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AMENDMENT C129 MONASH PLANNING SCHEME

REZONE FORMER SAND QUARRY AT 1221-1249 CENTRE ROAD OAKLEIGH SOUTH TO COMPREHENSIVE DEVELOPMENT ZONE

SUBMISSION ON BEHALF OF ANGELO VALENTE

1. INTRODUCTION

This submission is made on behalf of Angelo Valente as the owner of the property at 23 Scotsburn Avenue Oakleigh South. In our opinion, the proposed rezoning of the land at 1221-1249 Centre Road Oakleigh South, (“the former quarry site”) from part Special Use Zone Schedule 2 and part General Residential Zone Schedule 2 to the Comprehensive Development Zone Schedule 2 should not be approved.

We submit that it should not be rezoned to allow housing development, but instead purchased by local or state government and then remediated to allow a passive use, such as public open space.

2. SECTION 173 AGREEMENT BETWEEN CITY OF OAKLEIGH & CONSOLIDATED QUARRIES LIMITED DATED 15TH MARCH 1993

The history of the site has been described in the expert evidence submitted on behalf of the owner of the site.

However, the expert evidence does not refer to the fact that the previous owner of the site entered into a s.173 agreement with the previous City of Oakleigh in 1993. The agreement settled three proceedings which were issued in the Administrative Appeals Tribunal against the previous owner by the City of Oakleigh for alleged illegal uses of the land. From our knowledge as residents of the area at that time, these proceedings occurred as a result of the off-site amenity impacts to all the surrounding residential areas caused by the business of sand quarrying, sand washing and the operation of the concrete batching plant at the site. This agreement is still registered on all the certificates of title to this land, a copy of which has been provided to the Planning Panel in Council’s folder of documents.

In 1994, the City of Oakleigh and City of Waverley were dissolved and all of the land in the former City of Oakleigh and City Of Waverley, except for the suburb of Clayton South (the area immediately to the south of Centre Road) came under the jurisdiction of the newly formed City of Monash.

As a lot of the planning staff at the former City of Oakleigh were not re-employed, the implementation of the covenants contained in the s.173 agreement was in our view overlooked by the City of Monash. Council's representative has advised the Planning Panel that Council staff have not been able to find the previous files relating to the operations of this former quarry site during the 1990s. As the agreement was drafted by Maddock Lawyers, who we understand are still Council's Lawyers, we are not sure if any inquiries were made by Council to Maddocks regarding whether they have any files relating to these proceedings at the AAT and the drafting of the s.173 agreement.

From all publically available documentation, this agreement has not been amended or ended in accordance with sections 178 or 178A of the Planning & Environment Act. Pages 4 to 9 of this agreement contain a range of covenants that burden the owner of the land, including its successors in title. Most of the covenants relate to regulating the use of the land and a timeline for the filling and end use of the former quarry site.

In our view, one of the most important covenants is contained in clause 4.2.13 which states as follows:-

"if required by Council, transfer filled or unfilled land progressively to the Council as a negotiated fair market price".

From our knowledge as residents of this area at that time, this covenant was included in order to fulfil the promise made by the former City of Oakleigh to the residents of this area that the former quarry site would eventually be converted to public open space.

In our view, given the contamination and geological issues of the site and the need for public open space for the area, the proposed zoning as Comprehensive Development Zone should not be approved. The owner of this land should not be encouraged to undertake intensive remediation practices on the land for the purpose of achieving higher density development, which may not only affect the health and safety of the workers and future occupiers of the former quarry site, but also the health, safety and

amenity of the users of Talbot Park and the residents of the surrounding residential areas.

In our view it would be a superior planning outcome for the community if the land was converted to public open space in the same way that Talbot Park was created. As you are aware, Talbot Park was originally part of the large quarry pit located on the south-east part of the land that was filled with non-engineered fill.

If this Planning Panel allows the rezoning as specified in this Amendment, the opportunity to consider this land for public open space will be lost.

3. MONASH OPEN SPACE STRATEGY 2017 – DRAFT FOR CONSULTATION

The need for more public open space in this area is confirmed by the Monash Open Space Strategy 2017, (“the Open Space Strategy”) which was recently adopted by Council on 25th July 2017. Attachment A includes some parts of the Open Space Strategy that we wish to highlight in our submissions.

The Open Space Strategy provides a guide for the future planning of open space in Monash for the next decade. As a result of the Open Space Strategy, the Council will embark on extensive consultation with the community regarding the contents of the draft Strategy. As stated in its Executive Summary:-

“The Strategy is aspirational, and it is acknowledged that not all of the recommendations will be able to be implemented in the life of the Strategy. Implementation relies on a number of factors including budget, the level of development and the availability of land to purchase in appropriate locations.”

The impetus for the Open Space Strategy came as a result of Council abandoning its quest for a flat 10% open area contribution fee for Clayton as part of its residential rezoning of land in the Monash Planning Scheme Amendment C125, as it did not have a detailed and costed program of open

space acquisition and development works covering the next five to ten years for Clayton and indeed for the whole municipality.

What is clear about the statistics in page 16 of the Open Space Strategy is that areas that have residential development potential, especially within the Monash Employment & Innovation Cluster, have some of the least amount of Council owned public open space. Oakleigh South and Clayton are both within the Investigation Areas of the Monash Employment & Innovation Cluster.

In 2014, the State Government sold by public tender four former school sites located in the suburbs of Clayton and Oakleigh South, after the sites had been offered for sale to Council. Unfortunately, at that time, Council did not have the draft Open Space Strategy and therefore the community and Council did not recognise the lack of open space in the area. This lack of open space has become even more important, as Council and the VPA proposed the higher residential density zones as specified in Amendment C125. If these higher residential density zones are approved by the Minister for Planning, then it will become extremely difficult and costly to purchase large parcels land in Clayton for public open space.

Therefore, in our view it is not in the interest of the community at a local level and even at a State level to encourage the development of land that is high risk environmentally and geologically and rezone it for housing and then purchase clean low risk land having a high value that's already developed for public open space.

Given that the land is approximately 18.79 hectares, there will not be another opportunity for the Council to purchase undeveloped land of this size in the whole of the municipality and remedy the significant shortfall in open space that exists.

The Open Space Strategy highlights on pages 26 and 27 that many of the parks in Monash are too small and that *“larger parks mean more social, physical and environmental benefits, better relationships with adjacent residences and more people likely to use them”*. It states that one of the

strategies to adopt in addressing the size and viability of parks is to acquire land adjacent to existing open spaces. This former quarry site is book ended by Davies Reserve to the north and Talbot Park to the south thereby making it an ideal site for a large park.

The Open Space Strategy highlights on page 37 that the majority of sports parks in Monash are too small having an average size of only 3.14 hectares and that:-

“The equivalent of two AFL or three soccer football pitches plus two netball courts (if for training only) is a desirable minimum footprint for a sports park. One large area of continuous sports turf that can be marked any way is better able to respond to fluctuating demand for club sports over different seasons.”

This is also emphasised on page 98 of the Open Space Strategy where it states that a sports park should be ideally 12 hectares in size for mainstream football and cricket and that:-

“Typically, will include facilities suitable for night competition and hence a high level of lux, as well as large grounds and multiple change rooms determined by the standard of ground. Buffer may be required to provide separation from adjacent housing or other non-compatible land use, or lower order facilities. Typically, would be large enough for and have spectator facilities such as undercover seating. May also have food and beverage services/function space rather than small club social facility”.

In relation to the **suburb of Oakleigh South** specifically, pages 66 and 67 of the Open Space Strategy, which is attachment A recommends the following for the areas north of Centre Road (noted in bold) as areas where land should be purchased for open space:-

- **“Consider the acquisition of land abutting the Oakleigh South Secondary College”:-** In relation to this recommendation, our response is that the former quarry site is only one kilometre away from the Oakleigh Secondary College, Oakleigh South Primary

School, Huntingdale Primary School and across the road from the Clarinda Primary School. Given its size, the former quarry site could easily be developed as a Sports Park, as it is within walking distance of all of these schools.

- ***“Should either of the golf courses ever be developed and the land use change, consider taking parkland required for the future land use, as well as doubling the size of the current sports reserve for an additional playing field in the north west and for social/family recreation in this area”***:- In relation to this recommendation regarding potential development of the golf courses and taking some as parkland, our response is that the latter option will unlikely eventuate as they are world renowned private golf courses.
- ***“Consider expanding Robinson Reserve and Davies Reserve for additional social/family recreation functions”***:- Our response to this recommendation is that a large portion of the northern boundary of the former quarry site abuts Davies Reserve, which is used mainly as an athletics track. Its direct abuttal would make this former quarry site ideal for the location of a Sports Park with social/family recreation areas. This is also reinforced at page 20 of the Open Space Strategy, which recommends rectifying gaps in the distribution of open space by purchasing land abutting existing open spaces.

As the draft Monash Open Space Strategy shall be released for public consultation next month, we submit that the zoning of this land should be abandoned pending due consideration of this land for public open space.

Kingston City Council, which is the adjoining municipality, commencing on the south side of Centre Road has rehabilitated old landfill sites into parkland, such as the following:-

- Baldhill Park located approximately 2 kilometres south of this former quarry site at Eulinga Road Clayton South;
- Mavis Hutter Reserve located approximately 5 kilometres south of this former quarry site;
- Heatherton Park located on Heatherton Road Clayton South: and
- Elder Street Park currently being rehabilitated by Kingston City Council.

4. DOCUMENTS EXHIBITED WITH C129 WERE NOT “COMPREHENSIVE”

Apart from the notice and instruction sheet, the documents exhibited with this amendment were as follows:-

- the explanatory report
- Residential development – overview (21.04-1)
- Residential development and character policy (22.01)
- Schedule 2 to the Comprehensive Development Zone
- Schedule to Clause 81.01
- Map 19 Comprehensive Development Zone – Schedule 2
- Map 19 Environmental Audit Overlay
- Former Talbot Quarry & Landfill Comprehensive Development Plan 2016 Exhibition

Based on the above, we submit that:-

- some of the above exhibited documents lacked relevant information so that the public could not fully comprehend the scale of the proposed development: and
- documents relevant to the assessment of this Amendment were not exhibited at all.

We make this observation for the following reasons:-

- Site Remediation Strategy Plan entitled, “*Huntingdale Estate: Site Environmental Strategy Plan*” dated 28th November 2014, (“SESP”) not exhibited.

The explanatory report states on page 3 that the owner of the former quarry site is requesting this rezoning of the land for an urban use prior to obtaining the Statement or Certificate of Environmental Audit. This is based on The 2012 Advisory Committee's report entitled "Potentially Contaminated Land" which states that this process **may** be appropriate in some circumstances, (refer to page 43 of this report). The rationale for this is that it gives certainty to the developer that the land can be used for some form of urban use to enable it to commit the investment in undertaking the required remediation of the land.

The Advisory Committee's 2012 report also states that even if an audit were to be delayed, the Council must still satisfy itself that the land can accommodate the proposed use or development before supporting a rezoning.

In this case, the proponent lodged with Council a Site Remediation Strategy Plan entitled, "*Huntingdale Estate: Site Environmental Strategy Plan*" dated 28th November 2014, ("SESP"), which basically states that the remediation strategy to be adopted demonstrates "*with a reasonable degree of confidence that the site is capable of being remediated*". (We shall discuss later in our submission why we do not agree with this).

Even though the SESP was lodged with Council, it was not exhibited with this Amendment. We submit that as a result of this the community and other authorities that were notified of this Amendment did not comprehend the scale of the proposed development on the land and the consequential scale of the proposed remediation works that are required to be undertaken at the site.

A copy of the SESP was kindly provided to us by Council on 26th July 2017, as it was not contained in the folder of documents provided to us on 14th July 2017 by Sterling Global in accordance with the Panel's direction. If this document had been exhibited, it would have clearly shown to the public the intensity of the development as shown at Figure 11 and the proposal to build dwellings on putrid waste and slimes as shown at Figures 12 and 13 of the

SESP. We believe that the lack of disclosure of this document at the exhibition stage amounts to inadequate notice being given of this Amendment.

B. The Titles to the Land together with the Section 173 Agreement were not exhibited

In our view certificate of titles to the land together with a copy of the s.173 Agreement should have also been exhibited or at the very least, an explanation by Council as to why it is supporting this Amendment and not exercising any of the covenants contained within this agreement. Most people in the surrounding residential area are not aware that this s.173 agreement exists.

C. Former Talbot Quarry and Landfill Comprehensive Development Plan 2016 Exhibition

The above exhibited document in our view is drafted in such a simplistic way that it contains very little information for the public to fully comprehend the intensity of the development proposed for the land. This is despite the fact that Figure 11 of the SESP clearly shows the intensity of the proposed development, together with the gas venting systems and other remedial measures proposed for the former quarry site, which was kept from the public.

D. Comprehensive Development Zone – Schedule 2

The Draft Schedule 2 to the Comprehensive Development Zone states at clause 2 that the Council is required to approve an Overall Development Plan before deciding on planning applications. Clause 2 states that the Overall Development Plan “must” address the matters listed in clause 2. However, we submit that most of the items listed are too general in nature.

Unlike the Neighbourhood Residential Zone and General Residential Zone, the proposed Comprehensive Development Zone does not have any mandatory design requirements, such as maximum building heights or garden areas. As a result, the future development of this land will be more intense than the proposed Residential Growth Zone as adopted by Council on 28th

February 2017 in the Monash Planning Amendment C125 for the residential areas surrounding the Clayton Activity Centre.

Please refer to Attachment “B” headed “Amendment C125 – Proposed New Zone Application” adopted by Council. This new zone map shows the following:-

- that part of this former quarry which is currently zoned General Residential 2 is proposed to be rezoned General Residential 3, which does not encourage high density development which is contemplated for this housing development.
- that part of this former quarry which is currently zoned Special Use Zone remained the same, as C125 only related to reforming the current residential zones in accordance with the Monash Housing Strategy.
- This former quarry site is not located within a 20 minute walk from the higher density zones surrounding the Clayton Activity Centre, Monash Medical Centre and Monash University. These proposed higher density zones are coloured yellow on the map representing the General Residential Zone Schedule 6 and the zone coloured red on the map represents the Residential Growth Zone Schedule 3.

Furthermore, the Victorian Planning Authority, (“VPA”) has released a draft Framework Plan for the Monash National Employment and Innovation Cluster dated March 2017. The former quarry site is within the investigation area of this cluster. According to the VPA website, this draft Framework Plan is in the “finalisation and approval” stage. Please refer to attachment “C” which is the draft framework Plan for the Monash National Employment and Innovation Cluster.

It is noted that the VPA’s draft Framework Plan for the Monash Employment Cluster as exhibited to the public shows the following:-

- Figures 2 and 3 show the “*cluster core and accessible residential areas*” coloured yellow. This former quarry site is not included in that area;

- Figure 5 shows this land to be adjacent to bus routes along Centre Road, but almost 2 kilometres from either the Clayton Activity Centre and Clayton Railway Station & 3 kilometres from the Huntingdale Activity Centre and Huntingdale Railway Station.
- Figure 6 shows the existing locations of “open space and recreation” in the Monash Employment Cluster, together with the proposed “Cranbourne-Pakenham linear parkland” which shall be located underneath the Clayton Skyrail once completed. What is obvious from this figure 6 is the lack of open space in the Clayton and Oakleigh South areas.
- Figure 7 shows the Urban Renewal Precincts and Strategic Sites Plan. This former quarry site is not highlighted as a strategic site on this plan.

We note that the VPA is supporting this rezoning subject to certain amendments and additional requirements to be included in the proposed Schedule 2 to the Comprehensive Development Zone. However, as detailed above, the SESP was not exhibited with this Amendment application and the draft Monash Open Space Strategy has only recently been released.

As noted on page 24 of the draft framework plan for the Monash Employment & Innovation Cluster, one of the Strategic Outcomes to be achieved includes strategy outcome 4 “*Develop public open space and community infrastructure*”. As can be seen from figure 6, there is very little open space in Clayton and Oakleigh South which is also confirmed by the draft Monash Open Space Strategy.

E. Clause 3.3 of the draft Schedule 2 of the Comprehensive Development Zone

This clause lists decision guidelines for Council to consider before deciding on planning applications, one of which is as follows:-

“Consistency with the ‘Former Talbot Quarry and Landfill Comprehensive development Plan 2016’, or for applications that propose to vary from the approved Comprehensive Development Plan,

the documented rational for an alternative approach due to the findings of the SESP and ESA”.

As stated previously, because the Former Talbot Quarry and Landfill Comprehensive Development Plan 2016 is very general in nature, “consistency” with this plan will be easily achieved as there are almost no limitations on the type and intensity of development that could be approved by Council at its discretion.

Basically, this zoning gives the developer the flexibility to apply for planning permits for residential densities according to whatever can be achieved as a result of the remediation of the site, without any mandatory design requirements specified in the Zone or in the Comprehensive Development Plan.

Our view is that a more “comprehensive” framework plan should have been exhibited.

The lack of exhibited documentation with C129 was also expressed by the City of Kingston. As noted in the Monash City Council minutes of its meeting on 30 May 2017 regarding C129, a summary of the City of Kingston submission is noted as follows:-

“These comments are provided by Council officers on a without prejudice basis and are not considered to be a formal Kingston Council position. Having reviewed the documentation provided, it is unclear to Kingston what the potential future land use will be on this significant parcel of land and therefore makes it difficult to comment as to the effects on our municipality. We would encourage the City of Monash to clarify the principal uses foreseen on this site. In order to address this concern, it is requested that should the Planning Authority be of a mind to further advance Monash C129 beyond its exhibition, that the strategic direction and main land use of the site be clarified. The City of Kingston welcomes the opportunity to provide further feedback”.

We submit that if the SESP had been exhibited, perhaps a more detailed submission could have been made by Kingston City Council given its experience with rehabilitation of old and current landfill sites.

F. Schedule 2 to the Development Contributions Plan Overlay

Subsequent to the exhibition of the amendment, the Council has introduced the requirement for the preparation and incorporation of a development contributions plan. Presumably this development contributions plan or a section 173 Agreement will list all the infrastructure that is to be paid for by the developer for the ultimate development of the site, which will be crucial to this future housing estate and the rest of the surrounding community.

The proponent has argued that it shall not agree to the DCPO. We submit that without the completion of the remediation works and the details of the proposed development, the DCPO details cannot be formulated, which in our view should be required if this proposed ^{rezoning} development proceeds. Therefore the Amendment should be abandoned pending further details to be incorporated in the DCP should the remediation of the site be completed.

G. The procedure adopted for the rezoning of the Former Epping Quarry

The Council has provided to the Planning Panel the minutes of the City of Whittlesea Council meeting of the 30th May 2017, which resolved to adopt the recommendation to authorise the Minister for Planning to prepare and exhibit an amendment to the Whittlesea Planning Scheme affecting land at part 183-189, 215, 315W, 325C Cooper Street and 80 Deveny Road, Epping. This is the former Epping Quarry (**Basalt not sand quarry**) and the Epping Waste Disposal site. We wish to highlight paragraphs 2 and 4 of that resolution, which state as follows:-

2. a) the submission of a Site Remediation Strategy which has been reviewed by the Environmental Auditor is submitted for the purposes of exhibition, prior to seeking authorisation from the Minister for Planning.

4. Not adopt the planning scheme amendment to rezone land that permits a 'sensitive use' until a Statement or Certificate of Environmental Audit has been issued for that land and a s173

agreement has been entered into to implement the conditions of any Statement of Environmental Audit.

We have highlighted paragraph 2 of the Council resolution which specifies that the Site Remediation Strategy reviewed by the Environmental Auditor is to be exhibited with the amendment. We believe that the SESP for this site should have been exhibited as part of this Amendment given that this site has more environmental and geotechnical issues than the former Epping basalt quarry site.

Furthermore, in relation to the rezoning of the former Epping Quarry, the Council Officer's report to the Whittlesea Council stated in his report the following:-

"Both the Growling Grass Frog and the Golden Sun Moth, which are species listed under the Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act) and Flora and Fauna Guarantee Act 1988 (FFG Act) have been recorded on the subject land. The former quarry holes and associated wetlands on the site are considered important to the conservation of the Growling Grass Frog's population along the Edgars Creek. The proponent has made application under the EPBC Act to obtain approval for the proposed works. Quarry Hole 3 will be retained as habitat as part of a conservation area in accordance with the EPBC Act. To compensate for the removal of Quarry Hole 2, the proposal includes the construction of new off-stream wetlands as part of the augmentation of the Edgars Creek and refuge wetlands in the south west of the site to facilitate the Growling Grass Frog east-west link to the Merri Creek. The proposal will mean that the habitat will need to be established and colonised by the Growling Grass Frog before the existing habitat (Hole 2) is removed and developed".

