



Bush Fire Preparedness and Resilience Strategies

This report was endorsed by Council at a Council meeting held on Wednesday August 24 2022

V.2

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1. Introduction

The Shire of Toodyay, like every local government, has a civic responsibility for its community's safety. In 2015, the Shire of Toodyay engaged an external consultant to conduct a strategic review of bush fire related matters within the shire. This was seen as a step towards understanding the Shire's immediate bush fire planning and management issues and identify areas for improvement moving forward.

The Shire's knowledge in this area has matured since the '2015 Report' and seeks to provide a new report that leverages in-house knowledge. This approach then supports a seamless transition between reviewing and implementing any of recommendations subsequently endorsed by Council.

Actions to address certain recommendations of this report will require long-term, ongoing strategic commitment. This will require a wider organisational approach, involving Council, development and regulatory services, infrastructure and assets services and emergency management teams, in their areas of expertise to achieve successful outcomes.

Recently within the state of Western Australia, there has been a renewed focus on bush fire safety planning in response to a number of devastating fires.

This report examines a range of themes relating to bushfire. However, a major focus will be addressing historical sub-division design deficiencies related to evacuation, built before bush fire planning standards became more robust.

The contemporary planning standards have been used to both reject flawed subdivision proposals that did not provide adequate evacuation options (Shire of Mundaring, 2019) and applied retrospectively to address historical evacuation issues.

Recommendation 39c) of the Perth Hills 2011 Report (Keelty, M. (2011) endorsed 'examination options to retrospectively bring these areas into compliance with Planning for Bushfire Protection Guidelines'. An example of this was the 'Shady Hills Estate' in Bullsbrook where Council resolved to apply the standards retrospectively and provide the residents with an alternative evacuation option.

The above lobbies for consideration of the above so it doesn't haunt us in the future.

To assist in interpreting this report, the 2015 Report 'Strategic Review of Bushfire Policy' conducted by Bushfire Prone Planning is referred to as the 2015 Report throughout the body of this report.

Likewise, the Guidelines for Planning in Bushfire Prone Areas (Version 1.4) which are part of State Planning Policy 3.7 are referred to as The Guidelines.

For further terminology, please see the glossary contained at the end of this section.

1.1 Local Context

Most sub-division areas were developed during the 1980's when bush fire planning was virtually non-existent. Despite being a rural shire, the prevalence of residential subdivisions in Toodyay is largely due to the Shire's proximity to Perth. This makes Toodyay attractive to retirees and tree changers from the city, a demographic which is not overly familiar with bush fire risk or what to do in the event of one. Such demographic is less likely to stay and defend their property and would be more inclined to evacuate in line with State government messaging. Thus, the evacuation options within Toodyay subdivisions areas are of paramount concern.

Of the 26 State defined hazards, bush fire is the most likely to impact Toodyay, with the potential of high consequence (loss of life, homes, structures), all of which have occurred in Toodyay within living memory.

A recent Australia Fire Danger Rating System Project has identified the Shire of Toodyay as containing 45% forest fuel types. The majority of subdivision areas exist in these more heavily fuelled areas. These areas represent locations not suitable for farming (generally due to challenging terrain) which were subsequently subdivided.

While not in itself a local phenomenon, Toodyay should not consider itself exempt from the effects of climate change. This is resulting in more extreme weather events, reduced rainfall, and extended bush fire danger periods. This means the likelihood and severity of fires are only likely to increase as the effects of climate change continue to be felt.

As identified in the Bushfire Risk Management Program, the combination of demographics, location and adverse conditions place a significant proportion of the Toodyay population at extreme risk from bush fire.

Most notably, the 2007 Chatcup fire which claimed one life and the 2009 Toodyay bush fire which destroyed thirty-eight homes and affected some two hundred properties are examples of how a fast-moving fire impacts a subdivision area. Fortunately, the majority of the impacted area had relatively good egress options for residents – the outcome may not have been the same in other areas of the shire with less directional egress options.

Additional challenges for Toodyay include its limited reticulated water supply outside of the Toodyay town site. This represents challenges for bush fire response.

In summary, there are significant bush fire challenges facing the Shire of Toodyay which require careful consideration in addressing legacy and future issues.

1.2 A brief history of the 2015 Report

The 2015 Report 'Strategic Review of Bushfire Policy' was conducted by *Bushfire Prone Planning* as a due diligence review of the then, sizable program of completed and planned fire egress and access tracks. The review made several recommendations to refocus the Shire's efforts by utilisation of the Planning for Bushfire Protection Guidelines (2010) as a guiding doctrine.

Since then, the Shire's knowledge of these guidelines (now updated) has increased to the point that critical review of some of the recommendations made in the 2015 Report is possible.

This had led to identification of alternate preferred options, recommendations requiring additional or varied actions, and in some cases rejection of the recommendation due to factors not considered in 2015.

Geographically, the focus of the 2015 Report largely represented the Shire's existing egress/access program at the time, however, only focused on the major sub-division areas of Julimar, Coondle, Morangup, Moondyne Park and the greater Majestic Heights area.

Omissions included Mountain Park (Nairn Drive) and Walkey Heights (Whitfield Road), Toodyay townsite and West Toodyay townsite. The latter included the example of North Street, which was briefly mentioned, but not investigated to the same degree to facilitate an appropriate recommendation. This report will address these geographic gaps, as well as review subdivisions considered in the 2015 Report.

The 2015 Report made recommendations in two ways, some as listed sentences (Refer Strategic Review of Bushfire Policy, Section 9, Page 42) and also tabulated in an appendix, listing existing and proposed tracks with specific work recommended for each (Refer Strategic Review of Bushfire Policy, Page 46, Appendix One).

This report contains a position on each recommendation made in the 2015 Report in Appendix A. Recommendations of this report can be found in Section 11.

1.3 Scope

The scope of works for this report includes an in-depth review of the 2015 Report, with the objective of confirmation, amendment or removal of 2015 Report recommendations to deliver a refined set of recommendations for Council's consideration.

Themes considered are categorised as Primary or Secondary focus as outlined below:

Primary Focus

The primary focus is to analyse and identify deficiencies in subdivision area/road networks regarding safe egress in the event of a bush fire, or other applicable hazard.

Definition of subdivision area: For the purpose of this report a subdivision area will be defined as a grouping of lots which have the primary purpose of providing residence, being the following zones: Residential, Rural Residential and Rural Living

The map below shows the aggregated outline of these areas (including contained reserve land, i.e., recreational and road), their extent and distribution within the shire.

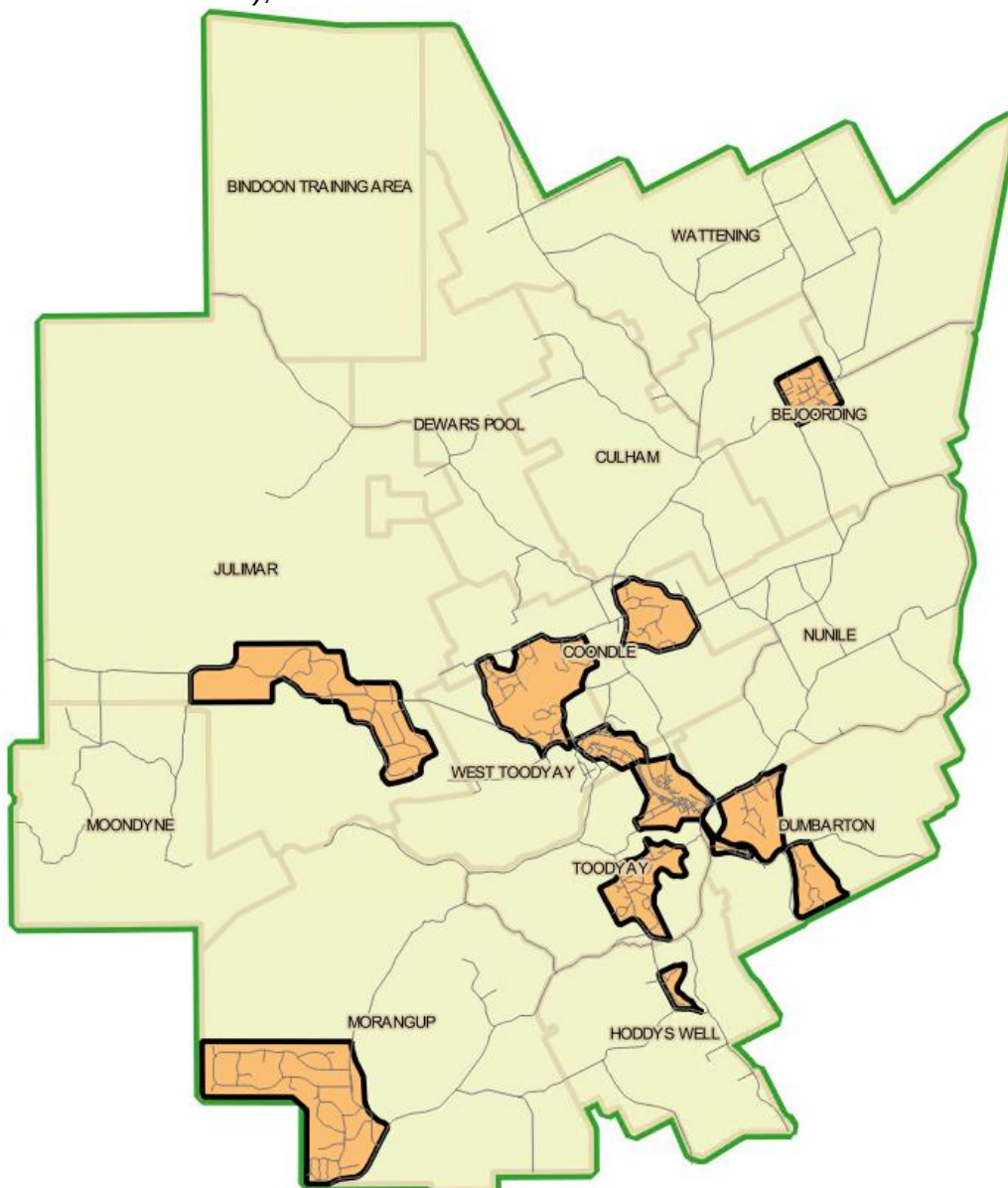


Figure 1 - Shire of Toodyay Subdivisions

Secondary Focus

Also included in the scope is a variety of related subjects, including but not limited to:

- Potential Shire easement liabilities,
- Other infrastructure i.e. fire emergency water supplies,
- Other risk reducing programs i.e. mitigation and public education
- Appropriate tasking and utilisation of Shire resources i.e. systems and staff

Additional considerations

Where applicable, the scope includes analysis by way of numerical and spatial techniques to provide results based on statistics, not human opinion.

Relevant bushfire reports and case studies applicable to the scope of works were identified, reviewed and findings referenced where appropriate in the context of this report.

Not all themes of the 2015 Report are specifically addressed as part of this review, based on relevancy to the primary or secondary focuses above. However, where a recommendation was made, Appendix A contains a summary response, progress, or position.

1.4 Definitions and Glossary

BFB	Bush Fire Brigade
BRMS	Bushfire Risk Management System
CESM	Community and Emergency Services Manager
EAW	Emergency Access Way (also referred to as 'Egress')
EMO	Emergency Management Officer
FSAR	Fire Service Access Route (also referred to as 'Access')
LGGS	Local Government Grants Scheme
MAF	Mitigation Activity Fund
R2R	Resource to Risk Document
RMO	Reserves Management Officer
2015 Report	'Strategic Review of Bushfire Policy' conducted by Bushfire Prone Planning in 2015
Strategic Firebreak	This is an historical term which relates to the former Shire firebreak program. This term is no longer in use and as such is not used in this document to avoid confusion
PPRR	Preparedness, Prevention, Response and Recovery
MOU	Memorandum of Understanding
UCL	Uncleared Land
UMR	Unmanaged Reserve
DC	Department of Communities

2. Egress from Sub-Divisions - Analysis

The majority of the Shire's subdivision areas predate contemporary bush fire planning considerations. The Guidelines place a strong emphasis on road network connectivity, to provide multiple directions of egress in an emergency. Many of the Shire's subdivision areas were not designed with this principle in mind – such subdivision proposals would be unlikely to gain planning approval utilising current planning controls. This highlights the challenges that Toodyay faces in rectifying these designs to a safer standard.

While the purpose of the Guidelines is for the planning and development of new subdivisions, they also represent the best guidance for retrospectively applying current principles to existing subdivisions. In support of utilising the Guidelines in this fashion, Recommendation 39c of the Perth Hills 2011 Report (Keelty, 2011, Page 20) states:

“State and local Governments: Examine options to retrospectively bring these areas into compliance with Planning for Bushfire Protection Guidelines”.

While The Guidelines have retrospectively been applied elsewhere, Shire officers note that it is not viable to connect every no-through road in the Shire, given the complexities of dealing with legacy decisions. Therefore, alignments are proposed where there is a need and viable options to achieve evacuation objectives.

2.1 Methodology of Analysis

Since the Shire received the 2015 Report, Shire officers have extensively traversed subdivision areas to assess relevant local conditions including topography, terrain features, vegetation type and density and confirm the overall bush fire risk in each locality.

These on ground assessments have been backed up with extensive desktop analysis, which factors in the relevant performance principles of Element 3: Vehicular access, as per 'The Guidelines' (Page 73).

This analysis was undertaken following development of a numerical and spatial algorithm, which analyses a plotted route based on the below performance principles, with the intent of reducing the initial subjectiveness and opinion-based theory for any given alignment.

For each performance principle considered, a score is assigned which either increases or decreases the final output number. This provides a numerically comparable outcome for all assessed routes, by removing the complexities in independently considering numerous competing performance principles.

Additional performance principles have been considered which are not part of The Guidelines but relevant in a retrofitting scenario. These are also numerically scored and where possible, reference other existing standards, such as Local Planning Scheme Number 4.

For the purpose of interpreting final calculated scores, a lower number represents a more favourable outcome.

These principles are further explained in Table 1 below.

PERFORMANCE PRINCIPLE DESCRIPTION		ANALYSIS APPLICATION
A3.3 – No-through Roads	Cul-de-sacs should be avoided in Bush fire Prone Areas.	A beneficial numerical weighting is assigned incrementally for each cul-de-sac removed by a proposed alignment.
A3.2b – Length	EAW should be no longer than 500 metres in connecting to a public road.	A non-beneficial numerical weighting is assigned incrementally based on any length over 500 metres. NOTE: If a solution is met by building a road (as opposed to an EAW), technically the A3.6 requirement would not apply according to the Guidelines. However, regardless of the construction standard, shorter alignments are still considered preferable for other reasons, such as cost correlation. Therefore, all alignments factor length, including those recommended in this report for construction as roads.
A3.2b – Maximum Gradient	Maximum gradient should not exceed 1:7 for a sealed road or 1:10 for an unsealed road.	A non-beneficial numerical weighting is assigned incrementally for each 50 metre length of gradient in excess in 1:10. Using the more stringent of the grade requirements of 'The Guidelines' ensures that routes of steep gradients are not promoted by the analysis and that the extra cost of sealing steeper grades is reflected in the scoring.
Bush fire Prone Vegetation	One of the key considerations in overall subdivision assessment via the Guidelines, is provision of the appropriate separation distances to bush fire prone vegetation.	A non-beneficial numerical weighting is assigned incrementally based on the percentage length of the alignment contained within bush fire prone vegetation.

NON-GUIDELINES PERFORMANCE PRINCIPLE DESCRIPTION		ANALYSIS APPLICATION
Directness of alignment	An alignment, which significantly changes directions, has the potential to intersect the path of the fire and disorientate the user.	A non-beneficial numerical weighting is assigned incrementally based on the degree a route deviates from a reference straight line, directly connecting start to end.
Number of properties benefited	Analysis of the number of residents (via property count) whose risk would be reduced by the proposed alignment.	A beneficial numerical weighting is assigned incrementally for each property that the alignment services.
Number of Properties Backtracking	Considers how many properties would need to backtrack within the internal subdivision road network to access the proposed alignment. A lesser number would indicate a more optimal positioning of the alignment.	A non-beneficial numerical weighting is assigned incrementally for each property that needs to backtrack within the internal subdivision road network to access the proposed alignment.
Number of Hazards Mitigated	Considers how the number of hazards for which this alignment may provide egress. For example, does the alignment also service flood, in addition to bush fire.	A beneficial numerical weighting is assigned incrementally for each hazard the proposed alignment provides egress for. NOTE: The calculations do not consider wide impact area hazards, such as storm or earthquake as they would apply equally in all cases.
Land Tenure	Considers the number and type of land tenures crossed by the alignment, which could affect the ease of implementation.	A non-beneficial numerical weighting is assigned incrementally to the number of non-road reserve tenures crossed or utilised. Shire owned or Shire managed crown land has been assigned half the weighting, to that of privately owned, non-Shire managed land.
Existing Building Setback	Considers the alignment's proximity to existing dwellings, utilising the relevant setback requirements of the Shire's planning policies' and for the potentially impacted properties' zoning.	A non-beneficial numerical weighting is assigned incrementally for each occurrence of a residence falling within the setback requirement.
Downstream Evacuation Options (end of proposed Alignments)	Applying the Guidelines concept of providing multiple access routes (A3.2a), this measure looks favourably where multiple egress options exist at the end of a proposed alignment. For example: Egress which intersects an existing through	A beneficial numerical weighting is assigned incrementally for each option (direction) of travel, once reaching the existing road network.

NON-GUIDELINES PERFORMANCE PRINCIPLE DESCRIPTION		ANALYSIS APPLICATION
	road, will provide multiple options for the user.	
Other identified issues	This accounts for existing issues with the proposed alignment and may include, but not limited to: • Tangible impact on existing traffic flows, with the potential to trigger other road network upgrades. • Impact of existing infrastructure (i.e. power poles/lines) • Traversing of known water course (added construction considerations/costs)	A non-beneficial numerical weighting is assigned incrementally for each identified issue. It does not attempt to quantify an issue as more or less major than another issue.

Table 1- Performance Principles Descriptions and Applications

2.2 Analysis of Outcome Scores

Included in the analysis are alignments recommended in the 2015 Report, and additional or alternate alignments identified. Therefore, in some instances, multiple alignments were evaluated to serve the same objective, in others only a single alignment was evaluated.

Table 2 below is ordered by the best scoring route for a given objective, with grouped alternate alignments for ease of comparison and is a navigation index for recommendations and map references. In all, 38 alignments were considered to meet 22 objectives.

Objective Ranking (Relative)	Alignment Reference (2015 Ref)	Rank	Alignment Description	Recommendation & Map Ref		Priority
1	13.1	1/38	Drummond - Burt	Rec 20	6	MEDIUM
	13.2	2	Burt - Drummond	Rec 21	6	MEDIUM
2	18.1 (6A)	3/38	McDonald - Extracts	Rec 29	9	LOW
3	1.1	4/38	Malkup Brook - Harders Chitty	Rec 6/7	1	HIGH
	1.2 (1B)	10	Malkup Brook - Harders Chitty			
	1.3 (1C)	24	Parkland - Harders Chitty			
4	10.1	5/38	North - Collett	Rec 18	5	HIGH
	10.2	8	North - Fitzgerald	Rec 18	5	HIGH
5	6.1	6/38	McIntosh - Leeming	Rec 11	3	HIGH
	6.3	7	McIntosh - McPherson	Rec 11	3	HIGH
	6.2	9	Coondle - Leeming	Rec 12/13	3	MEDIUM
	6.5 (2D)	12	Leake - Charlton			
	6.6 (2C)	14	Alan Twine - Church Gully			
	6.4	23	Coondle - Church Gully			
6	7.1 (5C)	11/38	Wilkerson - Dreyer	Rec 14	4	MEDIUM
7	14.1	13/38	Settlers - Telegraph	Rec 22	6	LOW
8	2.1	15/38	Sand Spring - Malkup Brook	Rec 5	1	LOW
9	21.1 (7A)	16/38	Panorama - Hoddy Well	Rec 32	11	MEDIUM
10	9.1	17/38	Clarke - River	Rec 17	5	LOW
	9.2	32	Clarke - River			
11	3.1 (5F)	18/38	Horseshoe - Jarrah	Rec 8	2	LOW
12	20.1	19/38	Twilight - Toodyay	Rec 31	11	MEDIUM
	20.2	29	Twilight - Clackline			
13	12.1	20/38	Nottingham - Nottingham	Rec 19	6	HIGH
14	5.1	21/38	Fawell - Church Gully	Rec 10	3	MEDIUM
15	4.1 (5I)	22/38	Horseshoe - Waters	Rec 9	2	MEDIUM
	4.2	30	Timber Creek - Waters			
16	8.1 (5B)	25/38	Ridley - White Gum	Rec 15	4	HIGH
	8.3	31	Wilkerson - Picnic Hill	Rec 16	4	LOW
	8.2 (5D)	35	Wilkerson - Waters	Rec 16	4	LOW
17	16.1	26/38	Sesselis - Folewood	Rec 25/26	8	LOW
18	22.1 (4J)	27/38	Red Brook - Toodyay	Rec 33	12	MEDIUM
19	15.1	28/38	Whitelakes - Proposed Bypass	Rec 23/24	7	MEDIUM
	15.2	34	Whitelakes - Dumbarton			
20	17.1	33/38	Pindi - Toodyay	Rec 27	8	LOW
21	11.1	36/38	Francis - Wilkerson	Rec 16	5	LOW
22	19.1	37/38	Drumree - Katrine	Rec 30	10	MEDIUM
	19.2	38	Drumree - Dumbarton	Rec 30	10	MEDIUM

Table 2 – Overall Objective Analysis Rankings

The analysis results table introduces recommendations to action a selection of the proposed alignments. It is important to comprehend the various implementation strategies or toolkit, as this assists in understanding the contextual analysis of each subdivisions area as discussed in Section 4.

2. Toolkit

Prior to looking at each subdivision area's requirements and possible solutions (Section 4), it is important to understand the different construction standards, methods of achievement and land tenure approaches, which may be employed in implementing recommendations in this report.

These options may be referred to as **The Toolkit**. This term has been adopted to explain the tools applicable to the trade.

3.1 Construction Standards

There are two standards of construction which can be applied to achieve suitable egress. Both previous questions answered supporting safer evacuation.

These are:

1. Construction as Public Road
2. Construction as Emergency Access Way (EAW)

Please note: The Guidelines also discuss standards of a Fire Service Access Route (FSAR). These are designed for use by fire response crews in combating a fire and should not be considered suitable for evacuation planning, due to distinct differences in their siting requirements and construction standards.

The preference is to build roads, as this improves the overall connectivity of the road network, removing the need for an EAW. This is supported by the Guidelines (Page 79) which state:

"An emergency access way is not a preferred alternative to through public road access and should only be considered acceptable where it has been demonstrated that it will provide the safety and performance needs of emergency services and the community, including consideration for future needs, and that public road access to satisfy A3.2a cannot be achieved due to site constraints, such as an established road network with no opportunity to provide a public road for secondary access. Acceptance of an emergency access way should also consider the ability to accommodate reasonable worst-case vehicle volumes."

In short, where a road can be built for the purpose of egress, then it is the preferred option over an Emergency Access Way.

Advantages of a constructed road include:

1. Residents are naturally aware and more familiar with roads that are part of the normal road network due to regular 'peace time' use, which is conducive to enhanced understanding and safer use in a time of panic.

2. Newly constructed roads would be maintained as part of the road asset protection budget and schedule. This would remove similar duplicated maintenance actions and structures by other business areas.
3. The use of a road is not in itself misuse that would apply to an EAW. Any misuse of a road (i.e. speeding, hooning) would fall under the jurisdiction of the [Road Traffic Act 1974](#) and therefore the responsibility of WA Police. The Shire currently receives correspondence and phone calls on an annual basis regarding the misuse of EAWs & FSARs, with limited ability to police the issues effectively. This would reduce Shire officer time in responding to such concerns.
4. The construction standards of an EAW are extremely high and not dissimilar to that of a public road. For example, the minimum width requirement for an EAW is 6-metre trafficable by a two-wheel drive vehicle. A typical Shire road is constructed at 7-metres trafficable width. EAWs contain major drainage engineering, guideposts and signage approximating a road standard. Therefore, there is little financial justification to favour EAWs over the construction of roads.
5. Acceptable solution A3.2a of The Guidelines (Page 73) states *“Public road access is to be provided in two different directions to at least two different suitable destinations with an all-weather surface (two-way access)”*. Hence, enforcing the requirement for road connectivity. Furthermore, the acceptable solution states: *“Emergency Access Ways should only be used where Site constraints or alternate design option does not exist”*. Thus, it is incumbent on the Shire to exhaust all road-building options prior to considering an EAW.
6. The use of a road is ubiquitously understood, the same cannot be said for an EAW partly due to the choice of terminology promoted by The Guidelines. The main ambiguity is the choice of the word ‘access’ for a piece of infrastructure designed to facilitate egress or evacuation. To get around this, when signing Emergency Access Ways (a requirement of The Guidelines), the Shire has included a sub-heading of ‘Alternate Evacuation Route’ to try and overcome any ambiguity for the public. Recommendation 1, advocates for the Shire to provide feedback, when invited, to any subsequent review of The Guidelines in support of less ambiguous terminology denoting an ‘Emergency Access Way’ and that the Shire continues to dual label such routes with the term ‘Alternate Evacuation Route’ in the interim.

