Landserv
Environment

Natural Environment and Hazards Analysis Golden Plains Shire

Prepared for:

Golden Plains Shire Council
PO Box 111,
Bannockburn,
VIC 3331

29 July 2022

DOCUMENT DISTRIBUTION

Number of Copies	Recipient
1 Electronic Copy (via email)	
Original Electronic File	Held on file by Landserv

DOCUMENT STATUS

Author	Technical Review	Editorial Review	Revision Date
			FINAL 29 July 2022
Lachlan Judd Senior Environmental Scientist	Damien Chappell Principal Environmental Scientist	Andrew Wigley Principal Environmental Scientist	

Landserv Pty Limited
ABN: 87 065 632 895

GEELONG
14 Albert Street
Geelong West
VIC 3218
T. 03 5222 4173

MELBOURNE
293A Bay Street
Port Melbourne
Vic 3207
T. 03 9646 0833

www.landserv.com.au

CONTENTS

LIST OF FIGURES

LIST OF TABLES

FIGURES (Appendix A)

APPENDICES

EXECUTIVE SUMMARY

Whenever planning for future growth on a municipality-scale, ongoing consideration must be given to the relative importance of factors relating to the natural environment and hazards. Given that such factors can have considerable importance in relation to risk to lives, property and infrastructure, ensuring they have been appropriately considered will allow for best practice future planning.

The following is a summary of natural environment and hazards as possible constraints and opportunities for growth, in nominated portions of the municipality:

Northern Portion of Golden Plains

In the northern portion of Golden Plains key consideration to growth are:

- High bushfire risk zones around heavily vegetated areas such as Enfield State Park, Bamganie State Forest and Brisbane Ranges National Park. Priority is placed on the protection of lives and the elevated fire risk ranking in these areas should be seen as a key limiting factor to growth unless specific controls can mitigate risk to a more manageable level (GPSSBA, 2022). This report states that it would be difficult to direct growth into settlements in these areas under the applicable bushfire planning guidelines given that alternatives are available.
- Large proportion of high bushfire risk areas are also subject to additional protections including vegetation and environmental significance overlays which restricts growth.
- Potential flooding and inundation along waterways, additional protection overlays and higher susceptibility to erosion will limit growth potential along catchments.
- Consideration should be given to salinity management zones within this proportion of the municipality and how they may constrain future development and / or require engineering solutions where built infrastructure is proposed.
- Whilst operational growth around Smythesdale Landfill may be constrained within a 500 m buffer due to landfill gas and amenity concerns. However, after the landfill is closed, some areas within the buffer may be suitable, depending on the outcomes of landfill gas risk assessments that would be required.
- Significant historical mining activity is evident in this section of the municipality. Further assessment for soil contamination, mineshaft safety and geotechnical impacts would be advised if growth areas are contemplated in historical mining areas.
- Consideration should be given to Mt Mercer Windfarm buffers on growth.

Eastern Portion of Golden Plains

In the eastern portion of Golden Plains key consideration to growth are:

- The townships of Inverleigh and Teesdale are susceptible to flooding risk. LSIO and FO areas should generally be avoided for growth if alternatives are available. Once the Teesdale Flood Study is completed (estimated 2023) any findings should be incorporated into future growth planning and overlays.

- As with the northern extent of Golden Plains, other existing overlays and susceptibly to erosion will limit growth potential within these flood-prone areas of the municipality.
- The low risk determined by LFGRA at the Tawarri, and Teesdale Landfill should be considered in relation to future zoning. Audit conditions of the Tawarri Landfill should be adopted for localised growth.
- Consideration should be given to salinity management zones within this proportion of the municipality and how they may constrain future development and / or require engineering solutions where built infrastructure is proposed.
- Overlays and buffers applicable within the Golden Plains Intensive Animal Precinct and for Lethbridge Airport should be considered in relation to growth in these areas.

Western Portion of Golden Plains

In the western portion of Golden Plains key considerations to growth are:

- Portions of this region are high fire risk zones. The elevated fire risk ranking in these areas should be seen as a key limiting factor to growth unless specific controls can mitigate risk to a more manageable level (GPSSBA, 2022). Directing growth into these areas would be difficult under the applicable bushfire planning guidelines given that alternatives are available (GPSSBA, 2022).
- Additional environmental and vegetation overlays further restrict development into these areas of high bushfire risk.
- Waterways including Woady Yallock River, Naringhil Creek and Mt Misery Creek all have LSIO and ESO overlays along their lengths. The risks posed and protection offered by these overlays along with increased susceptibility to erosion will limit potential growth along these catchments.
- Depending on the size, age and landfill gas risk associated with the former Rokewood Landfill development is unlikely to be prevented within most of the 500 m buffer area. However, a landfill gas risk assessment (LFGRA) is required to confirm this.
- Consideration should be given to salinity management zones within this proportion of the municipality and how they may constrain future development and / or require engineering solutions where built infrastructure is proposed.
- Significant historical mining activity is evident in this section of the municipality. Further assessment for soil contamination, mineshaft safety and geotechnical impacts would be advised if growth areas are contemplated in historical mining areas.
- Consideration should be given to proposed Golden Plains Wind Farm development buffers on growth in this area.