In relation to this former quarry site, we confirm that the owner's Lawyers provided to us a copy of the Ecological Assessment prepared by Ecology and Heritage Partners dated 2 October 2014 pursuant to the Planning Panels direction, ("the Ecological Assessment"). It states in section 6 under the

heading “further action” that additional surveys for the Growling Grass Frog from November to March is required to be conducted. The Ecological Assessment states in Table 4 the following:-

“There is suitable habitat (moderate likelihood of occurrence) within the study area for one of the fauna species (Growling Grass Frog Litoria raniformis) listed under the EPBC Act. This species has been recorded in 1999 approximately one kilometre southwest of the study area and is known to inhabit waterbodies in abandoned quarries such as the present site. The presence of several other (common) frog species during the assessment is further evidence that the water quality is sufficient to sustain frog populations. Targeted surveys are recommended to determine the presence or absence of this species. If Growling Grass Frog is recorded, the project should be referred to the Commonwealth Environment Minister for consideration”.

We have not been advised firstly whether additional surveys were undertaken for the Growling Grass Frog from the months of November to March. Secondly, if the Growling Grass Frog was recorded, whether this project was referred to the Commonwealth Environment Minister for consideration before the backfilling works to the open quarry pit in Zone ~~2~~ commenced.

5. THERE IS A RISK THAT THE LAND MAY NOT ACCOMMODATE THE PROPOSED USE OR DEVELOPMENT

A. MR. SINCLAIR’S EXPERT EVIDENCE

- i. 98-116 Cavanagh Street Cheltenham: “The Cheltenham site”

Mr. Sinclair’s evidence on page 25 states as follows:-

“Although not commonly conducted previously in Australia, there are numerous examples of successful development of former landfill sites internationally, including for residential land-use. In addition, recent development of a former landfill site at Cavanagh Street in Cheltenham, Victoria was successfully completed to allow residential

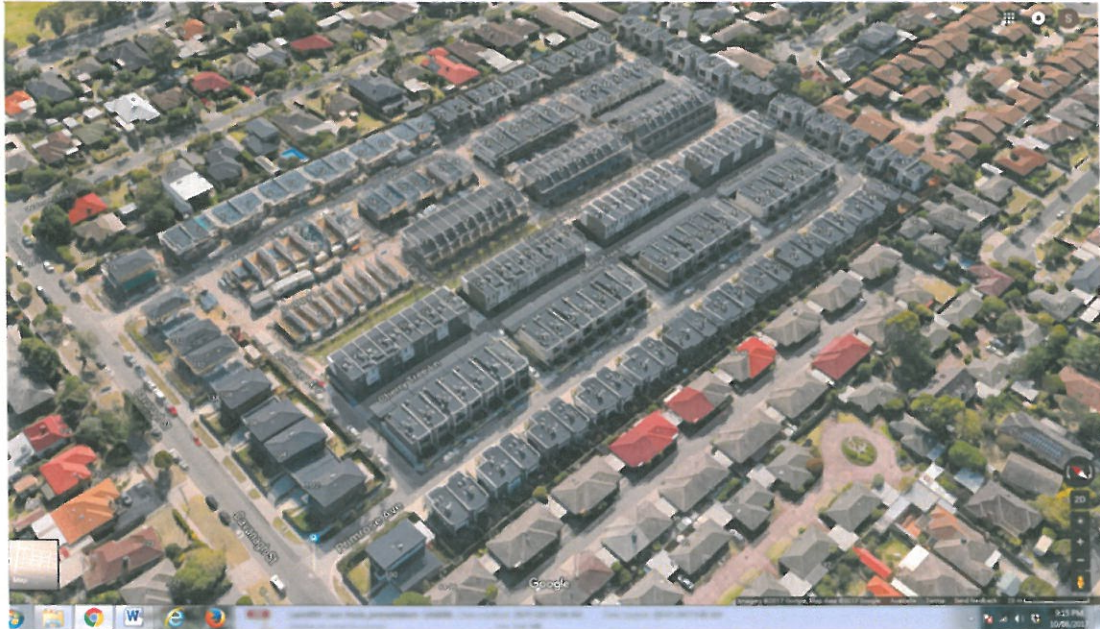
landuse after issuing of a Statement of Environmental Audit by an EPA appointed Auditor.”

From our reading of the City of Kingston Minutes dated 13th December 2010 (which considered the planning application for residential development for the Cheltenham site), we the note the following important characteristics of the Cheltenham site :-

- The land was already zoned residential and there was no application for rezoning of that site;
- The land was only 4.06 hectares in size;
- The land was used as a former sand quarry.
- Once the sand quarrying ceased, it was backfilled with predominantly inert waste, ie, not putrid waste.
- The land did not contain any slimes. This is confirmed by the Geotechnical report for this site by Golder & Associates dated 25 November 2010, (which is attachment “D”), that states as follows:-

“the fill material typically comprised of very loose to medium dense clayey sands and sandy clays with inclusions of gravel, brick pieces and wood fragments. The fill layer was typically yellow-brown in colour and varied in thickness from about 0.4 m around the landfill edge to about 19 m in the centre of the landfill”.

Please refer to the aerial photograph of the residential development at the Cheltenham site.



By contrast, this former quarry site is almost 5 times bigger than the Cheltenham site. It also has a different history. A significant part of this site contains slimes associated with the previous quarrying operations. Most of this site was filled with putrid waste without any clay liner or capping at the time. And Zone 4 of this site is still not filled. Therefore, from our observation this site has environmental and geotechnical issues that are significantly different to the Cheltenham site.

We have referred to the Cheltenham site, as it is the only former sand quarry site that has been identified by Mr. Sinclair in his evidence. The other sites mentioned in Mr. Sinclair's evidence have a different geology and therefore our view is that the success of the remediation measures adopted for those other sites are not relevant to this site.

Given the above differences between the Cheltenham site and this site, Mr. Sinclair's evidence in our view does not provide the Planning Panel with the appropriate degree of confidence that other former landfill sites similar to this one has been successfully remediated and developed for residential uses.

Mr. Sinclair in fact confirms this when he states that it is "*not commonly conducted previously in Australia*" but that "*there are numerous examples of*

successful development of former landfill sites internationally, including for residential land-use.” – see section 4 of his report. We interpret this paragraph as meaning that Mr Sinclair does not have other examples of similar landfill sites that have been successfully remediated in Victoria.

Given that his evidence does not include any of “the *numerous examples of successful development of former landfill sites internationally, including for residential land-use,*” it is difficult for us to verify what sites Mr. Sinclair is actually referring to. Even if he were to give us the international examples, we submit that our city of Melbourne does not have a need to encourage developers to build houses on top of slimes and putrid waste. Even in the densely populated city of Hong Kong, this type of land use is not encouraged. In a document compiled by the Victorian Municipal Engineering Foundation 2007 Study Tour entitled “*Planning for the Redevelopment of Former Landfill Sites and the Establishment of Alternative Waste Facilities*”, it notes the following regarding former landfill sites in Hong Kong:-

“In Hong Kong the Environmental Protection Department (EPD) manages landfilling and the redevelopment and aftercare of landfill sites. As Hong Kong has a high population density former landfill sites provide an opportunity for the provision of key recreational assets. The EPD manages a restoration and development program for 13 closed landfills in Hong Kong. The objective of the program is to reduce the environmental and health risks associated with closed landfills and to provide green zones within urban areas so that the community can enjoy a healthier living environment.”

As previously noted in our discussion regarding public open space, this site should be seriously considered as public open space and not rezoned as requested by the developer.

ii. Landfill Gas Migration

Mr Sinclair’s evidence has relied on the British Code ***BS 8485:2015 – Code of Practice for the Design of Protective Measures For Methane and Carbon Dioxide Ground Gases for New Buildings*** to quantify the level of

gas hazard present on this site and the resulting proposed remedial measures to be adopted. Please refer to section 4.4 pages 31-34 of Mr. Sinclair's evidence. But in our view, this is looking at the code in isolation and outside of the British regulatory system in which it operates. We are concerned that this British Code is being used outside of its intended jurisdiction, namely in the State of Victoria which has a different regulatory building framework and building practices than Britain.

Britain has historically significant issues with brownfill sites and gas contamination soils, that is, methane contamination, (which is flammable) and carbon dioxide contamination (which is toxic). It has a Building regulatory framework in place that has developed over time to manage these issues as part of its building regulations. Therefore, we question the use of this British Code in isolation in Victoria without the appropriate supporting hierarchy of building laws and regulations to manage these issues effectively.

The proposed remediation works will require reliance on the Owners Corporation to manage on- going significant issues associated with the fermenting putrid waste and fluid slimes outside of the scope of the Victorian Building Regulations which do not address the management of former landfill sites.

Mr. Sinclair's evidence outlines in section 4.4, pages 31 to 34 including Figures 10B, 10C and 10D the proposed remedial measures to be adopted for the landfill gas for the whole site.

In our view, the integrity of these remedial measures is dependent on the following:-

- a) The workers and the supervisors out on site achieving the construction of these remedial measures to tolerances that **are not** normally achieved out on site for residential buildings;
- b) The passive or active ventilation system located below ground not being compromised by the long-term overall and differential settlement of the putrid waste and slimes;

- c) The gas resistant membrane located below the slabs of each building not developing any penetrations and the durability of this membrane over the life span of a dwelling;
- d) The differential movement of the building relative to the filled soil layers not damaging the service connections to each individual building over its expected life span;
- e) The differential movement of the soil over the putrid waste areas not adversely affecting:-
 - the capping and horizontal venting layers located below ground level; and
 - the boundary gas venting barrier to perimeter boundary.
- f) That the total gas extraction system will collect all the gas and prevent it from travelling sideways into adjoining properties, especially during and after the preloading of the putrid waste and slimes as discussed in Mr. Pedler's evidence at paragraph 3.1 of his evidence. The effect of this preloading on the proposed gas migration into adjoining properties has not been addressed in the evidence of Mr. Sinclair.
- g) That none of the adjoining properties chose to construct dwellings with a basement structure. The construction of any below ground structure on any of the adjoining properties may lead to an increase in gas infiltration into these basements.

If any of the above are not achieved and/or compromise the integrity of the remedial measures, possible toxic or flammable gases can infiltrate the buildings to the detriment of the health of the occupiers and to surrounding residential areas.

We note the above remedial measures also rely on the installation of piles through the fill layers. This construction process of itself may release trapped landfill gases and also create new pathways for underground gas migration, which may impact adjoining residential land. This issue has not been

addressed in the evidence of Mr. Sinclair and is another reason for not encouraging housing on this site.

Furthermore, as former residents of this area, we are aware that when there is a temperature inversion, the air quality in the area is polluted from the landfill gas migration caused by the other landfill sites located south of Centre Road in the City of Kingston. Our observation is that these landfill gases are trapped by the temperature inversion and are kept closer to the ground. The remedial measures proposed for this site rely on the venting of the landfill gases above the ground. But should there be a temperature inversion, then the landfill gases of this site together with the landfill gas migration of the other sites will combine to produce greater pollution that will affect the future occupiers of this site.

Please refer to attachment E which is the EPA publication entitled “Current Issues: Clayton South, Clarinda and Dingley Village Odours’ issued on its website on 6 February 2017. The paragraph headed “Cold Weather” states as follows:-’

“Cold weather can cause an increase in odour reports, as rain reduces the effectiveness of gas extraction systems. Still conditions during the day, followed by cold, still nights, can also cause gas to become trapped and accumulate close to the ground instead of dissipating into the atmosphere”.

iii. Groundwater Contamination

Page 28 of Mr. Sinclair’s evidence outlines the proposed method of addressing the groundwater contamination emanating from the putrid waste in Zones 1, 2 and 3 which now discharge into the quarry lake located in the south-west part of Zone 4 open pit. Figures 8A and 8B shows the current direction of flow of this groundwater into the lake of Zone 4 open pit. The filling of Zone 4 with engineered fill will alter this direction of groundwater flow. These changing groundwater flows can contaminate groundwater beyond this site’s boundaries.

The “do nothing” scenario of keeping the lake in Zone 4 as it is “*would continue to act as a groundwater sink limiting the migration of groundwater contaminates off-site*” is one of the conclusions reached by the report of HLA-Envirosciences Pty. Ltd. (July 2005) entitled “*Groundwater Numerical Modelling*”. This report is quoted in the Table on page 15 of Mr. Sinclair’s evidence headed “*Summary of Investigations and Findings*”.

The concern that we have is that we have not been able to identify from the remediation works as specified on page 28 of Mr. Sinclair’s evidence that the contaminated groundwater of this former quarry site will not flow outside its boundaries as a result of the backfilling of Zone 4 and the compaction of the slimes to be adopted for the remaining Zones.

iv. Maintenance of the remediation measures

The intensive remediation measures described in Mr. Sinclair’s evidence will in our view also lead to major maintenance issues for the future land owners and occupiers of this land especially if they are not installed correctly. We submit that it is too simplistic to say that the future Owners Corporation will have to deal with these complex technical issues as they arise. It may be problematic for the Owners Corporation to obtain insurance for this housing estate given all the remediation measures that need to be maintained at the former quarry site together with insurance for damage caused by an earthquake.

The Owners Corporation may be able to deal with minor maintenance issues. However, in our view it will be difficult for the Owners Corporation to address any major issues, such as a failure in the capping and horizontal venting layers underneath all the buildings which may result in toxic or flammable gases infiltrating the buildings.

As can be seen from the recent issues with combustible external cladding on the Lacrosse building, it has now been two years since the fire at that building and the combustible external cladding has still not been replaced by the Owners Corporation given the building complexities and costs involved.

B. MR. PEDLER'S EXPERT EVIDENCE

Mr. Pedler's evidence states at sections 1.5 and 5 that all the zones across the former quarry site can be developed for the proposed mixed and sensitive uses:-

“subject to the undertaking and results of further site investigations, detailed design of appropriate foundation systems and service connections and close monitoring of the performance of the fill and building structures”.

In relation to the above statement, we wish to provide the following comments:-

i. Zone 4

The process that has been detailed in carrying out the engineered fill in Zone 4 in our view shows that the emphasis has been placed on maximising the extent of the footprint of the engineered fill area without taking into account the normal cautionary approach to maintain the structural stability to adjoining properties and batter stability to Talbot Road which is used as a haul road for trucks.

Similar concerns were also expressed in the Geotechnical Peer Review of the Backfill design prepared by Golder Associates dated 19 February 2015 at paragraphs 5 and 7. At paragraph 7 on page 5 in response to the concerns expressed by Golder Associates, Coffey in its response notes that one of the measures that can be adopted to address this unstable batter is:-

“where battering is not possible due to access or space restrictions, it will be necessary to create an exclusion zone at the base or top of the batter to ensure works are conducted so that any local fretting will not impact on the safety of workers”.

However, how can the remediation works in Zone 4 be undertaken if the workers cannot for safety reasons work in the “exclusion zone”? We will not

know this because this problem has been moved into the “Construction Management Plan” phase of the proposed remediation works.

Furthermore, since the Peer review was undertaken in February 2015, the single storey/part double storey former nursing home building previously situated on the top of the embankment on the north-east corner of Centre Road and Huntingdale Roads was demolished and a new 5 storey apartment building is now under construction on that site. Mr. Pedler’s evidence does not refer to this new adjoining building and all his attachments with the aerial photography show the outline of the previous nursing home building.

We submit that this new 5 storey apartment building requires a reassessment of the stability of the southern batter in Zone 4 and all the other technical assumptions regarding the remediation works in Zone 4. The batters that are described in the evidence as being in existence for 20 years were established at a time when the only adjoining building was the original office building of the quarry operator in the 1970s, (before it was extended and converted to the nursing home) and this previous office building was located closer to the Centre Road frontage. In addition, at the time these batters were formed, Huntingdale Road was a narrower unmade dirt road located further away from the edge of the western batter of the open pit in Zone 4.

In our view the open pit in Zone 4 should be filled expeditiously given the following:-

- the current instability of the batters, which has been admitted in the Peer review;
- the unacceptable risks to the safety of the workers to produce the engineered fill which involves the removal of the slimes at the bottom of the pit to then be placed to dry out in summer in Zone 2; and
- the unacceptable risk to the stability of the adjoining 5 storey apartment building.

The Council pursuant to clause 4.2.10 of the s.173 agreement registered on the titles of this former quarry site has the right to fill this pit. It states as follows:-

“4.2 The owner covenants and agrees that it will:

4.2.10. make the site of the eastern dam available to Council or to third parties at Council’s discretion to accept clean fill on a no charge basis to enable the dam to be filled as quickly as possible, subject to reasonable notice being given of large volumes of fill”.

Furthermore, given that the evidence of Mr Pedler does not discuss the effects his proposed backfilling works will have on the new adjoining apartment building, we can only conclude that no protection works have been adopted or planned as part of his strategy to remediate Zone 4 to ensure that the adjoining apartment building and Huntingdale Road are not destabilised.

ii. Zones 1, 2, 3 and 5

Mr. Pedler’s evidence states in part 3.2 in the paragraph commencing with “Zone 1” that this zone will be “preloaded” and monitored so that when the settlement of the putrid waste and slimes is at an acceptable tolerance, that the new dwellings will then be constructed and supported on pile foundations. We note that a similar process will also be applied in Zones 2, 3 and 5.

From the above evidence, we assume that the preloading will require the placement of additional soil on these zones, with the height of these soil mounds to be determined by Coffey. The purpose of the above from our reading of Mr. Pedler’s evidence is to accelerate the compaction of the slimes and putrid waste. However, the effectiveness of compacting slimes with an approximate thickness of 15 metres and a depth of 19 metres has not been demonstrated by the provision of other examples where this has been achieved for slimes.

We have also not been given a timeline of how long this compaction process will take, which appears to be at the total discretion of Coffey. However, what

is clear to us is that all the adjoining residential property owners and residents will be required to endure years of soil mounds located near their property boundaries, which will be highly visible not only from their properties but from properties uphill from this former quarry site. We also do not know what the composition of these soil mounds will be. Will they smell, blow onto adjoining properties on windy days, and wash away into adjoining properties after heavy rainfall or a storm?

More importantly, this process of compaction of the putrid waste and the slimes has not been addressed in the evidence of Mr. Sinclair. We are concerned with the effect that this preloading will have on the gas migration paths, namely will it accelerate gas migration into adjoining residential properties? We also could not find any discussion in the SESP as to the effect of this preloading of the slimes on landfill gas migration.

The s.173 agreement registered on the titles was executed to stop the previous quarrying operations and improve the amenity of all the surrounding residential area. In our view, these remedial processes as proposed will create more offsite amenity impacts than the original quarrying operations. Therefore, we submit that the adjoining residential properties together with the wider surrounding residential areas should not be submitted to these very probable offsite amenity impacts from any of these remedial works.

Our understanding is that this preloading will reduce, not eliminate, the differential movement between the structures supported on piles and the external services and roads supported on the slimes and putrid waste.

For this former quarry site, any differential movement may affect hundreds of dwellings and thousands of people. Any differences in levels between the houses and the external pavements would create tripping hazards for able and disabled persons, and access along the road network and private driveways may be compromised. The Owners Corporation may not have the means to deal with the magnitude of claims for repairs as a result of any differential movement.

iii. The Slimes

We note that Mr. Sinclair's evidence states the following on page 10:-

“Zones 2 and 3 comprise former sand pits that have been backfilled with remnant slimes from the former sand mining operations. Historical information indicates that Zones 2 and 3 were backfilled predominantly with slimes in the 1990s. Slimes are a waste product generated when the fine sand, clay and silt fractions are washed from natural sands during sand mining operations. Typically, the slimes are stored in a saturated state in former quarry pits, and comprise very soft clays and silts and very loose sands. The slimes are highly compressible, with in-situ moisture contents higher than their liquid limit, giving the slimes fluid properties.

The subsurface conditions within Zones 2 and 3 generally comprise a 1m to 4m thick soil cover over slimes up to about 20m deep. Solid inert waste (building waste) and some foundry waste is also present in these Zones.”

The above comments are also stated in Mr. Pedler's evidence. Figure 5 of Mr. Pedler's evidence shows that a significant portion of the housing shall be constructed over the slimes, together with their associated underground services and road network. We note that this part of metropolitan Melbourne is identified in *“The 2012 Australian Earthquake Hazard Map”* to be within a seismic activity area. In 2016, Emergency Management Victoria issued a document entitled *“State Emergency Response Plan Earthquake Sub-Plan Edition 1”*. Attachment F is chapters 2 and 3 of this emergency plan.

Chapter 2 of this Emergency Plan states on page 4 the following:-

“Although Australia is popularly considered to have a low earthquake risk, a major earthquake could still occur under a heavily developed and populated area in Victoria. The impact of such an earthquake could have widespread consequences throughout Melbourne and surrounds. Whilst there is a low probability that this event will occur in

the foreseeable future, it is important to recognise the potential for such catastrophic impacts”.