The only disadvantage of a road relates to tenure requirements being more specific (i.e. Road Reserve or ‘Right of Way’), as opposed to an EAW, which may be built on Shire reserves not designated as a road reserve, or appropriately specified easements. However, given that most EAW options which exist on Shire-controlled land have already been built, the majority of new alignments would require appropriate tenure to be negotiated and secured regardless of the construction standard pursued. Therefore, similar tenure related efforts would be required in either eventuality.

In summary, the concept of an EAW exists to address deficiencies in the road network. It is therefore preferable to improve the connectivity of the road network, rather than the Band-Aid solution of an Emergency Access Way.

Given the consideration above, most evacuation alignment recommendations in this report are recommended to be achieved as roads.

3.2 Construction Options (Projects versus Planning):

There are two major approaches to achieving construction of evacuation routes. The applicable construction approaches are dependent on urgency of need, current land tenures and the likelihood of future adjacent subdivisional development in the area.

The two approaches are:

1. Shire led construction projects versus;
2. Developer installed connectivity (Planning)

The simplest way to meet an evacuation objective is for the Shire to manage and fund the construction of an evacuation alignment directly. This provides the greatest control over timelines in achieving the outcome.

Shire funds may be augmented with grant funding, to increase the spending capacity and hence the number of objectives achievable in a given timeframe.

The Shire has previously utilised Natural Disaster Resilience Program (NDRP) funding to achieve a number of existing EAWs.

The most likely current funding program is the National Disaster Risk Reduction (NDRR), which has grant rounds to run in 2022/2023, 2023/2024 and 2024/2025. No commitment beyond the 2024/2025 round has been confirmed. The Shire may be eligible under this program. Eligible grants may receive up to \$250,000 when matched by the same figure in cash or in-kind (i.e., 50% contribution), by the applicant. With a high level of investment, the Shire could therefore implement projects of up to \$500,000 annually by leveraging this grant.

The Shire has an Access and Egress reserve fund where money has been transferred as per the amounts shown below.

- 2016/2017 - \$50,000
- 2017/2018 - \$100,000
- 2018/2019 - \$50,000
- 2019/2020 - \$30,000
- 2020/2021 - Nil
- 2021/2022 - Nil

With interest, the balance of this reserve as at April 2022 is \$234,319.

As outlined above, matched contributions are an important aspect of securing grant funding. Therefore, Recommendation 2 is that the Shire recommits to tangible and appropriate contributions to this reserve, every financial year on an ongoing basis to capitalise on grant opportunities to assist in improving connectivity.

The current balance could leverage a near maximum grant amount under the NDRR funding scheme in the 2023/2024 Financial Year. It is however critical that the reserve is replenished in an ongoing strategic manner to support subsequent future opportunities.

An officer's project brief for 2022/2023 Budget consideration requests \$100,000 to be contributed to this reserve fund and foreshadows an additional \$100,000 in subsequent years. This would replenish the fund for an additional maximum NDRR application in the 2024/2025 round (the last currently confirmed opportunity) under the scheme.

Additionally, the Shire should consider any offers by business stakeholders wishing to contribute to their community, and the ability to direct such contributions towards meeting the objectives of this report.

However, given the high number of evacuation risks that exist, directly funding all projects, even when augmented by grant funding, as the sole approach, is not realistic. Such an approach would need extensive timeframes and therefore, alternative options should be considered.

The 2015 Report contained a recommendation advocating for the Shire to support subdivision proposals where increased connectivity is provisioned by the developer providing *"a clear material, public benefit and increased community safety"*.

Such an approach aims to encourage development and support proposals which contain road links from existing subdivision areas, providing an alternative direction of egress. This removes the need for the Shire to fund tenure acquisition and construction costs for a number of proposed alignments.

Subdivisions are likely to be long-term propositions limiting control of implementation timeframes by the Shire. However, this is likely to produce the best outcome in the long term, as it transfers financial and project management overheads, which would have otherwise been borne by the Shire over a potentially similar period.

This report identifies land parcels, which would likely support future subdivision proposals, which augment and reduce risk in existing subdivision areas. In the majority of such cases, the recommendations within this report advocate planning for developer led implementation. Allowing areas to be subdivided would also require enforcing minimum fire emergency water as per The Guidelines. This could present opportunities for extra capacity to be provided to assist subdivision areas which are currently under capacity. (Refer to Section 5 for further analysis of Fire Emergency Water provisions).

Recommendation 3 advocates for a list of identified lots to be entered into applicable policies, strategies and procedures in support of individual alignment recommendations in this document. This includes but is not limited to Local Planning Scheme, Local Planning Strategy and the next iteration of the Toodyay Strategic Community Plan. Appendix B contains a map displaying these lots.

The option for the Shire to purchase land and become the developer of a subdivision also exists. While becoming the developer would ensure tighter controls over implementation timelines, it should be recognised that such a function does not represent the Shire's core business. Acting as the developer also transfers subdivision project associated risks to the organisation and therefore is not a supported variation of the developer led approach.

Any recommendation containing a developer led subdivision solution, does not exclude the Shire from considering construction as a Shire led project as discussed at the start of this section. This should not be confused with the Shire as developer (subdivider) approach above.

In summary, owing to the above, the recommendations contained within this report advocate for solutions which implement both of the above approaches, most suitable to the risk and locality.

By utilising a combination of approaches, the Shire seeks to optimise its options by acting promptly on high need projects with little subdivision opportunities, while protecting Shire finances in delivering solutions in areas which may benefit from future adjacent development.

3.3 Tenure

As mentioned previously, securing the correct tenure to implement recommendations of this report will be required in a number of instances. The tenure requirements differ for roads and EAWs.

Land tenure use for each construction standard is summarised in Table 3:

	Road	EAW
Road Reserve	●	●
Right of Way *	●	●
Shire Managed Reserve		●
Shire Freehold Land		●
Easement *		●

Table 3 - Land Tenure Use

* These land tenures are assigned usage parameters within supporting land title documentation. The use of any or formation of any of these tenures would require the correct usage parameters for the intended purpose.

As evident in Table 3, EAWs may be built on a wider range of tenures, than a road. However, as per Section 3.1 of this report and supported by The Guidelines (Page 73), EAWs should only be explored if all other options have been exhausted.

Conversion of Shire owned or managed tenure to road reserve for the purpose of a road represents less obstacles than obtaining road reserve from private freehold land. While an easement may seem like a more attractive way to secure tenure over private land, this would not support a road. Additionally, it is important to consider the other negative aspects of easements in the context of evacuation.

These are:

1. Easements for the purpose of evacuation by their nature increase the access to a piece of land. This impacts the easement grantors (the land holder) negatively in the following ways:
 - a) It reduces the landholders' ability to secure their property by way of fencing
 - b) The lack of ability to secure a property impacts the ability to keep pets or livestock on said land.

This results in the common practice of the easement becoming double fenced, meaning the grantor loses effective use over the easement portion of land. The other common approach of grantors, when presented with this problem, is to fence or gate across the easement, against the purpose as specified in the deed of easement (obviously, an EAW would require being trafficable without impediments at all times to serve its function, as support by A3.2b of The Guidelines). Neither outcome is preferable. The former is not preferable for the grantor (landowner) and the latter is not preferable for the grantee (in this case, the Shire). Figure 2 below illustrates the above mentioned actions typically taken by land holders of easements.

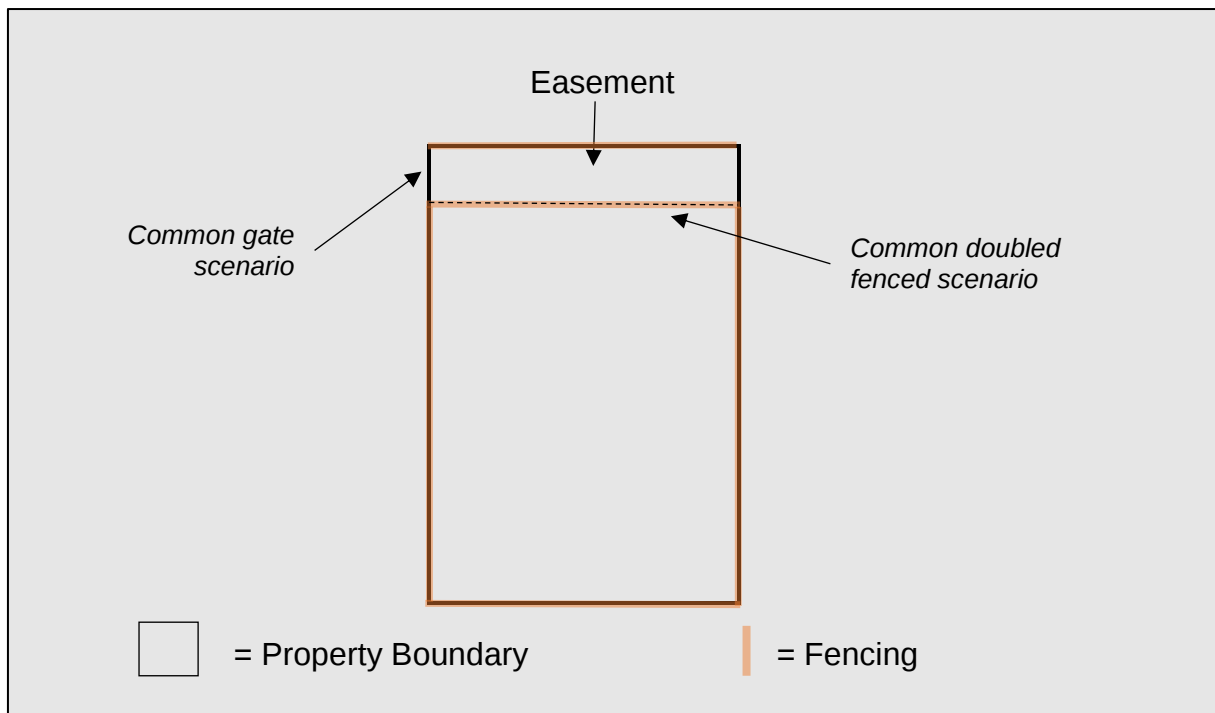


Figure 1 - Easement Example including common fencing and gate issues

The only practical solution to the above, is in the form of drive over or knock down gates (often designed as single use), that may be driven over in an emergency. However, misuse could result in vandalism, requiring repetitive replacement by the Shire. Furthermore, pet or livestock containment may be immediately jeopardised at that point in time. Additionally, some residents may not understand the concept and use of a drive over or knock down gate and not use the evacuation route when required -defeating the objective of the evacuation route.

2. The challenges presented in Point 1 above are multiplied where easement alignments span across multiple properties (multiple grantors). One grantor taking independent action against the deed of easement (i.e. installing a gate) renders the entire alignment impassable and creates an unsafe dead end entrapment situation for evacuees.

Therefore, easements that go across multiple land tenures are not generally supported in the recommendations of this report.

An example of an easement spanning multiple properties, which were otherwise impassable, is explored in the Easement Case Studies (Refer Appendix C and D).

3. The final consideration is that easements are a multi-party arrangement with requirements on both parties. Some negative experiences noted by the Shire include lack of understanding of the concept of an easement and its requirements on the grantor. The other being misuse of the easement by the public which can be seen by the grantor as the Shire not upholding its easement responsibilities (as the grantee), therefore providing an avenue of complaint and potential liability to the Shire under the deed of easement. Both of the above add complexity which does not exist with Shire managed or owned land titles. Thus, easements by their nature come with a higher level of risk in delivering this critical community infrastructure.

As easement often results in practical loss of land to the grantor (due to double fencing), landholders may see little value in granting an easement. Consequently, subdividing a strip of road reserve with appropriate compensation to the landholder would likely represent a more attractive and ultimately successful offer.

Should land tenure not be able to be negotiated, the Shire has powers to adversely acquire land where there is a community interest. Such an approach to land tenure has the potential to cause negative perception of the Shire within the community. This report advocates for negotiation over adverse possession with the latter only being considered as a last resort, where the needs of the community outweigh the opposition of the landholder.

Combined with the complexities and construction standard limitations posed by an easement, few recommendations of this report support easements and EAW's as the preferred solution.

Thus, the Shire should adopt the mantra of provisioning something that functions as a road, as a road as its default position (Refer Recommendation 4).

3. Sub-Divisions Assessments

4.1 Greater Julimar Sub-Division

To be read in conjunction with Map 1

The Greater Julimar subdivision area encompasses the developments of Julimar Springs, Julimar Farms Estate, Malkup Brook Estate, Parkland Ridge Estate in the south and Timberden Estate and Marri Glades in the north.

Access is via Julimar Road, running east-west and intersecting the developed area. Internal road layouts are predominantly oriented north-south, connecting with Julimar Road.

To the north of the subdivisions is the Julimar State Forest. Within the subdivision area, there is a mixture of vegetation, with large portions dominated by Marri and Banksia (Dryandra) vegetation types. This vegetation type commonly supports the highest fuel loads assessed in the Shire with a fuel arrangement which is conducive to fast moving crowning fires.

Predominant summer wind conditions persist from the north-west, meaning a fire is most likely to impact from the north to south. The portion of the subdivision north of Julimar Road is therefore at less risk as its road network connects in southerly directions to Julimar Road, via Timberden Drive, Nerramine Drive, Marri Road and Blue Gum Way.

Unfortunately, the opposite is true for the larger portion of the subdivision south of Julimar Road, where the road network connects in a northerly direction, via Parkland Drive and Sand Spring Road, but currently there is no connectivity or means of evacuation to the south to address the risk. This is one of the Shire's largest subdivisions, stretching up to 5km south, from its only arterial road connection and includes approximately 160 properties.

The closest point in the Shire's road network to the southern end of the Greater Julimar subdivision is Harders Chitty Road, approximately 1.5 kilometres to the southeast. Harders Chitty Road is in itself a no-through road and connection would provide evacuation options, in either direction in differing scenarios.

Previously, the Shire has installed an egress (EAW) route from the ends of Donegan View and Sinclair Place to Julimar Road. The 2015 Report recommended this to be downgraded to a FSAR, as the northerly travel on this route offered no alternate direction, and therefore no benefit in an evacuation. Hence, this route has not been considered in this report's analysis of suitable evacuation options.

In 2017, the Shire installed a small internal EAW (Alignment 2.1), linking the end of Sand Spring Road across Malkup Brook (via floodway) to Malkup Brook Road, with the expectation that future development of a southern evacuation route would augment this pre-existing investment. Recommendation 5 is that the Shire continues to maintain this alignment as an EAW. Consideration of a potential future upgrade to a road should be reassessed upon analysing traffic flows post extension of Harders Chitty Road (see below).

There is a compelling case to consider options to provide a southerly connection with Harders Chitty Road. As per the analysis, the preferred option is Alignment 1.1 Malkup Brook Road - Harders Chitty Road as per Recommendation 6.

Alignment 1.1 scores favourably due to its relatively flat gradient with only a short 50m portion of this 1.5km alignment exceeding a 1:10 gradient of an unsealed road. The 50m portion did not exceed the maximum 1:7 gradient permitted by The Guidelines for a sealed road. Therefore, this

alignment fully complies with the gradient requirements. Alignment 1.1 was also the best alignment in this area for avoiding bush fire prone vegetation, represents a relatively direct route and complements the positioning of the existing EAW 2.1 (linking Sand Spring Road to Malkup Brook Road). The indicated alignment positioning is on the eastern side of Malkup Brook, thus avoiding a significant watercourse crossing.

Alignment 1.2 which was promoted by the 2015 Report, traverses a significant amount of bush fire prone vegetation, contains a steep gully and a swampy area. It also contains a portion of steep gradient that exceeds the 1:7 maximum gradient of The Guidelines.

Alignment 1.3 was unreasonably long, indirect, steep and would significantly impact an existing residence. Significant portions of this route exceed the 1:7 maximum gradient of The Guidelines. No recommendations were made for these alignments.

Recommendation 6 promotes the construction of Alignment 1.1, a road linking Malkup Brook Road and Harders Chitty Road, as a Shire led project. This is the preferred method to deliver this critical piece of infrastructure on timelines over which the Shire would have more control. Recommendation 7 should be considered as an alternate to Recommendation 6, which could achieve this alignment by allowing rezoning and subsequent subdivision proposals over Lot 604/P062188 and Lot 606/P062118 or Lot 605/P062188.

Additional Access Consideration

The Shire is currently in the process of drafting a new 'Resource to Risk', a guiding document in conjunction with the Department of Fire and Emergency Services. The Resource to Risk document analyses risks, aims, and acts as a business case for resources relevant to the identified risks.

As part of the 'Resource to Risk' process, analysis was conducted to evaluate response time of fire appliances against a given requirement. The analysis identified that a pocket of properties within the southern Julimar subdivision fell short of the minimum requirement of six appliances able to arrive within 20 minutes of turnout.

Noting this requirement and the need for a southern egress in Julimar, the analysis was re-run, including the proposed Alignment 1.1 Malkup Brook Road - Harders Chitty Road. This greatly improved the number of fire appliances able to reach the southern end of the Julimar subdivision in the specified timeframe.

The following comparison maps thematically show the number of appliances, which can reach the Julimar Subdivision area within 20 minutes of turnout from station. As is evident, the six-appliance minimum is currently not met in the southern portion of the subdivision, with some areas only receiving the local Julimar BFB appliances from within the subdivision area (as per Map 2). Map 3 for comparison, shows that Alignment 1.1, if built as a road, provides the minimum six appliances by lessening the travel time of Coondle-Nunile BFB and Toodyay Central BFB. Please note: this would also benefit response times of other emergency services such as WAPOL & St John Ambulance, further enhancing community benefit.



Figure 3 – R2R Assessment without Alignment 1.1 access

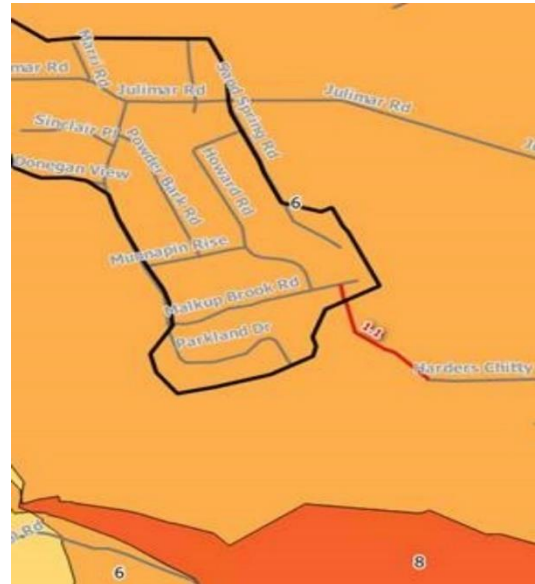


Figure 4 - R2R Requirement with Alignment 1.1 access

DFES would likely look favourably on resourcing requirements for the Shire, where it is demonstrated that the Shire is also taking proactive steps in minimising risks. It also allows for any extra resource request to DFES to focus on areas which cannot be addressed via enhancements to the road network.

Recommendation 6 should be considered as having the highest priority of any recommendation contained in this report. Hence, Recommendation 6 is preferred over Recommendation 7.

4.2 Coondle (West)

To be read in conjunction with Map 2

The Coondle West sub-division encompasses two discrete road networks accessing Coondle West Road from different points.

The westerly road network encompasses the developments of Sanctuary Park, Park Views Estate and Forest Edge. These estates are well linked internally with multiple north and west linkages to Coondle West Road, providing satisfactory evacuation options in multiple directions.

Conversely, the easterly network, being the development of Woodland Heights, has only a single access north to Coondle West Road. The internal road layout consists of a major loop (Timber Creek Crescent) and the long cul-de-sac of Horseshoe Road. This locality is characterised by extremely steep and rocky terrain.

The entire Coondle West area contains large pockets of forest and woodland vegetation on private and public tenure.

The Woodland Heights development includes a narrow perimeter Shire reserve. The east and west portions of this reserve contain FSARs maintained by the Shire. The location and alignment of this reserve, combined with inaccessible terrain on the southern boundary, result in limited opportunities for evacuation planning or any other form of bush fire mitigation.

An EAW (Alignment 3.1) linking these two networks exists from the end of Horseshoe Road in a general westerly direction to Jarrah Court. This EAW sits on portions of Shire reserve and internally along the southern boundary of DBCA land (with permission).

The existing EAW provides enough benefit to justify its retention (Refer Recommendation 8), however planning for a southern evacuation route to Waters Road would provide a better alternative, taking into account the likelihood of fire approaching from the north-west, given predominant summer wind conditions.

Two alignments have been assessed as southern evacuation possibilities, Alignment 4.1 Horseshoe Road – Waters Road and Alignment 4.2 Timber Creek Crescent to Waters Road, with the former being the preferred option, despite multiple land tenures along its proposed path. This alignment features topography that is more favourable and requires less properties/residents to back track in order to access it. Alignment 4.2 also has an extremely steep section, which would be undesirable from engineering and safety perspectives.

While roads are generally considered the preferred option, it should be noted this would likely have a substantial impact on regular traffic flows along Waters Road and Picnic Hill Road east to and from Bindi Bindi-Toodyay Road. The portion of Picnic Hill Road between Bindi Bindi- Toodyay Road- is a narrow road reserve containing two flood ways and a shallow-angle rail crossing.

Significant upgrades of this section of Picnic Hill Road would likely be required to handle changed traffic flows. This could be seen as undesirable or as an opportunity, by providing an enhanced business case for future infrastructure upgrade.

Therefore, Recommendation 9 advocates for Alignment 4.1 as either an EAW or a road.

4.3 Coondle (East)

To be read in conjunction with Map 3

The Coondle East sub-division encompasses the developments of Toodyay Highlands, Royd Nook and Balgaling Views. For the purpose of this report, it may be considered the rural residential zoning east of Bindi Bindi-Toodyay Road.

The subdivision is former grazing land, thus while not heavily vegetated relative to other portions of the Shire, it contains high grass fuel loads on hilly terrain, which is conducive to fast moving bush fires. The subdivision has a general west facing aspect meaning that the current direction of evacuation is towards a fire intensity of greatest risk (an intense uphill moving fire).

Access to the majority of the estate is from the west, via Bindi Bindi-Toodyay Road that runs on a north-south axis. The majority of properties are accessed either directly or indirectly via Coondle Drive, in a crescent formation intersecting Bindi Bindi-Toodyay Road at both ends. Likewise, the combination of Church Gully Road and Balgaling Road form an outer crescent of a similar nature but do not intersect with Coondle Drive. A minority of properties are accessed from Church Gully Road and Balgaling Road. The properties that rely on Coondle Drive for access and egress are most at risk due to being severely limited by the lack of evacuation options. A need for easterly egress is required.

An EAW (Alignment 5.1) is installed from the north end of Fawell Road and joins with Church Gully Road in the north. This EAW sits on a ten (10) metre wide road reserve. The narrow nature and sharp elbows do not support the corner radius requirements of the Guidelines. Recommendation 10 is that this EAW is upgraded, either to meet standard, but preferably as a road, as minor land acquisitions would be required for either approach.



Photo 1- Emergency Access Way - Fawell Road - Church Gully Road (03/06/2022)

While this EAW has enough value to be retained and upgraded, it does not in itself absolve the risk to the greater subdivision area, due to the high level of properties that would need to back track to reach it and its general direction facing the predominant prevailing summer winds (most likely direction of fire impact).

Options for easterly connectivity to Church Gully Road are explored below.

Lot 9500/P059240 (zoned 'rural residential') sits at the south-eastern extent of the subdivision and is possibly the best candidate for subdivision development contained in this report.

At its north-western extent, the existing McIntosh Road terminates on the boundary of this lot. Likewise, McPherson Avenue terminates on the southern boundary of this lot. This presents an opportunity (Alignment 6.3) to link these two roads across this lot. However, this does not directly fulfil the easterly egress need for this area.

At the eastern extent of Lot 9500/P059240 is the intersection of Leeming Road, Church Gully Road and Balgaling Road, which provides good egress options if linked. Thus, Alignment 6.1 explores the option of linking McIntosh Road to Leeming Road.

Currently understood development plans would indicate that Alignments 6.1 and 6.3 would be achieved by intersecting roads within a future development. Recommendation 11 advocates that the Shire favourably considers subdivision proposals linking McIntosh and Leeming Road (Alignment 6.1), this may or may not include the additional linking of McPherson Avenue.