Southern and Central Portion of Golden Plains

In the southern and central portion of Golden Plains key consideration to growth are:

- Waterways including Kuruc A Ruc Creek and Ferrers Creek have LSIO and ESO overlays along their lengths. The risks posed and protection offered by these overlays along with increased susceptibility to erosion will limit potential growth along these catchments

- Consideration should be given to salinity management zones within this proportion of the municipality and how they may constrain future development and / or require engineering solutions where built infrastructure is proposed.
- Overlays and buffers applicable within the Golden Plains Intensive Animal Precinct and proposed Golden Plains Windfarm and should be considered in relation to growth in these areas.

1 INTRODUCTION

1.1 Overview

Landserv Pty Limited (Landserv) was engaged by Golden Plains Shire Council (the Council) to complete a Natural Environment and Hazards Analysis (NEHA) to support the Councils broader Settlement Strategy that is currently in draft form.

Under Victoria's statutory land use planning scheme the Planning and Environmental Act 1987 enables planning schemes to 'regulate or prohibit any use or development in hazardous areas, or areas likely to become hazardous'. Therefore, allowing risks (i.e. flooding, bushfires) to be managed in the context of growth and development.

The NEHA focuses on the natural environment (e.g. vegetation protection), natural hazards (e.g. bushfire and flooding), man-made hazards (e.g. landfills and contaminated land), and broader strategic planning decisions of the Council (e.g. windfarms, food production precincts) within the context of suitability for future growth.

This assessment is not a comprehensive strategic and planning assessment, but an overview of factors that may potentially act as barriers or constrain future growth within the municipality. Given the large spatial extent of the municipality, and existing structure plans for major townships the NEHA broadly focusses on large scale limitations, and where necessary makes comment on specifics.

This NEHA relies on pre-existing assessments, including reports and maps for bushfire risk, flooding risk and other datasets and overlays. Within the context of future planning directions the NEHA is intended to provide only a preliminary overview and the individual reports. References should be read and interpreted in conjunction with the NEHA.

Figure 1 – Diagrammatic Extent of Golden Plains Shire

2 BACKGROUND

2.1 Golden Plains Shire

The Council is a predominately rural municipality located between the major regional centres of Ballarat and Geelong in Victoria and services a number of small to medium townships including Bannockburn, Meredith and Inverleigh. Encompassing an area of 2,705 km^2 with a population of 23,120 (as of June 2018), the municipality consists of a diverse range of landscapes from heavily vegetated bushland in the north to wide open grassy plains and river valleys in the south.

The Council's main source of employment and economic activity is centred around the agriculture and the relevant supporting industries. Key agricultural activities within the Council include production of livestock (sheep and wool), grain production, intensive poultry, pig farming and wine manufacturing. Other key industries throughout the municipality include retail, construction, manufacturing and more recently renewable energy production (i.e. wind farms).

Due to the location of Golden Plains relative to cities (Melbourne, Geelong and Ballarat), and rural lifestyle a significant proportion of the population work outside the municipality.

2.2 Golden Plains Settlement Strategy

Historically, the Council has relied upon localised decisions regarding location, form and scale of development to guide residential development and growth (i.e. individual township structure plans), however the goal of the broader settlement strategy is to develop a more municipality wide based approach. The Golden Plains Settlement Strategy (GPSS) currently under development is a 15-year strategy to manage growth and development across the municipality.

The GPSS is a joint initiative with the Victorian Government and Victorian Planning Authority, with the three main objectives of the strategy to:

- Identify settlement areas suitable for development;
- Determine the appropriate level of growth across the Shire; and
- Determine the density of growth in those locations where it is supported.

The GPSS will provide an overview planning framework for the municipality to maximise benefit from existing infrastructure and the environment. Ensuring the GPSS is developed in best practice, various bodies of work are to be incorporated into the broader strategy including the NEHA, which will assist in identifying barriers or limiting factors in regard to long term growth (i.e. flooding, bushfire, salinity, areas of environmental significance).

2.3 Natural Environment and Hazards Analysis

Under the Victorian State Government Planning Ministers Direction 6, a key aim is the management of sustainable rural residential development to support the development of sustainable housing and settlement. An objective of this planning direction is that residential development and growth does not compromise the surrounding farming landscape, natural environment, landscape, infrastructure resources and avoid predictable environmental processes and hazards.

The NEHA focuses on addressing this planning direction, where natural hazards and environmental constraints are used to identify areas that may be limited for future growth and present lower risk.