Chapter 2 of this Emergency Plan then describes and lists the 57 recorded earthquakes by magnitude in Victoria over the past 10 year period and the consequences of an earthquake at chapter 3, which also describes the effects of the 2011 earthquake in Christchurch New Zealand. In relation to water supply, it is noted on page 10 of the Emergency Plan the following:-

“In case of liquefaction, breakage of pipes is likely to be widespread and concerns over contamination may render the water not suitable to drinking”.

Liquefaction occurs when earthquake shaking can cause soils to behave like a liquid and lose their ability to support structures. Liquefaction often causes buried gas and water pipes to break. The highest hazard is where there are soft soils such as slimes or poorly compacted artificial fill, as these types of soil amplify earthquake shaking.

Both Mr. Sinclair and Mr. Pedler’s evidence state that the buildings will be supported on pile foundations and that the infrastructure and associated services will be supported on compacted putrid waste and slimes. As these two support systems will act substantially different in an earthquake, their evidence has not demonstrated that widespread damage will not occur on this site rendering the buildings uninhabitable after an earthquake.

Given the intensity of the proposed residential development on the putrid waste and slimes in Zones 1, 2, 3 and 5, the Planning Panel should not overlook the importance of ensuring that the dwellings/buildings, the services, the landfill gas migration measures, the pavements and roads will not fail or be beyond repair as a result of an earthquake.

Although normally the design of buildings and infrastructure for earthquakes is considered to be applicable after the site has been environmentally “remediated”, if the expert evidence in this case cannot confirm that buildings supported on a rigid pile structure and the associated infrastructure and

services supported on compacted putrid waste and slimes will not fail in the event of an earthquake, then this rezoning should not proceed.

iv. Examples of other land fill sites with putrid waste and slimes

Mr. Pedler's evidence has not provided to us any examples of other sites that he or other Geotechnical Engineers in Victoria have successfully remediated from a geotechnical perspective for sensitive uses that have the same or similar characteristics as this former quarry site. Mr Pedler has not given to us examples of other former **sand** quarry sites that have been filled with **putrid waste and slimes and then developed for housing.**

At paragraphs 4.2 of his evidence, Mr. Pedler has given us the following examples of where piled solutions were successful on landfill sites:-

- the site of the now Footscray Secondary College. Mr. Pedler's evidence does not indicate that slimes were used as the landfill at this site. However, there is a comment in paragraph 997 of the Ombudsman Report into the Brookland Greens Estate that this school is often evacuated because methane is detected and that there have been a number of fires caused by the escape of methane at this school. Attachment
- the McDonald's store in North Geelong. Mr. Pedler does not indicate that slimes or putrid waste were used as the landfill at this site.
- The Cheltenham site. Mr. Pedler does not indicate that slimes were used as the landfill at this site. However, as previously stated the Geotechnical report from Golder of the Cheltenham site which is attachment D to our submissions, confirms that this site was not filled with slimes.

At paragraph 4.3 of his evidence, Mr. Pedler has given us examples of where preloading of landfill sites was successful where the land comprised of Coode Island Silt, but we believe that those examples are not relevant. This site contains putrid waste and slimes which are contained in former sand quarry

pits, which will exhibit behavioural properties different from all the other examples provided to us in paragraph 4.3.

CONCLUSION

We are of the view that the history of this former quarry site does not qualify it for the proposed rezoning. From the evidence provided to us by the proponent, this former sand quarry site filled with either putrid waste and slimes, has never been remediated in Victoria, let alone rezoned to allow even the possibility of residential uses.

Our view is that as a society, we should not be encouraging the rezoning of this land to facilitate the construction of houses over putrid waste and slimes.

Sites of this nature in Melbourne are rehabilitated for passive uses, such as open space. This reduces the risks to Council and its ratepayers to possible future legal action which could result from the failure of any component of the complicated and intrinsic remediation measures to be installed on this proposed housing estate.

Given that this site was filled with municipal waste and slimes, we consider that Council has a duty of care to continue to rely on the existing s.173 agreement by taking control of this land, complete the process that it had begun in the 1990s and rehabilitate it for open space.

Therefore we respectfully request that the Planning Panel not support this rezoning.

ANGELO VALENTE B. Eng (Monash)

Registered Building Practitioner in the following categories:-

Civil Engineer	EC 1319
Draftsperson Architectural Building Design	DP-AD 1252
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MONASH OPEN SPACE STRATEGY 2017
DRAFT FOR CONSULTATION

About this document

This document is the Draft Monash Open Space Strategy.

Several other reports have been prepared for this project that summarise the key components of work. These are:

- Demand and Consultation Findings
- Locality Analysis
- Discussion Paper

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Executive Summary

The Open Space Strategy (the Strategy) will guide the future planning, provision, design and management of open space in Monash for the next decade. The Strategy is a high level strategic document that seeks to identify the open space needs of existing and future residents of Monash, gaps in the provision of open space and opportunities to address those gaps.

The Strategy is aspirational, and it is acknowledged that not all of the recommendations will be able to be implemented in the life of the Strategy. Implementation relies on a number of factors including budget, the level of development and the availability of land to purchase in appropriate locations.

The provision of appropriately located, designed and accessible public open space is a key function of local government and a critically important part of liveable urban neighbourhoods.

As an established urban area, Monash has an extensive network of public open space that includes playing fields, local parks and trails, particularly along creek valleys.

Due to historical development differences, and in some instances topography, the distribution, type and quantity of public open space across the city varies. This can present challenges in meeting the diverse needs of existing residents and providing equitable access to open space, particularly as demographics, recreational choices and expectations change. Meeting these changing needs will require a shift in the way that existing open space is used, accessed and developed. This will help to ensure that the usefulness and accessibility of open space to all members of the community, regardless of where they live, their age, gender, income, ethnicity, education or abilities, is equitable.

In addition to the changing needs and expectations of current residents, additional demands will be placed on the public open space network as the population of Monash continues to grow. In some locations, such as Clayton, these growth pressures will be compounded by the population growth occurring at a much higher density than has previously occurred in Monash.

It is within this context of change that the Strategy has been developed to respond to those challenges. A detailed implementation plan will be prepared following extensive consultation with the community on the draft Strategy.

Vision and principles

The vision for open space in the City of Monash is:

- Open space is acknowledged as a land use of significance to the health and wellbeing of residents, workers and visitors because it contributes to social, community and economic and environmental improvement.
- Open space will be acquired, developed and managed to provide a diversity of social, physical and environmental opportunities and experiences for the widest range of the population, both now and in the future.
- Open spaces to meet different functions will be available close to where all people live and work, and enable people to see and experience green space.
- Strengthening the Garden City character of Monash by integrating open space into the planning and development of residential, commercial and industrial areas.

The principles that underpin this plan:

- **Equitable access to open space** for all residents regardless of where they live, their age, gender, income, ethnicity, education or ability.
- **Diversity of opportunities and experiences** to ensure all residents can use and benefit from open space.
- **Quality (fit for purpose)** – ensuring that the function of an open space meets the requirements and agreed core service levels for that function.
- **Sustainability** – in design, development and management of open space.
- **Dependency** – some people, activities and assets are dependent on the inherent natural qualities of open space reserves. And as a priority, open space should support activities and users who are more dependent upon it;
- **Environmental protection enhancement and appreciation** including the protection of canopy trees, habitat, flora and fauna and waterways.

How are we assessing open space provision and need?

In assessing the extent of the open space network and the future needs of the community the Strategy looks beyond the provision of land as the only measure of the suitability of the network. Whilst land is a key component and the obvious starting point for the basis of the network there are a range of other factors that contribute to the adequate provision of open space in Monash.

The Strategy takes a combined approach to measuring the provision and accessibility of open space. The measures include:

- Initial community consultation around the use of open space and community need
- A locality analysis which includes the physical size and location of open space
- The facilities present in open space parcels
- The role and function of open space parcels
- The location of residents and catchment distances from open space parcels.

The distribution of open space is assessed based on the proximity to residences (distance thresholds) of the priority open space function types and is set out below.

- An **Off-road trail** (local shared or park perimeter trail) should be within **400m** of all residences in Monash.
- **Social/family recreation spaces** should be within **500m**. These are places where the whole family (regardless of age or ability) can gather, play, picnic and have fun outdoors.
- A **sport facility** should be within **1km** of all residences in Monash. These spaces may provide competitive club sport, free practice or social facilities.

In addition to the above provision, the strategy identifies a potential for lower level, incidental access to green space for visual amenity or relaxation /contemplation for restorative values to be considered within 300m of all residences, employment areas, and accommodation in the City.

How is open space apportioned across the City of Monash and its population?

What the distribution assessment showed

The most common type of open space function types in Monash is *play*.

Most residences in Monash have access to sporting open space within 1km.

Whilst there is generally a good distribution of open space, there are areas where residents have either:

- Limited access to a park that serves a social/family recreation function (see Appendix 1) within 500m, or
- access to an off-road trail within 400m.

Gaps in distribution are mapped and described in the summary of findings for each locality.

Other possible considerations are related to measuring equity of provision.

The amount of open space per person by suburb is shown in the following table :

- by type, by effective population (relevant user age group) and by suburb
- by proportion of high or medium density dwellings by suburb (those less likely to have private open space).

Note: this is not the sole measure of open space provision or access.

Table 1. Population by suburb and open space

Precincts	Population			Council Open Space		
	Total 2016	% of Monash total population	% of medium or high-density dwellings	Hectares (ha)	% of total open space	Ha per 1000 residents
Glen Waverley	41,303	22.4%	19	136.8	28.6%	3.3
Mount Waverley	34,052	18.5%	20	102.3	21.4%	3.0
Wheelers Hill	20,989	11.4%	6	54.4	11.4%	2.6
Mulgrave	19,339	10.5%	7	51.9	10.9%	2.7
Ashwood/ Burwood	9,809	5.3%	26	34.9	7.3%	3.6
Oakleigh	7,669	4.2%	29	34.5	7.2%	4.5
Chadstone	8,427	4.6%	29	22.9	4.8%	2.7
Oakleigh South	5,221	2.8%	12	14.3	2.9%	2.7
Clayton	18,222	9.9%	48	11.3	2.4%	0.6
Oakleigh East/Huntingdale	8,274	4.5%	34	10.7	2.2%	1.3
Hughesdale	7,669	4.2%	42	3.2	0.7%	0.4
Notting Hill	3,354	1.8%	43	1.3	0.3%	0.4
Total	184,328	-	-	478.5	100%	2.6

Table 2. Priority types of open space (excluding trails¹) – provision 2016

Open space function type	Ha per 1000 pop.	Total Ha
Sport	1.04	191
Play	0.21	38
Social/family recreation	0.10	18
Total other (visual amenity, relaxation, conservation etc.)	1.23	227
Total open space	2.57	474

Quantity of open space

In total there are an estimated 816 hectares of public open space in City of Monash of which 337ha is managed by other authorities such as Parks Victoria, VicRoads and Melbourne Water.

The south-west of the municipality has a limited amount of open space (due mainly to the lack of defined waterway corridors) and it has a more gentle undulating topography. In the north the topography is steeper and there are defined waterway corridors including Scotchman's Creek, Gardiners Creek, and Dandenong Creek Parklands.

There are significant differences in the quantity of open space in different precincts.

Open space comprises 21.7% of the total area of Wheelers Hill, compared to less than 1% of the total area of Notting Hill. These differences are also a reflection of the area of residential and other land uses, and the presence of the Dandenong Creek floodplain in Wheelers Hill. Wheelers Hill has six times the residential population of Notting Hill and six times the

land area, however by density, it has three people more per hectare than Notting Hill.

Glen Waverley has the largest area of Council open space (136.8ha). Notting Hill has the least with 1.2ha.

Glen Waverley has the largest number of Council owned open spaces (168 sites), followed by Mount Waverley (136 sites) and then Mulgrave (112 sites).

There are gaps in the distribution of particular types of open space in a number of areas, particularly in the south-west parts of the City including Hughesdale, Oakleigh, Clayton, Notting Hill and the western parts of Mulgrave. In relation to the population, Oakleigh has the highest number of hectares per 1000 people (4.5ha), followed by Ashwood/Burwood (3.5ha), and Glen Waverley (3.3ha).

In some industrial areas, there are considerable landscape setbacks that play a similar role to public open space for visual amenity in the residential areas, although on private land.

Ideally in a typical one square mile grid of residential land at least 10% of land area would be provided as open space to achieve the desirable range benefits and functions of open space at the recommended core service levels (See Appendix 2 and following table).

This percentage is based on the types of open space functions required to provide the range of benefits typically sought by any community, and with the priority function types (social/family recreation, off road trails and sports parks, at the minimum sizes cited in the core service levels).

A summary of core service levels to be aspired to are provided in the following table for the priority open space function types for residential areas.

¹ Trails excluded as difficult to calculate area and some trails are in other reserves.

Core service levels

1. Social /family recreation spaces

	Local	District	Regional
Size	Preferred minimum 1ha unencumbered land and min 70m in any direction.	Larger sites. Minimum 1ha unencumbered land - 70m in any direction preferred.	Dependant on the nature of Minimum 1ha unencumbered land - 70m in any direction preferred.
Distribution	Local or district within 500m of every residential property.	Local or district within 500m of every residential property.	No minimum distance for regional facilities- as it assumed usually only one or two will be provided in the City.
Facilities	Elements to encourage social, physical and environmental activities for all ages and abilities. Seating and tables, paths, trees, shade and soft landscaping. No BBQs or toilets or dedicated car parking will be generally provided.	Must include a kick to kick space/ area for ball games as well as quiet play. May have picnic facilities, car parking and social sports facilities, BBQ and toilets. A selection of sites may be fenced. Includes canopy trees, path circuit, and a high degree of accessibility to include more people with a disability.	Accessible, unique and large scale facilities, with high play value. Support visits of longer duration. A major destination facility, substantive picnic and social gathering or environmental activities. Fully accessible toilet. Specific elements to include people with vision, and physical impairments.

2. Sports open spaces

Attribute	Local	District	Regional
Size	Generally, one field or less- no club competition sport or over flow only, generally provided in association with an SFR, or a school. May not meet standards for ground size.	All club home and away competition grounds. Minimum size for two senior playing fields AFL / cricket, or three soccer- football together, plus support facilities, training facilities and a car park – on the perimeter of the reserve. Space for park perimeter trail on lead dog-walking etc.	Ideally 12ha if mainstream football/ cricket etc. Standard of competition ie regional, state or higher. Buffer to provide separation from adjacent housing. Large enough for undercover seating.
Distribution	One in each suburb and within 1km of every residential property- some element of free access facilities i.e. practice cricket nets- free access hard court, playing field with goal posts. May be provided in a local school.	One sports facility within 1km of every residence. Buffer may be required to separate facility from adjacent housing, creek corridor, school, and overhead transmission lines. Access to playing fields, practice facilities or courts by community for non-club use.	Not subject to distance thresholds. Generally, co-located with either a major sporting or cultural complex, or unique or significant landscape feature.
Facilities	Typically, no social room facilities provided. May have unisex toilets. Goals, space for practice facilities for social community use. May not be competition standard – more suited to school use and training. facilities to be lit. May not be irrigated or drained. Shelter and seating; some hard court ball courts; boundary, and shade planting. Generally, not fenced. <i>Example: D.W.Nicoll Reserve, Oakleigh</i>	Code compliant sports lights, irrigation and drainage. Boundary fencing not preferred. Multiple field markings across seasons. Open gate, except on match days. Shade, shelter and seating; publicly accessible toilets; some social sport e.g. hard court ball courts; BBQ facilities and SFR. Boundary, shade and amenity planting. Small-shared sports pavilion serving sports in both seasons. Includes canteen, referee/umpire and first aid room compliant to code standards. Small social room, multi gender change facilities, storage to include goals, club and maintenance equipment. Practice facilities, such as cricket nets. <i>Example: Warrawee Park, Oakleigh, Mt Waverley Reserve</i>	Facilities for night competition and a high level of lux. May have food and beverage services /function space. Large pavilion or clubroom facilities to serve more than one sport. At least two preferably three playing fields. May include synthetic surfaces. Fully accessible and spectator facilities / under cover seating. Generally enclosed by a perimeter fence - not necessary locked. Onsite car parking. Sealed path circuit. <i>Example: Central Reserve, Glen Waverley</i>

3. Off-road trail

	Local	District	Regional
Size	Trail corridor includes treadway, right of way and buffers on both sides. Minimum treadway width of a sealed shared path 2.2m. Single track trails in bushland setting minimum width of 300m.	A minimum of 2.5m treadway (or 3m for commuting route) with right of way and buffers- on each side with a row of trees. Desirable width of 10m corridors when trail only, less when in conjunction with other open space. Should include break out points at intervals along length.	In association with regional corridors - Minimum of 3m treadway with right of way and buffers- desirable in 10m minimum corridors. Space should include trail heads at nodes or intervals with parking, toilets, drinking water seating and shelter.
Location	Local circuits for fitness walking and jogging / dog walking through residential areas. Shared paths in road verges, or as perimeter paths around large open spaces (greater than 1ha) with links to district trails. Away from sensitive riparian areas / river banks.	Along creek corridors, or as part of larger open spaces. Trails to be kept away from sensitive riparian areas, centre of bushland sites unless specifically designed to address environmental impacts. All new residential areas to be provided with shared trail circuits, with connection to regional or other district trails.	Flagship trails between suburbs, along rail easements and waterways and through regional park land. Scenic and sub-regional trails targeting visitors will require connections to local residential areas. Trails to be kept away from sensitive riparian areas and conservation sites.
Distribution	Within 400m of every dwelling connecting to district or regional trails.	Within 800m of every dwelling. Connecting to regional trails.	In regional open space or transport corridors.eg. Gardiners Creek, Scotchmans Creek, Dandenong Creek, East Link. Pipe tracks and rail corridors.
Facilities	Surface materials: stable, firm, relatively smooth and slip resistant in wet or dry conditions. Gradients suitable for users with prams and mobility aids. Ensure appropriate border edging on formed paths. Interpretation signage not required. No water, bins or toilets to be provided.	Formed paths (including consolidated gravel pavement or asphalt. Not screenings or toppings). Interpretation signage not required unless the trail attracts high use and is of particular significance. Seating at key intervals with a minimum of 1m clearance from the path. May have access to seating and drinking water at nodes.	Sealed surfaces for wheeling / skating. Unsealed for perimeter paths / jogging tracks / mountain bike tracks. May include boardwalks. May provide robust interpretive signage. Provide accessible seating are arranged to facilitate social interaction and are aligned to outlook attractive vistas and points of interest.

Recommendations: provision and distribution standards

1. For suburban areas adopt proximity and size of open space to meet core service levels, by function type, as the prime determinant of how much land is required to meet demand for open space.
2. Adopt as open space provision standards for the City of Monash that the sum of additional land required to meet the core service levels and distance thresholds for each priority function type, determines the quantity of open space required, plus:
 - o additional public open space within 300m areas of medium and high density, and in non-residential zones
 - o a diversity of open space function types and landscape setting types in each suburb
 - o qualitative criteria as outlined in the core services levels specified by open space function type and catchment hierarchy.
3. Provide access to a range of open space function types in public land within each suburb. In addition to sport, off-road trails and social/family recreation space this may include community garden, visual amenity, relaxation/contemplation, memorial park or conservation open space.
4. Provide access to a range of landscape setting types in open space in each suburb, where possible. These may include for example: community garden, bushland/forest, ornamental or cultivated garden, treed parkland, plaza/paved/hard court area, lawn/managed turf, open grassed area or water body.
5. Landscape setting types should complement the nature of settlement type and neighbourhood character. For example, consider the provision of bushland or treed parkland in medium-high-density areas.
6. Rectify the gaps in distribution by purchasing land abutting existing spaces:
 - o that can serve a social/ family recreation function
 - o currently serving as sports reserves with any of the following: only one playing field, no practice facilities, non-compliant field sizes, no perimeter path, no boundary canopy tree planting or a co-located social/family recreation area
 - o to increase the size of other public reserves to improve area under canopy trees, functionality, amenity or use
7. Consider increasing the distribution of open space which as a priority:
 - o includes residential areas
 - o has a low social economic profile (SEIFA index)
 - o has the least amounts of open space per person
 - o has no social/family recreation space, sports parks and or off-road trails
 - o is projected to grow and where housing density will increase.
8. Wherever possible investigate the options for co-location and sharing of school's open space after hours to benefit the community.

Size and viability of open spaces

Many of Council's parks are small.

Larger parks mean more social, physical and environmental benefits, better relationships with adjacent residences and more people are likely to use them.

