long term exposure. Concentrations below 1 µg/m^3 would also be below concentrations where odours would be noticeable.

For a number of service stations in China, concentrations around the bowsers ranged from 10-300 µg/m^3 (depending on the chemical) (Wu et al. 2006). The higher concentrations were reported for service stations that had no vapour recovery systems in place. Again, a dilution of 600 fold would reduce all these concentrations to less than 1 µg/m^3 which would be relevant for consideration within the drive-through lane at this site and for neighbouring houses.

A study in the UK reported concentrations around bowsers ranged from 5-60 µg/m^3 for one of the chemicals (Uren 1996). This study undertook testing at 12 different service stations and was undertaken in the 1990s when vapour recovery equipment was less refined/available. Again, a dilution of 600 fold would reduce all these concentrations to less than 1 µg/m^3 which would be relevant for consideration within the drive-through lane at this site and for neighbouring houses.

A study undertaken in Australia measured air concentrations of fuel related chemicals downwind and upwind of the bowsers at service stations (Environment Australia 2003). The concentrations downwind of the bowsers for one of the fuel related chemicals in this study were 10-11 µg/m^3 and 5-9 µg/m^3 for the upwind location. Other locations with higher concentrations of this fuel related chemical included a basement carpark (18 µg/m^3), a nightclub (14 µg/m^3), and inside a car (10 µg/m^3). For another of the common fuel related chemicals, the measured concentrations were 45 (downwind) and 27 (upwind) µg/m^3 respectively. Again, a dilution of 600 fold would reduce all these concentrations to much less than 1 µg/m^3 which would be relevant for consideration within the drive-through lane at this site and for neighbouring houses.

This approach assumes that the air around the bowser can be blown directly to the south of the site without interference.

In fact, the retail building proposed for the site will be constructed between the bowsers and the southern boundary – this will redirect air from around the bowsers toward the east and the west rather than allowing it to be blown directly toward the houses. This means the air will mix into a larger box of air and it will mix into that box with more energy (as it bounces off surfaces etc.) – i.e., more turbulent. This means the box into which the air will mix will be taller resulting in even more dilution. This means that the concentrations that might be reached next to the bowser will be diluted by even more than 600 fold before they reach the closest houses.

As well as the dilution of these fuel related chemicals, it is important to recognize that these chemicals are routinely present at low levels in urban air that everyone breathes. They are present due to emissions from vehicles as they travel around and due to a range of other sources including use of gas in homes for cooking and heating, use of woodfires etc.

National guidance and studies undertaken by state governments provide information about average air concentrations of these fuel related chemicals in urban areas (CRC CARE 2013; NSW EPA 2004). These reports indicate that fuel related chemicals are present in normal ambient air at levels between 1 and 20 µg/m^3 depending on the chemical being looked at, the time of year and proximity to major roads. This means the concentrations of fuel related chemicals already present in and around homes in urban areas in Melbourne (including Mt Evelyn) are already around 1 µg/m^3, so it is likely that the additional levels of these chemicals in air due to this new service station would not be discernible.

In 2007, the NSW Department of Environment and Climate Change published a discussion paper about service stations and the potential for air emissions of these volatile chemicals (NSW DECC 2007). The paper notes that service stations are often located in areas where there are residences or in shopping precincts. In one of the documents they refer to, it is recommended that service stations should be located at least 15 m

from sensitive land uses (i.e. 50 feet). This is in a guidance document from California EPA and California Air Resources Board (Cal EPA 2005). The bowsers at this site will be compliant with this recommendation.

8.0 Conclusion

As noted in **Section 4**, a development application for such a site must demonstrate that this project will not adversely affect the amenity of the neighbourhood including through airborne emissions and odours (as well as other matters addressed elsewhere).

This assessment has shown that the potential for air emissions from this proposed new service station to adversely affect the amenity of the neighbourhood is low and acceptable in line with National guidance. In fact, any emissions from this are not likely to change the air quality of the area to a discernible extent.

9.0 Limitations and closure

has prepared this report for the use of n accordance with the usual care and thoroughness of the consulting profession. It is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this report.

It is prepared in accordance with the scope of work and for the purpose outlined in this report.

The methodology adopted, and sources of information used are outlined in this report. has made no independent verification of this information beyond the agreed scope of works and assumes no responsibility for any inaccuracies or omissions. No indications were found that information contained in the reports provided for use in this assessment was false.

This report was prepared in June and July 2022 and is based on the information provided and reviewed at that time. disclaims responsibility for any changes that may have occurred after this time.

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