The NEHA acknowledges relevant planning decisions by the Council in the broader context of future growth potential (i.e. wind farm, intensive animal precincts).

2.4 Objectives of the NEHA

2.4.1 Context

Given the close association between natural hazards (i.e. flooding, fire, salinity) and the social, environmental and economic costs associated with the development of land, these factors need consideration in relation to growth to facilitate informed strategic planning. As risks and natural constraints are better understood, analysing this knowledge in the context of future planning can reduce risks to lives, property and infrastructure.

Although Golden Plains Shire is a large municipality with a relatively small population comparatively to many other more metropolitan areas, recently there has been an influx of people and growth into the region. The NEHA will assist the Council in designing and implementing long term decisions in regard to managing risks to human health, economic impacts and the environment.

The following key components have been included within this assessment:

- Natural Events – understanding how natural occurring events can potentially impact lives, property and infrastructure (e.g. bushfires).
- Natural Hazards – understanding the potential impact of natural landscape (i.e. landslip or erosion prone areas), in relation to risk and planning.
- Man-made Hazards – human derived hazards that may limit future growth due to potential environmental or human health risk (e.g. landfills).
- Natural Environment – general environmental condition that based on level of protection impact future growth (e.g. areas of environmental significance).
- General Planning Limitations – pre-existing or future planning decisions by the Council which may limit future residential growth (e.g. wind farms).

3 ASSESSMENT APPROACH

3.1 Summary

This NEHA focusses on the sourcing, integration and interpretation of geospatial data along with a review of available reports (i.e. land suitability, flooding, bushfire). A summary is provided of rationale as to why each report and data set has been included, as well as commentary surrounding potential implications for future growth.

The review also provides commentary on the need to consider buffer zones (e.g. for landfills), or areas where growth may be constrained over a longer time frame.

3.2 Data Sourcing

Landserv is reliant on the accuracy of the data sourced. We have attempted to obtain all data from sources that we regard as being reasonably reliable, where possible reducing the potential for erroneous data to be included within the assessment.

The key sources of data used within this assessment have been:

- Golden Plains Shire Council;
- Geoscience Australia;
- Corangamite Catchment Management Authority; and
- Land Vic.

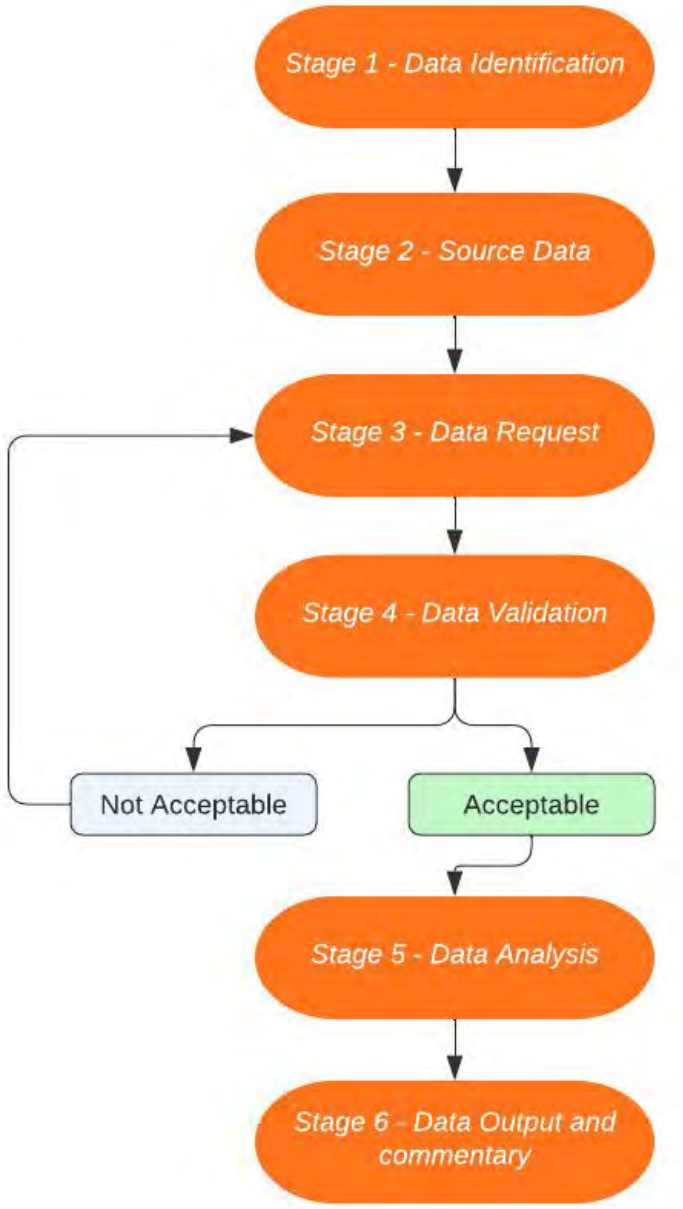
3.3 Data Screening and Quality Assurance

Landserv has adopted the following standardised screening method on all data sets:

- Ensuring the data is considered to be from a reliable source;
- Assessing data currency to ensure the data is the most recently available;
- Assessing data completeness to ensure the data sufficiently covers the spatial extent; and
- Cross checking spatial accuracy and formatting of data.