Why size matters

The size of open space affects Council's ability to:

- provide a range of opportunities for a range of different age groups, social and noisy places as well as those for reflection, peace and quiet
- develop park perimeter paths for exercise
- manage solar access to open space in high-density housing and mix-use areas and protect the desired amenity and uses in the space
- provide sufficient buffers around sports fields, creeks and waterways, for example, for personal safety and noise abatement
- have multiple sports playing fields located together, to manage wear and support sports club viability, and minimise the pavilion-per-ground ratios.
- manage carrying capacity and spaces cost effectively
- protect the integrity of bushland and habitat by minimising the invasion of weed, storm damage and over use, and providing less significance space for additional social elements
- benefit a large number of dwellings within close proximity rather than misappropriation by immediate dwellings only.

Size also affects the capacity of a park to meet:

- expected standards of residential amenity
- stormwater management requirements as well as core service levels.

Furthermore, constricted spaces are a limitation on the ability of a park to:

- evolve and adapt to preferences and demographics over time
- provide enough space between different types of users to avoid conflicts between activities
- protect small areas of significant vegetation and fauna.
- generate economic benefits
- insulate a park user from traffic noises and other visual intrusions or which may affect the recreation experience sought
- have houses overlooking parks from across a road on at least two sides, and limit the area where private yards and parkland adjoin

Some 85% of Council parks are smaller than one hectare, and the median size of an open space parcel in the City of Monash is 1300m².

There are many open spaces in the City of Monash that are small single purpose play equipment areas. They are not the most viable form of park for a diverse and ageing population, nor are they the most sustainable in terms of return on investment. The model of this type of provision for the future should be reviewed. See previous comments under 'Quality and diversity'.

Strategies for addressing size and viability

- Acquire land adjacent to existing open spaces to make existing conservation, social/family recreation and sports open space fit for purpose and increase their capacity to serve future generations. This will be central to their success. In many cases adding land will also resolve access issues, reduce conflict and provide a better configuration of public surveillance which will increase the variability and use of sites.
- Small play parks with limited equipment need to be selectively migrated to potentially fewer larger more diverse social/family recreation parks which provide for a wider range of people and offer a greater diversity of opportunities.
- Former small play sites can generally be repurposed as tree reserves for visual amenity, nature play, relaxation and developed as food or ornamental gardens. Some councils have schemes that allow residents to develop and manage small public spaces.

This plan doesn't recommend the disposal of small parks on two accounts: firstly, because land is a valuable community resource that can generally be repurposed when the current use is no longer sustainable. Secondly, the sale of relatively marginal open space areas is not likely to net a good return when taking into account preparation and sale costs.

A better return can generally be made by increasing participation, environmental

benefits or community development by redesign or development for another purpose.

Recommended actions: size and viability

14. Seek to acquire land abutting selected existing parks (especially sports and play parks) to increase their size, diversity, capacity, public surveillance, prominence and functionality.
15. Seek to deliver a park of greater than one hectare within 500 metres of all Monash residents.
16. Provide guidance to developers about the functions of open space required in specific locations to be developed, and design guidelines and core service levels for each.
17. Ensure the size of any public open spaces proposed in planning proposals is adequate (and complies with core service levels) for each primary function required.
18. Seek to deliver parks that have dwellings overlooking from across a road on at least two sides, and limit the area where parks adjoin private yards.
19. Review play provision in each precinct with the objective of developing at least one fit for purpose social/family recreation space of a suitable size.

5. Managing spaces for sustainable sport

Quantity and distribution of sports reserves

Monash has 61 sports reserves (191ha). These include Central Reserve – a centrepiece of Monash’s open space network.

Currently Monash has 1ha of sporting open space per 1000 people or 2ha per 1000 effective population.⁴

There are few areas without access to a sports park within a reasonable distance. Residential areas currently outside a 1km catchment of a sports reserve include:

- east of Notting Hill and Clayton (although Monash University would be in this catchment)
- north-west of Oakleigh South (however the private golf courses are located in this gap)
- west of Springvale Road in Mulgrave
- to the west of Valley Reserve in Mount Waverley and south of the MONASH FREEWAY
- In Hughesdale: just south of the railway line and in the north just east of Warrigal Road
- North of Waverley Road near Gallaghers Rd in Glen Waverley.

The small size of most sports grounds

The average size of sports parks in Monash is 3.14 ha. The majority of sports reserves in Monash are a single AFL football or cricket ground. Single and small grounds have considerable limitations, including not being able to:

- rotate use and manage wear
- be flexible to change with demand and address increasing standards for playing infrastructure
- attract large, more viable clubs
- provide adequate social and practice facilities, social/family recreation and trails
- allow support facilities in the best location
- generate economies of scale in maintenance
- serve increasing population densities.

The equivalent of two AFL or three soccer football pitches plus two netball courts (if for training only) is a desirable minimum footprint for a sports park. One large area of continuous sports turf that can be marked any way is better able to respond to fluctuating demand for club sports over different seasons.

⁴ Effective population for sport is people 5-40 years of age

Co-located facilities and those not dependent on parks

Facilities (such as community centres) that are not dependant on open space should not be located in parks, especially sports parks.

All support facilities should be sited adjacent to the street verge, and where possible car parks should be offsite.

Providing circuit trails and social/family recreation spaces in sports parks reduces the need for other parks close by and also reduce the overall land take required to meet the priority open space functions in any local area.

Redesign of ageing infrastructure may provide an opportunity to enhance layout, encourage sharing and social use, and provide for a greater range of users and opportunities at sports parks.

Some residents raised concerns about sports parks that are the only major open space in a local area being fenced and leased to sports clubs. Typically, community use and access can be accommodated on enclosed grounds.

Surface quality, greening and carrying capacity

There is a need to maximise carrying capacity of sports grounds by adding lights and increasing playing times to meet increased demand for sport.

Increasing demand for synthetics, social and community sport and for sports codes traditionally played in one season playing in the other, are now more prevalent. However more synthetic fields may mean less canopy trees and boundary planting, issues with dog use, increased temperatures, and mean that grounds are fenced.

Additional females playing and emerging sports require additional facilities. These mean larger built facilities.

Many sports reserves could accommodate additional canopy trees around the verges and provide shade.

Some fields do not have warm season grasses and reuse and water reduction works had been discontinued. As temperatures continue to increase turf water management is likely to be more cost effective than more regular remediation

Protecting sport from encroachments by housing

Additional and higher density residences in close proximity to sports facilities increase the likelihood of complaints about noise, traffic, lights, whistles etc. These may ultimately impact on when and what sport can be played. Planning controls on new residences should consider these.

Increasing residential densities, the number of employees in activity centres and the employment cluster may provide opportunities for sports and increased demand for small footprint social sports facilities in these areas.

Oakleigh South

The several major gaps areas with inadequate space in Oakleigh South. These include:

- the area bounded by the railway line and North Road
- the area bounded by Huntingdale Road, North Road
- the area north of Centre Road
- the area immediately to the south of North Road and west of Huntingdale Road.

Social/family recreation

The area bounded by the railway line and North Road

This is primarily an industrial area will that abuts Clayton to the east.

Sport

The area bounded by Huntingdale Road, North Road

In this area there are two major golf courses, however the area to the west has no open space. Embellishment of reserves some distance away may assist in providing for this area.

171. Consider acquiring land abutting WA Scammell Reserve in the north of the precinct and Robinson Reserve in the east for additional social/family recreation function.

The area north of Centre Road

172. Consider the acquisition of land abutting the Oakleigh South Secondary College, or in conjunction with Progress Park, or a new site in the vicinity of Devoy Street.

173. Should either of the golf courses ever be developed and the land use change, consider taking parkland required for the future land use, as well as doubling the size of the current sports reserve for an additional playing field in the north west, and for social/family recreation in this area.

Area immediately to the south of North Road and west of Huntingdale Road

174. Consider acquiring land abutting WA Scammell Reserve in the north of the precinct for social/family recreation.

Area immediately to the north of Centre Road and east of Huntingdale Road

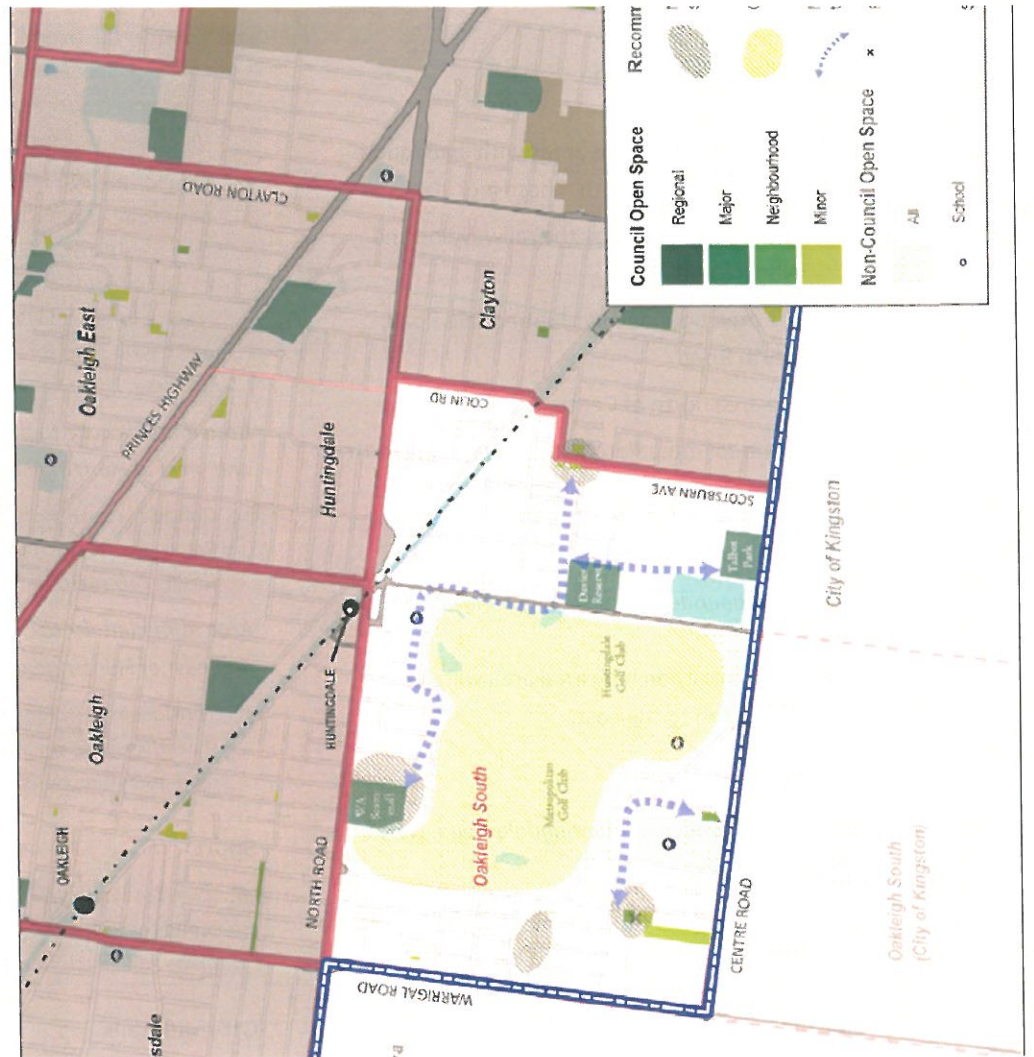
175. Consider expanding Robinson Reserve and Davies Reserve for additional social/family recreation functions.

Sport

176. Consider closing the road (Pitt Street) that separates Progress Park and the other open space adjoining Stan Riley Reserve.

Off-road trails

177. Create an off-road trail circuit around street verges, to connect to community facilities, school and sports facilities.



2. Sports parks -core service levels

Attribute	Local	District	Regional
Size	<p>Determined by available land. Generally, one field or less- no club competition sport or over flow only, generally provided in association with an SFR, or a school. May not meet standards for ground size.</p> <p>Typically, no social room facilities provided. May have unisex toilets. Will include goals, space or practice facilities suitable for social community use.</p>	<p>All club home and away competition grounds where visitors will travel out of their own neighbourhood to play.</p> <p>Minimum size for two senior playing fields AFL / cricket, or three soccer- football or equivalent for example - together, with adequate space for sports lighting, support facilities, training facilities such as practice nets, and a car park – on the perimeter of the reserve. Full sized playing fields as per code requirements.</p> <p>Where possible includes space for park perimeter trail for training and parent exercise, on lead dog-walking etc.</p> <p>Buffer may be required to separate facility from adjacent housing, creek corridor, school, and between overhead transmission lines, due to sports floodlighting and highball sports facilities.</p> <p>Access to playing fields, practice facilities or courts by community for non-club use. Typically, will include a social /family recreation area where space is available.</p>	<p>Ideally 12ha if mainstream football/ cricket etc. + however size is dependent on sports code and standard of competition ie regional, state or higher.</p> <p>Typically, will include facilities suitable for night competition and hence a high level of lux, as well as large grounds and multiple change rooms determined by the standard of ground.</p> <p>Buffer may be required to provide separation from adjacent housing or other non-compatible land use, or lower order facilities. Typically, would be large enough for and have spectator facilities such as undercover seating. May also have food and beverage services /function space rather than small club social facility.</p>
Distribution	<p>One in each suburb and within 1km of every residential property- some element of free access facilities i.e. practice cricket nets- free access hard court, playing field with goal posts. May be provided in a local school.</p>	<p>One sports facility within 1km of every residential property (may be local level within 1km of all residential dwellings)</p>	<p>Not subject to distance thresholds.</p>
Location	<p>Prominent locations with high visibility. Not directly under power lines. Generally, in residential areas. May be provided in business / commercial and industrial zones depending on the sports code.</p>	<p>Prominent locations with high visibility. Not directly under power lines. Fields not on land encumbered by drainage. Allow adequate buffers between buildings and residences in order to minimise nuisance from vehicles, lights, stray balls and the noise of whistles and social functions. For new reserves separate from residences by a roadway or a clear buffer, and overlook the fields. Desirably no rear fences of private residences abutting the park.</p> <p>May be provided in residential, business / commercial and industrial zones depending on the sports code. May adjoin or include school or other institution.</p> <p>Where possible new sports facility complexes, synthetic playing field surfaces and indoor sports facilities should not be built in existing green space, but on brown field sites, and in high foot traffic areas.</p>	<p>Prominent locations with high visibility that draws users from across the Council area. Fields not on land encumbered by drainage requirements or other encumbrances.</p> <p>May be provided in residential, business / commercial and industrial zones depending on the sports code.</p> <p>Allow adequate buffers between facilities and residences in order to minimise nuisance from vehicles, lights, stray balls and the noise of whistles and social functions.</p>
Access	<p>Provided central to a community.</p>	<p>May be located on collector / arterial roads. Shared path access into facility.</p>	<p>Located on collector / arterial roads.</p>

Attribute	Local	District	Regional
	<p>Social facilities and hard courts accessible to people with a disability. Generally, car park not provided on site – only on-street. Shared path access into facility.</p>	<p>Car park. Street lighting to car park. Perimeter shared path for exercise. Car park provided on-street or perimeter not internally. Generally two road access points.</p>	<p>Access to major public transport routes. Access by shared trail. Perimeter shared path for exercise. Lighting on sealed car park on street/perimeter. Generally two road access points.</p>
Facilities	<p>All competition standard facilities to be lit. May not be irrigated or drained. Bicycle parking and shared trail access; natural and built shade e.g. veranda of toilets in park or adjacent facility. Path access. Shelter and seating; some hard court ball courts; boundary, shade and amenity planting as a priority. Generally, not fenced. May provide bins.</p>	<p>All playing fields to be lit with code compliant lights. All fields to have irrigation and drainage. Boundary fencing not preferred -to enable sharing and multiple field markings across seasons. Where fenced, fences should be open gate, except on match days. Bicycle parking and shared trail access; natural or built shade, shelter and seating; publicly accessible toilets; some hard court ball courts; BBQ facilities subject to demand; may be co-located with / include skate, mountain bike or BMX facilities and or SFR; boundary, shade and amenity planting. Small-shared sports pavilion serving sports in both seasons. Located where possible on west side of ground. Includes canteen, referee/jumpire and first aid room compliant to code standards. Small social room, multi gender change facilities, storage to include goals, club and maintenance equipment. Practice facilities, such as cricket nets. Bins. Provide natural turf playing fields as one large footprint of managed turf – desirably on the same level, without separation by car parking so that fields can be marked flexibly for multiple codes competitions in both seasons. Cricket wickets should be placed between soccer -football pitches so as not to impact on winter sports. In new reserves provide for a social/family recreation space in conjunction with sports facilities. Sports pavilions should be designed to be shared for multiple activities and if large enough, provide for public meetings. Support facilities such as the: clubrooms, canteen, storage etc. best consolidated into one building envelope, located on the perimeter of the playing fields. They should serve 2-3 fields. Clubrooms should face the main field from the north or west in order to avoid sun glare for spectators.</p>	<p>As per district facilities. Large pavilion or clubroom facilities to serve more than one sport, may include social of function centre. At least two preferably three playing fields. May include synthetic surfaces. Fully accessible facilities. Spectator facilities provided- such as under cover seating. Generally enclosed by a fence – at least on the perimeter of the reserve- not necessary locked. Onsite car parking.</p>



Monash

National Employment and Innovation Cluster

Draft Framework Plan

March 2017



VICTORIA
State
Government

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Executive Summary

The Monash National Employment and Innovation Cluster (Monash Cluster) has and will continue to have the largest concentration of jobs outside of the Melbourne Central Business District. Positioned centrally within Melbourne's south-east on key arterial roads, bus routes and the Cranbourne-Pakenham railway line, the Monash Cluster has significant investment and specialised activities providing a good foundation for the growth of knowledge industries.

Growing partnerships between the major institutions of Monash University, Monash Medical Centre, Monash Children's Hospital, CSIRO, Australian Synchrotron with business and affiliated research and development facilities will unlock the future potential for growing employment and innovation in the precinct and surrounds.

Planning for the long term and strategic public and private investment will provide the potential to double the number of jobs in the precinct. With suitable buildings, services and facilities to serve a new breed of worker and increased accessibility for established and growing areas of Melbourne's south-east it will thrive.

The Monash National Employment and Innovation Cluster Framework Plan (the framework plan) sets out a shared vision for the next 30 years to build on the cluster's key assets and boost local employment by defining actions to improve the amenity of the cluster, encouraging new services and businesses to establish, improving transport links and public transport and creating partnership groups to coordinate business attraction and investment.

The plan gives the Victorian Government, Councils, developers, business and residential communities greater certainty and confidence about future development within the Monash Cluster.

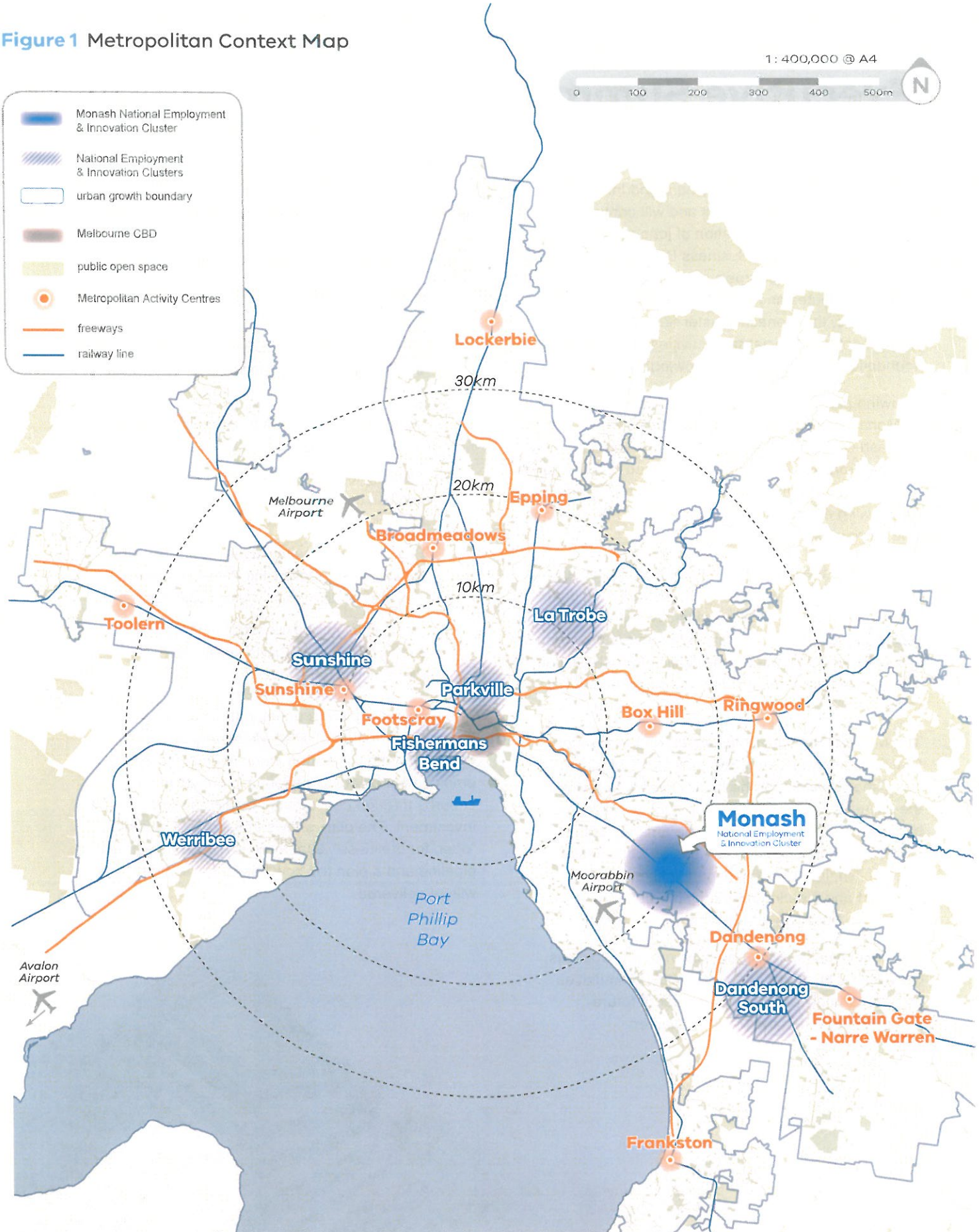
The framework plan outlines a range of strategic priority outcomes to achieve this vision, including:

- Identifying priority projects and partnerships to support implementation of the framework plan;
- A transport plan to increase sustainable transport options and address congestion issues;
- Investigating high capacity public transport projects for Monash University and Monash Technology Precinct;
- Accelerating Westall Road extension project delivery;
- Planning for new business town centres and review of urban design guidelines for development in the Monash Technology Precinct;
- Precinct planning around railway stations and the Health, Education and Research Precinct to support local living and working opportunities; and
- Planning for mixed use urban renewal projects at strategic sites, e.g. Clayton Business Park and PMP Printing (Clayton).