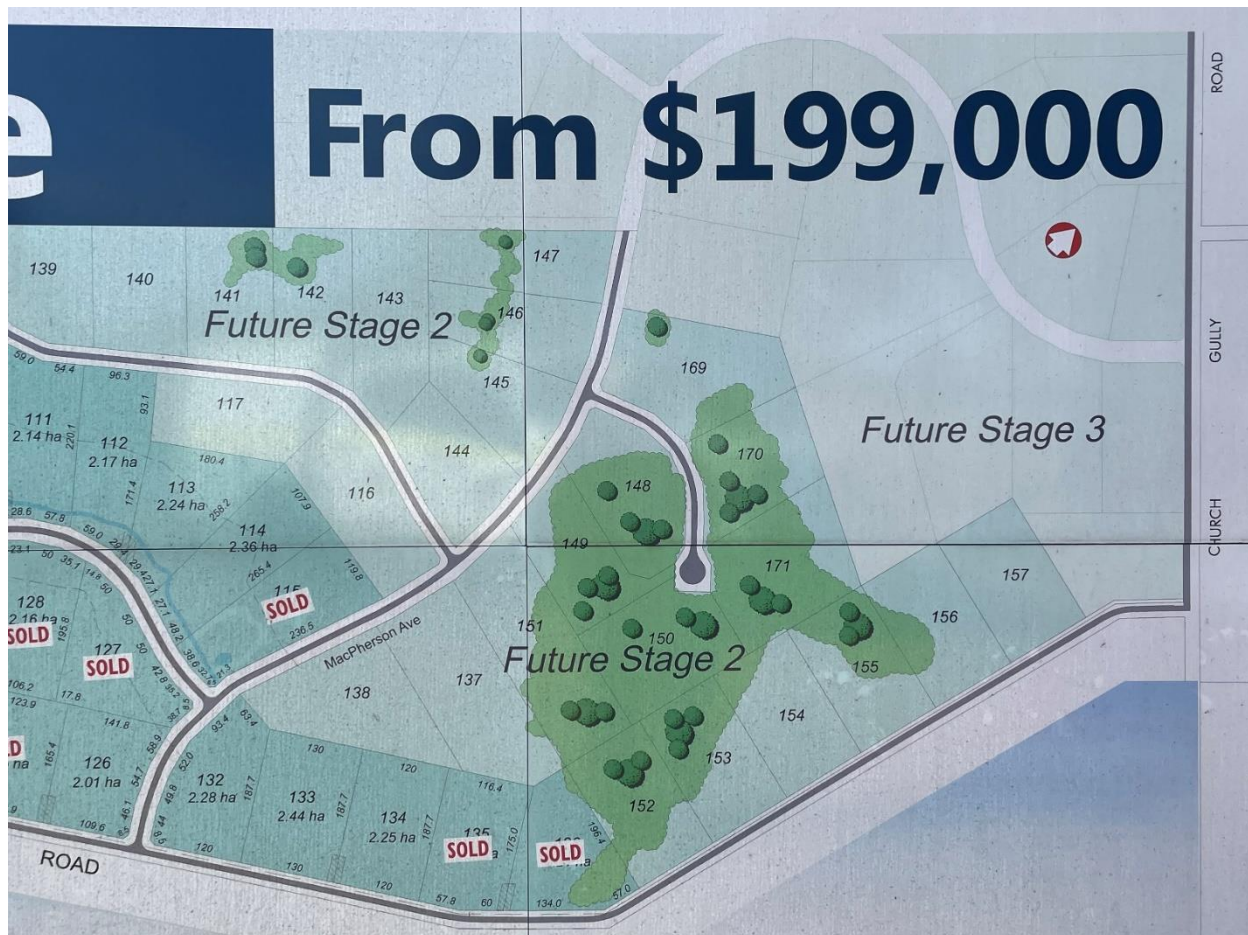


Photo 2– Real Estate Sign on Balgaling Road (03/06/2022)

An opportunity exists to further enhance connectivity (Refer Recommendation 12) by considering a direct link from Coondle Drive to Leeming Road (Alignment 6.2). This alignment represents the optimal location for the commencement of an easterly egress with a minimum of properties that need to backtrack in an evacuation. However, 210 Coondle Drive (Lot 518/P012216) would need to be traversed in some way to provide this link. This could be achieved without encroaching on the current resident on this property and should be considered as an additional requirement to the subdivision of Lot 9500/P059240 as per Recommendation 11.

Furthermore, an opportunity to offer a land swap for the required road reserve tenure exists via the eastern portion of adjacent Shire reserve 39747 (Lot 101/P12216), which the property currently bounds on three sides. Until recently, this reserve was used to house a gravity fed fire emergency water tank, which has recently been superseded by a new tank in the vicinity. Given the location and size of this reserve, it offers no benefit to the Shire or community in its current state. Recommendation 13 advocates for the Shire to negotiate this land swap with Lot 518/P012216 to provide additional road reserve frontage to Lot 9500/P059240 in order to facilitate Alignment 6.2, the subject of Recommendation 12. Thus, Recommendation 13, represents a Shire led action in support of a potential future developer led action.

Further supporting the land swap is the final considered Alignment 6.4 from Coondle Drive to Church Gully Road, which would be accessed via the created road reserve. However, this is not the preferred option in this area as it is unlikely have a reciprocal benefit to a developer and would likely result in a Shire constructed project. Given the other options that exist in this area, no recommendation is made at this time with respect to alignment 6.4.

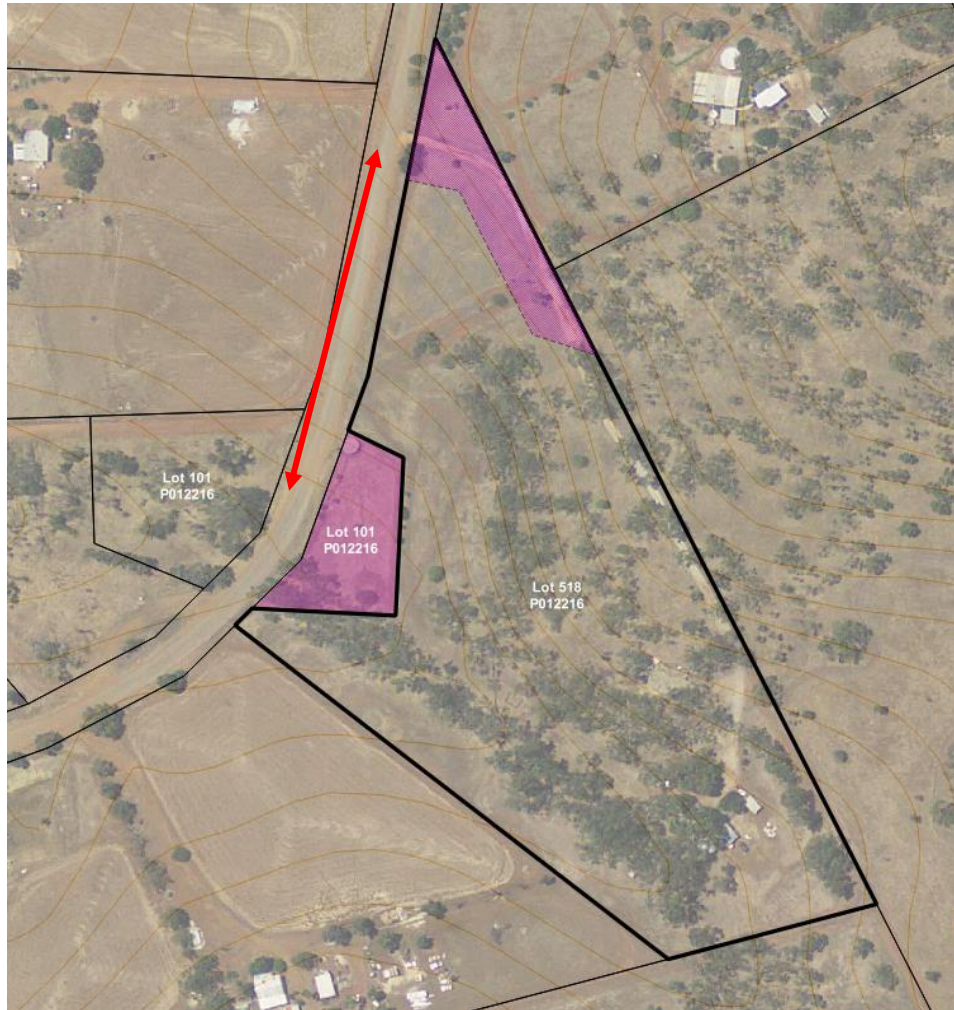


Figure 5 – Coondle Drive Land Swap Depiction – Land areas shaded are equal

Two other alignments considered in the 2015 Report were reanalysed (Alignments 6.5 and 6.6) in forming recommendations for this objective, the alignments both ranked lower than 6.1, 6.2 and 6.3 and are not desirable due to the direct and indirect impact on numerous properties. No recommendations are made for these alignments.

While Alignment 6.6 had merit in positioning and final scoring, no recommendation is made owing to the multiple tenures and the other viable options.

Thus, this area provides up to four (4) viable alignments (Alignments 6.1, 6.2, 6.3 and 6.4), with all except Alignment 6.4 being suitable for incorporation in future subdivision plans.

4.4 West Toodyay (Rugged Hills)

To be read in conjunction with Map 4

The suburb of West Toodyay is considered in two parts in this report; the greater Rugged Hills subdivisions area which falls outside of the gazetted West Toodyay townsite; and the area within the West Toodyay townsite. The former is discussed within this section and the latter in the following section.

The greater Rugged Hills subdivision area encompasses the developments of Rugged Hills and Brookdale Estate.

There are two discrete road networks. The westerly road network is the minority, made up of two no-through roads, Dreyer Road and Davies Road. The easterly portion is more extensive in size and length, containing multiple no-through roads; Wilkerson Road, Weir Road and Flexuosa Place, along with Ridley Circle. The latter is a looped road, which in itself is accessed via the indirect, meandering alignment of Wilkerson Road.

Taking from its name, the Rugged Hills subdivision area contains steep terrain. Travelling from Julimar Road, both the elevation and vegetation density increases as one navigates deeper (north) into the subdivision. This places many properties, particularly those on Wilkerson Road and Ridley Circle at extreme risk of an intense uphill moving fire, blocking the only egress direction.

An EAW (Alignment 7.1) links the two above mentioned road networks by connecting the ends of Wilkerson and Dreyer Roads. This was a recommendation of the 2015 Report, which the Shire has now installed. While this improves opportunities for properties in the immediate vicinity, it offers little benefit to the majority of properties on Wilkerson Road and all those on Ridley Circle.

This existing EAW has proven a useful link to residents, to the point that its misuse has been the cause of concern by some residents during the fire season when the gates at either end are unlocked. The Shire should recognise the practicality of this alignment and remove misuse concerns by considering upgrading to a road (Refer Recommendation 14). This may require investigation for any necessary conversion of the current 'Right-of-Way' tenure to a conventional road reserve vested with the Crown.

For the balance of properties, a northerly (or easterly) direction of egress is required. Options in this locality are limited and challenging when dealing with this legacy subdivision, however three alignments have been considered due to the extreme risk faced in this subdivisions area:

- Alignment 8.1 Ridley Circle north to White Gum Way
- Alignment 8.2 Wilkerson Road north-east to Waters Road
- Alignment 8.3 Wilkerson Road (east) to Picnic Hill Road

The Shire does not have tenure for any of these alignments. Alignment 8.1 contains one private (Lot 9002/P037111) and one government (DBCA) tenure. Alignment 8.2 would require negotiation with two private tenures. 8.3 leverages a portion of landlocked, unconstructed road reserve, but still requires negotiation on three private tenures.

Alignment 8.1 is considered shorter, more direct, over relatively flat terrain with fewer properties required to backtrack, compared to Alignment 8.2 and 8.3, which both have steep sections and are less direct. This is reflected in the more favourable overall score for Alignment 8.1 and forms Recommendation 15.

The purpose of the DBCA tenure traversed by Alignment 8.1 is nature reserve meaning environmental sensitivities could impact this proposed alignment. This was the primary concern of DBCA when the Shire first raised this proposition in 2011. The exact nature and parameters of the previous approach to DBCA is not well understood. Acknowledging that negotiation will be required in this case, the Shire should be flexible with its views on constructing as an EAW versus a road in any subsequent correspondence with DBCA on this matter. Regardless of construction method, this alignment would likely require fencing either side to protect the interests of the nature reserve.

Despite the preference for 8.1, the Shire should also consider carefully, any future subdivision proposals on Lot 151/P18487 (Refer Recommendation 16), in providing land tenure to support

either Alignment 8.2 or 8.3 should it be required in the future. This report does not specifically recommend the construction of Alignments 8.2 or 8.3 at this time. This is proposed as a future proofing action.

4.5 West Toodyay (townsite)

To be read in conjunction with Map 5

4.5.1 South of the river

The West Toodyay townsite is a historical subdivision area encompassing portions north and south of the Avon River. The southern portion is bounded by the Avon River on three sides with Julimar and River Road providing good egress in three directions for some properties. However, the road network comprising Clarkson, Beaufort and Clarke Streets is severely constrained by the rail loop, which approximates the path of the river. For the most part, this rail loop is grade separated either in deep cuttings or on steeply built batters. The only point where the rail line is near natural ground level is in the vicinity of Fitzgerald Street and Wellington Street. Existing road reserve is located either side of the rail corridor for both of these streets. Two alignments were analysed:

- Alignment 9.1 - Clarke to River (via unconstructed Wellington Street)
- Alignment 9.2 - Clarke to River (via unconstructed Wellington Street, Fitzgerald Street and Grey Street)

Alignment 9.1 ranked more favourably owing to its shorter length and direct nature. Alignment 9.2 scored less favourably due to its longer length, indirect nature and rail crossing line of sight limitation. The line of sight for Alignment 9.1 is better owing to it being further from the rail cutting.

The above said, the need for a rail crossing represents a potentially large barrier to achieving either of these alignments. Requirements and standards related to rail crossings have not been investigated as part of this report. Thus, Recommendation 17 does not promote construction at this time in favour of further investigation of issues regarding any potential rail crossing.

4.5.2 North of the river

The portion north of the river features small land holdings along (but not necessarily serviced by) Toodyay West Road. Many properties are accessed by narrow, no-through roads, which lack connectivity. The major fire risk is contained within the vegetation along the Avon River compromising the arterial Toodyay West Road. This portion of the Avon River and by location, Toodyay West Road, is also subject to flooding. In the 2017 floods, the water level came within 0.1metres of flooding Toodyay West Road in the vicinity of Cottage Street.

This means that properties which solely rely on Toodyay West Road may have their egress impacted by two hazards. This is most pronounced in properties serviced by Cottage, Small and North Streets. North Street runs approximately parallel to Toodyay West Road, but as currently constructed, forms a double-ended no-through road. Two unconstructed road reserves meet the eastern end of the constructed portion of North Street and thus provide opportunity to link to an additional road network.

Two alignments have been considered:

- 10.1 Extension of North Street to Collett Way, via existing road reserve.

- 10.2 Extension of Fitzgerald Terrace to North Street, via existing road reserve.

As per the analysis ranking, both routes scored favourably with very little separating them on score. Although construction of either alignment would fulfil the objective, Alignment 10.1 is the preferred alignment, owing to:

- The removal of a second no-through road (Collett Way).
- The alignment represents a direct straight line.
- Better egress from any future development north of North Street.
- Avoidance of the tight angled intersection created when turning from Collett Street west, into Fitzgerald Terrace if constructed as Alignment 10.2.
- The 2015 Report advocated for the construction of North Street to be '*reopened as a two-way road in this area*'. The report however did not formalise this assessment with a recommendation, possibly an oversight.

Consequently, Recommendation 18 advocates for the construction of North Street to Collett Way (Alignment 10.1), as a road as the preferred option, with construction of Fitzgerald Terrace to North Street (Alignment 10.2) as an alternate option in meeting the local objective.

Please note: This recommendation does not advocate for the construction of North Street east from Collett Way through to Picnic Hill Road.

Also located north of the river in West Toodyay is Francis Street, a no-through road that is approximately 400 metres long. Only four properties are serviced from Francis Street and the primary driver for the investigation of this cul-de-sac is due to ratepayer concerns raised with officers. Alignment 10.1 shows a direct connection to Wilkerson Road (Rugged Hills). This alignment attracted an unfavourable score due to terrain, vegetation and lack of properties it benefited. It should be noted that this alignment connects itself to a currently compromised road network.

However, as per Recommendation 16, the Shire should consider carefully any future subdivision proposals on Lot 151/P18487 to incorporate the connections to Francis Street in its design.

4.6 Toodyay Townsite

To be read in conjunction with Map 6

The Toodyay townsite consists of both legacy and currently developing subdivision areas. Although representing an established built-up area, the townsite should not be considered immune from bush fire. Thus, consideration should be given to improvements in legacy subdivision areas, as well as future expansion of the town site that provides connectivity to multiple directions of egress.

A number of options have been identified for the Shire's town site.

4.6.1 Nottingham Road

On the south-west border of town, Nottingham Road currently exists in two constructed portions and two unconstructed portions. One of the constructed portions, results in a double no-through road, with a single point of access to Folewood Road via Retford Road. The other has good connectivity to the greater townsite network via Julimar Road.

At present, the two constructed portions of Nottingham Road are linked by an EAW on road reserve. The existing EAW Alignment 12.1, has proven a useful link for residents, to the point that its misuse has been the cause of concern by some residents despite the seasonal management via gates.

The Shire should recognise the practicality of this alignment by honouring the intent of the road reserve and remove misuse concerns by considering upgrading to a road (Refer Recommendation 19).

Upgrading to a road would require drainage considerations near the intersection with Lukin Street, some widening of the trafficable surface and spray seal to reduce ongoing maintenance to this sloping alignment.

Due to the alignment's short length and existing levels of construction, this represents a financially simple, shovel ready project.



Photo 3 - Nottingham Road Emergency Access Way

4.6.2 River Hills Estate

River Hills estate is a relatively new development, north of the river within the Toodyay town site.

The estate is currently developing in a westerly direction. The Shire's recreation precinct and Toodyay district High School are key infrastructure in the area. Current access/egress is in the

east via Drummond Street (East), to Goomalling-Toodyay Road. Drummond Street is immediately adjacent to the river and is associated with heavy fuels and fire risk.

Despite this representing a recent development, several issues exist with regards to egress and internal connectivity.

This is partly due to the staged nature of the development, for which temporary intra-stage egress has not been provided (a recommendation of the Guidelines, Page 79).

This has been further complicated by the Shire's purchase of Lot 9508/P077718, for the Recreation Precinct, which has the effect of altering the original development plans. Specifically, the originally proposed alignments of Drummond Street and Burt Parkway have been affected by this land purchase.

While the Recreation Precinct now occupies the land originally proposed for the extension of and possible linking with Drummond Street (east to west), opportunity to extend Burt Parkway eastwards as per its original planned extent still exists.

Provision of this link as a road would provide internal linkage between the developed part of the subdivision and the Recreation Precinct, utilising Alignment 13.1, away from the heavy fuels of the river. As the Shire owns this land and with the exception of selling the southern portion of Lot 9508/P077718 for further development, the responsibility and cost of providing this link rests with the Shire (Refer Recommendation 20).

However, this link has no value when considering the lack of downstream-formalised egress to the west to Drummond Street (West).

Currently informal egress exists via a dirt track linking Drummond Street (West) to Burt Parkway via road reserve. However, this should not be considered to be maintained to the standard of an EAW due to seasonal conditions.

This section of track is prone to water logging and may remain un-trafficable to two-wheel vehicles well into the bush fire season. South of the unconstructed road reserve is Crown land with private land to the north. The Shire should consider carefully and be supportive of any future subdivision proposals on Lot 9011/P062847 and Lot 9010/P062847 if the future development results in construction of Drummond Street (West) to Burt Parkway as a road. Both these lots currently have the required residential zoning (Refer Recommendation 21).

Despite Alignment 13.1 ranking the highest among any alignment considered in this report, the dependency on Alignment 13.2 means that required expenditure can be deferred to coincide with future development supporting Alignment 13.2. Therefore, Recommendation 20 receives a lower priority than some other recommendations in this report at this time. This will afford the Shire time to consider a plan for the southern portion of Lot 9508/P077718 and how to incorporate this link.

4.6.3 Settlers Ridge

At the north-east end of town is the development of Settlers Ridge with its only egress and access in a southerly direction. At the northern extent of the subdivision, the road of Settlers Ridge terminates on the development's boundary with Lot of 1/D074943.

The Shire should consider carefully and be supportive of any future subdivision proposals on Lot 1/D074943, provided that the future development results in construction of a northerly link (such

as to support Alignment 14.1) to Telegraph Road. This lot currently has the required residential zoning (Refer Recommendation 22).

4.7 Walkey Heights and Wicklow (Dumbarton)

To be read in conjunction with Map 7

The subdivision south of Goomalling-Toodyay Road includes Walkey Heights and Wicklow Estate.

Road network access is only from the north via Whitfield and Boyagerring Roads. Much like the southern Julimar Estates, this area does not have egress in an alternative direction to the south.

The properties closer to Goomalling-Toodyay Road are located on relatively flat land with properties located further south along Whitfield Road and Whitelakes Drive at a higher elevation. The landscape is open grasslands with sparsely located trees. This greater subdivision was not considered in the 2015 Report.

There is currently a FSAR from Goomalling-Toodyay Road to the western end of Whitelakes Road on a 3km easement. It is likely this was put in place to pass planning regulations at the time; however, it does not offer a practical means of evacuation as it leads back to the same road from which the subdivision area is accessed and does not provide alternate directions of egress. A portion of this alignment does however, feature in one of two assessed alignments in this subdivision.

The general elevated nature of this estate makes it vulnerable to fast moving fires in many directions. A predominantly southern egress is sought.

This area has a major obstacle to the south, being the Avon River, limiting options to a south-easterly alignment to Dumbarton Road (Alignment 15.2) and a south-westerly alignment to the proposed development of the Toodyay Bypass (Alignment 15.1).

These two alignments present challenges of a different nature – Alignment 15.2 poses significant engineering challenges over steep terrain, while Alignment 15.1 relies on a connection to a proposed, uncommitted and unconstructed arterial road.

Lot 9001/P405299 over which Alignment 15.1 traverses, is zoned favourably for future subdivision, which could be leveraged in providing this future link combined with the advent of the Toodyay Bypass.

Alignment 15.2 would require negotiation over multiple land tenures with unrealistic further subdivision potential.

Considering the above, Alignment 15.1 obtained the most favourable scoring. This adds weight to the business case for the construction of the Toodyay Bypass and should be promoted in any strategies or lobbying for the bypass's construction. (Refer Recommendation 23).

Additionally, Recommendation 24 supports the favourable consideration of a subdivision proposal on Lot 9001/P405299. This is subject to the construction of the Toodyay Bypass (in particular the section spanning the Avon River) and the linking of the Bypass to Whitelakes Road. Completion of any proposed subdivision expansion prior to the completion of this section of the Toodyay Bypass would be deemed irresponsible and would only serve to increase the number of properties and lives with compromised evacuation and safety.

Meanwhile, the Shire should focus its efforts on other priority recommendations of this report. No alternative recommendation to pursue Alignment 15.2 is supported while the prospect of the proposed Toodyay Bypass is unconfirmed.

4.8 Greater Majestic Heights (Toodyay)

To be read in conjunction with Map 8

The greater Majestic Heights area includes the developments of Majestic Heights, Majestic Waters, Lozanda Heights and Vernon Hills. The area is reasonably well connected via Sandplain Road and Racecourse Road allowing egress in multiple directions to Toodyay Road and Folewood Road. There are however a number of looped roads and cul-de-sacs on the periphery of the greater area, which represent localised one way in and out scenarios.

The area has a mix of rolling and rugged terrain, with Wandoo woodlands the predominant vegetation type in the area.

To the east of the subdivision area, is substantially vegetated, steep and rugged terrain. This area receives localised morning easterly winds during summer putting this estate at risk from a fire originating in the Avon Valley (railway line, Toodyay Road, farming land use).

Two alignments serving different objectives are considered in this report:

- Alignment 16.1 - Extension of Sesselis Road to Folewood Road.
- Alignment 17.1 - Pindi Place to Toodyay Road.

4.8.1 Sesselis Road

Sesselis Road is a 1km long road serving approximately fifteen properties, with the majority of the properties with an easterly exposure to fire. A road reserve exists between the currently constructed portions of Sesselis Road north to Folewood Road.

This would provide an alternate direction of access in this locality. The road reserve narrows in the vicinity of 195 Folewood Road (Lot 45/P223149) and a wider reservation in this portion may be required.

Construction of this connection would provide an attractive alternative to access the greater subdivision for travellers accessing the Toodyay townsite. Therefore, this proposal does have the potential to substantially change traffic flows along Sesselis Road. An EAW is not recommended in this case, owing to the Shire's past experience in constructing convenient access as EAWs in other areas.