To track and ensure that each of the quality assurance steps have been followed within this assessment, Table 1 in Appendix B provides a tracking register of the data layer. Figure 2 below is a diagrammatic representation of the strategy adopted.

Figure 2 – Adopted Quality Assurance Procedure



3.4 Geospatial Analysis

Landserv acknowledges that specific layers and data sets may be of varying importance in relation to growth and development considerations. Therefore the NEHA has assigned [1]preliminary inferred levels of importance to each data set. This is not a risk assessment, but a ranking of relative importance within the context of this assessment.

No ranking has been given to existing Council planning decisions (e.g. windfarms) given that these are pre-existing planning decisions.

The following is a summary of Landserv's [1]preliminary inferred levels of importance for each layer:

Very High Importance

- Fire Risk
- Flooding Risk

High Importance

- Vegetation Protection
- Environmental Significance

Medium to High Importance

- Landfills

Medium Importance

- Historical Mining Activity
- Landslip / Erosion Susceptibility
- Salinity
- EPA Audit site / Licensed EPA Activities / Contaminated Land
- Geological Sites of Significance

Other factors that may have implications for growth and development but have not been allocated a level of importance include:

- Windfarm – buffers
- Intensive animal husbandry activities – buffers
- Airport – distance buffers / SUZ3 zone

[1] Landserv's inferred levels of importance are preliminary and are based on our interpretation of environmental factors only. We have not applied planning expertise in allocating these levels.

4 NATURAL EVENTS

4.1 Bushfire

Importance to Assessment: VERY HIGH

4.1.1 Overview

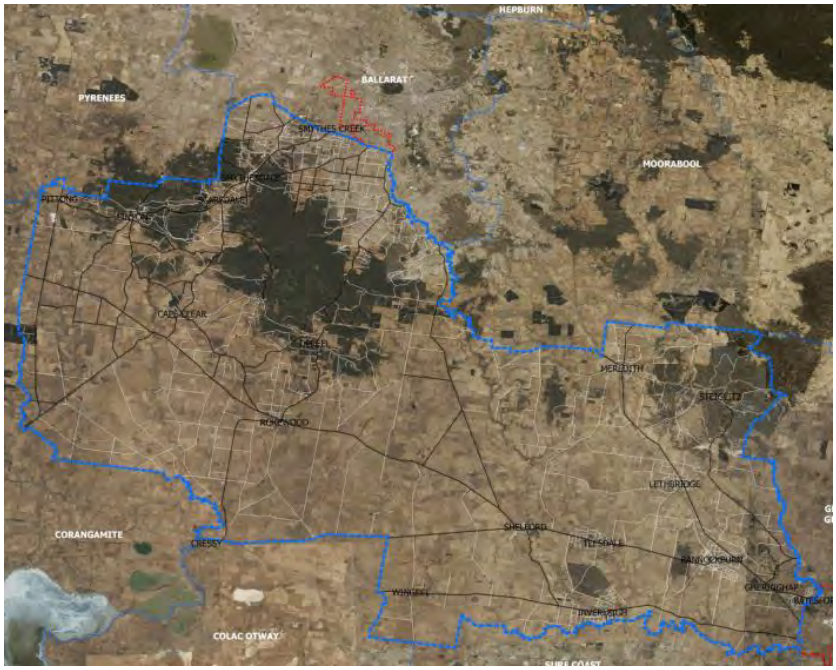
Victoria is one of the most fire prone areas in the world. Destruction of communities and impacts to people, properties, the economy and the environment have occurred in recent years throughout large rural areas of the state. Although a function of climatic condition (i.e. wind and heat), bushfire threat is also intrinsically linked to natural environmental setting (i.e. proximity to fuel load, vegetation composition and topography), and therefore some areas pose a higher fire risk. Given the risk to lives and property posed by fire, strategic planning in relation to fire risk is considered to be of very high importance within the context of future growth and development.

Although controls can be implemented in the management of fire risk (e.g. fuel load reduction) and building construction requirements based on bushfire attack ratings, one of the key triggers in reducing risk is to limit growth in zones that are susceptible to fire risk. With changing climatic conditions, consideration also needs to be given to the potential for increased frequency and magnitude of fire events throughout the municipality.

4.1.2 Context

The municipality comprises a diverse range of landscapes, each with their own unique characteristics that play an important role in fire risk. Open grassy plains (i.e. native grasslands, pastures and cropping) are the predominant landscape in the south, west and central districts, grading into topographic relief in the northern and north western section of the municipality (i.e. Brisbane Ranges National Park and Enfield State Park). The varied topography and associated density of trees in these areas is considered to elevate the fire risk posed.