The framework plan is an important step forward in the implementation of *Plan Melbourne 2017-2050*. It is a coordinating action plan aimed at increasing employment by driving economic growth in the suburbs through coordinated public and private investment. The plan shows that Monash cluster is "open for business", that there is a clear investment pipeline and a plan for how this city-shaping project will be delivered.



Figure 1 Metropolitan Context Map



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Context

The population of metropolitan Melbourne is forecast to grow to 7.9 million people by 2050. The state government's strategic planning policy, *Plan Melbourne 2017-2050*, provides directions to successfully navigate the challenges associated with this growth.

It describes Melbourne as a city of centres linked to regional Victoria. The focus of which is to achieve a productive city that attracts investment, fosters innovation and creates jobs. Driving investment into areas with the potential to foster innovation and growth of the knowledge industries will help sustain an increase in jobs at pace with population growth.

The Monash Cluster is one of seven major agglomerations of health, education and employment activities identified within *Plan Melbourne*. Focussing on these agglomerations and connecting them to bring jobs closer to where people live will help to reduce travel times, minimise greenhouse gas emissions and enable greater localisation of activities which contribute to enhanced livability.

The Monash Cluster is located 20km south-east of central Melbourne and is a significant contributor to the national economy. It supports approximately 75,000 jobs across a diverse range of industries and contributes over \$9.4 billion to the Victorian economy each year. It is anticipated that employment numbers within the Monash Cluster have the potential to double over the next 35 years.

With the highest concentration of jobs outside the Melbourne Central Business District, nationally significant facilities, important institutions and a skilled local workforce, the Monash Cluster has all the ingredients for a successful modern business destination.

Strategic investment in the economic precinct centred upon Monash University, Monash University Business Precinct, Australian Synchrotron, CSIRO, Monash Technology Precinct, Monash Children's Hospital and Monash Medical Centre will contribute to employment growth and ensure that the Monash Cluster has continued economic success.

The attraction of the cluster as a middle-suburban destination on the Monash Freeway and the Cranbourne-Pakenham railway line has supported

investment. However, increased road congestion, changing business needs and the expectations of a new breed of workers demands innovative approaches in planning for the cluster.

The business and worker amenity is at risk of decline in some parts of the cluster. Consistent feedback on these issues have resulted in this framework plan seeking to raise the profile of the cluster, implement public transport improvements, promote public realm enhancements and establish new business town centres as destinations that are home to restaurants, cafes, hotels and retail supporting key employment areas.

The planning of the Monash cluster has been underway since 2014. The key outcomes and principles presented in this document, have been developed through research and diverse stakeholder engagement. The plan has evolved from the earlier consultation on the key ideas in April 2016, which received strong support. Key findings of this engagement and subsequent stakeholder consultation have been incorporated in the framework plan.

The framework plan aims to facilitate economic development and foster the intensification of key commercial, education, research and health precincts. Unifying the existing world class facilities and enhancing the image and identity of the Monash Cluster as a globally competitive destination for the brightest minds and greatest innovations will support the vision for more jobs closer to where people live. Strategic sites, activity centres and neighbourhoods close to railway stations provide focal areas for addressing future housing shortages.

This framework plan is the result of research and consultation over the past three years in collaboration with the Cities of Greater Dandenong, Kingston and Monash, as well as Monash University, research institutions, major businesses, representative organisations and the local community. These ongoing partnerships are an essential part of delivering the framework plan and will be instrumental in the ongoing success of the Monash National Employment and Innovation Cluster as it continues to prosper.

Vision

The Monash National Employment and Innovation Cluster will **transform and modernise over the next three decades** as a connected and exciting place for employment, education, innovation, leading-edge technology and research. It will be positioned as a **globally competitive value-creating economy**.

The number of jobs will double over the next 35 years with a significant increase in the education, research, health, science and technology sectors. Through place-making, transformative transport projects and urban renewal investment the cluster will be further established as a highly desirable destination with the highest job density outside of a capital city CBD in Australia.

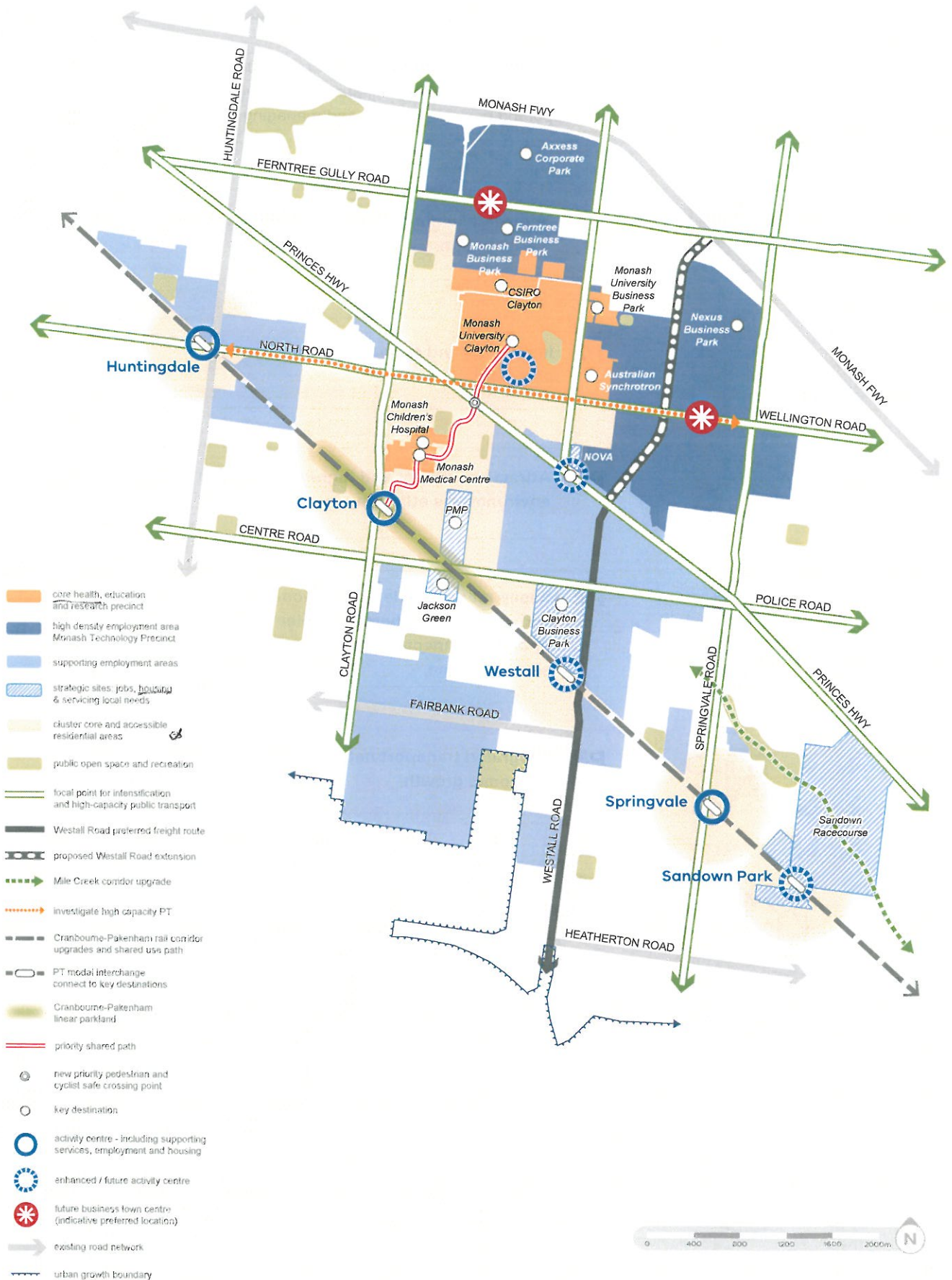
Investment in world leading assets such as Monash University, the Monash Medical Centre, CSIRO and the Australian Synchrotron will attract new research institutions and an array of internationally recognised innovative businesses. Delivery of the Westall Road link to Monash Freeway, grade separation of the Cranbourne-Pakenham rail corridor and creation of the new linear parkland will also catalyse change.

Employment areas will thrive with the development of new business town centres and the renewal of existing activity centres. This will increase local living and create a focal point for life within the cluster. Attractive and connected walking and cycling routes combined with a 'turn up and go' public transport network will revolutionise access and provide connections to health, education and business destinations.

Addressing investment barriers and selecting sites for strategic mixed use renewal will encourage private investment and catalyse changes in the amenity, image and function of these areas. These changes will support a viable 24 hour hub of activity serving the needs of the cluster's major businesses, as well as the worker and resident populations.



Figure 2 Monash National Employment and Innovation Cluster Framework Plan



Principles

The following principles provide a common understanding on the foundation for all future activities required to implement the vision. The principles will be used by government organisations, investors, stakeholders and communities. They are also a reference tool supporting decision-making and managing change within the cluster.



P1 A diverse economy with local community participation.



P2 Intensified and rejuvenated employment precincts.



P3 Attractive, vibrant and high-quality urban environments attracting investment.



P4 Easily recognisable destinations and activity centres where local elements are strongly connected to the broader Cluster's sense of place.



P5 Integrated transport networks that support economic growth.



P6 Affordable and diverse housing that are close to jobs.



P7 Sustainable social infrastructure and open space that meets the needs of people living, working and visiting the Cluster.



P8 Sustainable development with increased climate change resilience, integrated water management and resource efficiencies.

Strategic Outcomes

The framework plan outlines five focused strategic outcomes which build upon the aforementioned principles. These strategic outcomes provide detailed actions to realise the vision for the Monash Cluster.

The strategic outcomes below summarise the key activities that will be the focus of planning and investment in the coming decade. These are further detailed overleaf.



STRATEGIC OUTCOME 1

Grow employment and innovation in the health, education and research precinct.



STRATEGIC OUTCOME 2

Boost jobs growth and develop attractive employment areas with business town centres.



STRATEGIC OUTCOME 3

Transform the transport network to support economic growth of the cluster.



STRATEGIC OUTCOME 4

Develop public open space and community infrastructure.



STRATEGIC OUTCOME 5

Plan and deliver urban renewal projects and strategic sites.

Strategic Outcome 1:

GROW EMPLOYMENT AND INNOVATION IN THE HEALTH, EDUCATION AND RESEARCH PRECINCT

The Health, Education and Research Precinct encompasses the major institutions of Monash University and Business Centre, Monash Medical Centre, Monash Children’s Hospital, CSIRO and the Australian Synchrotron. These world class institutions are the major assets upon which the Monash Cluster is founded, they provide capacity for the cluster to increase employment and harness the resultant investment opportunities.

In particular the Health, Education and Research Precinct requires an increase in education activities, delivery of the Victorian Heart Hospital and new accommodation projects that will enable students, visiting academics, researchers and health professionals to live locally with reduced travel needs.

Forecast expansion of facilities at the Monash University Clayton Campus and a new Victorian Heart Hospital in the precinct will bring new opportunities that will require improved connectivity.

Actions	Time frame	Lead agencies
<p>1.1 Prepare a Structure Plan for the Health, Education and Research Precinct to:</p> <ul style="list-style-type: none"> a) Integrate land use and transport and establish walking and cycling links with safe arterial road crossings connecting from the university to research facilities, hospitals and Clayton Station; b) Support growth of major institutions and establishment of Victorian Heart Hospital; c) Encourage non-government investment in health, research and education activities nearby; and d) Address the need for diverse housing opportunities within a walkable distance. 	Short	VPA
<p>1.2 Establish a taskforce to advocate for and represent key interests from health, education and research institutions.</p>	Short	VPA



Figure 3 Health, Education and Research Precinct Plan



Strategic Outcome 2:

BOOST JOBS GROWTH AND DEVELOP ATTRACTIVE EMPLOYMENT AREAS WITH BUSINESS TOWN CENTRES

To support the forecasted doubling of jobs in the Monash Cluster, a concerted effort will be required to create more vibrant activity and business centres. The cluster has been very successful as a major employment area. It must now continue to grow and modernise, in particular addressing gaps in the range of land uses and infrastructure that is sought by businesses and their employees. Addressing planning scheme limitations and investing in public transport and the public realm will catalyse positive change.

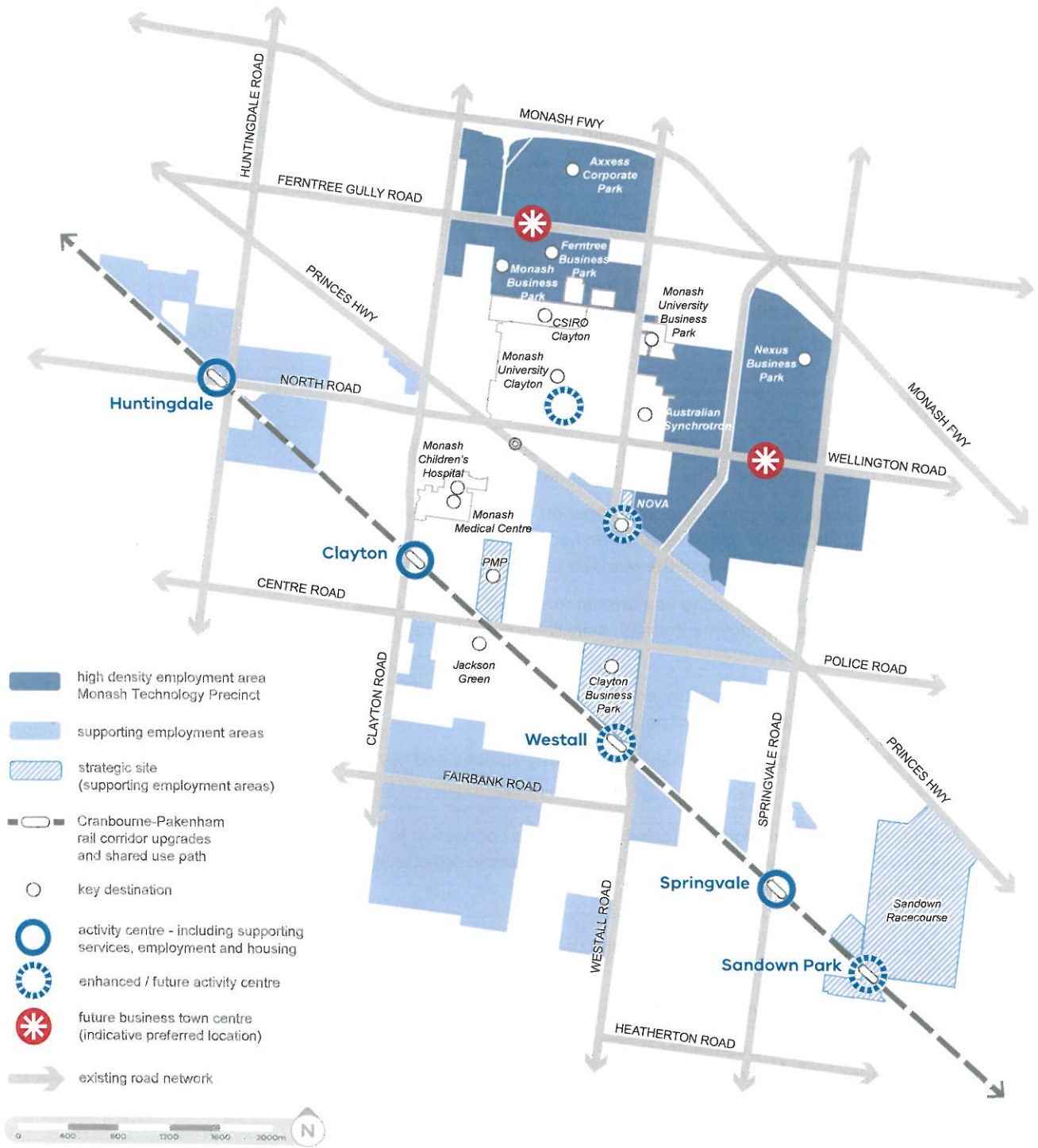
By concentrating a range of retail, business accommodation, community services and public open space within the heart of the employment areas, there will be greater potential to deliver the amenity, vibrancy

and interest that is lacking in areas such as the Monash Technology Precinct. There is also increasing need to serve the employment areas with commercial, retail and entertainment opportunities which are complemented with high-quality housing nearby.

Fostering investment in the Monash Technology Precinct (high density employment area) and the industrial areas of Huntingdale, Clayton and Springvale (supporting employment areas) will also catalyse change. Diversifying business mix, taking advantage of agglomeration benefits and prioritising linkages with the health, education and research facilities will leverage opportunities for growth.

Actions	Time frame	Lead agencies
<p>2.1 Prepare a future employment and investment attraction strategy for the cluster and update planning policies for high density and supporting employment to promote investment and renewal opportunities that target jobs growth.</p>	Short	DEDJTR
<p>2.2 Plan for at least two new business town centres in the Monash Technology Precinct and implement with a planning scheme amendment to:</p> <ul style="list-style-type: none"> a) Ensure the majority of employment area is within 500m walkable distance; b) Include a mix of retail (including small supermarkets), hospitality and open space to suit business and worker needs; c) Have convenient access to or include visitor accommodation, conference facilities; and d) Be accessible by public transport. 	Short	VPA MCC
<p>2.3 Amend the Monash Planning Scheme to allow residential hotels as a permissible use within the Monash Technology Precinct to support business accommodation and conference activities that serve the employment areas.</p>	Short	VPA
<p>2.4 Review the Urban Design Guidelines for the Monash Technology Precinct to support higher density employment and development of a 21st century business park environment.</p>	Short	MCC
<p>2.5 Advocate for the rollout of high performance broadband to business and employment areas.</p>	Short	DEDJTR
<p>2.6 Plan a network of vibrant activity centres that provide a range of services and facilities to support local living with good sustainable transport links. Refer to Strategic Outcome 5 for further detail.</p>	Short-Medium	VPA MCC KCC GDCC

Figure 4 Employment Areas Plan



Strategic Outcome 3:

TRANSFORM THE TRANSPORT NETWORK TO SUPPORT ECONOMIC GROWTH OF THE CLUSTER

Good transport connections to and within the Monash Cluster are critical to its success. The precinct will require a substantial shift to more walking, cycling and public transport patronage to alleviate congestion, promote commercial activity and ensure the cluster is a destination of international standing. Congestion impacts productivity and detracts from a precinct's ability to attract employment.

A regular mile grid and network of north-south and east-west arterial roads, the Cranbourne Pakenham railway line as well as shuttle and Smart Bus routes in the cluster offer an excellent foundation on which to overlay more convenient connections and new transport modes. A range of significant infrastructure projects complemented by small scale interventions will be required to ensure that the economic performance of the area does not decline.

With a place making role and a focus on the 10km radius of connectivity, the transport vision for the cluster and other clusters in metropolitan Melbourne will form an overlapping network within the polycentric city.