Recommendation 25 advocates for the construction of this alignment as a road but acknowledges that there are higher priorities contained within this report. Recommendation 26 provides an alternative recommendation to consider favourably the subdivision proposal over Lot 1469/P247186 and if necessary, Lot 1431/P247190, which results in the linking of Sesselis Road to Folewood Road.

4.8.2 Pindi Place (Wandoo Circle)

At the south-west extent of the greater subdivision area is the local network of Wandoo Circle (loop road) and Pindi Place cul-de-sac. This network connects to Sandplain Road in the east.

Pindi Place terminates on the western boundary of the subdivided area and therefore represents an opportunity on which to base future egress options via the adjoining 5459 Toodyay Road (Lot 3412/P415291).

The predominant land use for this lot is extractive industries, however the Shire should consider carefully, and be supportive of any future subdivision proposals on Lot 3412/P415291, provided that the future development results in construction of a road network connecting Pindi Place to Toodyay Road. (Refer Recommendation 27).

4.8.3 Non-Egress Consideration

Although the focus of this report is evacuation route options, an otherwise supported fire-break recommendation of the 2015 Report did not adequately consider land tenure with respect to access for maintenance.

The fire-break in question runs around the rear of a group of properties on Hibbertia Place and Drummondi Drive. The 2015 report reference for this track was 3H and has been retained on Map 8. The 2015 report advocated for the retention and maintenance of Track 3H as a fire-break, which is supported by Shire officers. However, due to terrain, the best access to the portion of this fire-break which resides on Shire owned land, is via private property to which the Shire does not have legal access.

Land acquisition is not required in this case, however an easement over Lot 40/D056678 should be sought to connect the current dead-end (safety risk to firefighters) back to the road network (Refer Recommendation 28). Ensuring this fire-break is easily accessed for maintenance and removal of the dead end is essential.

4.9 Glencoe Estate and Extracts (Toodyay townsite)

To be read in conjunction with Map 9

Glencoe Estate is a small residential estate residing immediately west of the Extracts industrial complex, both areas are bounded by the Avon River to the north and Northam-Toodyay Road to the south.

The land slopes gently downwards from Northam-Toodyay Road to the river, has limited vegetation with a collection of slightly spread-out houses and vacant blocks awaiting development.

Each area has its own point of entry from Northam-Toodyay Road, but thereafter the two networks are not internally linked.

Despite the two areas having no through roads and with one entry point each, the cul-de-sacs of Macdonald Retreat and Extracts Place are separated via a narrow linear reserve representing less than 50m in width. An informal track between these two cul-de-sacs exists in a trafficable condition as per Photograph 4 below.



Photo 4 – Google Maps Street view from Extracts Place viewing the end of MacDonald Retreat.

Although any action in this area is of low priority, it is recommended (Refer Recommendation 29) that Alignment 18.1 be considered for a spray seal from cul-de-sac kerb to cul-de-sac kerb, aligned to the next resealing of Macdonald Retreat or Extracts Place to formalise this link as an EAW.

4.10 Mountain Park (Dumbarton)

To be read in conjunction with Map 10

The Mountain Park development in Dumbarton is yet another example of a one way in, one way out subdivision.

All roads in the development end with cul-de-sacs with a single access egress north to Dumbarton Road via Nairn Drive.

The area is bound by the Avon River to the west, the Shire of Toodyay and Shire of Northam local government boundary to the south and farmland to the east. Only one road (Drumree Drive) terminates at the edge of the subdivision area, however this is on the aforementioned shire boundary.

Ruling out a crossing over the Avon River due to complexities, two alternative alignments have been assessed. Both alignments come with their own significant challenges.

These alignments are:

- Alignment 19.1 - Drumree Drive, south to Katrine Road (within the Shire of Northam)
- Alignment 19.2 - Drumree Drive, northeast along and within the Shire boundary to Dumbarton Road.

Alignment 19.1 being wholly in the Shire of Northam, would require consultation and support from an external stakeholder. The most practical way of achieving this link, would be for the Shire of Northam to support development on Lots 8/D005700 and 56/P0179915 to provide for the construction and ongoing maintenance of a road, linking Drumree Drive to Katrine Road. However, the terrain on these lots would likely detract from the financial viability of sub-divisions in this area.

Alignment 19.2 avoids the complexities of an external jurisdiction, but achieving this alignment would require significant expansion of the subdivision area to the east to support the development of this alignment.

Both Alignments 19.1 and 19.2 are excessive in length, at approximately 4km each. Therefore, an EAW does not form a desirable alternative in these cases.

Neither option achieve a favourable analysis scoring and thus, a recommendation to seek construction is not made within this report. However, further analysis of the viability of future development in the Dumbarton area should be conducted by appropriately skilled personnel to validate, or otherwise, the viability of such concepts. This should include correspondence with the Shire of Northam. (Refer Recommendation 30). Either way, this is unlikely to be a short term priority, relative to other egress options within the shire.

4.11 Moondyne Park (Hoddy Well)

To be read in conjunction with Map 11

Moondyne Park Estate is a subdivision in Hoddys Well and has two separated, no-through road networks (Panorama View & Twilight Brae) that access the area from the west, via Salt Valley Road.

Although the subdivision has a buffer zone of open paddocks and sporadic trees to the west and south, beyond that is a corridor of dense bushland, stretching from Toodyay Road to the south of Salt Valley Road. Certain properties to the east of Panorama View and south of Twilight Brae contain and are bounded by significant bushland.

The 2015 Report stated that there was limited need to install EAWs in this area, which is broadly supported by Shire officers when considering other priorities within the Shire. However, opportunity still exists for connectivity for residents within this area and thus three alignments were assessed.

With respect to Twilight Brae, two options were considered:

- Alignment 20.1 Twilight Brae north to Toodyay Road
- Alignment 20.2 Twilight Brae east to Toodyay – Clackline Road (Considered in the '2015 Report')

The analysis scoring significantly favoured Alignment 20.1 due to reduced number of land tenures and separation of bush fire prone vegetation.

The end of Twilight Brae meets 5748 Toodyay Road (Lot 600/P042855). This lot is currently zoned Rural Living which would permit further subdivision and thus, as per Recommendation 31, the Shire should consider any future subdivision proposal on this lot provided it connects Twilight Brae to Toodyay Road. The Shire should also consider options for rezoning to Rural Residential, should this make the proposal more viable for the proponent.

Alignment 20.2 was assessed based on its inclusion in the 2015 Report but is not considered a suitable alternative to the above.

With respect to Panorama View, a single alignment (Alignment 21.1) was considered from the end of Panorama View to Hoddy Well Road. The 2015 Report also analysed this route (as it

existed at the time as informal egress) and advocated for its upgrade to an EAW standard. The 2015 Report did not consider the lack of land tenure over Lot 135/P032527 to support the recommendation.

This omission was identified by Shire officers while further analysing the recommendation in question. Unfortunately, despite efforts by the Shire, land tenure in the form of an easement was unable to be secured. This resulted in the removal of the previously existing informal egress in this area.

The Shire should consider re-visiting land tenure over Lot 135/P032527 and/or Lot 136/P032527; for this alignment, either by way of an easement to support an EAW or subdivision of a strip of land, for a road. This forms Recommendation 32.

4.12 Greater Morangup

To be read in conjunction with Map 12

The estates included in the Greater Morangup subdivision area are Gidgegannup Springs, Regal Hills, Rolling Green Estate and McGellin Estate.

Access is via Morangup Road from the north and south, and Dryandra Road from the south, both intersecting with Toodyay Road. The estates west of Morangup Road all have looped roads as the major artery (McKnoe Drive, Louisa Circle and Red Brook Circle respectively) with a number of connected no-through roads.

The most glaring example of this is the fifteen-kilometre long McKnoe Drive, which penetrates some seven kilometres west of Morangup Road and terminates on the same road, less than one kilometre from where it started.

The predominant vegetation in the area consists of Marri and Banksia (Dryandra) which can result in high fuel loads. The estate is bounded by substantially DBCA reserves to the east, north and west. A portion of the western boundary is private tenure, but still heavily vegetated.

The scale of the subdivision combined with location and density of vegetation and lack of westerly egress options, puts this community at risk in a large fire event.

The nearest road to the west is North-East Road in Gidgegannup, approximately 3.8km as the crow flies from the end of South Place, a small cul-de-sac off McKnoe Drive. North-East Road in Gidgegannup could itself benefit with an easterly egress in the opposite direction towards the Morangup Road network.

However, in investigating this potential two-way egress option, two distinct challenges are immediately apparent. The first challenge is the western boundary of the greater Morangup subdivision area, which forms the local government boundary with the City of Swan. The second and more pronounced challenge is the unfavourably steep and heavily vegetated terrain to the west and south of South Place.

Officers have also considered an alignment south, from South Place to the northern end of the constructed portion of Utah Road, a distance of 4.5km. A very similar situation exists.

Rudimentary analyses of gradients alone have been undertaken which indicate that both routes have gradients in the vicinity of 1:4 to 1:5, over extensive lengths (around one kilometre or more),

which well exceeds the 1:7 gradient maximum permitted for EAWs in The Guidelines (Page 76). For context, using a local example, the portion of Stirlingia Drive between Hatfield Place to Sesselis Road in Toodyay, represents a gradient of 1:7.4.

Any deviation to these alignments which seek to follow flatter ground or more favourable terrain, would result in alignments so indirect and lengthy, they would fail to meet their original objective of efficient evacuation routes.

It is regrettable that despite the need and risk, no viable solution is apparent in this case due to the anticipated excessive financial and engineering undertaking that would be required. The 2015 Report noted that such a route was impractical and as this report's high level analysis supports this view, the alignments above have not been scored or ranked or indicated on Map 12.

Despite the setback above, an opportunity to improve egress exists in the southern portion of the greater subdivision area, namely the contained road network of Red Brook Circle, Blackboy Way and Brook Close.

Currently this is a one way in – one way out road network, serving 69 properties with a single easterly egress to Dryandra Road. Toodyay Road bounds the southern portion of the development providing an opportunity for a short link to provide an alternative direction of egress to the south as per Alignment 22.1, linking the southeast corner of Red Brook Circle to Toodyay Road.

Such a link would improve access to and from the subdivision to a point it would likely become the primary means of accessing Red Brook Circle. The link should therefore be built as a road to avoid the inevitable misuse of an EAW (which was the recommendation of the 2015 Report). Land tenure however would need to be negotiated.

A standard twenty metre road reserve could be achieved without encroaching on the applicable 30 metre building setback for Rural Residential zoned land, by favourable negotiations with either Lot 229/P018296 or a combination of Lot 229/P018296 and Lot 230/P018244. (Refer Recommendation 33).

Consultation with Mainroads WA for a suitable intersection design with their asset (Toodyay Road) would be required under this proposal.

As analysed in-depth in Appendix D (Case Study: McKnoe Drive Easement), an extensive easement network within the subdivision does not provide practical options for either firefighting operations or evacuation. Therefore, these easements do not factor into any egress alignment related recommendations.

4.13 Bejoording

For completeness, the townsite of Bejoording (subdivision area) has been assessed as part of this report. Given that multiple arterial roads intersect near its centre, its favourable flat geometry and minimal forest fuel loads, no additional evacuation egress is recommended.

4. Fire Emergency Water

Strategic provision of water is essential for effective firefighting operations, with time to access the most critical factor. The reticulated water supply in Toodyay is geographically limited. The Shire's only standpipe, near the end of Toodyay-Northam Road, is located near to town and within the only portion of the Shire to feature Water Corporation fire hydrants. The Shire of Toodyay recently worked with the Water Corporation on a fire hydrant infill program. This included, at the request of the Shire, an expansion of the fire hydrant network along Julimar Road which provided a single, strategic hydrant within the West Toodyay townsite. While this addition provides benefit in its local area, alternate solutions are relied upon for most sub-division areas which are situated further afield.

Alternate solutions are most practical and commonly found in the form of dedicated fire emergency water tanks. The Guidelines contain standards regarding positioning and capacity of emergency firefighting water for subdivision areas. The Guidelines, while intended for future development, may be viewed as the best reference for achieving retrofitted fire emergency water supplies in high-risk areas.

The Guidelines have two main criteria:

1. Located within a 20-minute turnaround time (from entrance to a property).
Note: For the purpose of analysis the Shire has factored fill time into this figure as this was the standard up to version 1.3 of the 'Guidelines'.
2. 50,000ltr per 25 lots (or part thereof).

The Shire's fire emergency water network consists of 27 sites with total capacity of 2.61 million litres.

The table below contains statistics of aggregated statistics for subdivision areas across the Shire in relation to the above criteria:

Total Number of Lots (Subdivision Areas)	1,948	Number of Lots with 20min turnaround time	1,932	Compliance
Required Capacity (litres)	3.90m	Current Capacity (litres)	1.32m	99.18%
				33.84%

Table 4 – Aggregated Fire Emergency Water statistics for subdivision areas

Note 1: Not all sites are located in subdivision areas – this explains the difference between totals mentioned above and those contained in the above table.

Note 2: The above figures do not include townsite properties (reticulated service), or Shire Depot coverage/capacity. The latter has been excluded as its large capacity, which is used for other purposes besides Fire Emergency Water, would unreasonably distort the above figures.

Note 3: Capacity figures do not include additional capacity provided by bore fed sites in feed rates.

Note 4: These are aggregated figures. Performance of an individual subdivision area may be better or worse than the aggregate.

As is evident from the above table, reasonable coverage is achieved based on the turnaround time criteria. The coverage map below shows coverage of all fire emergency water locations within the Shire with exception of three Avon Valley tank sites which do not reside on the road network data set required for analysis - their purpose is to supply water in the difficult to access Avon Valley.

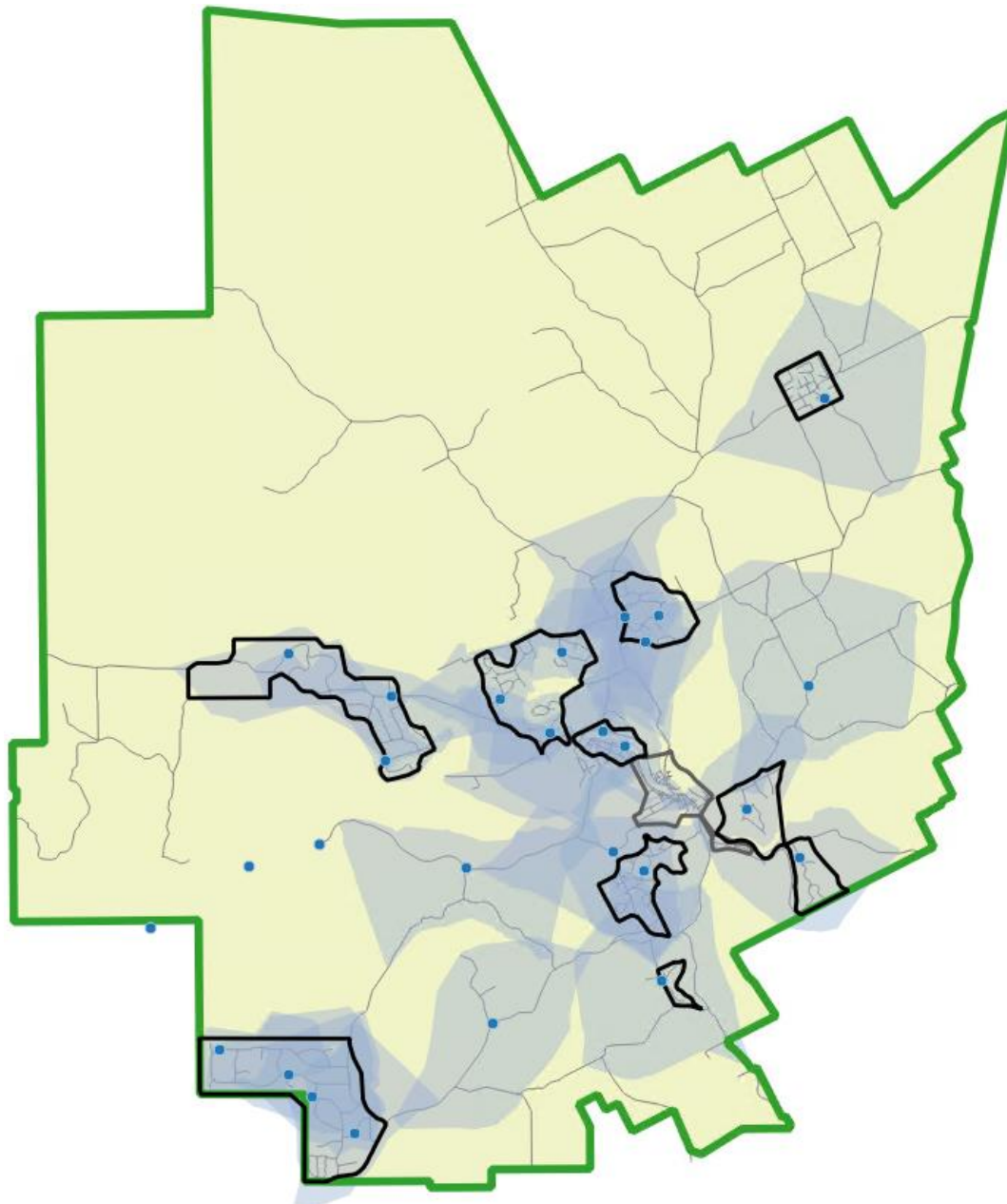


Figure 5 - Fire Emergency Water – 20 minute Turnaround Coverage.

While not considered as critical as strategic placement, capacity remains the Shire's biggest gap to the standards of The Guidelines. Achieving capacity standards would require continued major investment to achieve.

The Guidelines allow for alternate solutions in meeting fire emergency water source specifications. While not specifically mentioned as an alternate solution in The Guidelines, the Shire has implemented a 'hub' system within each major sub-division area to augment water supplies. The hub system at each of Coondle-Nunile, Julimar, Bejoording and Morangup bush fire brigade facilities, provide capacity of between 94,000 and 141,000L, pressurised by high flow electric pumps with backup power and drafting plumbing redundancies. This allows for non-

potable water carts (BFS, DBCA and private contractors) to efficiently transfer water from, to and within an incident without reliance on the Shire's sole standpipe. This aims to reduce the capacity draw of firefighting applies on static 'satellite' tanks in the area during an incident.

The Shire's fire emergency water network has been made possible by contributions from both direct and grant augmented funding from the Shire, Department of Water and DFES over an extended period.

The Shire should continue to consider and seek funding for further enhancements to its fire emergency water supplies (Recommendation 34). This includes increasing capacity at existing sites in subdivision areas and infill in rural areas with large travel times (northern half of Shire).

Fittings

The Shire of Toodyay typically fits its fire emergency water facility with the following fittings:

- 2-inch Camlock Female; and
- 3-inch Camlock Male; and
- (in the case of a pressurized hub site) 2.5-inch British Instantaneous Coupling Female.

This configuration has been adopted as it allows most fire appliances to connect to these facilities without need for an adaptor.

However, standards for fire emergency water facilities have long been focused on metropolitan requirements. This has been a recent point of discussion at the state level DFES Bush Fire Operation Committee. The Guidelines have introduced standard fittings in their current iteration, these appeared to remain metropolitan focused and do not align (allow connection) with a bush fire appliance either directly or by standard equipment issued by DFES which specifies, builds, and supplies fire appliances to local government Bush Fire Services.

The Guidelines current fitting requirement for non-commercial use is:

- 2-inch Camlock Male; or
- 4-inch Camlock Male.

The Shire of Toodyay has stowed additional fittings on its appliances to ensure that appliances can connect to a wide range of tank fittings they may come across on private land or out of shire. The Shire should also consider the ability of out of Shire appliances to be able to connect to its water supply during large incidents.

Given the current 'Toodyay standard' allows at least some appliances to connect directly to tanks without the need for adaptors not supplied as standard by DFES, and the lack of alignment between DFES appliance specifications and those of the Guidelines, caution is advised in making changes to the Shire's standard tank fittings at this time.

Recommendation 35 advocates for the raising of the issue with relevant stakeholders DFES/Department of Planning, with the view of making relevant changes when the appropriate alignment occurs.

Signage

The Shire's current water tank network is currently sign posted by 'FIRE Emergency Water' street blade style signs. The placement of signs should not be considered comprehensive or constant. No signage is located on/at the fire emergency water facilities themselves. While local fire crew have a good understanding of tanks in their immediate area, this knowledge is less reliable for crews outside of their local area, and almost non-existent for crews from outside of the Shire. Signage to assist fire crews in locating fire emergency water facilities should be installed in such a way to effectively direct crews from arterial roads or points of entry in high-risk areas.

Recommendation 36, advocates for a review and upgrade of signage to the following standard:

- White on Red 'Fire Emergency Water' street blade style signage is placed at intersection of arterial roads leading into subdivision areas, and then at each intersection thereafter.
- Each sign should point in the direction of travel to the fire emergency water facility and contain distance information.
- Where an interim turn (intersection) needs to be navigated the distance should be contained in brackets ().
- White on Red rectangular signage at the fire emergency water facility: 'Fire Emergency Water - Emergency Use Only – Do Not Obstruct'

The table below demonstrate the proposed signage:

Intersection signage where further navigational turn is required	
Intersection signage – where no further navigational turn is required	
Roadside signage directly opposite tank facility location	
Facility usage signage attached to tank	

Table 5 - Proposed Fire Emergency Water Signage

5. Shire Easement Liability

Recently the Shire became aware of an easement for which it had maintenance responsibilities under the [Land Administration Act 1997](#). This highlighted a gap in the Shire's understanding of easements in which it is party to and the specific obligations of those easements. Lack of understanding represents a risk where the Shire may be liable for not meeting its legal obligations specified in a Deed of Easement.

Landgate's (2021) simple definition of an easement is defined as "*a right attached to a parcel of land which allows the proprietor of the parcel to use the land of another in a particular manner or to restrict its use to a particular extent.*"

An easement does not change ownership of land but provides rights to another party for a specified use. The use and obligations of both the grantor and grantee are specified in a Deed of Easement, which becomes a legal instrument under the [Land Administration Act 1997](#).

Understanding what easements the Shire is party to (as a grantor or grantee) and its obligations under each Deed of Easement are key to reducing the risk of liability stemming from un-serviced obligations.

Easements in benefit of the Shire are common in the area of fire management, however easements may exist for other purposes which may contain similar liabilities. Thus, the concept of better understanding the Shire's easement liabilities in this section of the report should not be contextualised as being solely fire related.

Appendix C, Harvester Drive Easement Case Study, details the above-mentioned example where the Shire had obligations under the Deed of Easement. While checks have been performed on other easements known to the Shire's Emergency Management officers, data obtained via Landgate indicates a high probability of the existence of additional easements for which the Shire is not aware of;

- a) The existence of such an easement,
- b) Whether it is party to such an easement,
- c) Any obligations with respect to such an easement

In the example of Appendix C, Harvester Drive Easement Case Study, the Shire, for a period of approximately ten years, was not meeting its obligations for fire-break maintenance required by the Deed of Easement. Had a bush fire impacted the area and led to loss of property and/or life, the Shire may have been exposed to legal claims of landholders/residents or insurance companies. The reason the Shire was not maintaining the subject easement was due to lack of knowledge of its responsibilities.

Increasing knowledge is the key to reducing risk. Recommendation 37 advocates that the Shire allocates appropriate resourcing to undertake a project to identify and record easement 'Grantors', 'Grantees' and responsibilities for all easements within the Shire. Where a Shire responsibility is recorded, the relevant Shire department should review whether obligations are being met under the Deed of Easement and take any required action or seek to extinguish the easement if it is deemed to have no benefit to the Shire.

To understand the full extent of the Shire's responsibility, easement documents (Deed of Easement) would need to be purchased.

Unfortunately, Landgate's spatial dataset is not complete. Therefore, the approach required to ascertain individual easement responsibilities would differ depending on the completeness of Landgate dataset in relation to a given easement.

In the case where an easement document number is identified within the Landgate Data, the document can be directly purchased.

Where an Easement Document Number is not identified in the Landgate Dataset, the Certificate of Title would need to be purchased first, in order to obtain the Easement Document Number for purchase of a Deed of Easement.

The current cost for a Certificate of Title or Easement Documents search is \$27.20.

The Shire has analysed the Landgate dataset for completeness and provides the following statistics and cost projections.

			Certificate of Title Document Purchase	Easement Document Purchase	Total Cost (incl. GST)
Number of Easement Documents identified in Landgate Dataset	274	These Easement documents can be purchased directly	N/A	\$7,452.80	\$7,452.80
Properties without Easement Document Numbers	271	These Easements would require a Certificate of Title search prior to obtainment of the Easement Document.	\$7,371.20	\$3,699.20*	\$11,070.40
		Totals	\$7,371.20	\$11,152.00	\$18,523.20

Table 6 - Projected costings of obtaining Landgate Document

* The estimated Easement Document Purchase total is based on the premise that some of the 271 properties without Easement Document Numbers would share common easements, thus reducing the number of Easement documents that need to be obtained. The extent of Common Easements on these properties cannot be quantified. A figure of 50% has been used for the above estimate.