Figure 3 – GPSSBA Golden Plains (Kevin Hazell Bushfire Planning, 2022)



The municipality is dominated by warm dry summers and cool wet winters, with the bushfire season running generally between December to April. Given the changing climate anticipated into the future it is anticipated that the bushfire season will increase in duration and there will be larger, more severe and frequent bushfires occurring in the future (DELWP, 2020).

4.1.3 Guiding Documents

The Victorian State Government policy on fire risk indicates that in planning for settlement priority must be given to the protection of human lives (i.e. limit development in areas identified as being subject to risk from fire), above all other policy considerations (such as economic, environment and social based on land use and development).

Council's Planning Strategy indicates that bushfire risk can be mitigated by the following:

- Avoiding development in bushfire prone areas
- Avoiding the rezoning of land that allows for settlement in areas of high bushfire risk, particularly where natural assets will be compromised
- Minimising the impact of bushfire portion measures on vegetation with high environmental value

The *Golden Plains Shire Strategic Bushfire Assessment – (GPSSBA; Kevin Hazell Bushfire Planning, 2022)* has been developed to provide a high-level assessment of the bushfire risk within the municipality and for incorporation into the Settlement Strategy. This assessment identifies areas for low-risk settlement growth and directing property growth to locations to where human lives can be better protected from the effects of bushfires. This assessment has adopted a landscape-based approach to assessment of risk, which takes into account aspects such as likely bushfire scenarios, potential for destruction, and availability of access to safety. That (bushfire) assessment adopts the *Planning Permit Applications Bushfire Management Overlay Technical Guide* (DELWP, 2017) as provided in Figure 4 below to assess landscapes on a scale of 1 to 4 in regard to their risk ranking.

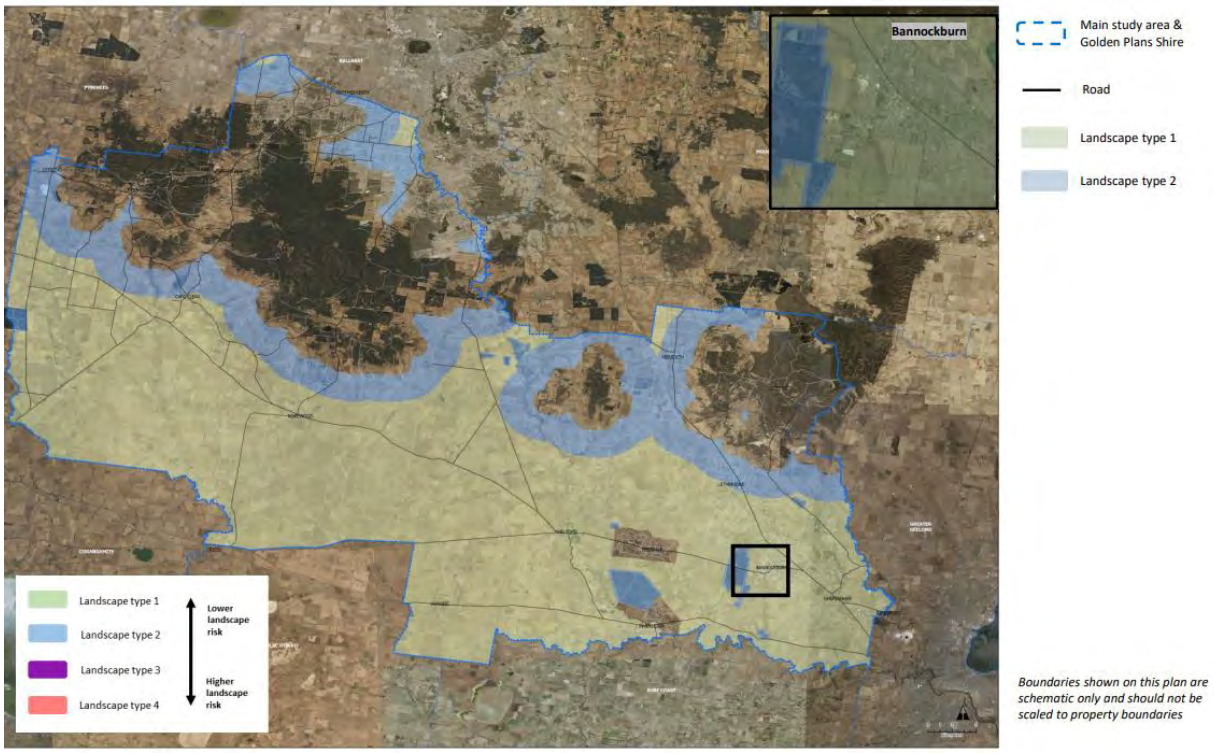
Some findings of the bushfire assessment are summarised in Section 4.1.4 and the overlay has been included in Landserv's compilation of data. The bushfire assessment should be read in full and referred to as the key document.