Actions	Time frame	Lead agencies
<p>3.1 Plan for a range of high-frequency and high-capacity public transport solutions to be developed in the short to long term, including:</p> <ul style="list-style-type: none"> a) Investigate high-capacity public transport options to serve Monash University as well as the associated health, education and research institutions, and the Monash Technology Precinct; b) Boost bus services along key arterial roads and connect major destinations (employment areas, activity centres and residential areas); c) Prioritise links between key employment, retail and residential areas with the broader rail network; and d) High-quality modal interchanges at railway stations and key destinations. 	Short-Long	TV VPA
<p>3.2 Accelerate the Westall Road preferred freight route connection to Monash Freeway, ensuring adequate levels of access in order to support the growth of local jobs.</p>	Short	VicRoads
<p>3.3 Develop a high quality walking and cycling network to achieve the following:</p> <ul style="list-style-type: none"> a) Connect high demand destinations; b) Recreational and commuter routes including continuous Cranbourne-Pakenham railway line shared path and along arterial routes connecting to the broader region; and c) Expanding the local bike share scheme from Monash University to the surrounding areas to enable efficient and low-cost movement between key destinations. 	Short- Medium	TV MCC KCC GDCC

Figure 5 Transport Plan



Strategic Outcome 4:

DEVELOP PUBLIC OPEN SPACE AND COMMUNITY INFRASTRUCTURE

A large part of the amenity and social life of the cluster is derived from the public places, buildings and services that support the needs of the local community. They offer places of respite, cultural expression and help to meet every day needs for childcare, health centres, libraries and education. Open spaces and landscaped streets also contribute to sustainability and resilience against the effects of climate change.

Community infrastructure is delivered by both the public and private sector to support the needs of the community, including workers, visitors, students and residents. Areas of higher change will require a concerted effort to plan for and deliver the types of places that meet the needs for a good quality of life. This is essential as an attractor for people who live, work in, or visit the cluster.

Actions	Time frame	Lead agencies
4.1 Plan for infrastructure and open spaces within employment areas to assist in creating a sense of community and meeting worker needs such as health and fitness facilities, co-working spaces and meeting places.	Short	MCC KCC GDCC
4.2 Identify community infrastructure priorities as the basis for developing an Infrastructure Contribution Plan.	Short	MCC KCC GDCC
4.3 Establish public open space contribution rates that will ensure open space improvements, support anticipated change in employment, resident and visitor population needs and mitigate the urban heat island effect.	Short-Medium	MCC KCC GDCC
4.4 Develop a future education growth plan to support local population changes with appropriate expansion or upgrades to primary and secondary schools.	Short-Medium	DET



Figure 6 Open Space and Community Infrastructure Plan



Strategic Outcome 5:

PLAN AND DELIVER URBAN RENEWAL PROJECTS AND STRATEGIC SITES

Urban renewal projects offer significant opportunities for integrated planning at the local level to address the goals of this plan and resolve specific opportunities and challenges. Planning will be delivered in a coordinated manner in the short term with development taking place in the medium to long term.

Precincts such as activity centres and underutilised industrial land offer opportunities for urban renewal.

These areas will be reimagined from segregated strip shopping centres to integrated mixed use precincts that offer a range of lifestyle activities across a larger proportion of the day and more diverse housing. Highly accessible residential areas with good access to services and facilities also offer opportunity for increased diversity of housing.

Strategic sites are places that have come to the end of Monash's post-war manufacturing economy and are available for reinvestment. These sites require a new 'vision' or purpose to guide change in a way that can support the cluster.

Key precincts and strategic sites are further outlined on pages 17-23. Further work will be undertaken to scope and deliver these projects with the involvement of local communities and stakeholders.

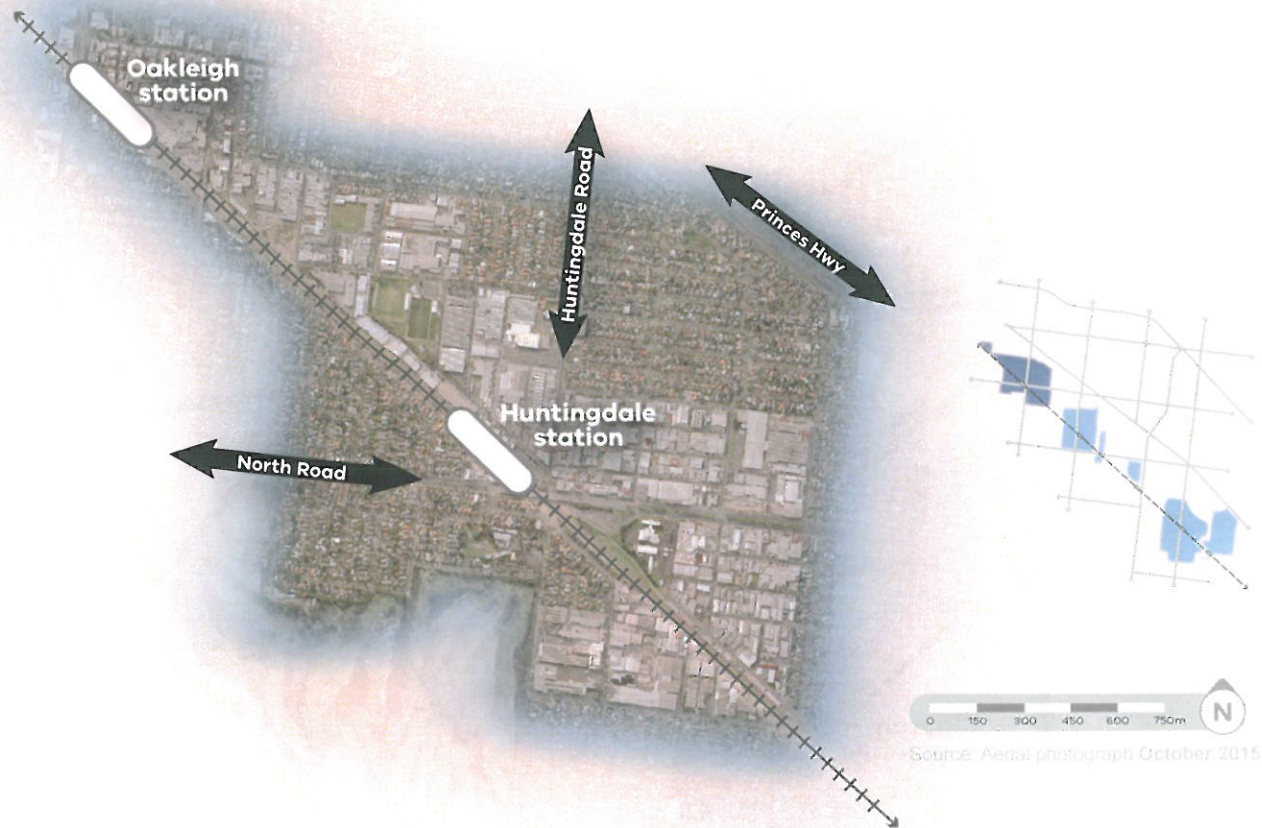
This detailed planning work should be undertaken on the basis of the following principles:

- Optimise economic and social participation of local communities through development of ongoing local employment opportunities and new housing choices;
- Prioritise contemporary approaches to integrated mixed use development founded on walking and cycling access, and where possible maximising public transport integration;
- Establish a high standard of urban design that can contribute positively to the image and identity of the cluster;
- Plan for open spaces and landscaping that can transform the image of the precinct, mitigate the urban heat island effect, provide water retention and address recreational needs;
- Future proofing development through early planning for utilities and service provision that optimise long term efficiency and affordability;
- Social, cultural and entertainment needs of the growing and changing population are met;
- New and diverse housing around existing activity centres, in proximity to the Health Education and Research precinct, Monash Technology Precinct and at strategic sites are a priority;
- A range of housing options that provide accommodation locally for workers, students, visitors to key institutions and those choosing to age in place; and
- Address the potential risk of community displacement through the provision of social and affordable housing within the cluster.

Figure 7 Urban Renewal Precincts and Strategic Sites Plan



5.1 – Huntingdale Activity Centre



Key Elements

- 238 Hectares
- Huntingdale Train Station
- Huntingdale Road strip shopping centre
- Industrial precincts aligned to the railway and North Road
- Huntingdale bus interchange
- Substantial industrial areas provide local employment

Long Term Objectives

The Huntingdale Activity Centre is an important gateway, transit interchange and node of activity for Monash University and the local community. A greatly improved public realm will change the feel of the area as a destination rather than simply acting as a transport interchange. Renewal of industrial precincts will boost local economic performance and expand the array of jobs in the cluster. Increased dwelling diversity and density will support a range of successful community, retail and recreational infrastructure.

Action

City of Monash to prepare a structure plan for the Huntingdale Activity Centre to foster the creation of a successful transport interchange, address barriers caused by road and rail infrastructure and to support renewal achieving commercial growth and residential diversity in the area.

Timing

Short term (1-5 years)

Current Status

City of Monash is preparing a project scope for future planning of the Huntingdale Activity Centre and surrounding industrial precinct. The City of Monash's Industrial Strategy identifies the Huntingdale / Oakleigh South employment land as a future business park commercial development. Under consideration in the Monash Planning Scheme Amendment C125 is application of the General Residential Zone to much of the area, however precincts closest to the Station are identified for further work under the Monash Housing Strategy.

5.2 – Clayton Activity Centre



Key Elements

- 125 Hectares
- Clayton Train Station (to be rebuilt as part of Cranbourne-Pakenham rail upgrades)
- Monash Medical Centre and Children's Hospital
- Clayton Road shopping strip
- Proposed level crossing removals on Clayton Road and Centre Road
- Clayton Community Centre
- Fregon Reserve and Meade Reserve

Long Term Objectives

Clayton Activity Centre will be one of a series of centres in the Monash Cluster. It will be home to a diverse mix of uses that will support the local and regional community. Increased access to services and facilities, improved housing diversity and vastly improved public spaces will elevate the importance of this centre as a major destination. The level crossing removals on Clayton Road and Centre

Road, provision of new public open spaces and upgrades to the railway station will be leveraged to catalyse changes nearby. These changes will further support the establishment of the Clayton Train Station transport interchange and shopping centre as a pivotal hub for the nearby Health, Education and Research Precinct.

Action

VPA (in collaboration with the Cities of Monash and Kingston) to prepare a structure plan and streetscape master plan for the Clayton Activity Centre to grow retail and employment, improve the public realm, support a greater mix of housing and develop a network of open spaces.

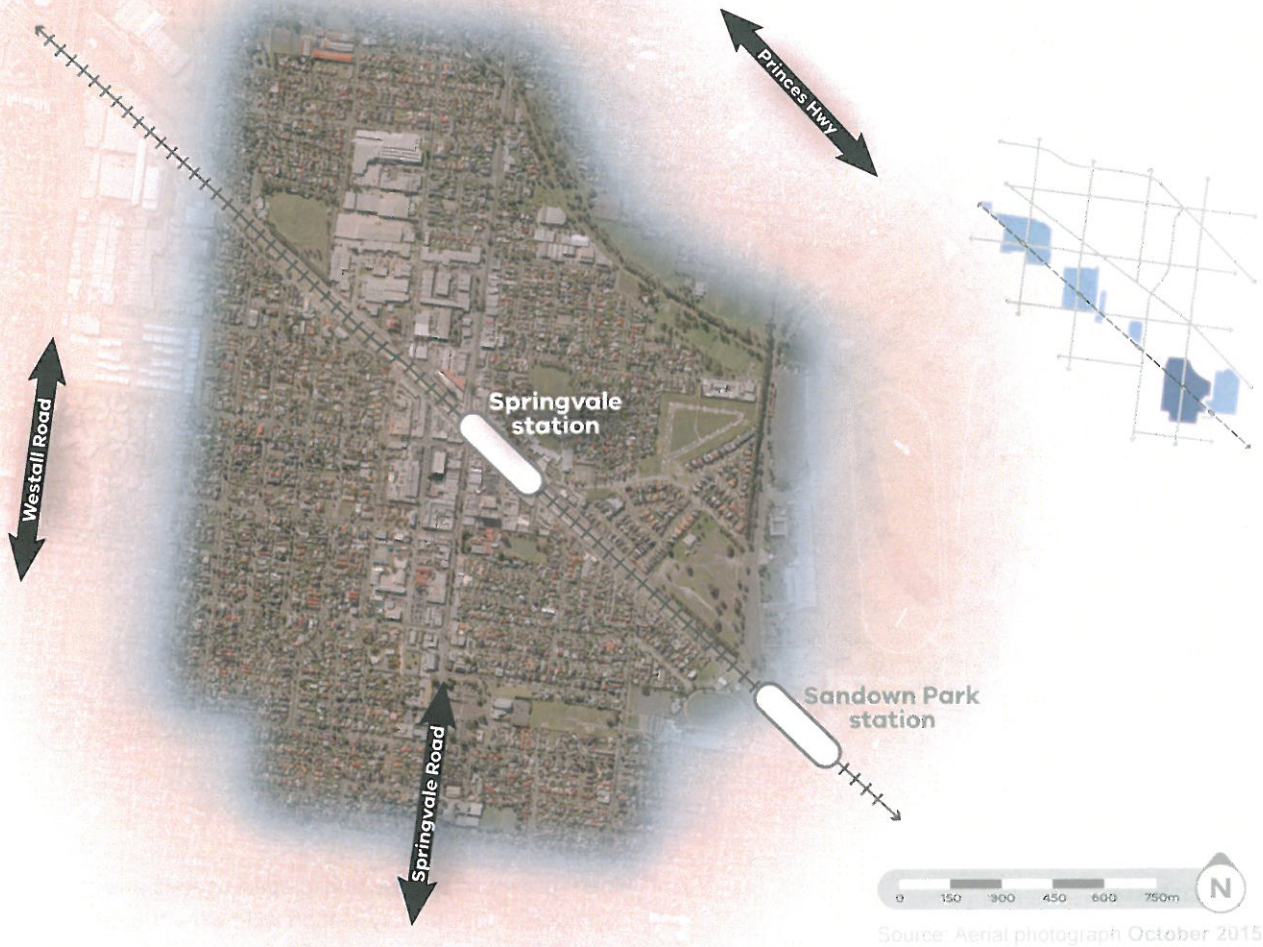
Timing

Short term (1-5 years)

Current Status

The VPA is currently leading the preparation of a precinct structure plan for the Clayton Activity Centre.

5.3 – Springvale Activity Centre



Key Elements

- 220 Hectares
- Springvale Train Station
- Growing night time economy and retail diversity
- Springvale Community Precinct
- Springvale Road Boulevard upgrade
- Asian Cultural Precinct

Long Term Objectives

Building on its unique cultural and food retailing strengths, Springvale Activity Centre will increasingly become a place of business growth and local employment opportunities supporting local living. A high degree of connectivity and accessibility for pedestrians and cyclists will improve movement and access. Greater housing choices and safer,

more attractive streets will enliven the area. Site responsive and innovative development that achieves environmentally sustainable design outcomes and distinctive, safe and green open spaces will be provided for residents, workers and visitors to enjoy.

Action

City of Greater Dandenong to prepare a structure plan and implement public realm improvements to support the growth and vitality of the activity centre

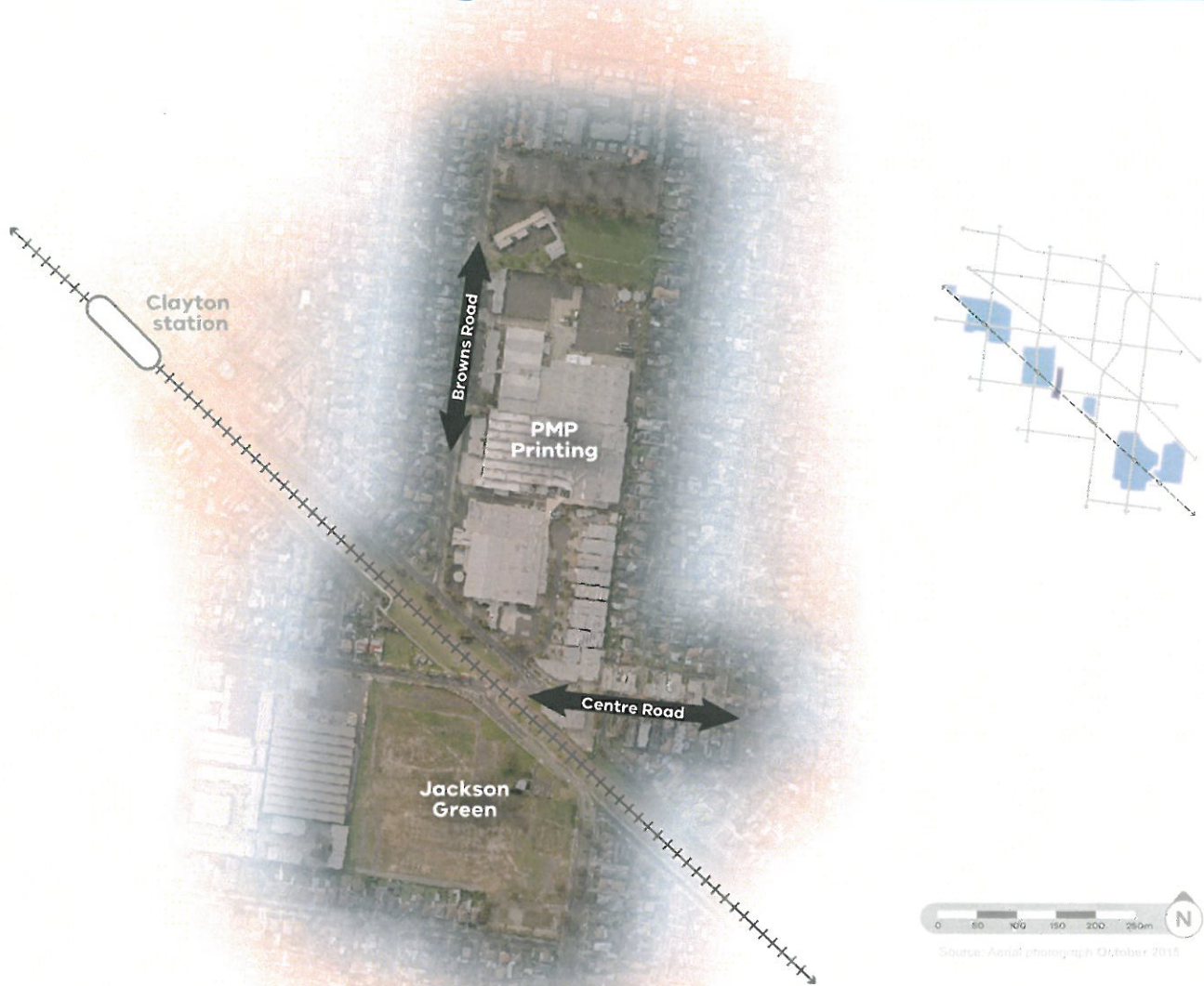
Timing

Short term (1-5 years)

Current Status

City of Greater Dandenong are leading the preparation of the Springvale Structure Plan update. This will be finalised in 2017.

5.4 – PMP Printing / Centre Road Precinct



Key Elements

- 22 Hectares
- PMP Printing strategic site comprises 7ha (31-49 Browns Road) and 4ha (201-209 Carinish Road)
- Adjacent Centre Road/Browns Road with the Jackson Green urban renewal site located to the south
- Bendix Drive small lot industrial precinct

Long Term Objectives

Renewal of the industrial development to complement Clayton Activity Centre and the adjacent Centre Road commercial precinct with a range of employment opportunities, diverse housing and public open space will rejuvenate and enhance the character of the precinct. Regeneration of the adjacent Commercial 1

Zone will encourage shop-top housing and retail that serves the local community.

Action

The VPA (in collaboration with City of Monash) to prepare a structure plan addressing the future of industrial land at the PMP Printing site and surrounds

Timing

Short term (1-5 years)

Current Status

The Level Crossing Removal Authority is finalising the Centre Road level crossing removal site design. VPA has commenced a process to plan the precinct with City of Monash, landowners and other stakeholders.

5.5 – Clayton Business Park



Key Elements

- 31 Hectares
- Westall Train Station
- Westall Road frontage on the eastern boundary, preferred freight route
- Large industrial area to the north and east
- Westall Primary and Secondary Schools to the south

Long Term Objectives

Centred on a new high density business park with supporting retail and a mix of housing, redevelopment of the Clayton Business Park will create a contemporary mixed use precinct for the Monash Cluster. The site will offer increased access to employment, services, housing and public spaces adjacent to the Westall Train Station. The new

business town centre will service the needs of the future community as well as local businesses and their employees.

Action

The VPA (in collaboration with City of Kingston and landowners) to prepare a Comprehensive Development Plan and planning scheme amendment.