Staff Administration time is in addition to the above and has been estimated at 30 minutes to process each Easement document. This includes obtaining, interpreting and recording the relevant information. This equates to 28 days or approximately 6 weeks (One Staff Member full time).

Given the inherent complexities surrounding easements which have been highlighted in both this Section and Section 3 – Toolkit, the Shire should seek to limit the number of easements to which it is party to in the future. This will reduce the risk of potential future liabilities. The Shire should also consider adopting a position of opposing development proposals, which attempt to establish easements across multiple properties in the context of fire. Furthermore, when applying subdivision perimeter vehicular access solutions, higher-level controls such as the use of a perimeter road or Shire managed tenure should be favoured (See Recommendation 38).

6. Mitigation

7.1 Background

Bush fire mitigation is an important activity that can reduce the spread and severity of a bush fire.

Mitigation amounts to maintenance of vegetation and should be considered an ongoing operational requirement, similar to the grading of a road. Retreatment ranges from one year to fifteen years, depending on the vegetation type. As a rule of thumb, vegetation loads of over six tonne per hectare make bush fire hard to control. Grass fuel types can achieve six tonne per hectare annually, where Marri/Jarrah typically add one tonne per hectare annually. Wandoo woodlands add fuel loads at approximately half this rate.

Mitigation is a shared responsibility where all landholders play their part, including local governments, other relevant agencies and private landholders.

7.2 Mitigation Activity Fund (MAF)

In the past five years, mitigation has become a major focus of the State, with increased funding to local governments via the Mitigation Activity Fund (MAF), funded by the Emergency Services Levy (collected by the Shire on behalf of the State). MAF enables mitigation works on Crown land that is managed by the local government. This includes reserves, road reserves and Unallocated Crown Land (UCL) and Unmanaged Reserves (UMR). MAF does not support works on private land or land directly owned by the Shire.

The Shire has received and invested approximately \$2.5 million for mitigation activities via MAF. This has enabled the Shire to do work primarily in and around high-risk subdivision areas, which have received little mitigation attention since their inception - in some cases, forty years ago. The Shire has now largely cleared its backlog and is progressively moving its upcoming MAF program to a “maintenance program”.

The Shire now needs to continue and consider increasing its mitigation investment on its directly-owned tenure. An example of this is the balance of the Recreation Precinct land, which has been left in an unmanaged state Refer Photos 5 and 6, despite its proximity to public and private assets. The Shire should consider a mitigation program and budget to meet needs on its private tenure (Recommendation 39).



Photo 5 - View of Shire land adjacent to Recreation Precinct



Photo 6 - View from Shire land between Recreation Precinct and local Residential area

7.3 Tools and Techniques

As discussed, different vegetation types have different fuel load behaviours and characteristics requiring a range of mitigation approaches to address fuel loads and meet the needs of the local environment. Therefore, the Shire has adopted an approach of identifying and applying the most appropriate mitigation method to ensure the best mitigation and environmental outcomes.

Methods used successfully within the Shire include forestry mulching, chemical application, biological (grazing), slashing and prescribed burning.

Despite the wide range of mitigation approaches available, the 2015 Report almost exclusively promoted 'Planned burning', as the most effective treatment method. In fact, Recommendation 9.6.4 of the 2015 Report stated:

"The Shire should strongly consider a wide ranging strategic hazard reduction burning program as the most effective way to manage fuel loads".

This does not align with the Shire's experiences in dealing with its land tenures, which vary greatly in terms of vegetation, size, shape, function and terrain. Officers do not support a one-size fits all approach, instead favouring the most appropriate method to support the objectives and constraints of the site.

A summary of mitigation methods is provided in the table below.

METHOD & SUITABILITY	ADVANTAGES	DISADVANTAGES
<u>FORESTRY MULCHING</u> Machinery based approach using a spinning toothed drum to change the structure of the vegetation, via a mulching action. Mulched material is left in-situ reducing a fire's access to well-structured fuel. It is an effective mitigation method. Particularly useful on dense shrub fuel types such as Banksia (dryandra). The Shire has used this method on selected road verges and reserves.	The in-situ mulch, which is left behind, provides a natural barrier against weed growth and erosion. Can be conducted in a wide range of weather or seasonal conditions. This method can be selective to avoid key vegetation such as grass trees or trees, as well as assets such as fences or utilities. Encourages regrowth of more diverse species from seed bank in soil. This technique is gaining recognition within the industry, resulting in more contractors able to conduct this type of work. Does not have the patrol and follow up requirements of hazard reduction burning.	Can be expensive, particularly when dealing with small areas.
<u>CHEMICAL (Spraying)</u> Suitable on grass fuels such as road verges or grass reserves.	Relatively cheap and quick. Correctly timed spray can reduce grass going to seed and therefor reducing grass growth for the next season. Wide availability of contractors.	Limited application window. Relies on a consistent and timely budget settlement process.
<u>MECHANICAL</u> Machine Clean-up (Used on degraded reserves to improve the land such that a follow up mitigation strategy (slashing/spraying) can be carried out in a cost-effective manner in the future).	Wider timeframe to be able to conduct compared to spraying. More cost effective than mulching in the context of clean-up. Generally regarded as a one-off process followed up by chemical method. Wide availability of contractors.	Produces heaped waist that requires secondary attention (burning).

<u>BIOLOGICAL</u> The use of stock animals such as sheep to reduce grass fuel levels on already degraded grassland reserves.	Cheap (high demand sheep owners to obtain grazing opportunities for their stock) Can occur over a wide time frame. Suitable for grass land areas featuring rugged/steep terrain.	Animal welfare considerations (These responsibilities often deferred to stock owner). Need for adequate fencing to be established. It restricts the public use of land during the treatment.
<u>BURNING</u> Useful on larger, natural bushland reserves. The Shire has very few of reserves of this nature at a scale where burning would be considered the most effective method.	It is the most natural mitigation method (Mimics nature).	Requires largest personnel commitment of any method. Requires machinery preparation and standby. Potentially long patrolling requirements, which can last several days. Only cost effective with scale. Can be controversial with the public and potentially impactful to public (i.e. smoke). Can lead to weed invasion requiring following treatments (chemical) in some environments.

Table 7- Mitigation Methods used within the Shire of Toodyay

As is evident above, there are a range of options available, many of which have advantages over burning.

7.4 Mitigation Workforce considerations

7.4.1 In-house (Staff and Volunteers)

The 2015 Report strongly advocated for the use of volunteer bush fire brigades as the major workforce for burning on both public and private land. This report does not support such a position for a number of reasons.

Bush fire brigades should not be considered as pseudo-Shire workforce given their unpaid nature. The same extends to any expectations that they form a workforce to placate private landholders. This is a position which featured strongly in BFAC member feedback on the 2015 Report. In short, the volunteers do not appreciate the assumption made on their behalf by the '2015 Report'.

It should be noted that the Shire's bush fire volunteers are trained to control and extinguish wildfire, not to conduct hazard reduction burning. While there is some overlap of both knowledge and equipment, these two activities should not be considered the same skill set.

In addition, the equipment and extensive training required, coupled with the diversity of fuel-types and the inherent time-poor nature and availability of volunteers make this an unsustainable option.

While Shire officers could be an option, there are a limited number of appropriate staff and impacts on other scheduled activities must be considered. Finally, given the highly weather dependant nature of hazard reduction burning, sufficient scale would be a barrier to retention of knowledge within both Shire staff and volunteers.

While fuel loads on private land do represent a concern in the management of bush fire and the Shire has the ability under the [Bush Fires Act 1954](#), to compel landholders to reduce fuel loads, an approach which advocates for education and one that supports industry development is a preferred position.

The 2015 Report's notion that an individual brigade could conduct 10 – 15 burns annually is an unrealistic assumption of brigade capabilities in a rural setting. The combined 'free time' of brigade members to conduct burns would not be sufficient to have a tangible overall impact on bush fire management, when considering servicing private land tenure. Provision of such a resource to private landholders would undermine the concept of the landholder's responsibility in managing their own land, and likely result in a reduction of landholders currently self-managing fuel loads without burdening the Shire's Bush Fire Service. It also undermines the prospects of a viable private, local mitigation industry.

7.4.2 The role of industry

Since 2015, the Shire has conducted the majority of its mitigation activities via appropriately skilled practitioners. Specifically, in respect to hazard reduction burning, this has resulted in improved ecological outcomes, minimised impact on Shire operational schedules, while supporting local contractors. Despite the 2015 Report advocating the use of contractors as being "prohibitively expensive", the Shire has been able to fund such activities through a combination of its own funds and grant funding opportunities. While MAF has been the primary contributor to contractor led hazard reduction burning, it should be noted that MAF did not exist at the time of the 2015 Report.

While the private fire response and mitigation industry has faced insurance driven obstacles over the last couple of years, to the point where hazard reduction burning services are currently not commercially available, discussions between the mitigation industry, insurance industry and government are currently occurring and the prospect of re-establishing this aspect of the industry should not be ruled out long term. Thus, the Shire should not dramatically alter its course from contractors being the preferred option at this time.

Together with the challenges of the alternative (in-house) approaches discussed above, and the Shire's relatively low requirement for hazard reduction burning (in part due to past diversification of mitigation methods) the Shire can afford to monitor this situation before an alternate approach needs to be considered or enacted.

7.5 Incentivising Mitigation

The 2015 Report supported (but not by Recommendation) the incentivising private landholders to mitigate their properties.

While encouraging mitigation through public education is essential, the concept of offering incentives masks the current legislative framework designed to ensure mitigation compliance.

The incentive for a landholder to mitigate is their own safety and protection of their own assets and to avoid penalty for non-compliance with notices issued under the [Bush Fires Act 1954](#).

Providing incentives for compliance would be a drain on Shire resources financially and administratively. The opposite is true for a financial education based approach where warranted and utilises existing legislation framework for which the Shire has responsibility to administer.

Community education should be used to increase awareness of risk and responsibility of private landholders to encourage positive mitigation outcomes. This education should be frank with respect to penalties for non-compliance. The Shire should not be afraid of enforcing penalties as a secondary tool for education.

7. Community Engagement

Recommendation 6 of the Perth Hills Bushfire Review (2011) stated:

The Fire and Emergency Services Authority, in partnership with local government conduct more focused pre-season bush fire education, which emphasises:

- *Water supply is not guaranteed during a bush fire*
- *Power supply is not guaranteed during a bush fire*
- *Water 'bombing by aircraft cannot be guaranteed in a bush fire*
- *Saving life will be a priority over saving property so expect to be evacuated*
- *Once evacuated, access to affected areas may not be possible for several days*
- *SMS warning are advice only and may not be timely.*

The reasoning behind Recommendation 6 was that the Special Inquiry found that there was a poor understanding in the community about some of these key messages, including unrealistic expectations of fire response – believing fire trucks and aerial bombers would be available to protect every property. This ultimately led to a sense of complacency and a lack of preparation.

This serves as an example of how important it is to constantly engage and educate residents about the realities of bush fire risk and preparedness. The challenge lies in keeping the momentum and awareness of bush fire risk in general and especially between catastrophic events.

The Victorian Bush fire Report (2009) included the figure below, demonstrating the cycle of stages after a major bush fire event and where complacency sets in between catastrophic events as below.

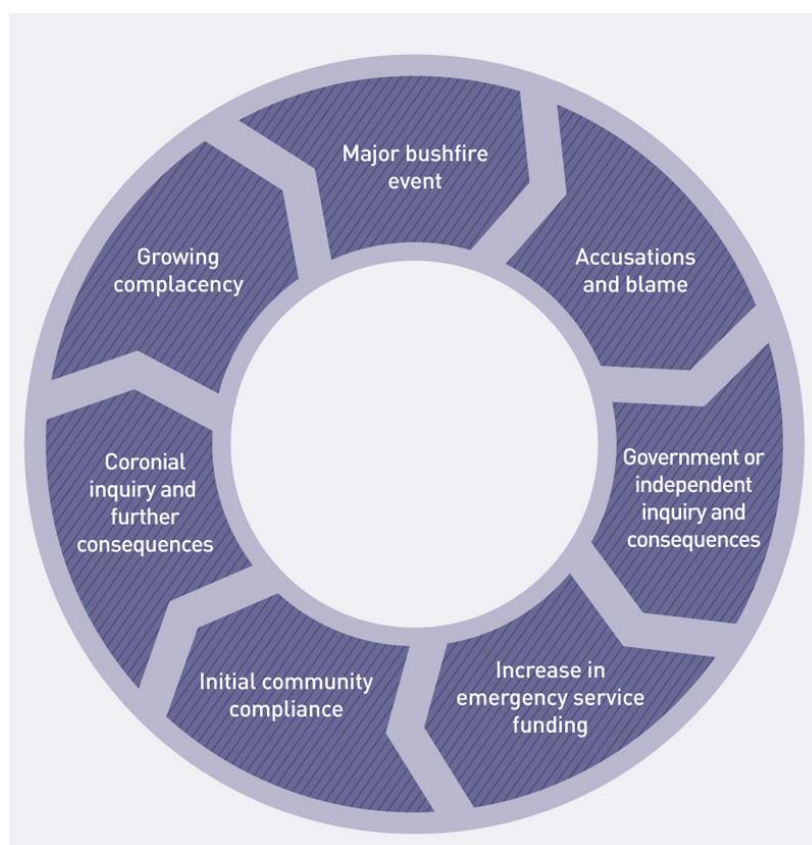


Figure 7 Complacency cycle between Catastrophic Bushfires

Currently, Toodyay can be described as being in the stage of 'Growing complacency', with the completed associated investigations, reports and inquiries from the last the major bush fire event occurring over a decade ago, in 2009. More than ever, now is the time to significantly increase the awareness of bush fire risk and maintain the concept as current.

Resourcing for community engagement has previously been limited until the recent establishment of the Emergency Management Officer (EMO) position, community engagement through a number of mediums will be increased to create a schedule of constant and consistent messaging in a proactive manner. This involves supporting bush fire volunteer led initiatives.

A baseline community engagement program should be developed as part of business as usual, leveraging low-cost mediums such as social media and Shire News in the Toodyay Herald. While not consistently available, grant funding can assist with more costly mediums/projects. Development of such projects which can leverage these grant opportunities should be developed.

The theme of enhancing communication and education with landholders was one heavily supported in comments provided by BFAC members. BFAC comments also referenced that despite a level of complacency among some in the community that will never be completely overcome, nor will the task of community engagement ever be complete.

Another consensus of the BFAC consultation for this report was that not only is increased community engagement needed, but that a more frank and direct approach about the realities of bush fire emergencies is required. The public needs to be made aware of these realities in a way that engages and slightly confronts them, so as to have the message understood 'loud and clear'. This sentiment is supported by the 2009 Victorian Bushfires Report (2010):

"It is essential that there be a continued focus on providing frank and meaningful advice about the risks and what is required to adequately prepare for and survive a bushfire."

This concept of a frank and meaningful approach to community engagement forms Recommendation 40 and strives to adopt a position of reality when it comes to communicating the risks of bush fire emergencies.

8. GIS

The 2015 Report Recommendation 9.1.1 endorsed developing a Geographic Information System (GIS) database to map risk and resources.

For the wider organisation, GIS is a new concept and, in the future, will form a fresh way of functioning, answering operational questions and communicating with the public.

This report supports the implementation of a GIS system for the organisation, allowing for all areas of the business to use spatial concepts to help understand and analyse their work areas more efficiently.

To date, the Shire's use of GIS has been a piecemeal approach of predominately, free systems, leveraged by staff members with an interest in exploring spatial solutions.

Recently, the Shire has engaged a market leading provider, ESRI to supply software which will enable the Shire to take a more common and holistic approach to GIS. This project is in its formative stage and the Shire's use of GIS in general and for emergency services/management will increase as the knowledge and experience of the organisation grows, resulting in the ability to make data-driven decisions.

Since 2015, the Shire has collected spatial data with respect to mitigation activities, fire emergency water assets and EAW and FSAR alignments and associated infrastructure. The Shire has also employed spatial analysis software (Feature Manipulation Engine) to enable an innovative fire permits system. This software has been used to perform the spatial analysis contained within this report. Additionally, the Shire has begun using GIS solutions to support the issuing of individual Firebreak Notices (variations) and the Shire's compliance inspection program.

The Shire also utilises the DFES Bush fire Risk Mitigation GIS System (BRMS) to communicate mitigation plans and subsequent activities to DFES. Future DFES plans for this system include bulk actions that allow data from a user's system to be transferred into BRMS. This represents an opportunity for further use of GIS within the Shire to create, analyse and store data for efficient input into BRMS. This would remove time-consuming manual tasks currently undertaken on regular basis.

As part of the establishment of the Emergency Management Officer role (discussed in Section 10), the Shire has for the first time, dedicated a resource to the progression of GIS within the organisation.

Maturity to a corporate system remains a longer-term goal; an example of an exploratory project undertaken within the fire management area is outlined below.



The Shire's Rangers have now moved away from a paper based Fire-break Inspection system and commenced the 2021/2022 Fire-break inspection season, utilising a specialised app and software, for a more efficient, trackable and sustainable process.

Image 1 - GIS driven Firebreak Inspection Application

This system allows the Rangers to record the results of Inspections electronically via an app (Refer Figure 8), attach photographs, enter comments relating to the properties requirements and submit. The Administration creates an outgoing letter from templates and the ratepayer promptly receives the correspondence.

The use of GIS allows the Shire to:

- Easily conduct inspections and re-inspections
- Easily find the details of the inspections
- Retain a visual history of what areas/properties were inspected in any given year
- View the result of the Inspections on a map at a glance
- Plan what areas/properties to inspect next

GIS is a rapidly growing tool and the Shire's GIS provider ESRI, have a suite of products at the Shire's disposal. In the future, the Shire will

transition any GIS functions/Mapping being used in free programs to the Shire's centralised ESRI location.

Some of the future GIS prospects for Emergency Services related solutions include:

- Fire Signage (location, age, condition)
- Verge Spray Program
- Schedule of Mitigation works
- Community Engagement
- Second generation electronic fire permit issuing system
- Future Strategic Planning

While no recommendations are specifically made in this section, the Shire should acknowledge that the progression to a corporate to a GIS system will be a long road, given it cannot justify a dedicated professional. The Shire's path to knowledge via the upskilling of the EMO and other staff is a process, which will take time. Sufficient training opportunities should be afforded to staff to assist in the expansion of knowledge.

9. Staffing

The Shire of Toodyay holds significant responsibility in managing risk in regard to Bush fire and Emergency Management Preparedness, Prevention, Response and Recovery (PPRR). These are the four pillars of integrated Emergency Management.

Currently the Shire has three roles, which broadly cover three of the four pillars. While these roles have significant overlap, each role can be categorised with primarily dealing the following pillars:

- CESM - Response
- RMO - Prevention
- EMO - Preparedness

The fourth pillar of Recovery is an organisational responsibility led by the Local Recovery Co-ordinator as per the State Emergency Committee Guidelines. The Local Recovery Co-ordinator (and deputy co-ordinator) responsibilities are designated to Shire staff by Council. The function of Recovery does not in itself commence until an incident occurs, however, planning for recovery may be considered as part of an overlap with Preparedness pillar.

Each position, including that of the Local Recovery Co-ordinator is considered in more detail below.

9.1 Community Emergency Services Manager (CESM)

The Community Emergency Services Manager (CESM) role is a partnership between DFES, Shire of Toodyay and Shire of Goomalling with a majority of funding for the role provided by DFES.

Responsibilities of this role are largely dictated by the DFES specified Memorandum of Understanding (MOU) and associated Business Plan. The existence of DFES and the Shire of Goomalling as partners effectively equates to the CESM role being part time, with respect to time allocation to the Shire of Toodyay, despite being employed being full time by the Shire of Toodyay.

The role of the CESM may be considered the broadest in its responsibilities to all pillars of Emergency Management. However, the primary focus is the operational functions of both Shires' Bush Fire Services. This includes volunteer management, training, administration, and operational response among other tasks. In addition, the business plan also has expectations of bush fire mitigation, emergency management and community engagement.

Toodyay's extreme exposure to bush fire, the combined actions required to meet the needs of the business plan, legislation and the expectations of the community, has resulted in the Shire providing additional resource to this business area.

9.2 Reserve Management Officer (RMO)

In April 2014, Council received a report proposing the establishment of a new position titled 'Fire and Land Management Officer', for the main purpose of fieldwork and bush fire mitigation required to manage Shire land holdings.

The 'Reserves Management Officer' role was confirmed, reflecting a broadening of the proposed roles responsibilities away from Fire Management, to include aspects such as amenity of reserves.

Over the past seven years the role has assumed additional non-fire management related tasks. This includes but is not limited to acting for Ranger Services, environmental administration, in particular the obtaining of vegetation clearing permits to support the Shire's road construction and dangerous tree inspections.

The combination of the broadened reserve program focuses initially adopted by Council, plus the advent of additional non-fire management tasks means this position is now removed from the original intent.

Over this period bush fire risk mitigation has become an increasing focus for the State with substantial funding for projects now available to the Shire. This has resulted in increased workloads in the fire management area.

Given the RMO role has not formally been reviewed since its inception, Recommendation 41 advocates that the role's position description is reviewed with the intent of refocusing duties and responsibilities to fire management and mitigation as its primary objective.

9.3 Emergency Management Officer (EMO)

In November 2021, in recognition of the increased requirements in fire management, Council agreed to allocate additional resources and the 'Emergency Management Officer' (EMO) role was created.

Key functions of this role include emergency management preparedness, Local Emergency Management Committee (LEMC), emergency and fire related administration and support, community engagement/education and assistance to the Local Recovery Co-ordinators.

The EMO also provides support to Ranger Services for fire related compliance inspections, and to progress the use of GIS across the organisation. The role also assists with aspects of volunteer training, helping the Shire meet its workplace health and safety obligations for the Bush Fire Service.

The position works closely with the CESM and RMO, provides diversification of Emergency Management knowledge within the organisation, and provides backfill of the CESM role for periods of leave or secondment.

The EMO role allows for a dedicated resource to increase knowledge and improve preparedness and community awareness. It also allows for greater scope for the role to leverage increasing funding opportunities available in this industry.

In summary, the creation of this position represents a maturing of the Shire's understanding of its obligations and its response to managing risk in the community.

9.4 Local Recovery Co-ordinator, Welfare Liaison Officers and supporting staff

The Recovery pillar of emergency management requires additional resourcing during and following a major incident.

The two key roles are Local Recovery Co-ordinator as required by the [Emergency Management Act 2005](#), Section 41(4), and Local Government Welfare Liaison Officer. The responsibilities of

these roles are outlined in the Shire of Toodyay's Local Emergency Management Arrangements seen in the table below.

Local Recovery Coordinator	To ensure the development and maintenance of effective recovery management arrangements for the local government. In conjunction with the local recovery committee to implement a post incident recovery action plan and manage the recovery phase of the incident.
Local Government Welfare Liaison Officer	During an evacuation assist Dept. Communities by providing advice information and resources (a) open and establish a welfare centre at the nominated facility until the arrival of DC; (b) establish the registration process of evacuees until the arrival of DC; (c) provide advice, information and resources in support of the facility; and (d) assist with maintenance requirements for the facility.

Table 8 - Excerpt of LRC and WLO roles from Shire of Toodyay Local Emergency Management Arrangements

Due to this importance of these two roles, it is essential that they are not held solely by an individual. At least two appropriate personnel should be appointed to each of these positions, to provide appropriate coverage and if required, added capacity and/or endurance to the recovery effort, remembering that an event in its early stages, recovery may require around the clock operations.

The Local Recovery Co-ordinator should be seen as strategic leadership role and as such is ideally suited to Shire officers with appropriate purchasing authority and ability to direct staff – senior management positions are recommended to hold these roles.

The Welfare Liaison Officer is ideally suited to Shire officers who live locally, to reduce lead-time, in establishing an evacuation centre.

Both the Local Recovery Co-ordinator and Welfare Liaison Officer will need to be supported by other Shire officers for the duration of any emergency.

Currently, the Shire has no Senior Management Group personnel in the Local Recovery Coordinator role and no formally dedicated Welfare Liaison Officers. However, the personnel nominated in the Local Recovery Coordinator role are expected to carry out the Welfare Liaison Officer function.

Neither officer has authority to direct staff or expend funds.

Recommendation 42 recommends that the Shire reviews its current Local Recovery Co-ordinators and Welfare Liaison Officers to effectively meet the requirements of its Local Emergency Management Arrangements.

Recommendation 43 recommends that all Shire officer positions descriptions contain a responsibility to support emergency management recovery/efforts. This ensures that all staff understand the organisation's requirements to manage recovery and clearly states the intent of the organisation to call upon staff in recovery when required.

Recommendation 44 therefore suggests that all Shire officers are required to undertake a level of WALGA Emergency Management training. This is:

- Senior Management Group and Welfare Liaison Officers - *Recovery Co-ordinators Course for Local Government*
- Shire Ranger Services - *Animal Welfare in Emergencies*
- All other staff – *Emergency Management Fundamentals*

Elected Members should also be offered the opportunity to attend training to ensure they understand the organisation's recovery responsibilities.