Figure 4 – GPSSBA Landscape Based Assessment (Kevin Hazell Bushfire Planning, 2022)

LANDSCAPE TYPE 1	LANDSCAPE TYPE 2	LANDSCAPE TYPE 3	LANDSCAPE TYPE 4
• There is little vegetation beyond 150 metres of the site (except grasslands and low-threat vegetation) • Extreme bushfire behaviour is not possible • The type and extent of vegetation is unlikely to result in neighbourhood scale destruction of property • Immediate access is available to a place that provides shelter from bushfire	• The type and extent of vegetation located more than 150 metres from the site may result in neighbourhood-scale destruction as it interacts with the bushfire hazard on and close to a site • Bushfire can only approach from one aspect and the site is located in a suburban, township or urban area managed in a minimum fuel condition • Access is readily available to a place that provides shelter from bushfire. This will often be the surrounding developed area	• The type and extent of vegetation located more than 150 metres from the site may result in neighbourhood-scale destruction as it interacts with the bushfire hazard on and close to a site • Bushfire can approach from more than aspect • The area is located in an area that is not managed in a minimal fuel condition • Access to an appropriate place that provides shelter from bushfire is not certain	• The broader landscape presents an extreme risk • Bushfires may have hours or days to grow and develop before impacting[1] • Evacuation options are limited or not available
Lower risk from the bushfire landscape			Higher risk from the bushfire landscape

Figure 5 below presents the distribution of Type 1 and Type 2 Landscape Types in relation to fire risk. Although the southern portions of the shire reports a degree of fire risk (generally Type 1), the inferred risk is lower than that in the highly vegetation areas in the north and north-eastern portions of the municipality. Areas with Type 3 and Type 4 Landscape Types are provided on Figure 3, in Appendix A.

Figure 5 – GPSSBA Landscape Types 1 and 2 (Kevin Hazell Bushfire Planning, 2022)



4.1.4 Relevant to Assessment

Bushfire is a significant issue across the municipality, affecting built communities and natural systems. As the population of Golden Plains continues to grow, there will be increasing pressure placed on the development into bushfire prone areas.

The GPSSBA outlines the key measures that can be adopted in limiting impact from fire, including avoidance of developing in bushfire prone areas and avoiding rezoning of land in areas of higher fire risk (particularly where natural assets will be compromised). A key recommendation is the redirecting of population growth and development to low-risk locations and ensuring the availability of safe access to areas where human life can be better protected from bushfires (Kevin Hazell Bushfire Planning, 2022)

Locations not included within the landscape-based assessment (Type 1 – Type 4) include areas around Bannockburn and Southern Inverleigh. Given an key consideration in the settlement strategy is the protection of human lives, lower risk locations might logically be considered more suitable as key growth areas. In accordance with the GPSBBA directing growth towards Bannockburn aligns with the reduction of risk in relation to fire as highlighted in Figure 6.

Figure 6 – GPSSBA Lower Risk Settlements on a Regional and Sub-Regional Scale

Lower ranking landscape risk areas (i.e. Type 1 and Type 2) although not unhindered by bushfire considerations may also warrant consideration for future development (see Figure 5). GPSSBA indicates that bushfire protection measures are able to be implemented in some of these areas to manage the risk to human lives.

Some higher ranked landscape areas (i.e. Type 3) are located in the southern portion of the municipality around Inverleigh and Teesdale due to high neighbourhood scale hazards which pushed up the risk ranking (i.e. Inverleigh Flora Reserve, scattered vegetation throughout the settlement of Teesdale). As outlined within GPSBBA, these areas have been identified as key growth zones. Future planning and direction by the Council should consider any relevant recommendations of GPSSBA.

The GPSSBA indicates that other areas within the municipality that fall under Type 3 landscapes (i.e. Smythesdale and Linton) pose a comparative greater risk to bushfire, given they have a reduced ability to implement bushfire management strategies than areas such as Inverleigh and Teesdale. The GPSSBA notes that it would be difficult to direct growth into these settlements (i.e. Smythesdale) under the bushfire guiding documents, given that alternatives are available. The report does provide potential options for consideration in areas that pose higher risk.