Timing

Short term (1-5 years)

Current Status

The VPA is currently working with a range of government agencies, councils and the landowner to develop a Comprehensive Development Plan for the Clayton Business Park.

5.6 – Sandown Park Station Precinct



Key Elements

- 150 Hectares
- Sandown Park Train Station and Princes Highway access
- Sandown Racecourse, 110ha major cultural destination for horse and car racing facilities and function centres
- Sandown Park Greyhound, 8ha destination for greyhound racing and affiliated activities
- Good access to both Springvale and Noble Park activity centres
- Mile Creek and public reserves to the north-west and south-east

Long Term Objectives

Redevelopment within Sandown Park Station Precinct to accommodate a mix of residential, employment, retail and community uses which encourage local living and take advantage of proximity to other parts of the cluster. The Mile Creek riparian area and water

management measures offer the potential to develop a distinctive urban precinct within a landscaped setting which takes advantage of the Cranbourne Pakenham railway corridor upgrades and new bus connections. The development of an activity centre, community infrastructure, open space and recreational facilities with convenient local access should be investigated.

Action

The VPA (in collaboration with City of Greater Dandenong) to prepare a structure plan for the overall precinct.

Timing

Medium term (5-10 years)

Current Status

The Melbourne Racing Club (MRC) in collaboration with the City of Greater Dandenong and Victorian Planning Authority are preparing a master plan for the Sandown Racecourse site.

Implementation

ACTION		TIMING	LEAD AGENCIES
Strategic Outcome 1: Grow employment and innovation in the health, education and research precinct			
1.1	Prepare a Health, Education and Research Precinct Structure Plan	Short	VPA
1.2	Establish a taskforce to advocate for and represent key interests from health, education and research institutions	Short	VPA
Strategic Outcome 2: Boost jobs growth and develop attractive employment areas with business town centres			
2.1	Prepare a future employment and investment attraction strategy for the cluster and update planning policies for employment areas	Short	DEDJTR
2.2	Plan for at least two new business town centres in the Monash Technology Precinct and implement planning scheme amendment	Short	VPA MCC
2.3	Amend the Monash Planning Scheme to allow residential hotels in the Monash Technology Precinct	Short	VPA
2.4	Review Monash Technology Precinct Urban Design Guidelines	Short	MCC
2.5	Advocate for the rollout of high performance broadband to business and employment areas	Short	DEDJTR
2.6	Plan a network of activity centres that provide a range of services and facilities to support local living with good sustainable transport links (refer to Strategic Outcome 5 for detail)	Short-Medium	VPA MCC KCC GDCC
Strategic Outcome 3: Transform the transport network to support economic growth of the cluster			
3.1	Prepare and implement a high-frequency and high-capacity public transport plan	Short-Long	TfV
3.2	Accelerate the Westall Road preferred freight route connection to Monash Freeway, ensuring adequate levels of access in order to support the growth of local jobs	Short	VicRoads
3.3	Develop a high quality walking and cycling network connecting high demand destinations including between major activity nodes	Short-Medium	TfV MCC KCC GDCC
Strategic Outcome 4: Develop public open space and community infrastructure			
4.1	Plan for infrastructure and open spaces within employment areas to assist in creating a sense of community and meeting worker needs such as health and fitness, co-working spaces and meeting places	Short	MCC KCC GDCC
4.2	Identify priority community infrastructure as the basis for developing an Infrastructure Contribution Plan	Short	MCC KCC GDCC
4.3	Establish Public Open Space contribution rates that will ensure open space improvements, support anticipated change in employment and mitigate the urban heat island effect	Short-Medium	MCC KCC GDCC
4.4	Develop a future education growth plan to support the growing local population with appropriate expansion or upgrades to primary and secondary schools	Short-Medium	DET
Strategic Outcome 5: Plan and deliver urban renewal projects and strategic sites			
5.1	Prepare Huntingdale Activity Centre and Industrial Precinct Structure Plan	Short	VPA MCC
5.2	Prepare Clayton Activity Centre Structure Plan	Short	VPA MCC KCC
5.3	Prepare Springvale Activity Centre Structure Plan update	Short	GDCC
5.4	Prepare PMP Precinct / Centre Road Structure Plan	Short	VPA MCC
5.5	Prepare Clayton Business Park Comprehensive Development Plan	Short	VPA KCC
5.6	Prepare Sandown Park Station Precinct Structure Plan	Medium	VPA GDCC

9. Golder Associates Pty Ltd report (Geotechnical Investigation) dated 25th November, 2010 (reference: 107612066-019-R-Rev1).

25 November 2010


GEOTECHNICAL INVESTIGATION
98 - 116 Cavanagh Street,
Cheltenham

Submitted to:
R Project 9 Pty Ltd
Level 10, 560 Chapel Street
South Yarra
VIC 3141

REPORT

A world of capabilities delivered locally

Report Number: 107612066-019-R-Rev1
Distribution:
1 Copy - R Project 9 Pty Ltd
1 Copy - Golder Associates Pty Ltd





98-116 CAVANAGH STREET

4.0 OBJECTIVES OF INVESTIGATION

In accordance with our understanding of your requirements, the objectives of the additional geotechnical investigations were:

- To assess the subsurface soil conditions beneath the proposed residential development.
- To assess the natural soils encountered beneath uncontrolled backfill, in particular at likely pile founding depths.
- To provide insitu strength/consistency data for natural materials.

5.0 PREVIOUS GEOTECHNICAL INVESTIGATIONS

R Project 9 provided copies of previous geotechnical reports to Golder Associates to review the site history and former earthwork activities at this site. These reports include:

- Solmech Pty Ltd, (19 October 1988). 'Filling and Development of Pit, Cavanagh Street, Cheltenham', Preliminary Report.
- SMEC Pty Ltd, (4 June 2010). 'Geotechnical Investigation, 98 – 116 Cavanagh Street, Cheltenham, Vic.', Ref: 3004557, Revision No. FINAL

The fill as described in the Solmech and SMEC borehole investigations appears to generally be clean, and described as sandy clay or clayey sand, but with some relatively extensive zones containing builder's and demolition rubble, including timber. We note that some near surface excavations undertaken by SMEC show some deleterious material present in test pit exposures.

The groundwater table within the quarry is understood to have been measured by SMEC at depths of between about 9 m and 15.7 m, suggesting locally higher perched water tables are present.

Borehole and test pit logs associated with these reports are provided in Appendix B. Figure 2 presents the approximate location of previous investigations.

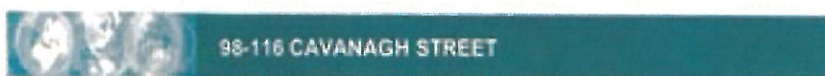
6.0 METHOD OF INVESTIGATION

The field program for the additional geotechnical investigation was developed to establish expected founding conditions for pile foundations. Boreholes were located where the anticipated depth of the base of the landfill is shallow or outside the landfill wall. The scope of work comprised the drilling of 5 boreholes, with one borehole drilled to a depth of about 30 m and the other four drilled to depths of about 25 m.

A licensed surveyor set out the proposed borehole locations. Three of the five proposed borehole locations were revised, by Golder Associates, in the field due to site constraints. Borehole BH03 was moved from the proposed location on a sloped surface due to unsuitable conditions to establish the truck-mounted drill rig. The as-drilled locations of the boreholes are presented on Figure 2.

The drilling program was undertaken between 8 November 2010 and 12 November 2010. Drilling was undertaken by a specialist drilling contractor using a truck-mounted drill rig to advance all of the boreholes included in the drilling program. The boreholes were advanced using solid auger and washboring techniques through fill and natural soils. Standard Penetration Tests (SPT) were undertaken at regular intervals for visual and strength assessment purposes. A geotechnical engineer from Golder Associates was on site during the investigation works and collected samples and described the soils encountered.

All boreholes were backfilled with grout to the surface upon completion.



7.0 RESULTS OF INVESTIGATION

7.1 Site geology

The geological survey of Victoria 1:63,360 "Ringwood" mapsheet indicates the subsurface materials (natural soils around and below the former sandpit) generally comprise Quaternary age recent swamp deposits overlying Tertiary age Brighton Group sands and gravels. These materials are described as fine to coarse grained with minor poorly sorted gravels, typically poorly consolidated. The Tertiary age Brighton group deposits are understood to be main purpose for the quarry activities at this site. The Brighton Group sands and gravels overlies a layer of black silty sand inferred to be of the Werribee Formation. The Werribee Formation is a Tertiary age sediment.

The following describes in further detail the geologic units encountered during the additional geotechnical investigation for the proposed residential development.

7.2 Subsurface Conditions

The subsurface conditions encountered during the field investigation are presented in the reports of Boreholes BH01 to BH05 presented in Appendix A of this report, along with the following information relevant to their interpretation:

- Explanation of Notes, Abbreviations and Terms used on Borehole Reports.
- Method of Soil Description used on Borehole and Test Pit Reports.

Unit 1 – Fill

Fill soils were encountered in all boreholes drilled at the site. The fill materials typically comprise of very loose to medium dense clayey sands and sandy clays with inclusions of gravel, brick pieces and wood fragments. The fill layer was typically yellow-brown in colour and varied in thickness from about 0.4 m around the landfill edge to about 19 m in the centre of the landfill.

Unit 2 - Brighton Group

The Brighton Group deposits were encountered in all boreholes drilled at the site below the Unit 1 - fill materials. The Brighton Group deposits typically comprise dense to very dense sand and clayey sand. These deposits are varied in colour, gravel content and cementations. Refusal or practical refusal was recorded in a number of SPTs performed in these deposits, but towards the base of this unit most notably in borehole BH05, lower penetration resistances were recorded.

The thickness of this layer ranges from about 2.6 m at borehole BH03 in the centre of the landfill to about 20.3 m at borehole BH01 on the landfill edge.

Unit 3 - Werribee Formation

All boreholes were terminated in what is inferred to be the Werribee Formation, which underlies the Brighton Group deposits. Soils encountered in this formation typically comprise dark grey and black, loose to medium dense silty sand. This formation comprises interbedded layers of cemented sand and gravel which typically accounted for the higher penetration resistances observed during drilling and in-situ testing.

Summary

A summary of the materials observed in the 5 boreholes drilled as part of this investigation and the levels at which they were encountered is presented in Table 1 below. Ground surface elevations at borehole



locations are approximate as as-drilled locations were not surveyed upon completion of investigation program.

Table 1: Summary of Subsurface Materials

Unit	Depth Range (m)				
	BH01 R.L. 43.43 (m-AHD)	BH02 R.L. 43.62 (m-AHD)	BH03 R.L. 42.96 (m-AHD)	BH04 R.L. 43.40 (m-AHD)	BH05 R.L. 38.16 (m-AHD)
Unit 1 – Fill	0.0 - 0.4	0.0 - 3.3	0 - 18.4	0 - 19.0	0 - 3.7
Unit 2 – Brighton Group	0.4 - 20.7	3.3 - 22.9	18.4 - 21.0	19.0 - 23.5	3.7 - 19.3
Unit 3 – Werribee Formation	20.7 - 25.5	22.9 - 25.5	21.0 - 25.45	23.5 - 30.0	19.3 - 25.5
End of Borehole (m)	25.5	25.5	25.45	30.0	25.5

The information presented above has been used to form a series of cross sections to represent the subsurface geology beneath the proposed residential development. The locations of the cross sections are shown on Figure 2 and cross sections are presented in Figure 3.

7.3 Groundwater

Groundwater was not encountered up to the depth augered at each borehole location. Observations below this depth were not possible as drilling fluid was used to complete all boreholes.

8.0 GEOTECHNICAL ISSUES AND DISCUSSION

The results of our geotechnical investigation indicate that the Brighton Group "bench" expected along the south and south west parts of the site as indicated on contour plans developed from Land Air survey photogrammetry was not encountered in borehole BH04. We have inferred that "benches" areas were possibly mined and then backfilled over a period not covered by the aerial photography used to develop quarry extent. This fill is classified as uncontrolled fill for the purposes of pile design. Without further exploration in these areas or additional photogrammetry data being made available, we recommend pile driving contractors assume that these materials are unsuitable founding soils and piles will need to extend in to the natural Brighton Group soils. At boreholes BH03 and BH04 the Brighton group formation was encountered at R.L. 24.56 and R.L. 24.40 m respectively. Based on these results, at a minimum, piles lengths in excess of 20 m may be necessary to found in natural soils in the thickest parts of the landfill.

The Brighton Group sediments at and below the approximate maximum depth of the landfill vary from very dense to loose and as such present a variable founding layer. We understand the use of 275 mm square precast piles is being considered and that the maximum design ultimate load for the piles is 963 kN. Except where there is a metre or more of very dense sand present, it is unlikely the piles will achieve this capacity in end bearing alone. Additionally, although 2.6 m thickness of the Brighton Group sediments were encountered in borehole BH03, the results of insitu testing in borehole BH05 indicate a reduction in soil strength at the base of the Brighton Group sediment which was not encountered in other boreholes. This indicates that the thickness of those potentially stronger materials may be even less elsewhere on site. As such, piles founded within the deepest sections of the landfill may not obtain the required capacity before exiting the Brighton Group. If the required capacity is obtained by founding piles in the Brighton Group,



settlement limits may need to be considered as pile loads will likely be transferred to the weaker Werribee Formation.

Piling contractors should consider the limited thickness of the Brighton Group formation in areas under the landfill, and be prepared to extend piles deeper into the Werribee Formation. The Werribee Formation sediments are typically less dense than the Brighton Group soils and based on in-situ testing are classified as loose to medium dense (low range). If the required pile capacities to support building loads are to be obtained within this formation, piles may need to be driven deeper into the layer to mobilize the required frictional capacity of the piles. Settlement of the looser Werribee Formation will also need to be considered as the part of the pile foundation design process.

9.0 LIMITATIONS

Your attention is drawn to the document - "Limitations" (LEG04, RL1), which is included in Appendix C of this report. The statements presented in this document are intended to advise you of what your realistic expectations of this report should be. The document is not intended to reduce the level of responsibility accepted by Golder Associates, but rather to ensure that all parties who may rely on this report are aware of the responsibilities each assumes in so doing.

We would be pleased to answer any questions the reader may have regarding these 'Limitations'.



Report Signature Page

Maysill Pascal
Geotechnical Engineer

Max Ervin
Principal

MGPIMCE/mgp

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State Government of Victoria

Environment Protection Authority



Environment
Protection
Authority Victoria

Call EPA 24 hours a day.
1300 372 842 or **1300 EPA VIC**

Current issues

Clayton South, Clarinda and Dingley Village odours



Landfills in the Clayton South, Clarinda and Dingley Village area.

EPA is working hard to ensure landfill operators are addressing the causes of odour issues in the area. We receive pollution reports relating to odour from the local community, and regularly inspect landfills and meet with landfill operators.

Closed landfills

The majority of landfills in the Clayton-Dingley region have stopped accepting waste. Victory and Fraser Road landfills are accepting waste, but are estimated to close at the end 2016 and middle of 2017, respectively.

The closed sites are in the process of complying with Pollution Abatement Notices (PANs), which require operators to develop plans for the long term management of leachate, gas management, and final rehabilitation of their site. Once these plans are verified by an independent auditor and therefore fulfil the requirements in the PANs, the closed sites will be issued with a final Post Closure Pollution Abatement Notice (PC PAN) which details the specific ongoing monitoring and aftercare requirements. Once issued, the closed sites will then have their licence revoked meaning they can no longer accept any waste.

What does this mean for odour?

As waste is no longer accepted at closed sites, we expect odour to decrease.

When remedial works take place, however, there may be short term odour impacts. Under the requirements of the PC PAN, sites may be required to install additional gas bores. During the installation of these bores, it may be necessary to turn off gas extraction systems. As a result of this, it is possible that some landfill gas may be emitted, potentially causing some short term odour.

It is important to continue to report odour to EPA, as the data assists us to profile any odour issues in the area, and informs the need for inspections.

Our work in regulating closed landfills

Ongoing environmental management of closed landfill sites is regulated by EPA through the use of a PC PAN as an ongoing regulatory tool.

The process of issuing a PC PAN commences with the closure of the landfill, when waste acceptance ceases. Once this has occurred, EPA requires the landfill owner to gather information and data on the management of the closed landfill, the development of rehabilitation plans, aftercare management and monitoring programs. A hydrogeological assessment is also required. Following the completion of these plans and documents, PC PANs are issued that require the implementation of these specific plans and programs, along with regular reporting to EPA and the independent environmental auditing of the closed landfill at a frequency appropriate to the risks posed by the site.

Once a final PC PAN is issued, the landfill surrenders its licence and is no longer permitted to accept waste. For further details on the PC PAN process please refer to the [Closed Landfill Guidelines](#).

Cold weather

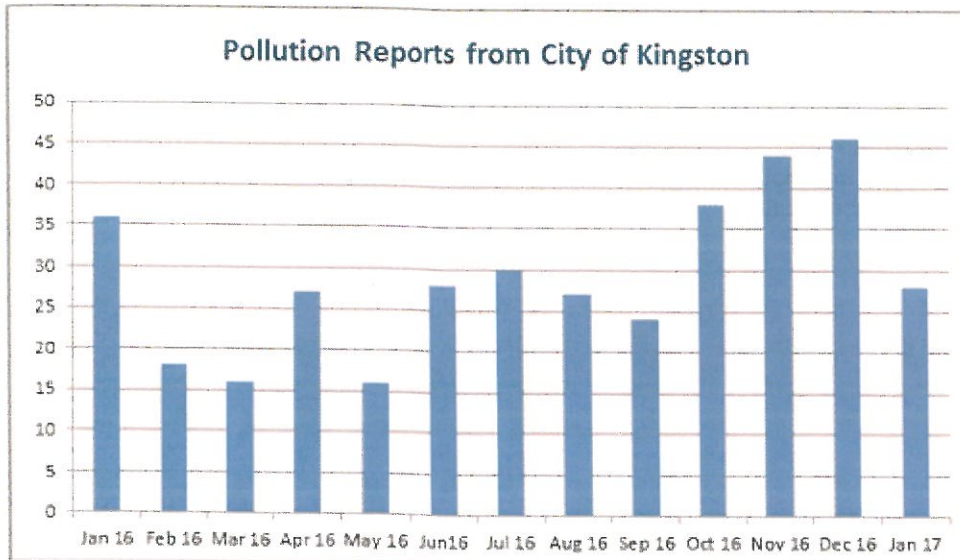
Cold weather can cause an increase in odour reports, as rain reduces the effectiveness of gas extraction systems. Still conditions during the day, followed by cold, still nights, can also cause gas to become trapped and accumulate close to the ground instead of dissipating into the atmosphere.

Kingston City Council planning amendment

Kingston City Council proposed an amendment to the planning scheme in the area. Among other changes, Amendment C143 includes rezoning land outside the urban growth boundary north of Kingston and Heatherton Roads. EPA provided a submission to the planning panel on 20 March 2015 and the amendment was approved by the Minister for Planning on 15 October 2015.

The amendment is required to implement the recommendations of the Kingston Green Wedge Plan, April 2012 in relation to landfills, waste transfer and materials recycling. The Plan was adopted by Kingston City Council on 27 August 2012. The Plan acknowledges that the northern section of Kingston's Green Wedge has been extensively mined for its sand resources and that a number of landfills located on these former mines are nearing the end of their lifecycle. Most landfills will cease waste operation by 2017. Post closure, these sites will require rehabilitation for a number of years.

See the [Kingston City Council website](#) for more information on current planning scheme amendments.



How you can get involved

Cleanaway operates several landfills in the Clayton area. It also has a 24/7 hotline service for concerned residents: **1800 213 753**. All calls are registered with an operator and followed up with a return call within 24 hours.

Continue to [report to EPA](#) if you're affected by odour pollution. It is best to report via our 24/7 pollution hotline: **1300 372 842 (1300 EPA VIC)**.

EPA officers need to respond to odour reports as they are reported, so delaying your call, lodging it online or emailing us may not give officers the best chance of verifying your report.

The odour needs to be strong and persist for more than a few minutes and reporters should try to accurately describe the characteristics of the odour as well as weather conditions, particularly wind strength and direction. This information will give our officers the best chance of tracking an odour to its source.

If you would like to better understand what happens when a pollution report has been made to EPA view the publication [How EPA responds to reports of pollution](#).

You can also [subscribe](#) to email updates on odour issues in the Clayton South, Clarinda and Dingley Village area.

Community events: Clayton and Dingley Waste Forum

Clayton and Dingley Waste forums are led by local waste operators with EPA present to update on our activities. The last forum was held on 20 April 2016.

See the [Clayton and Dingley Waste Forum website](#) for more information about community events.