10. Recommendations

Recommendation # / Section	Type	Recommendation
Recommendation 1 Section 3	Position Statement	Advocate for more appropriate terminology for 'Emergency Access Way' in The Guidelines and continue to dual label such routes with the term 'Alternate Evacuation Route' in the interim.
Recommendation 2 Section 3	Strategic Planning	Commit to appropriate contributions to Egress and Access Reserve fund as part of the annual budget process.
Recommendation 3 Section 3	Strategic Planning	Develop applicable planning, policies, strategies and procedures the following Lots in support of future subdivision proposals and enquiries: 1/D074943, 151/P018487, 3412/P415291, 9001/P405299, 9500/P059240, 9011/P062847, 606/P062188, 9010/P062847, 9508/P077718, 604/P062188, 1469/P247186, 1431/P247190, 600/P042855, 605/P062188
Recommendation 4 Section 3	Position Statement	Adopt the default position of provisioning egress as a road.
Recommendation 5 Section 4	Shire Project	Maintain Alignment 2.1 (Emergency Access Way linking Sand Spring Road to Malkup Brook Road) and consider potential upgrade to a road upon analysis of traffic flows post implementation of Recommendation 5.
Recommendation 6 Section 4	Shire Project	• Negotiate road reserve land tenure from 604/P062188 and 606/P062188 and if necessary 605/P062188; and • Apply for funding from the National Disaster Risk Reduction Program and/or other grant schemes; and/or • Utilise existing and/or future contributions to the Egress and Access Fund; and • Undertake relevant survey and design; to Construct Alignment 1.1, a road linking Malkup Brook Road and Harders Chitty Road.

Recommendation # / Section	Type	Recommendation
Recommendation 7 Section 4	Strategic Planning	Favourably consider any future subdivision proposal of 604/P062188 and 606/P062118 or 605/P062188, which results in Alignment 1.1 linking Malkup Brook Road and Harders Chitty Road as a road. Recommendation 7 should be considered as an alternate to Recommendation 6.
Recommendation 8 Section 4	Shire Project	Maintain Alignment 3.1 (Emergency Access Way linking Horseshoe Road to Jarrah Court.
Recommendation 9 Section 4	Shire Project	• Negotiate road reserve or easement land tenure from 280/P224200 and 72/P224630 and if necessary 190/P224215; and • Apply for funding from the National Disaster Risk Reduction Program and/or other grant schemes; and/or • Utilise existing and/or future contributions to the Egress and Access Fund; and • Undertake relevant survey and design; to Construct Alignment 4.1, as a road or Emergency Access Way, linking Horseshoe Road and Waters Road.
Recommendation 10 Section 4	Shire Project	• Negotiate road reserve land tenure from 17/P15443 and 86/P224582; and • Apply for funding from the National Disaster Risk Reduction Program and/or other grant schemes; and/or • Utilise existing and/or future contributions to the Egress and Access Fund; and Undertake relevant survey and design; to Either upgrade Alignment 5.1 to a compliant Emergency Access Way standard, or upgrade to a road, linking Fawell Road and Church Gully Road.
Recommendation 11 Section 4	Strategic Planning	Favourably consider any future subdivision proposal of 9500/P059240, which results in Alignment 6.1 linking McIntosh and Leeming Road or (Church Gully Road) as a road. This should include, but is not dictated by, the additional Alignment 6.3 linking of McPherson Avenue. This Recommendation should be considered with, but not bound by Recommendation 12.
Recommendation 12 Section 4	Strategic Planning	Favourably consider any future subdivision proposal of 9500/P059240, which results in Alignment 6.2 linking Coondle Drive and Leeming Road (or Church Gully Road) as a road.

Recommendation # / Section	Type	Recommendation
		This Recommendation should be considered with, but not bound by Recommendation 11.
Recommendation 13 Section 4	Shire Project	Negotiate road reserve tenure over 518/P012216 either directly or via a land swap utilising the eastern portion of 101/P012216 (Reserve 39747). This recommendation has relevance to Recommendation 12.
Recommendation 14 Section 4	Shire Project	Upgrade the existing Alignment 7.1 (Emergency Access Way) to a road linking Dryer Road and Wilkerson Road. This may require the conversion of current 'Right of Way' tenure to road reserve.
Recommendation 15 Section 4	Shire Project	• Negotiate road reserve or easement land tenure over 22049/P2011942 (Rugged Hills Nature Reserve from Department of Biodiversity, Conservation and Attractions; and • Negotiate road reserve land tenure over 9002/P037111; and • Apply for funding from the National Disaster Risk Reduction Program and/or other grant schemes; and/or • Utilise existing and/or future contributions to the Egress and Access Fund; and • Undertake relevant survey and design; to Construct Alignment 8.1, a road or Emergency Access Way linking Ridley Circle to White Gum Ridge.
Recommendation 16 Section 4	Strategic Planning	Favourably consider any future subdivision proposal of 151/P018487 where it provides the relevant land tenure to support possible future recommendations for Alignments 8.2 and 8.3 and 11.1 as a road.
Recommendation 17 Section 4	Strategic Planning	Undertake further analysis of the viability of over rail egress in the West Toodyay area, in the vicinity of Fitzgerald Street or Wellington Street.
Recommendation 18 Section 4	Shire Project	Construct Alignment 10.1 linking North Street and Collett Way as a road, with the alternative option of constructing Alignment 10.2 linking Fitzgerald Terrace as a road.

Recommendation # / Section	Type	Recommendation
Recommendation 19 Section 4	Shire Project	Upgrade the existing Alignment 12.1 (Emergency Access Way) to a road linking Nottingham Road (East) to Nottingham Road (West).
Recommendation 20 Section 4	Shire Project/ Strategic Planning	Create road reserve over 9508/P077718 and construct Alignment 13.1 linking Drummond Street (East) to Burt Parkway as a road or consider the development of this alignment by other means.
Recommendation 21 Section 4	Strategic Planning	Favourably consider any future subdivision proposal of 9010/P062847 and 9011/P062847 which results in Alignment 13.2 linking Burt Parkway to Drummond Street (west) as a road.
Recommendation 22 Section 4	Strategic Planning	Favourably consider any future subdivision proposal of 1/D074943, which results in Alignment 14.1 linking Settlers Ridge to Telegraph Road as a road.
Recommendation 23 Section 4	Strategic Planning	Record the egress opportunity facilitated by the proposed Toodyay bypass into its business case promoting the bypass's construction and consult with stakeholders so they are aware of this need.
Recommendation 24 Section 4	Strategic Planning	Favourably consider any future subdivision proposal of 9001/P405299, which results in Alignment 15.1 linking Whitelakes Drive to the proposed bypass as a road, on a timeline, which ensures such development occurs in conjunction with, or after the advent of the bypass.
Recommendation 25 Section 4	Shire Project	• Negotiate road reserve land tenure from 45/P223149 and/or 1431/P247190; and • Apply for funding from the National Disaster Risk Reduction Program and/or other grant schemes; and/or • Utilise existing and/or future contributions to the Egress and Access Fund; and • Undertake relevant survey and design; to To either build Alignment 16.1 as a road linking Sesselis Road and Folewood Road.
Recommendation 26 Section 4	Strategic Planning	Favourably consider any future subdivision proposal of Lot 1469/P247186 and if necessary, Lot 1431/P247190, which result in the linking of Sesselis Road to Folewood Road.

Recommendation # / Section	Type	Recommendation
Recommendation 27 Section 4	Strategic Planning	Favourably consider any future subdivision proposal of 3412/P415291, which results in Alignment 17.1 linking Pindi Place to Toodyay Road as a road.
Recommendation 28 Section 4	Shire Project	Negotiate an easement over 40/D056678 to provide maintenance and emergency firefighting access to existing Shire fire-break which terminates at the rear of this lot.
Recommendation 29 Section 4	Shire Project	Upgrade the current track (Alignment 18.1) linking Extracts Place and Macdonald Retreat to an Emergency Access Way.
Recommendation 30 Section 4	Strategic Planning	Undertake further analysis of the viability of future development in the Dumbarton area, via appropriate skilled personal and in conjunction with relevant stakeholders to assess the viability of egress concepts for the area.
Recommendation 31 Section 4	Strategic Planning	Favourably consider any future subdivision proposal of 600/P042855, which results in Alignment 20.1 linking Twilight Brae to Toodyay Road, as a road.
Recommendation 32 Section 4	Shire Project	• Negotiate road reserve or easement land tenure from 135/P032527 and/or 136/P032527; and • Apply for funding from the National Disaster Risk Reduction Program and/or other grant schemes; and/or • Utilise existing and/or future contributions to the Egress and Access Fund; and • Undertake relevant survey and design; to Either build Alignment 21.1 as a road or Emergency Access Way linking Panorama View to Hoddy Well Road.
Recommendation 33 Section 4	Shire Project	• Negotiate road reserve land tenure from 230/P018244 and/or 229/P018296; and • Apply for funding from the National Disaster Risk Reduction Program and/or other grant schemes; and/or • Utilise existing and/or future contributions to the Egress and Access Fund; and • Undertake relevant survey and design; to Either build Alignment 22.1 as a road linking Red Brook Circle to Toodyay Road.

Recommendation # / Section	Type	Recommendation
Recommendation 34 Section 5	Position Statement	Continue to consider and seek funding for further improvements to its fire emergency water supplies. Enhancements should focus on increasing capacity in subdivision areas (as per 'The Guidelines') or servicing rural areas currently un-serviced.
Recommendation 35 Section 5	Strategic Planning	Engage with DFES and Department of Planning and advocate for the alignment of the tank fitting requirements of 'The Guidelines' and standard design/stowage of fire appliances supplied by DFES. The Shire should consider changing its tank fittings in accordance with a satisfactory outcome.
Recommendation 36 Section 5	Shire Project	Invest in upgrading signage for its fire emergency water facilities. This should include directional street signage, distance notation and signage of the facilities themselves.
Recommendation 37 Section 6	Shire Project	Allocate appropriate resourcing to undertake a project to identify and record easement 'Grantors', 'Grantees' and responsibilities for all easements within the shire. Where a Shire responsibility is recorded, the appropriate Shire department should review if it is meeting its obligations under the Deed of Easement and, where appropriate, seek to meet said obligations or extinguish the easement, if it is deemed to have no benefit to the Shire.
Recommendation 38 Section 6	Position Statement	Consider adopting a position of opposing development proposals, which attempt to establish easements across multiple properties. Furthermore, when applying subdivision perimeter vehicular access solutions, higher-level controls such as the use of perimeter road or Shire managed tenure should be favoured.
Recommendation 39	Shire Project	Review mitigation requirements on its directly owned land tenure and structure an appropriate mitigation program and annual budget to meet this need.
Recommendation 40	Position Statement	Adopt a position of frank and meaningful community engagement communication and the residents of Toodyay.
Recommendation 41	Strategic Planning	Review the RMO with the intent of refocusing duties and responsibilities to Fire Management and Mitigation as its primary objective.
Recommendation 42		Review current Local Recovery Co-ordinator and Welfare Liaison Officers to effectively meet the requirements its Local Emergency Management Arrangements.

Recommendation # / Section	Type	Recommendation
Recommendation 43	Position Statement	Embed Emergency Management tasks within all employee position descriptions.
Recommendation 44	Position Statement	Require all staff to undertake a level of WALGA Emergency Management training, being: • Senior Management Group and Welfare Liaison Officers - <i>Recovery Co-ordinators Course for Local Government</i> • Shire Ranger Services - <i>Animal Welfare in Emergencies</i> • All other staff – <i>Emergency Management Fundamentals</i> Additionally Elected Members should be offered relevant Emergency Management training.

Appendix A – Position/Status of 2015 Report Recommendations

2015 Report Section 9 Recommendations

Recommendation	Position	Current Status
9.1.1 The Shire should develop a Geographic Information Systems (GIS) database allowing the mapping of risks and resources and subsequent appropriate development of fire policy and procedure;	Agree.	Partially Implemented. The Shire has obtained GIS software. The Shire has created a position with part-time responsibility for GIS. A range of bush fire themes has been mapped/analysed. (Refer Section 7).
9.1.2 The Shire should consider whether its bush fire policy deals adequately with all aspects off Prevention, Preparedness, Response and Recovery, in relation to strategic level bush fire planning.	Agree	Partially Implemented Extensive mitigation via MAF program (Refer Section 9). LEMA Document updated. R2R Review being undertaken. Contents of this report.
9.2.1 In general the Shire of Toodyay should abandon its policy of installing strategic fire-breaks around the outside of all estate areas;	Agree	Implemented
9.2.2 Instead the annual Fire-break Notice should be enforced annually and equally, and all private and public blocks in the Shire should have properly installed and maintained	Agree	Implemented

Recommendation	Position	Current Status
perimeter fire-breaks to allow fire service access for firefighting;		
9.2.3 The Shire should classify all breaks under one of three classifications: a) “Emergency Access Ways” primarily designed to allow the movement of civilians away from major fire events; b) “Fire Service Access Routes” primarily designed to allow emergency services access for firefighting activities; and c) “Fire-breaks” or perimeter fire-breaks that can be used for a range of standard firefighting activities as appropriate. Each of these should be constructed to the relevant national standard as outlined in <i>Planning for Bushfire Protection Guidelines 2nd Edition</i>;	Partial Agree As per this report EAW terminology is considered ambiguous (Refer Recommendation 1).	Implemented
9.2.4 Emergency Access Ways and Fire Service Access Routes should only be installed on public land, or where an easement has been granted for their construction. These types of tracks should not be constructed on private land;	Partial Agree As per this report and ‘The Guidelines’, a position of roads as the preferable construction solution is promoted.	Implemented
9.2.5 The Shire should consider allowing the sub-division of blocks where that sub-division would allow the installation of Emergency Access Ways that will provide a clear material public benefit and increase community safety;	Agree	To be implemented (Refer to Recommendation 3)
9.2.6 The Shire should include a maintenance budget within its annual budgeting process to	Agree	Implemented

Recommendation	Position	Current Status
allow for the maintenance and upkeep of existing tracks;		
9.2.7 The Shire should install new tracks or re-categorise existing ones as defined in section 5 of this report.	Refer to Following table in this Appendix.	
9.3 The existence of large rural estates with only one point of access or egress is a clear risk to the safety of residents living within those estates. To alleviate this risk the Shire should prioritise the installation of Emergency Access Ways to provide a second point of egress in the following areas: 1. South from the Julimar estates; 2. South from Regal Hills in Morangup; 3. North or east from Rugged Hills; 4. Southeast from Woodland heights; and 5. The Shire should consider how a westerly or southerly point of egress can be achieved for the Gidgegannup Springs estate in Morangup. In either case this would probably require the installation of a new road.	Partially Agree Consideration of alternate routes required. Roads should be prioritised over Emergency Access Ways, as per 'The Guidelines' (Refer Section 3.1).	Not Implemented Reviewed in depth in this report (Refer Section 4). Refer Recommendation 4.
9.4.1 Construction of emergency signage should conform with standards outlined in <i>Planning for Bushfire Protection Guidelines 2nd Edition</i> (2010: 37) for size, location and language used;	Not Applicable Current edition 1.4 of 'The Guidelines', while requiring signage, do not contain a specification for said signage.	
9.4.2 Signage should be consistent throughout the Shire;	Agree	Implemented

Recommendation	Position	Current Status
9.4.3 The word “egress” should be removed from all emergency signs in the Shire of Toodyay	Agree	Implemented
9.5.1 The Shire of Toodyay should undertake strategic mapping of all water supplies, with specific reference of location in relation to assets and turn-around times for use by fire appliances;	Agree	Implemented Refer Section 5.
9.5.2 The Shire should adopt a dual policy of using static water tanks, and mobile water tankers to ensure water supplies during fire incidents;	Partial Agree This relates to operational <u>procedures</u> .	Implemented
9.5.3 A water tank should be installed at the north-western end of Gidgegannup Estate in Morangup;	Agree	Implemented
9.5.4 All water tanks should be fitted with standard couplings as defined by DFES.	Partially Agree Currently the couplings defined for static water sources do not match equipment specification of DFES defined bush fire fighting appliances. Refer Section 5.	Not Yet Implemented Refer Recommendation 34
9.6.1 The Shire should engage in the assessment and mapping of fuel age and fuel loads throughout the Shire;	Agree	Implemented
9.6.3 The Shire should compel residents to reduce heavy fuel loads on private land where those fuel loads comprise a public risk;	Agree in Principle	Partially Implemented Via Shire’s Fire-break Notice.

Recommendation	Position	Current Status
9.6.4 The Shire should strongly consider a wide ranging strategic hazard reduction burning program as the most effective way to manage fuel loads.	Disagree The Shire advocates for the mitigation method that is most suitable to the site, conditions and objectives. This may or may not include burning. Burning should not be considered in its own right the best or most effective in any given situation, therefor, the position of disagree above. (Refer Section 9).	Not Implemented Burning planned and undertaken where deemed appropriate.
The Shire should work to find methods of communicating effectively with the public in the following areas: 9.7.1 The necessity for people living in areas of extreme fire danger to have a preparedness plan for what they will do in the event of a fire, what are their options for evacuation, how to prepare their properties for the passage of fire and where to source up to date information during a fire incident; 9.7.2 The danger caused by heavy fuel loads, the necessity of hazard reduction programs and why appropriately carried out hazard reduction burning benefits rather than damages the bush; 9.7.3 The fact that Bush Fire Brigades are staffed by volunteers who need the support of their community to be effective;	Agree	Ongoing A part-time Shire resource has been dedicated to emergency community engagement. The Shire has undertaken a number of actions in this area, however community engagement should be considered a job that is never complete.

Recommendation	Position	Current Status
9.7.4 Information related to enforcement of fire regulations in the Shire (e.g. requirements to install fire-breaks and reduce fuel loads);		
9.7.5 Information about how to use Emergency Access Ways in the event of a fire.		
9.8.1 The Shire should investigate ways it can support volunteer Bush Fire Brigades in recruiting and retaining quality volunteer firefighters;	Agree	Ongoing The Shire has undertaken a number of actions in this area, however supporting volunteers should be considered an ongoing action.
9.8.2 The Shire should examine ways it communicates with Brigades and ensure important information is being received and understood by Brigade members;		
9.8.3 The Shire should organise events that include volunteers, outside of standard working hours (i.e. outside of the hours of Monday to Friday 9-5) to allow the maximum volunteer participation.	Agree	Implemented (always has been)

2015 Report List of Existing and Proposed Tracks

Track Code	Location	Standard of Track?	Work Required?	Priority	Support Objective	Support Alignment	Status	Intention
1A	East end of Donegan View north to Julimar Road	Fire Service Access Route	1. Maintain as current 2. Remove "Egress signs" 3. Consider installation of gates	Medium	Yes	Yes	No Action	Reason no Action: Anticipated downgrade based on construction of Egress south to Harders Chitty Road.
1B	South from the end of Malkup Brook Road to the west end of Harders Chitty Road	Emergency Access Way	1. Install a suitable Emergency Way 2. Maintain annually	High	Yes	No	No Action	Refer Section 4 for alternative alignment to achieve this outcome.
1C	East from the end of Parkland Drive to the west end of Harders Chitty Road	Emergency Access Way	1. Install a suitable Emergency Way 2. Maintain annually	High	Yes	No	No Action	
2A	North end Fawell Road north to Church Gully Road	Emergency Access Way	1. Install measures to deal with degradation from water run-off 2. Consider upgrade to full road	Medium	Yes	Yes	Installed	Upgrade to EAW or road standard (Recommendation 9)
2B	East from Fawell Road to Church Gully Road	Fire Service Access Route	1. Maintain as current 2. Installation of suitable gates and signs	Medium	No	No	Reserve	Maintain as Reserve. Managed access and Fuel Load to fire-break notice.
2C	East from the end of Alan Twine Drive to	Emergency Access Way	1. Install a suitable	Low	Yes	No	Not Installed	Not supported. Alternatives recommended in this report (Refer Section 4).

Track Code	Location	Standard of Track?	Work Required?	Priority	Support Objective	Support Alignment	Status	Intention
	intersect with Church Gully Road		Emergency Access Way 2. Maintain annually					
2D	South from the end of Leake Road to intersect with Charlton Boulevard	Emergency Access Way	1. Install a suitable Emergency Way 2. Maintain annually	High	Yes	No	Not Installed	Not supported. Alternatives recommended in this report (Refer Section 4).
3A	Abandon plans to install fire-break south from Stirlingia Drive	N/A	N/A	N/A	Yes	N/A		
3B	Abandon plans to install fire-break north from Drummond Drive	N/A	N/A	N/A	Yes	N/A		
3C	Abandon plans to install fire-break to east of and parallel to Stirlingia Drive	N/A	N/A	N/A	Yes	N/A		
3D	East-west internally in Shire Reserve 28748	Fire-break	1. Downgrade to fire-break 2. Maintain annually by Shire	N/A	Yes	Yes	Installed, Maintained as Fire-break.	
3E	External to properties east of Sesselis Road	Fire-break	1. Downgrade to fire-break 2. Maintain annually by landowners	N/A	Yes	No	Individual Fire-break Notice/Variation suitable to terrain.	

Track Code	Location	Standard of Track?	Work Required?	Priority	Support Objective	Support Alignment	Status	Intention
3F	North of properties on Hemiandra Place and Stirlingia Drive	Fire-break	1. Downgrade to fire-break 2. Maintain annually by landowners	N/A	Yes	Yes	Individual Fire-break Notice/Variation suitable to terrain.	
3G	North of Properties on Adenanthus Road	Firebreak	1. Downgrade to fire-break 2. Maintain annually by landowners	N/A	Yes	Yes	Individual Fire-break Notice/Variation suitable to terrain.	
3H	External to properties on Hibbertia Place	Fire-break	1. Downgrade to fire-break 2. Maintain annually by Shire	N/A	Yes	Yes	Installed to the extent of Shire tenure.	Pursue easement over 40/D056678 to connect existing fire-break to Drummondi Drive (Recommendation 27)
3I	West from Sandplain Road to east end Wandoo Circle	Fire Service Access Route	1. Maintain as current 2. Installation of suitable gates and signs	Medium	Yes	Yes	Installed	Continue to maintain. Low priority on Gates/signage
3J	North from the west end of Wandoo Circle to the south-west end of Hovea Way	Fire-break	1. Downgrade to fire-break 2. Maintain annually by Shire	N/A	Yes	Yes	Installed to the extent of Shire tenure. Noting that the majority of the alignment occurs on DBCA managed tenure.	
3K	South-east from Drummondi Drive north of properties on Harvester Drive	Fire-break	1. Downgrade to fire-break 2. Maintain annually by landowners	N/A	Yes	Yes	Easement has been extinguished.	Property owners must comply with standard Shire Fire-break Notice.
3L	South from Drummondi Drive to Sandplain Road	Fire-break	1. Downgrade to fire-break 2. Maintain annually by landowners	N/A	Yes	Yes	No Action required.	Property owners must comply with standard Shire Fire-break Notice. Noting majority of alignment is on DBCA land

Track Code	Location	Standard of Track?	Work Required?	Priority	Support Objective	Support Alignment	Status	Intention
								which is governed by alternative legislation.
3M	East of properties on Harvester Drive	Fire-break	1. Downgrade to fire-break 2. Maintain annually by landowners	N/A	No	No	Easement has been extinguished	Property owners must comply with standard Shire Fire-break Notice.
4A	Perimeter of Gidgegannup Springs Estate, Morangup	Fire Service Access Route	1. Maintain annually to ensure 9m wide break maintained. 2. Install gates and appropriate signage at intersections with roads 3. Remove vegetation at the centre of the track between public and private breaks	Medium	No	No	All properties must maintain Fire-breaks as per Shire Fire-break Notice	
4B	South from Hill Place to join Track 4A	Fire Service Access Route	1. Upgrade to meet standard 2. Installation of suitable gates and signs	Medium	See comments referring to Track 4A above (These are spur access points to 4A)			
4C	South from McKnoe Drive to meet Track 4A	Fire Service Access Route	1. Upgrade to meet standard 2. Installation of suitable gates and signs	Medium				
4D	South-west from South Place to meet Track 4A	Fire Service Access Route	1. Upgrade to meet standard 2. Installation of suitable gates and signs	Medium				

Track Code	Location	Standard of Track?	Work Required?	Priority	Support Objective	Support Alignment	Status	Intention
4E	North from North Place to meet Track 4A	Fire Service Access Route	1. Upgrade to meet standard 2. Installation of suitable gates and signs	Medium				
4F	North from McKnoe Drive to meet Track 4A	Fire Service Access Route	1. Install a Fire Service Access Track 2. Installation of suitable gates and signs	Medium				
4G	North from Short Place to meet Track 4A	Fire Service Access Route	1. Upgrade to meet standard 2. Installation of suitable gates and signs	Medium				
4H	South from Track 4A to west end of Brook Close	Fire Service Access Route	1. Maintain annually to ensure 9m wide break maintained. 2. Install gates and appropriate signage at intersections with roads 3. Remove vegetation at the centre of the track between breaks	Medium	No	No	Alignment is within the City of Swan. All properties within Toodyay and City of Swan are required to comply with their respective fire-break notices. DFES did extensive mitigation works along this alignment during the Wooroloo 2021 fire.	
4I	Around perimeter of Regal Hills Estate	Fire Service Access Route	1. Maintain annually to ensure 9m wide break maintained. 2. Install gates and appropriate signage at	Medium	No	No	No Action Taken.	All properties must maintain fire-break as per Shire Fire-break Notice.