Figure 7 – GPSSBA Landscape Type 3 Locations around Inverleigh and Teesdale

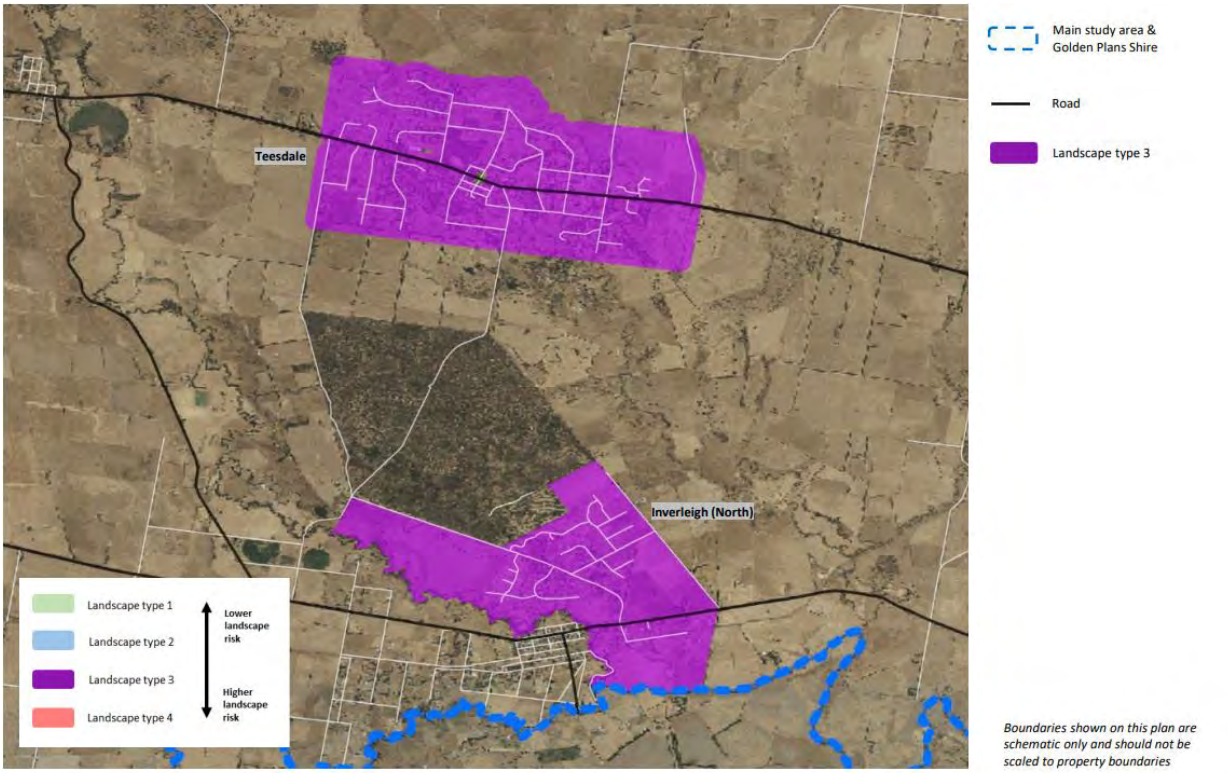
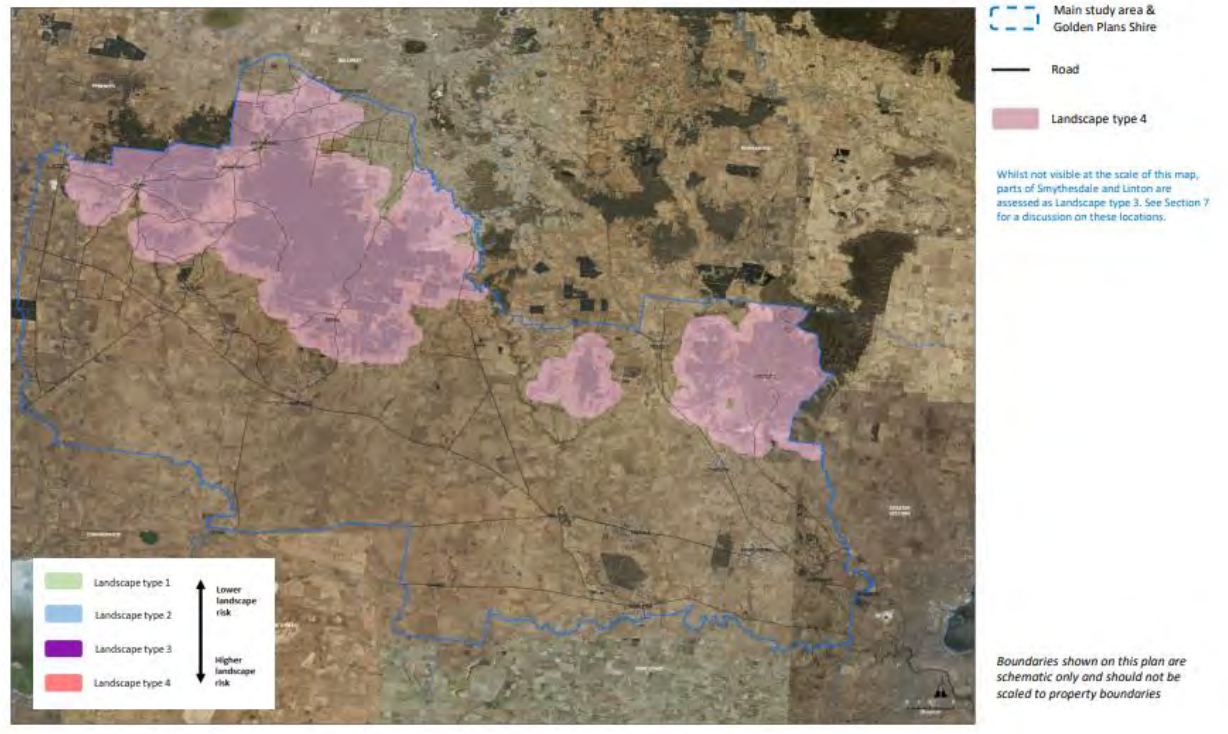