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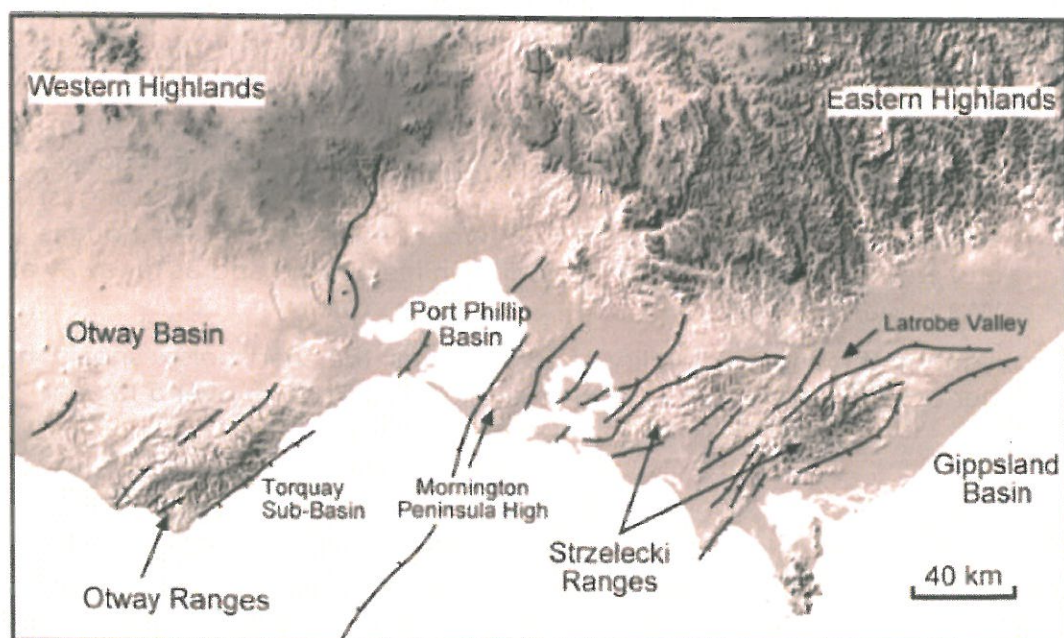
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2 The emergency context

2.1 The Earthquake Hazard

An earthquake is the shaking and vibration at the surface of the Earth caused by energy being released along a fault plane, at the edge of a tectonic plate or by volcanic activity. Earthquakes, unlike many other natural hazards, have the potential to cause catastrophic losses. Although Australia is popularly considered to have a low earthquake risk, a major earthquake could still occur under a heavily developed and populated area in Victoria. The impact of such an earthquake could have widespread consequences throughout Melbourne and surrounds. Whilst there is a low probability that this event will occur in the foreseeable future, it is important to recognise the potential for such catastrophic impacts.

Victoria is located away from geologically-active tectonic plate boundaries, which lie hundreds of kilometres seaward of the eastern coastline. However, Victoria regularly experiences small earthquakes that are felt and reported. Stresses and strains develop in the Indo-Australian plate (of which Australia is a part) as it drifts northward; as sediment loads continually transfer from upper catchment areas to lower basins and coastal areas due to erosion; and as fluctuating sea levels load and unload the continental shelf.



The size of an earthquake is referred to as its magnitude. For every unit increase in magnitude, there is roughly a thirty-fold increase in the energy released. For instance, a magnitude 2.0 earthquake (M2.0) releases about 30 times more energy than a magnitude 1.0 earthquake (M 1.0), while a magnitude 3.0 earthquake (M 3.0) releases 900 times (30x30) more energy than a magnitude 1.0 (M1.0)

In Australia, seismologists (people who study earthquakes) prefer the use of the moment magnitude scale, which calculates the magnitude of an earthquake based on physical properties such as the area of movement (slip) along the fault plane.

A M 6.0 earthquake can be anticipated for all of Australia, on average, every five years and a M 5.0 earthquake once per year. The probable maximum earthquake magnitude for Australia is approximately M 7.5.

Australia is not immune from damaging earthquakes causing significant human and economic loss.

- In July 1903, a M 5.3 earthquake caused extensive minor damage in Warrnambool, Victoria.
- In 1932, a M 4.5 event caused considerable damage on the Mornington Peninsula.
- On the 28th December 1989, a M 5.6 earthquake struck Newcastle killing 13 people. This earthquake caused damage to over 35,000 homes, 147 schools, and 3,000 commercial and/or other buildings, and hospitalised 120 people.
- In 1996 a M 5.2 earthquake was centred near Mt Baw Baw, the shock was felt up to 100 km away with minor damage reported in Melbourne.
- In August 2000, a M 5.0 earthquake in Boolarra caused minor damage and was felt throughout Gippsland.
- In 2009, Korumburra experienced two earthquakes within two weeks of each other on the 6 March and then the 18 March. Both earthquakes were recorded at M 4.6.
- In June 2012, a M 5.3 earthquake occurred in the La Trobe Valley, Gippsland. The earthquake caused minor damage. The earthquake epicentre was 16 kilometres southwest of Moe and was the strongest earthquake recorded since the 1982 Wonnangatta Valley earthquake and was felt across the state including in Melbourne and as far away as Wodonga.

Highlighting the unpredictability of earthquakes, the chart below shows the number of recorded earthquakes by magnitude in Victoria over a 10 year period.

MAGNITUDE	UTC DATE	APPROXIMATE LOCATION
3.0	12/06/2016	Off Cape Liptrap, VIC. (Reported felt).
3.2	4/04/2016	S of Leongatha, VIC. (Reported Felt).
3.1	5/03/2015	SW of Moe, Vic.
3.3	20/12/2014	S of Orbost, Vic.
3.3	3/12/2014	Pakenham, Melbourne, Vic.
3.4	2/12/2014	Korumburra, Vic.
3.3	17/10/2014	S of Moe, VIC.
3.2	20/05/2014	Offshore SE of Seaspray, VIC.
3.0	22/12/2013	Boort, VIC.
3.2	22/06/2013	N of Mansfield, Vic.
3.0	21/02/2013	W of Echuca, Vic.
3.0	27/10/2012	Near Moe, Vic.
3.1	11/10/2012	Rokewood, Vic.
3.0	9/09/2012	S of Port Macdonnell, SA.
3.1	9/09/2012	S of Port Macdonnell, SA.
3.1	31/07/2012	SE of Mallacoota, Vic.
3.2	30/07/2012	SE of Mallacoota, Vic.
3.5	30/07/2012	SE of Mallacoota, Vic.
4.4	20/07/2012	Near Moe, Vic.
3.1	30/06/2012	S of Moe, Vic.
3.1	19/06/2012	SW of Moe, Vic.
3.1	19/06/2012	SW of Moe, Vic.
5.4	19/06/2012	SW of Moe, Vic.
3.1	24/03/2012	Korumburra, VIC.
3.3	12/01/2012	Offshore, S of Mt Gambier, SA.
3.1	21/10/2011	Near Korumburra, VIC.
3.1	9/09/2011	Korumburra, Victoria.
3.1	10/07/2011	S of Bright, Vic.
3.0	7/07/2011	Korumburra, Vic.
3.3	5/07/2011	Korumburra, Vic.
3.7	5/07/2011	Korumburra, Vic.
3.3	5/07/2011	Korumburra, Vic.
4.4	5/07/2011	Korumburra, Vic.
3.8	1/06/2011	Grampians National Park, VIC.
3.0	28/12/2010	SE of Seaspray, Vic.
3.3	16/10/2010	N of Morwell, VIC.
3.0	26/05/2010	Colbinabbin VIC.
3.4	19/05/2009	Near Korumburra, VIC. Nearest station TOO.
3.0	3/05/2009	Korumburra VIC. Nearest station TOO.
3.1	18/03/2009	Korumburra, VIC. Nearest station TOO.
4.6	18/03/2009	Korumburra VIC. Nearest station TOO.
3.3	9/03/2009	Korumburra VIC. Nearest station TOO.
3.2	6/03/2009	Korumburra VIC. Nearest station TOO.
3.2	6/03/2009	Korumburra VIC. Nearest station TOO.
4.6	6/03/2009	N of Korumburra VIC. Nearest station TOO.

MAGNITUDE	UTC DATE	APPROXIMATE LOCATION
3.5	5/02/2009	Bass Strait. Nearest station TOO.
3.5	12/01/2009	Near Korumburra, Victoria. Nearest station TOO.
3.2	30/10/2008	SE of Tungamah, Vic. Nearest station TOO.
3.0	30/09/2008	NW of Mallacoota VIC. Nearest station MILA.
3.7	1/03/2008	SW of Echuca VIC. Nearest station TOO.
3.1	17/02/2008	S of Mt Gambier Vic. Nearest station ARPS.
3.4	24/01/2008	SE of Anglesea VIC. Nearest station TOO.
3.0	21/08/2007	Mt Baw Baw VIC. Nearest station TOO.
3.5	8/03/2007	S of Warburton Vic. Nearest station MILA.
3.2	18/02/2007	NE of Foster VIC. Nearest station TOO.
3.0	3/01/2007	Boolarra South Vic. Nearest station TOO.
3.4	1/10/2006	N of Bordertown near Vic/SA border. Nearest station ARPS.

3 Consequences

The effects of an earthquake depend on many factors, such as the magnitude of the earthquake, its depth and the distance from the epicentre. The below summarises the possible types of damage and disruption that may result in a major earthquake

Built infrastructure damage (e.g. buildings)

Individual buildings are likely to suffer damage. These may include homes, businesses and essential facilities such as hospitals, schools and emergency services facilities. The Newcastle Earthquake in 1989 caused damage to 35,000 homes, 147 schools and 3000 commercial and/or other buildings. This large scale damage can cause displacement and isolation in the community.

Casualties

Casualties and injuries are likely to result from large damaging earthquakes. People may also become trapped requiring rescue. Secondary public health impacts may occur if essential services are not readily available after the impact of an earthquake.

Displacement and isolation

As a consequence of damage, people can become displaced requiring temporary accommodation. The amount of time for which people would need temporary accommodation would depend on the number of family and friends that could take them in, how long it would take for building inspections to be made, how long it would take lifeline services to be back up and running, and how long it would take for residents to regain access after areas were cordoned off or had access ways destroyed/blocked.¹

Areas can become isolated requiring resupply of essential items.

Transport Access

Roads may be blocked as a consequence of debris from fallen buildings. Roads may also be shut where there is the potential for surrounding buildings to fail during aftershocks, even if no debris has yet fallen. As a result, and as observed in Christchurch, areas of a major CBD may be cordoned off for a minimum of 7 days following the event¹. Bridges and tunnels will likely be closed for inspection.

Public Transport Disruption

Public Transport Disruption may occur as a result of some rail and light rail bridges being damaged, airport runways or port infrastructure being extensively damaged.

Economic

Widespread damage and disruption will lead to direct economic impacts that will require a broad economic development strategy to be created and complemented by more specific strategies at the sectoral level across transport and ports, resources, investment attraction and facilitation, trade, innovation, regional development and small business, together with key services to sectors such as agriculture, the creative industries, extractive resources and tourism.

Assistance to business to access available information, advice and support and to encourage a return to business may be required.

Electricity and Gas

The complete failure of large power components, such as transformers or substations, may occur in the proximity of the epicentre. Almost all addresses close to the epicentre may experience at least minor power failures. Breakage of gas pipelines is likely to be widespread and concerns may arise over disruption to reticulated gas supply.

The below describes damage to the electricity network from the Newcastle 1989 earthquake:

"The Newcastle earthquake of 1989 had a significant effect on the high voltage transmission assets of the NSW electricity supply grid operated by the Electricity Commission of NSW. Multiple failures of equipment, mainly switchgear, occurred in a number of the electricity substations closest to the earthquake epicentre. These failures initiated a general and immediate shut-down of electricity supply to both industrial and domestic consumers in the affected area. The response of the Commission to this unexpected emergency was immediate and effective. Operational recovery saw high voltage supply restored to major industrial customers 1½ hours after the incident. Restoration of supply for general distribution began within 30 minutes, with all bulk supply points energised after 2½ hours. Of course, the damage then had to be assessed, plant safety assured and repairs commenced so that normal levels of reliability could be returned to the community. This phase of restoration took 3 weeks to repair most major circuits and many months to complete. In the latter stages, it was accompanied by a third phase of review which identified any areas where either the system design or the response of a power authority to any future such emergency may be improved."

Water supply

Major water facilities such as pumping stations and reservoirs may experience damage. Damage may occur across the network. In case of liquefaction, breakage of pipes is likely to be widespread and concerns over contamination may render the water not suitable to drinking.

This is supported by the experience in Christchurch 2011:

“Christchurch water and waste networks suffered extensive damage as a result of the 22 February 2011 earthquake. Approximately 50% of the city was without water for the first days following the earthquake; more than a third of households were without water for over a week. A month after the 22 February 2011 event, over 95% of occupied units (outside of the cordoned Christchurch CBD) had water, however a “boil order” was in-place for over six weeks for most of the city due to potential contamination caused by severe damage to the wastewater system. Chlorination, which was not used pre-earthquake, remains a requirement to ensure water is disinfected. Water conservation orders are in place as a result of damage to key water reservoirs and the loss of many groundwater pumping wells; all related to geotechnical problems. However, with few exceptions, water reservoirs structures and pump stations performed very well owing to pre-earthquake engineering and seismic upgrades.”

Waste water

Extensive damage may occur to waste water systems can occur even without the occurrence of liquefaction.

“Due to liquefaction, parts of Christchurch are, to date (>1 year after the second event) without sewage systems, and much of the population rely on portable toilet facilities. Furthermore, leakage in waste water piping was responsible for contamination of the clean water supply immediately after the event (2010).”

Communications

Communications infrastructure may suffer damage and be overloaded. Loss of communication can be due to a variety of reasons such as the crashing of telecommunication services, website crashes, and loss of power meaning mobile phones cannot be charged or cordless home phones will not work.

The below summarises the Christchurch earthquake experience:

“Telecommunication service providers took strong steps to restore services, and most services were back (or close) to normal within a week or so (except in the CBD where immediate restoration was not possible – nor was it a priority given cessation of most CBD activity). Nevertheless, the ability to make calls immediately after the earthquake, including 111 and other priority calls, was impacted by electricity outages, cable failures in liquefaction areas and congestion.

Cordless phones immediately ceased to work where electricity failed. Some physical damage to telecommunications assets also occurred but the effects were secondary – congestion largely resulted from the sudden substantial increase in call attempts rather than to equipment failure. Battery life at cabinets and cell towers also quickly became a constraint on telecommunications performance and significant losses of cellular coverage.”

Chemical and high risk industrial plants

These are usually located away from residential zones. It is expected that high risk facilities will be designed for increased resilience to earthquake damage, thus the probability of an accident induced by an earthquake is classified as low. If, however, there were damage, it could be such as in the 1998 Longford gas explosion in Victoria.

Hazardous material release

Hazardous materials are not exclusive to heavy industry and may be released as a consequence of building collapse. These may include carcinogenic or corrosive gases, poisonous liquids that contaminate the water table. Asbestos was used in Australia from the 1950's until 2003 when it was banned. Asbestos may be exposed as a result of earthquake building damage in an earthquake. Irrespective of the risk, it will impose large clean-up costs and require the cordoning of many properties.

Fire following earthquake

Fire following earthquake has caused extensive damage in the past. Well known cases are the San Francisco 1906 and Tokyo 1923 earthquakes, where much of the damage was caused by fire. Extensive fire following earthquake damage is less common in present times, and will likely be localised to high risk sites as was the case for the Cosmo Oil Company fire following the 2011 Tohoku earthquake in Japan. In that event, the continued functioning of the water supply for firefighting would become critical.

Long series of strong aftershocks

A series of aftershocks are possible after an earthquake event. The Christchurch event was notable for its unusual frequency of aftershocks, with the most damaging event (M6.3 Lyttelton) occurring as an aftershock of the original event (M7 Darfield) 4 months earlier. This earthquake sequence seriously disrupted recovery activities, and although unusual, aftershocks did more damage than the main quake. This occurred because the aftershock was located directly below the CBD whereas the main shock was located to the west of the CBD at a closest distance of 30 km.

The earthquake sequence in Christchurch did evidently move away from the city only one year after the main event, and posed a serious challenge to the recovery of the Christchurch CBD.

Other impacts

Consideration should also be given to:

- Land or mud slide,
- Tsunami, or
- Floods from dam and levee failure and subsidence.

Expert evidence – methane gas and risk of explosion

991. VCAT takes into account material presented to it at a hearing including evidence presented by witnesses. While expert evidence is not required to decide most applications for review, it is used to assist VCAT. For example, where environmental impacts are disputed, expert evidence from an environmental scientist or auditor may assist VCAT in deciding the merits of an application.
992. The EPA made Mr Bajwa available to the City of Casey for the purposes of providing expert evidence at VCAT regarding the operation of the landfill. While Mr Bajwa's statement made minor reference to the risks associated with the migration of landfill gas, his evidence did not specifically focus on the relevance of the walls of the landfill being unlined or the danger of methane gas migrating into service facility excavations or elsewhere on the estate. Mr Bajwa was asked why his evidence did not include reference to the risks associated with migrating methane gas. At interview, he said:

Look, to be honest that was the key focus at the time, the off-site odour emissions. But in my statement I mentioned about the actual migration.

993. Mr Bajwa has since stated:

... the issue of landfill gas migration was discussed in detailed [*sic*] including describing the difference that a well designed landfill would make in managing the landfill gas migration. This was discussed by comparing the subject site with the SITA Hallam Road landfill which was a well-designed landfill incorporating base liner, side liner and leachate collection system.

My response to a question asked during the cross-examination also highlighted the explosive nature of the landfill gas.

...

My statement and evidence during the cross examination consistently stated that no development should be allowed within the specified buffer until the landfill had been completed, capped, and rehabilitated and it was demonstrated over a period of time that there would be no impact on the amenity of the proposed residential development. In my view, this period of demonstration would have picked up amongst other issues the issue of landfill gas migration and as a result would not have allowed the subject development to go ahead, without satisfactorily addressing the issue.

994. My investigation identified evidence in the lead-up to the VCAT hearing indicating that officers from the City of Casey and the EPA, as well as Ms Heber, were aware of the potential risk of explosion caused by methane gas leaking from the landfill. Ms Heber made a file note on 7 January 2004 of a meeting she had with City of Casey and EPA officers which provides documentary evidence of this knowledge.
995. The file note states:

Secondary issue is gas explosions because the sides are not lined – a matter for the Council as manager.

996. At interview on 15 December 2008, Ms Heber was shown her file note dated 7 January 2004 and asked about the risk of an explosion occurring. She said:

I recall that the site is not lined. And that was a particular issue for this landfill site. In terms of discussions about explosions, no, I don't really recall.

997. Ms Heber was asked whether at the time of her file note she was aware of the potential risk of methane gas leaking from a landfill and causing an explosion. At interview, she said:

Actually I do – I do recall, and the reason why I recall is because my partner at that time's son went to Footscray High School, which is built on a landfill site. This has just come back to me. And they were often evacuated from school because methane was detected. They had quite a number of fires as well because methane was popping out everywhere around the school site.

998. In relation to evidence presented to VCAT regarding the risk of explosion, Ms Heber said:

I can't remember whether we wanted to – whether we wanted Michael [Jansen] to talk about that [migration of gas] in his evidence or get someone else.

999. Mr Jansen was called to give evidence by the City of Casey at the hearing. Mr Jansen's evidence made reference to the risk of landfill gas migrating off-site due to the landfill being unlined and the gas extraction system not operating at optimum capacity. Mr Jansen stated during the hearing:

The landfill is licensed as an unlined site, so it has no body liner at all, it has no side liners and this is one of the reasons that I feel that it is very important that the gas extraction system is working to its optimum capacity to ensure that there is no lateral migration of gas.

When gas is produced in a landfill its tendencies is [*sic*] for it to what you call dive vertically and if that landfill has been capped with an impermeable barrier such as a clay cap, it will hit the cap and it will look for an alternative way out of the site. So if there is no side barrier the tendency is that the gas can escape from the perimeter of the site.

The gas extraction system is designed to collect that gas and prevent it from travelling sideways. However, I am yet to hear of a gas extraction system that will collect 100% of the gas produced.²³

1000. At the VCAT hearing, Mr Daniel Fyfe, General Manager – Southern Region of SITA was called by Peet to give evidence regarding the management of the landfill. Mr Fyfe was questioned by Ms Heber about the lateral migration of gas. At the VCAT hearing he stated:

I'm aware from reading landfill literature that there's been instances of landfill gas migration laterally into basements and causing potential explosion risks for old style landfills in areas where houses have developed to the edge of the boundary. But I'm not in a position to say that there's a risk that may exist where the soil structure can permit that.²⁴

²³ Based on a review of the transcript of the VCAT hearing, published by VCAT on its website on 17 September 2008, and the audio recording of the hearing provided by VCAT.

²⁴ *Supra*.