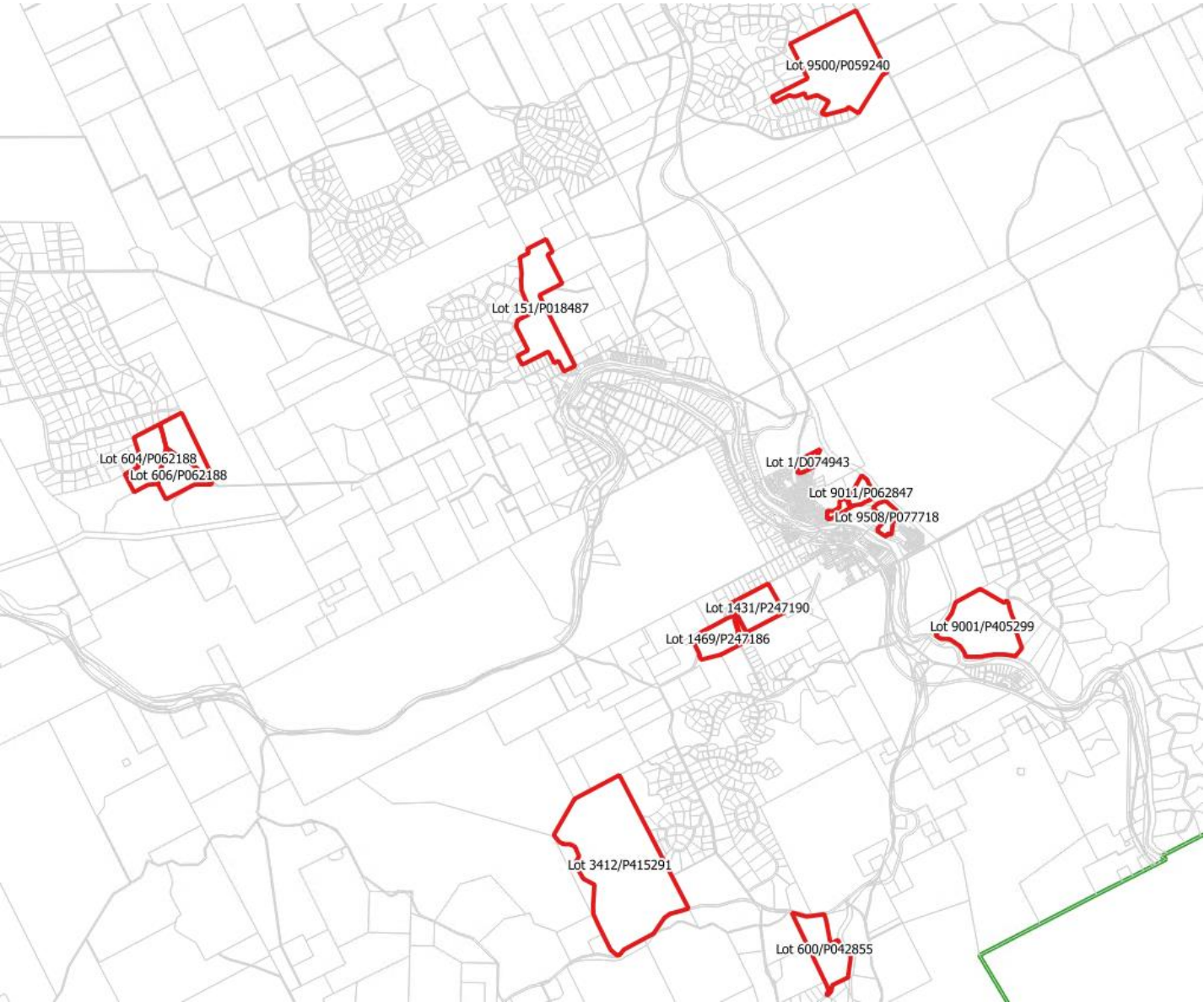
Track Code	Location	Standard of Track?	Work Required?	Priority	Support Objective	Support Alignment	Status	Intention
			intersections with roads 3. Remove vegetation at the centre of the track between breaks					
4J	Southernmost point of Red Brook Circle out to Toodyay Road between lots 229 and 230	Emergency Access Way	1. Install a suitable Emergency Access Way 2. Maintain annually	High	Yes – but as public road.	Yes	Not installed	Acquire land to construct as road as per Recommendation 32.
5A	West from Ridley Circle via lot 55 (between lots 212 and 213) to the north end of Davies Road	Fire Service Access Route	1. Maintain annually 2. Install gates and appropriate signage at intersections with roads	Medium	Yes	Yes – note: slight alignment amendment through reserve.	Maintained using MAF. Gates/signage not yet actioned	Continue to maintain. Low priority on Gates/signage
5B	North from Ridley Circle via lot 55 between lots 214 and 215, to the south end of White Gum Ridge	Emergency Access Way	1. Install a suitable Emergency Access Way 2. Maintain annually	High	Yes	Yes – note slight extension to meet White Gum Ridge see Map 4.	No Action Taken	Acquire land to construct as road or EAW as per Recommendation 15.
5C	West from end of Wilkerson Road to east end of Dreyer Road	Emergency Access Way	1. Install a suitable Emergency Access Way 2. Maintain annually	High	Yes	Yes	Completed	Recommendation 14, consider upgrade to road.

Track Code	Location	Standard of Track?	Work Required?	Priority	Support Objective	Support Alignment	Status	Intention
5D	East from Wilkerson Road south of lot 219 to west end of Waters Road	Emergency Access Way	1. Install a suitable Emergency Access Way 2. Maintain annually	Low	Yes	Yes as alternative to 8.1 (5B).	No Action Taken	Consider land tenure as part of future proposals as per Recommendation 16.
5E	East from White Gum Ridge to south of lot 171 along back of properties to south end of Jarrah Court	Fire Service Access Route	1. Install culverts 2. Maintain annually 3. Remove tight corner at east end	Medium	Yes	Yes	Existing tight corner issue addressed.	Continue to Maintain as FSAR
5F	East from Jarrah Court to north end of Horseshoe Road	Emergency Access Way	1. Upgrade to Emergency Access Way Standard 2. Make blind crest safe for users 3. Install water control measures	High	Yes	Yes	Upgrade works completed	Continue to Maintain as EAW.
5G	South from Track 5F to south end of Horseshoe Road adjacent to lot 95	Fire Service Access Route	1. Install water control measures 2. Install gates at both ends	Medium	Yes	Yes	Upgrade works completed	Continue to Maintain as FSAR
5H	East from Track 5F to intersect with Horseshoe Road opposite Lot 17	Fire Service Access Route	1. Install water control measures 2. Install gates at both ends	Low	Yes	Yes	Upgrade works completed	Continue to Maintain as FSAR.

Track Code	Location	Standard of Track?	Work Required?	Priority	Support Objective	Support Alignment	Status	Intention
5I	South from Timber Creek Crescent between lots 35 and 36	Emergency Access Way	1. Install a suitable Emergency Access Way 2. Maintain annually to Waters Road	High	Yes	No - but Yes with amendment	No Action Taken	Refer to Recommendation 9.
5J	South from Coondle Road West to east of properties on Timber Creek Crescent	Fire-break	1. Downgrade to fire-break 2. Maintain annually by Shire	N/A	Yes	Yes (North - South portion only)	Complete (North - South portion only)	Maintain
5K	South from Katta Rise to Timber Creek Crescent	Fire Service Access Route	1. Install water control measures 2. Install gates at both ends	Medium	Yes	Yes	Maintained	Continue to maintain as FSAR, gate low priority.
5L	Between lots 30 and 31 Timber Creek Crescent	Fire Service Access Route	1. Install water control measures 2. Install gates at both ends	Low	Yes	Yes	Maintained	Maintain as FSAR.
5M	Between lots 35 and 36 Timber Creek Crescent	Fire Service Access Route	1. Install water control measures 2. Install gates at both ends	Low	Yes	Yes	Maintained	Maintain as FSAR.
5N	From Coondle Road West at the north to Caledonia Drive at the south	Fire-break	1. Downgrade to fire-break 2. Maintain annually by landowners	N/A	Yes	Yes	Completed	N/A
6A	Between the east end of MacDonald Retreat and the west end	Fire-break	1. Downgrade to fire-break 2. Maintain annually by Shire	N/A	No	Yes	Maintained	Upgrade to EAW (Recommendation 28).

Track Code	Location	Standard of Track?	Work Required?	Priority	Support Objective	Support Alignment	Status	Intention
	of Extracts Place							
6B	North from the Northam-Toodyay Road between the two estates to meet the Bilya Walk track	Fire-break	1. Downgrade to fire-break 2. Maintain annually by Shire	N/A	Yes	Yes	Maintained	Maintain
7A	East and of Panorama View south through to Hoddy Well Road	Emergency Access Way	1. Upgrade to Emergency Access Way Standard 2. Install Signage 3. Install water control measures	Medium	Yes	Yes	Removed/ Closed	Refer Recommendation 31.
7B	East from Panorama View to Clackline-Toodyay Road	Emergency Access Way	1. Consider installing Emergency Access Way	Low	No	No	No Action Taken	Alternate alignment considered (Refer Recommendation 30)

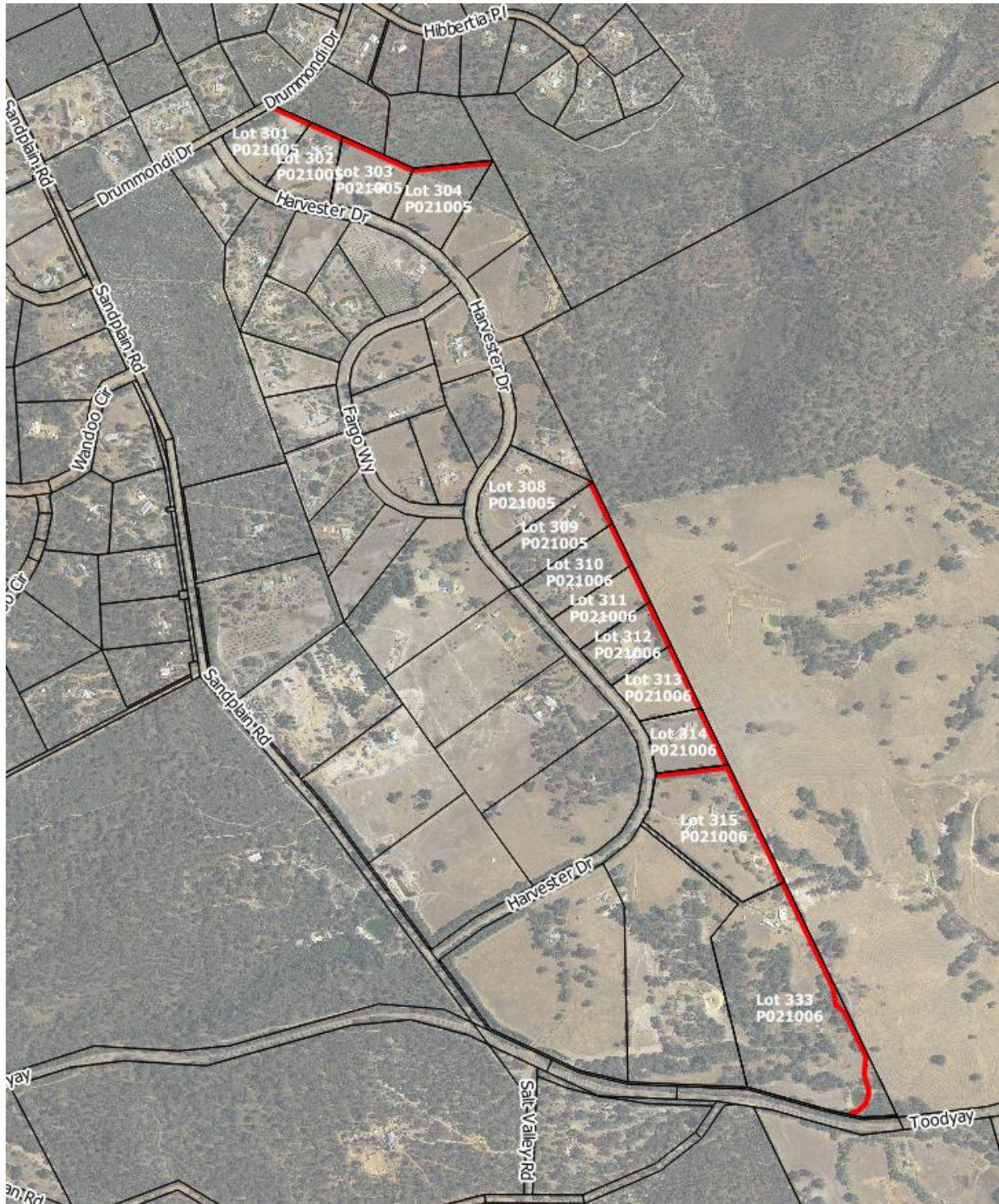
Appendix B – Map displaying lots with advantageous subdivision potential



Appendix C – Harvest Drive Easement Case Study

Background

This case study relates to easements G282738 and G282814. These easements combined ran along the rear of a number of properties on the eastern side of Harvester Drive.



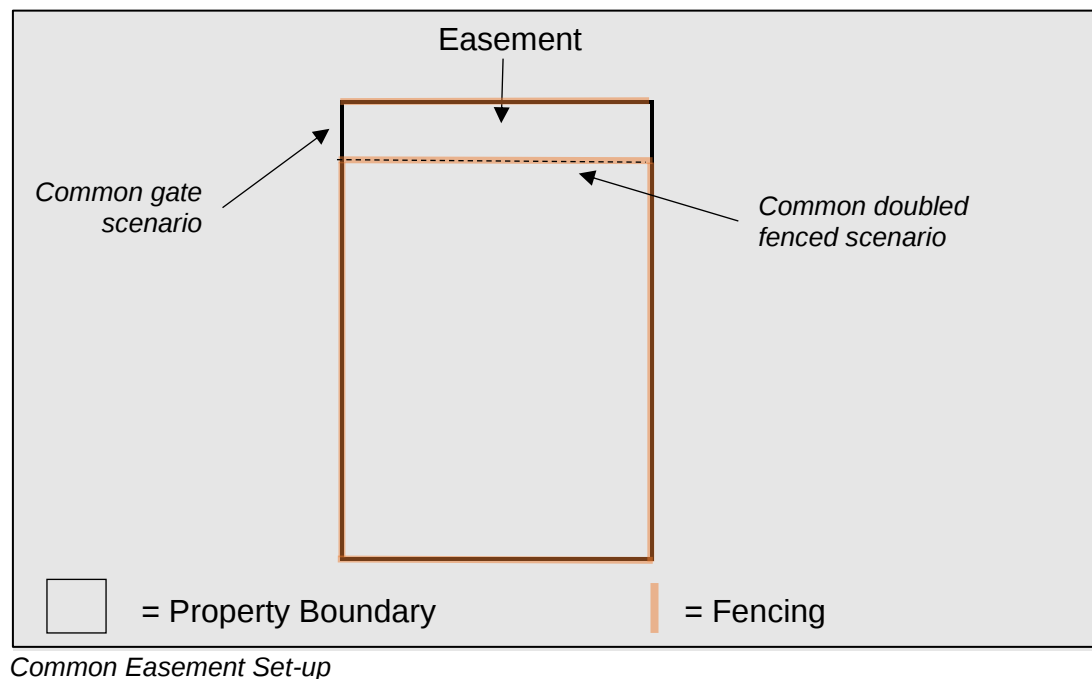
Harvester Drive Easement locations

The easement commenced in the north from Drummond Drive covering four properties and from Toodyay Road in the south covering nine properties as per the map above. A further four properties existed without an easement, creating a gap between the north and south extent of the easements. Each easement extent did not provide access to Shire owned or managed land, thus each terminated in a dead end.

The easement was granted to the Shire for the purpose of a fire-break. The Deed of Easement in this instance specified the Shire as being the party responsible for the fire-break maintenance.

The easement width was six metres.

For the most part, the majority of the easement was doubled fenced as displayed in the easement depiction below.



ISSUES

Legislative Implications

In 2010 the Shire ended its practice of maintaining 'Strategic Fire-breaks' in favour of applying a fire-break notice where all landholders had responsibility on their land and as such, the Shire ceased maintaining the easements referred to in this case study. Therefore, the Shire unknowingly created a discrepancy between its obligations under the Deed of Easements and the responsibilities the Shire was issuing landholders under the Fire-break Notice. This placed the [Land Administration Act 1997](#) and the [Bush Fires Act 1954](#) at odds with each other, potentially exposing the Shire to liabilities under the former.

The Shire became aware of this issue in 2019.

Safety and Effectiveness

In considering meeting its maintenance requirements under the [Land Administration Act 1997](#), the Shire considered the easement alignments with respect to practicality and safety.

A number of unfavourable factors were identified:

- The easements created dead ends, which are highly undesirable in an emergency scenario and can create entrapment situations for firefighting crews.

- The entrapment scenario was further compounded by the extensive use of double fencing which creates a 'laneway' effect where vehicles cannot turn around.
- Obstructions – There were numerous obstructions to easements. This included locked gates and side boundary fencing extending across easements, which represented Deed of Easement non-compliance by some landholders.
- Lack of strategic value – the alignments of the easements were parallel with the road network and served no strategic benefit, given the safety issues listed above. It is a safer and more practical option for firefighters to access via the road network

The factors experienced above have contributed to the Officers' position on easements in Section 3 – Toolkit, regarding the appropriate and considered application of easements.

Action taken

In consideration of the potential liabilities and overall ineffectiveness of the easements' alignment, Officers recommended to Council (94/04/19 and 207/08/19) to pursue extinguishment of the easements in this case study. This approach removed the Shire's maintenance responsibility under the Deed of Easement and removed safety concerns of the alignment going forward.

The processes involved consultation with the grantors (landholders), their mortgage providers and legal representation to guide the required process and documentation. This required all thirteen landholders and their mortgage providers supporting and signing the extinguishment documentation.

The consultation process with landholders demonstrated a low comprehension of the concept of an easement, with relation to ownership and responsibilities of the landholder.

The extinguishment process took approximately two years, in part due to a mid-process change of extinguishment requirements by Landgate.

Cost was estimated at \$10,500, plus considerable Shire staff time in liaising between all parties.

The extinguishment was successfully completed in 2021.

In light of the above scenario, other known Deed of Easements were reviewed for their maintenance responsibilities. This found no other easements with similar maintenance requirements to those extinguished. However, the potential for liabilities with easements in benefit of, but otherwise unknown to the Shire could exist (See Section 6).

Lessons learned

1. The process of extinguishing easements represents a major time and cost overhead to the Shire. Extinguishment should only be considered where the benefit of removing liability exists.
2. The Shire needs to understand all easements for which it has responsibilities (and potential liabilities).
3. Easements spanning multiple properties have a high chance of being obstructed by one or more landholder.
4. Easements may be double fenced by landholders creating a 'lane way' scenario, impeding safe egress.
5. Easements which mimic the road layout offer little strategic value for fire fighter access.
6. Grantors (landholders) commonly have misconceptions about ownership and their obligations under the Deed of Easement.

Appendix D – McKnoe Drive Easement Case Study

Background

This case study relates to easement C746962 E. This easement runs around the extremities of the Gidgegannup Springs subdivision and includes a number of deviations to link back with the road network as per map below. In total, the easement covers some fifty-nine properties and spanning a distance of more than 16 km.



McKnoe Drive Easement

The easement was granted to the Shire for the purpose of a fire fighting. The Deed of Easement in this instance does not specify any particular party as having responsibility for maintenance.

The easement width was six metres.

Despite there being no specific maintenance responsibility to the Shire, the Shire utilised municipal and an NDRRP (Natural Disaster Risk Reduction Program) Grant, to perform maintenance for the purpose of fire fighting access. This included clearing of the alignment and installation of double gates at every side property boundary encountered. Landholders were subsequently responsible for maintaining this alignment under the Shire's Fire-break notice.

ISSUES

In preparing for the 2015 Report an attempt to drive the alignment was made by Shire officers. A number of issues were encountered

- Due to the sheer volume of properties and gates involved, it soon became apparent that the effectiveness of this alignment in providing timely fire fighting access was non-existent.
- Many of the gates contained private padlocks further hindering progress and creating a potential entrapment scenario.
- Some properties had not maintained the alignment to a trafficable standard.
- Lack of strategic value – the alignment of the easement is parallel with the road network and serves no strategic benefit, given the safety issues listed above. It is a safer and more practical option for a firefighters to access via the road network

Combined, these issues led to the traversing of the alignment being abandoned after a number of hours.

The factors experienced above have contributed to the administration's position on easements in Section 3 – Toolkit, with respect to the appropriate and considered application of easements.

Action taken

- Enhancing Fire-break compliance inspections to address observed maintenance issues
- This easement has not been recommended for extinguishment, due to the Deed of Easement not specifying maintenance responsibilities (and potential liability) to the Shire.

Lessons learned

1. An easement traversing many properties is prone to obstruction by either gates, fencing or condition of trafficable surface. Meaning that the reliance of the alignment for critical access would be untimely and potentially unsafe.
2. Easements which mimic the road layout offer little strategic value for fire fighter access. Accessing properties utilising the road network is both safer and efficient.

11. References

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MAP 1
GREATER
JULIMAR

Key to Symbols

1.1 (1A)

Existing Alignment
With Reference
Number (and 2015 Ref)

1.1 (1A)

Recommended
Alignment
With Reference
Number (and 2015 Ref)

1.2 (1B)

Considered
Alignment
With Reference
Number (and 2015 Ref)

MAY ST

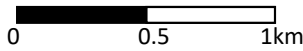
Existing Road
Network
With Road Name

Elevation Contours
2m Interval

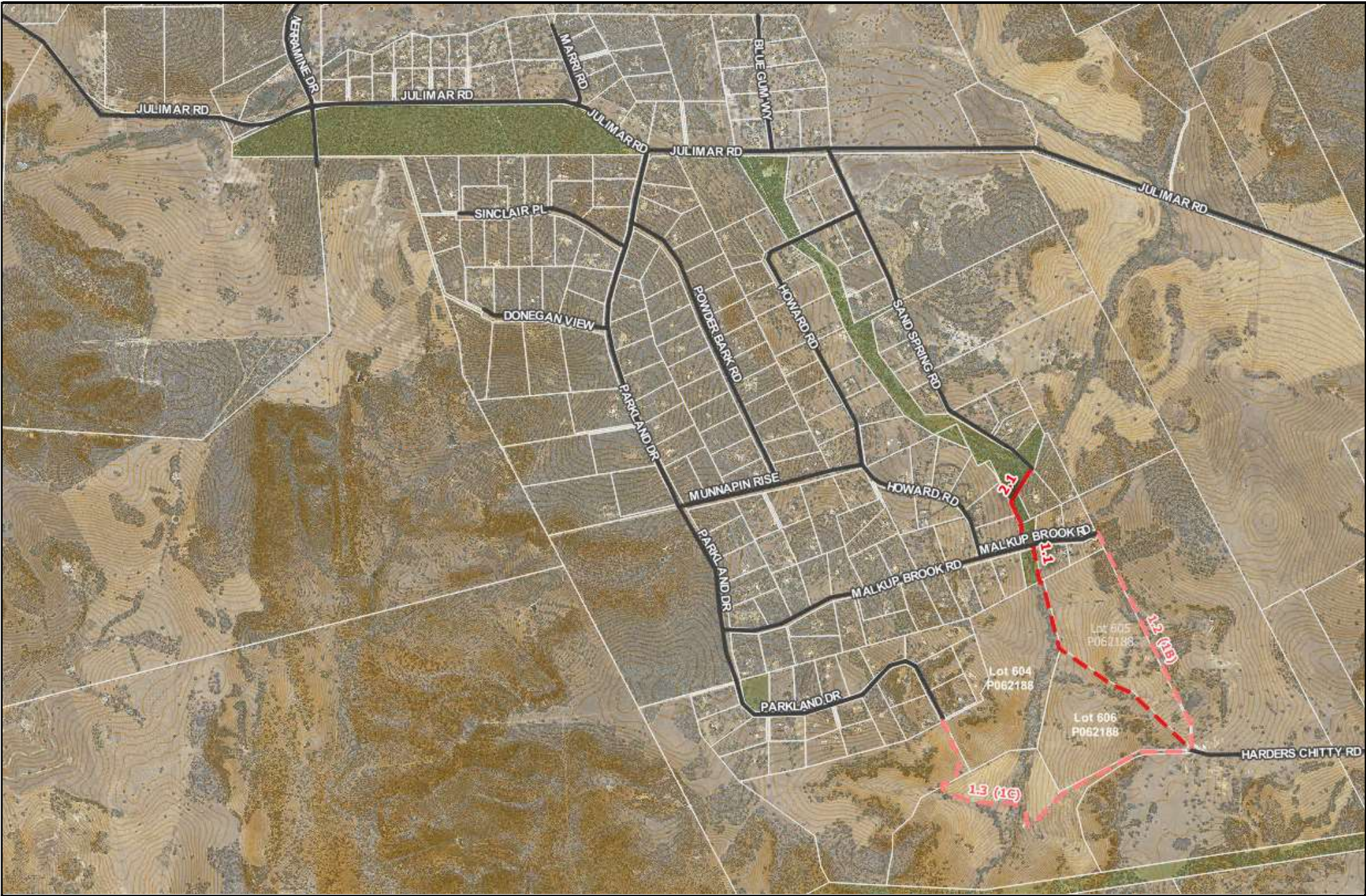
Reserve

Lot Boundaries

Scale 1:25,000
(when printed at A3)



Created: 04/05/2022



Overall Objective Raking	Alignment Reference	Alignment Score	Alignment Ranking	Alignment Description	Recommendation	Priority
3	1.1	0.251782968	3/38	Malkup Brook - Harders Chitty	Recommendation 6/7	HIGH
	1.2 (1B)	0.311883206	10	Malkup Brook - Harders Chitty		
	1.3 (1C)	0.580102097	24	Parkland - Harders Chitty		
8	2.1	0.375344353	15/38	Sandspring - Malkup Brook	Recommendation 5	LOW
	No Alternative Analysed					

MAP 2
COONDLE
(West)

Key to Symbols

1.1 (1A)

Existing Alignment
With Reference
Number (and 2015 Ref)

1.1 (1A)

Alignment
With Reference
Number (and 2015 Ref)

1.2 (1B)

Alignment
With Reference
Number (and 2015 Ref)

MAY ST

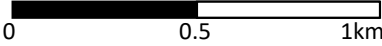
Existing Road
Network
With Road Name

Elevation Contours
2m Interval

Reserve

Lot Boundaries

Scale 1:17,500
(when printed at A3)



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Created: 04/05/2022



Overall Objective Raking	Alignment Reference	Alignment Score	Alignment Ranking	Alignment Description	Recommendation	Priority
11	3.1 (5G) No Alternative Analysed	0.442370770	18/38	Horseshoe - Jarrah	Recommendation 8	LOW
15	4.1 (5I) 4.2	0.561164206 0.835641609	22/38 30	Horseshoe - Waters Timber Creek - Waters	Recommendation 9	MEDIUM

MAP 3
COONDLE
(East)

Key to Symbols

1.1 (1A)

Existing Alignment
With Reference
Number (and 2015 Ref)

1.1 (1A)

Alignment
With Reference
Number (and 2015 Ref)

1.2 (1B)

Alignment
With Reference
Number (and 2015 Ref)

MAY ST

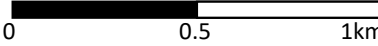
Existing Road
Network
With Road Name

Elevation Contours
2m Interval

Reserve

Lot Boundaries

Scale 1:17,500
(when printed at A3)



Created: 04/05/2022



Overall Objective Raking	Alignment Reference	Alignment Score	Alignment Ranking	Alignment Description	Recommendation	Priority
5	6.1	0.295655521	6/38	McIntosh - Leeming	Recommendation 11	HIGH
	6.3	0.300874607	7	McIntosh - McPherson	Recommendation 11	HIGH
	6.2	0.30911437	9	Coondle - Leeming	Recommendation 12/13	MEDIUM
	6.5 (2D)	0.333711197	12	Leake - Charlton		
	6.6 (14)	0.365597553	14	Alan Twine - Church Gully		
	6.4	0.563739608	22	Coondle - Church Gully		
14	5.1 (2A) No Alternative Analysed	0.524677431	21/38	Fawell - Church Gully	Recommendation 10	MEDIUM

MAP 4
WEST
TOODYAY
(Rugged Hills)

Key to Symbols

1.1 (1A)

Existing Alignment
With Reference
Number (and 2015 Ref)

1.1 (1A)

Recommended
Alignment
With Reference
Number (and 2015 Ref)

1.2 (1B)

Considered
Alignment
With Reference
Number (and 2015 Ref)

MAY ST

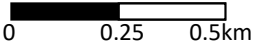
Existing Road
Network
With Road Name

Elevation Contours
2m Interval

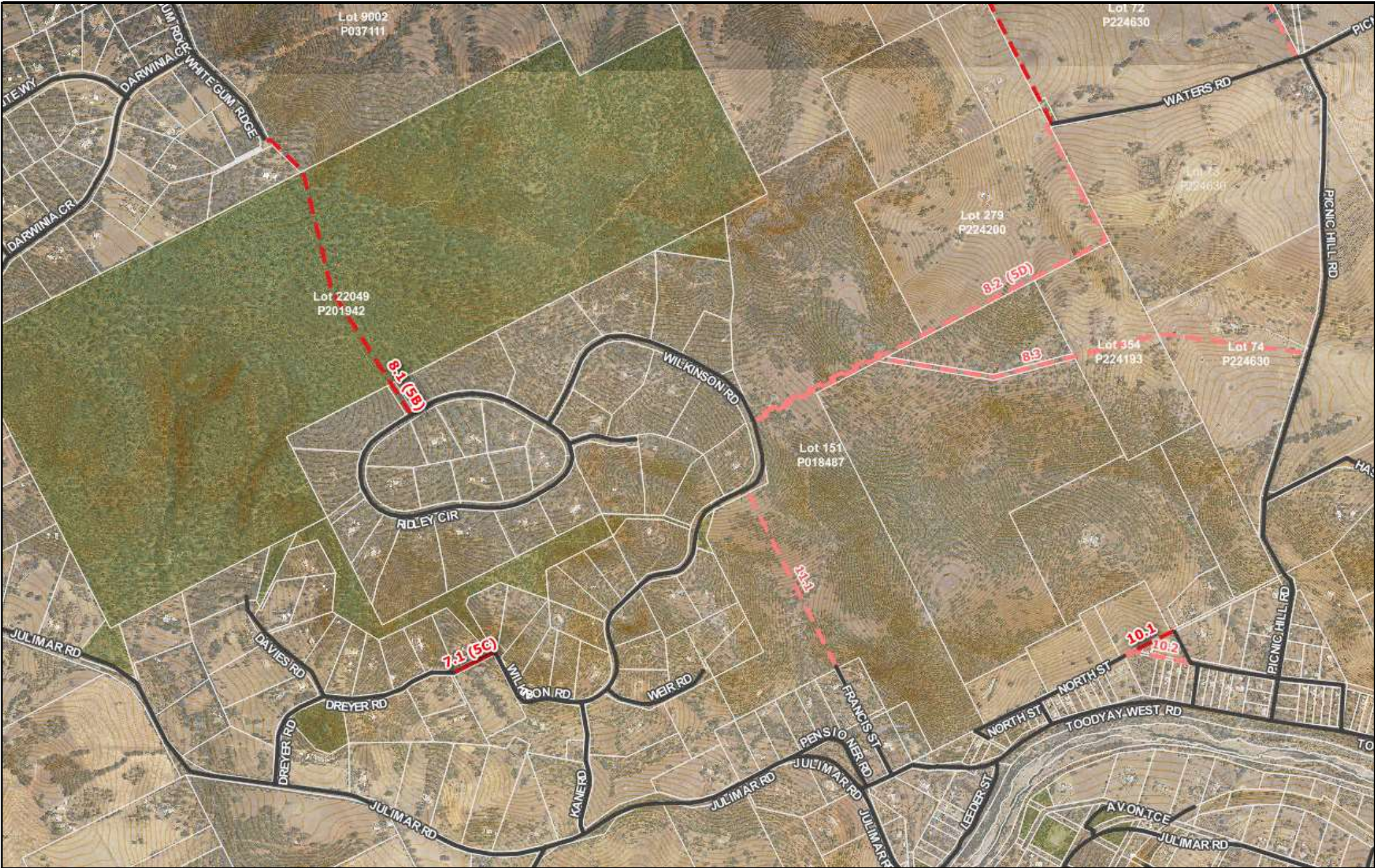
Reserve

Lot Boundaries

Scale 1:15,000
(when printed at A3)



Created: 04/05/2022



Overall Objective Raking	Alignment Reference	Alignment Score	Alignment Ranking	Alignment Description	Recommendation	Priority
6	7.1 (5C) No Alternative Analysed	0.325023488	11/38	Wilkerson - Dreyer	Recommendation 14	MEDIUM
16	8.1 (5B)	0.639722015	25/38	Ridley - White Gum	Recommendation 15	MEDIUM
	8.3	0.841919867	31	Wilkerson - Picnic Hill	Recommendation 16	LOW
	8.2 (5D)	1.216759777	35	Wilkerson - Waters	Recommendation 16	LOW

MAP 5
WEST
TOODYAY
(Townsite)

Key to Symbols

1.1 (1A)

Existing Alignment
With Reference
Number (and 2015 Ref)

1.1 (1A)

Recommended
Alignment
With Reference
Number (and 2015 Ref)

1.2 (1B)

Considered
Alignment
With Reference
Number (and 2015 Ref)

MAY ST

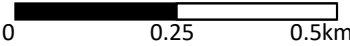
Existing Road
Network
With Road Name

Elevation Contours
2m Interval

Reserve

Lot Boundaries

Scale 1:10,000
(when printed at A3)



Created: 04/05/2022



Overall Objective Raking	Alignment Reference	Alignment Score	Alignment Ranking	Alignment Description	Recommendation	Priority
4	10.1	0.267553769	5/38	North - Collett	Recommendation 18	MEDIUM
	10.2	0.308252767	8	North - Fitzgerald	Recommendation 18 (Alt)	MEDIUM
10	9.1	0.420979831	17/38	Clarke – River	Recommendation 17	LOW
	9.2	0.842117988	32	Clarke - River	Recommendation 17	LOW
21	11.1	1.21754609	36/38	Francis - Wilkerson	Recommendation 16	LOW
	No Alternative Analysed					

MAP 6
TOODYAY
TOWNSITE

Key to Symbols

1.1 (1A)

Existing Alignment
With Reference
Number (and 2015 Ref)

1.1 (1A)

Recommended
Alignment
With Reference
Number (and 2015 Ref)

1.2 (1B)

Considered
Alignment
With Reference
Number (and 2015 Ref)

MAY ST

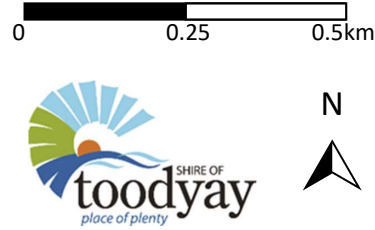
Existing Road
Network
With Road Name

Elevation Contours
2m Interval

Reserve

Lot Boundaries

Scale 1:10,000
(when printed at A3)



Created: 04/05/2022



Overall Objective Raking	Alignment Reference	Alignment Score	Alignment Ranking	Alignment Description	Recommendation	Priority
1	13.1	0.204904037	1/38	Drummond - Burt	Recommendation 20	MEDIUM
	13.2	0.231077996	2	Burt - Drummond	Recommendation 20	MEDIUM
7	14.1	0.346244131	13/38	Settlers - Telegraph	Recommendation 22	MEDIUM
	No Alternative Analysed					
13	12.1	0.522615827	20/38	Nottingham - Nottingham	Recommendation 19	MEDIUM
	No Alternative Analysed					

MAP 7
**WALKEY
HEIGHTS &
WICKLOW
(Dumbarton)**

Key to Symbols

1.1 (1A)

Existing Alignment
With Reference
Number (and 2015 Ref)

1.1 (1A)

Recommended
Alignment
With Reference
Number (and 2015 Ref)

1.2 (1B)

Considered
Alignment
With Reference
Number (and 2015 Ref)

MAY ST

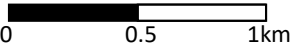
Existing Road
Network
With Road Name

Elevation Contours
2m Interval

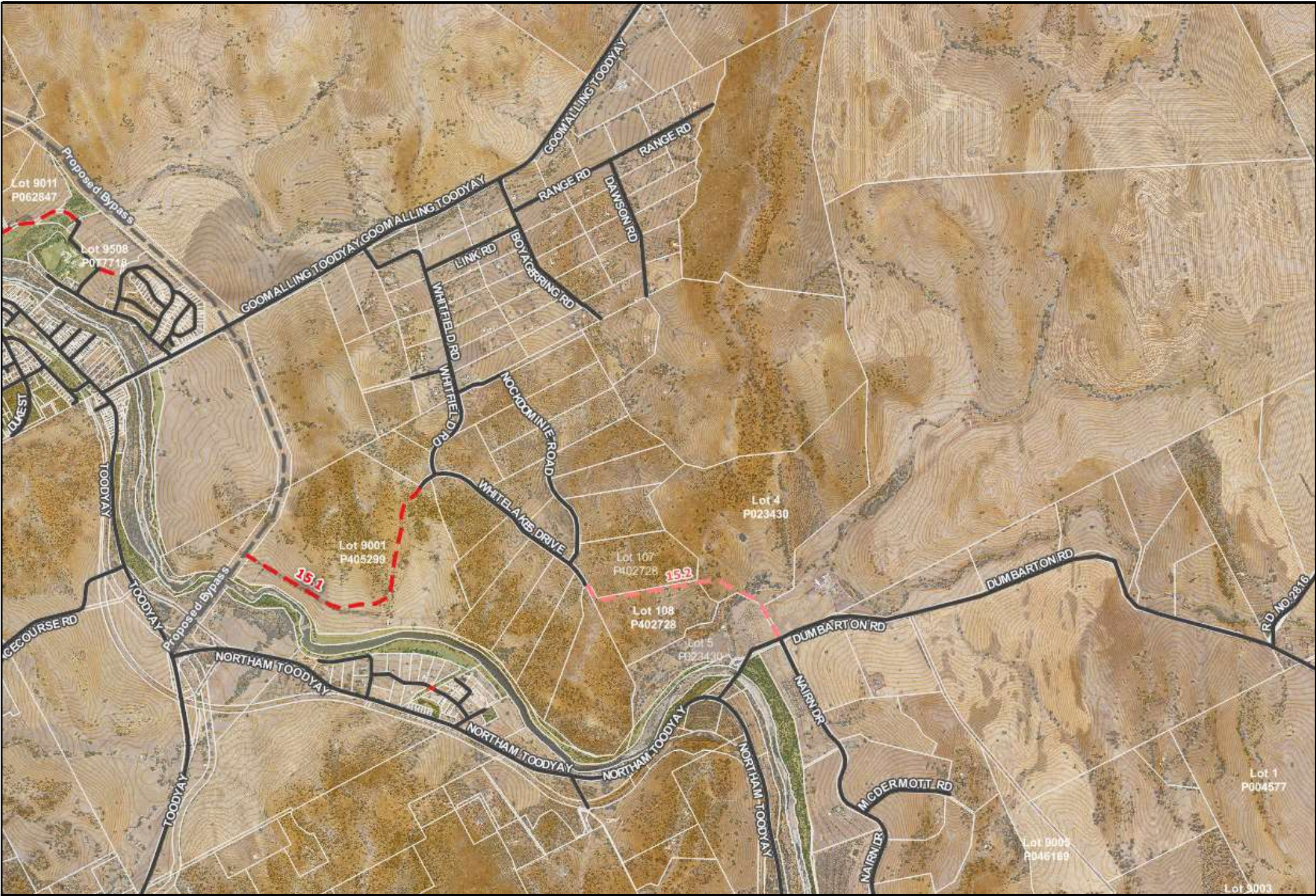
Reserve

Lot Boundaries

Scale 1:25,000
(when printed at A3)



Created: 04/05/2022



Overall Objective Raking	Alignment Reference	Alignment Score	Alignment Ranking	Alignment Description	Recommendation	Priority
19	15.1	0.711970162	28/38	Whitelakes - Proposed Bypass	Recommendation 23/24	MEDIUM
	15.2	1.075588269	34	Whitelakes - Dumbarton		

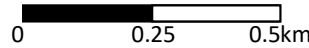
MAP 8
GREATER
MAJESTIC
HEIGHTS
(Toodyay)

Key to Symbols

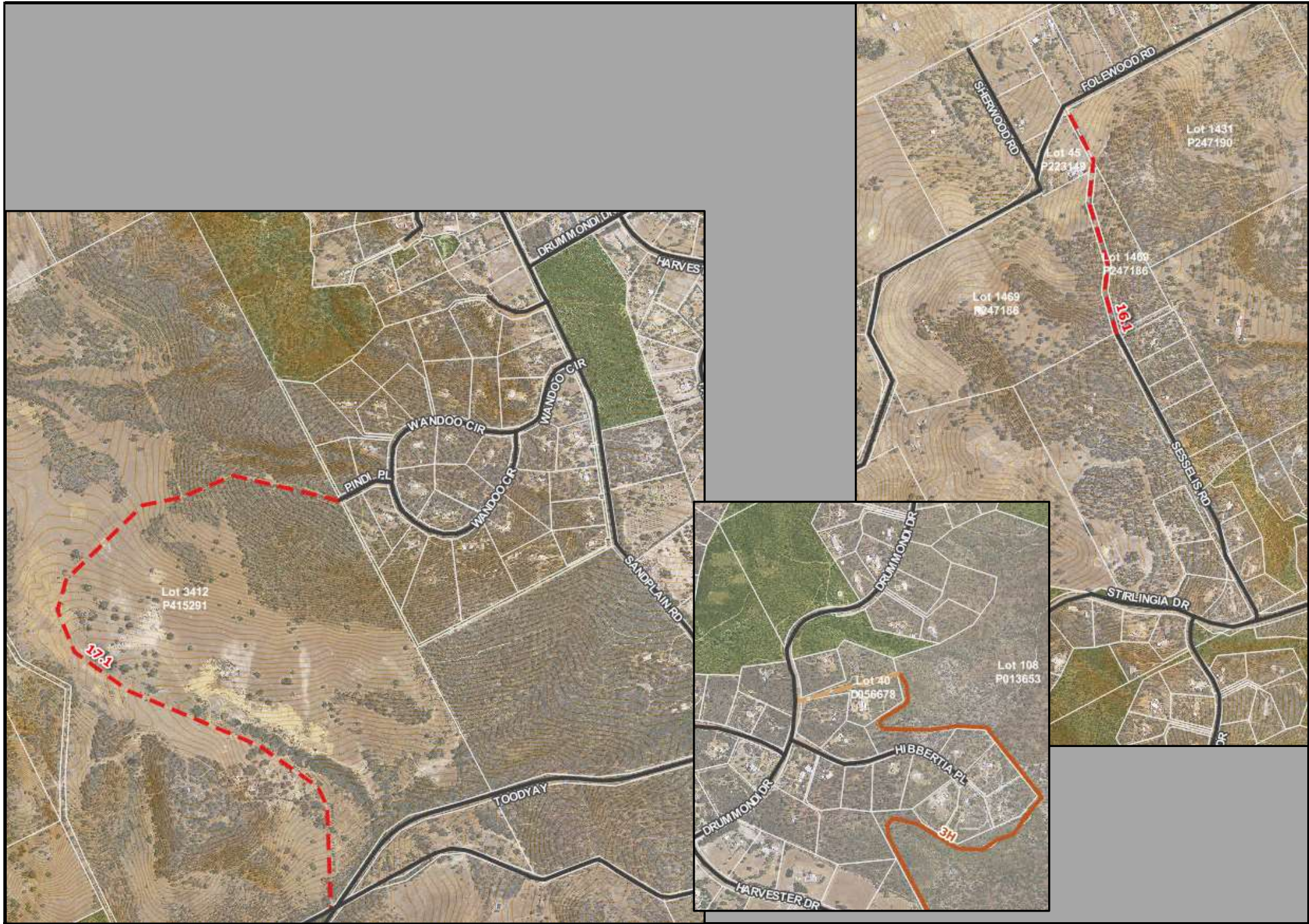
- 1.1 (1A) Existing Alignment
With Reference
Number (and 2015 Ref)
Recommended
Alignment
With Reference
Number (and 2015 Ref)
- 1.2 (1B) Considered
Alignment
With Reference
Number (and 2015 Ref)
- MAY ST Existing Road
Network
With Road Name
- 3H Existing Fire-break
With Ref. Number
Only Subject Feat Disp.
- Proposed Fire
Access Easement
- Elevation Contours
2m Interval
- Reserve
- Lot Boundaries

Scale 1:12,500

(when printed at A3)



Created: 04/05/2022



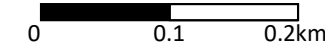
Overall Objective Raking	Alignment Reference	Alignment Score	Alignment Ranking	Alignment Description	Recommendation	Priority
17	16.1 No Alternative Analysed	0.662456917	26/38	Sesseis - Follewood	Recommendation 25/26	LOW
20	17.1 No Alternative Analysed	0.934343434	33/38	Pindi - Toodyay	Recommendation 27	LOW

MAP 9
GLENCOE &
EXTRACTS
(Toodyay
Townsite)

Key to Symbols

- 1.1 (1A)** Existing Alignment
With Reference
Number (and 2015 Ref)
- 1.1 (1A)** Recommended
Alignment
With Reference
Number (and 2015 Ref)
- 1.2 (1B)** Considered
Alignment
With Reference
Number (and 2015 Ref)
- MAY ST** Existing Road
Network
With Road Name
- Elevation Contours
2m Interval
- Reserve
- Lot Boundaries

Scale 1:5,000
(when printed at A3)



Created: 04/05/2022



Overall Objective Raking	Alignment Reference	Alignment Score	Alignment Ranking	Alignment Description	Recommendation	Priority
2	18.1 (6A) No Alternative Analysed	0.240173474	3/38	McDonald - Extracts	Recommendation 28	LOW

MAP 10

MOUNTAIN PARK

(Dumbarton)

Key to Symbols

1.1 (1A)

Existing Alignment
With Reference
Number (and 2015 Ref)

1.1 (1A)

Recommended
Alignment
With Reference
Number (and 2015 Ref)

1.2 (1B)

Considered
Alignment
With Reference
Number (and 2015 Ref)

MAY ST

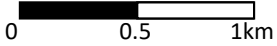
Existing Road
Network
With Road Name

Elevation Contours
2m Interval

Reserve

Lot Boundaries

Scale 1:27,500
(when printed at A3)



Created: 04/05/2022



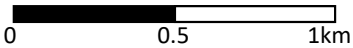
Overall Objective Raking	Alignment Reference	Alignment Score	Alignment Ranking	Alignment Description	Recommendation	Priority
22	19.1	1.424130571	37/38	Drumree - Katrine	Recommendation 30	MEDIUM
	19.2	1.457355085	38	Drumree - Dumbarton	Recommendation 30	MEDIUM

MAP 11
**MOONDYNE
PARK**
(Hoddys Well)

Key to Symbols

- 1.1 (1A)** Existing Alignment
With Reference
Number (and 2015 Ref)
- 1.1 (1A)** Recommended
Alignment
With Reference
Number (and 2015 Ref)
- 1.2 (1B)** Considered
Alignment
With Reference
Number (and 2015 Ref)
- MAY ST** Existing Road
Network
With Road Name
- Elevation Contours
2m Interval
- Reserve
- Lot Boundaries

Scale 1:20,000
(when printed at A3)



Created: 04/05/2022



Overall Objective Raking	Alignment Reference	Alignment Score	Alignment Ranking	Alignment Description	Recommendation	Priority
9	21.1 No Alternative Analysed	0.400616333	16/38	Panorama - Hoddys Well	Recommendation 32	MEDIUM
12	20.1 20.2	0.462435950 0.796184459	19/38 29	Twilight - Toodyay Twilight - Clackline	Recommendation 31	MEDIUM

MAP 12
GREATER
MORANGUP

Key to Symbols

1.1 (1A)

Existing Alignment
With Reference
Number (and 2015 Ref)

1.1 (1A)

Recommended
Alignment
With Reference
Number (and 2015 Ref)

1.2 (1B)

Considered
Alignment
With Reference
Number (and 2015 Ref)

MAY ST

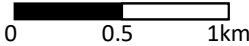
Existing Road
Network
With Road Name

Elevation Contours
2m Interval

Reserve

Lot Boundaries

Scale 1:30,000
(when printed at A3)



Created: 04/05/2022



Overall Objective Raking	Alignment Reference	Alignment Score	Alignment Ranking	Alignment Description	Recommendation	Priority
18	22.1	0.663636364	27/38	Red Brook - Toodyay	Recommendation 33	MEDIUM
No Alternative Analysed						