Figure 8 – GPSSBA Landscape Type 4 Risk Locations



4.2 Flood / Floodway Overlays

Importance to Assessment: VERY HIGH

4.2.1 Overview

Flooding is an integral ecological process of many of Australia's natural catchments. Flooding has the potential to cause significant damage to property and infrastructure and endanger lives. Victoria has a diverse range of flood plains and overland flow paths, each with distinctive characteristics that influence behaviours of individual flooding events, and the potential risk posed.

Floodplains have historically been key areas on which society has relied upon for development, with fertile soils, flat topography, access to secure water for drinking, transport and amenity.

Strategic planning and land use management in flood prone areas requires careful consideration into the future to limit risks to lives and infrastructure. With a changing climate, consideration also needs to be given to the potential increase of frequency and severity of flooding and inundation to occur and impacts on specific areas.

4.2.2 Understanding Flooding Risk

Risks posted by flooding vary between floodplains, depending on a range of topographic, geological and climatic conditions specific to the region and often individual catchment system (i.e. size of catchment, shape of river system). This makes any development on flood prone areas challenging to in relation to planning. Often the adopted approach accepts that whilst it is not practical to eliminate flooding risk, mitigation measures can be adopted to limit impact.

Some townships (i.e. Inverleigh and Teesdale) within the municipality are subject to a higher degree of flooding risk. Ensuring future planning accounts for this risk and implements appropriate planning and growth strategies to limit potential impact to river and waterway flood susceptible zones.

Understanding the probability and magnitude of potential flooding events is an approach used to quantify flooding risk. The 1% Annual Exceedance Probability (1% AEP) (representing a flood with a 1% AEP has a one in a hundred chance of being exceeded in any one year) is often adopted to inform decisions for development and growth.

Modern planning and building controls generally restrict development of homes in areas with AEP of 1% or higher, to limit risk. For future planning, consideration needs to be given to a changing climate and how this may impact overall flooding risk.

4.2.3 Guiding Documents

The *Victorian Floodplain Management Strategy (2016)* outlines the direction for best practice floodplain management within a Victorian context. The key emphasis of this strategy is '*avoiding or minimising future risks'*, with the strategy focusing on appropriate use of planning controls (i.e. zoning) to manage growth in high-risk areas.

At a regional level, the *Corangamite Regional Floodplain Management Strategy 2018-2028 (CRFMS; CCMA, 2016)* provides a planning document to assist floodplain management and guide future management priorities. This strategy takes into account

both the management of ecological and cultural values and risks to property, infrastructure and lives. Within the context of Golden Plains Shire, the strategy outlines priority riverine risk management areas at Inverleigh, Teesdale, and Shelford all of which have had historic flooding events.

At a local level, the *Flood Risk Management Study – Leigh and Barwon River at Inverleigh (FRMS, Water Technology,* 2018) and the Teesdale Flood Study proposed for completion in early 2023, are guiding documents on these individual flood plains and risk levels posed based on modelling and detailed analysis. Specific reference to these individual reports should be relied upon for understanding localised flood behaviour, future modelling, and areas subject to inundation.

4.2.4 Context

There are three distinctive catchment basins in the municipality - the Barwon, Corangamite and Moorabool. Generally the basins are confined topographically within their upper reaches, flattening out lower down in the catchments.

Based on the review within the CRFMS (CCMA 2016), Golden Plains Shire (at 2016) has 2,168 residential, 22 commercial and 6 industrial properties within a 1% AEP.

Table 4.1 – CRFMS Estimated Number of Properties within 1% AEP (CCMA, 2016)

LGA	Residential parcels within 1% AEP extent	Commercial parcels within 1% AEP extent	Industrial parcels within 1% AEP extent	Total Parcels within 1% AEP extent*
Borough of Queenscliffe	95	0	0	95
City of Ballarat	5,298	342	146	5,786
City of Greater Geelong	965	61	203	1,229
Colac Otway Shire	711	18	15	744
Corangamite Shire	179	24	13	216
Golden Plains Shire	2,168	22	6	2,196
Moorabool Shire	1,536	111	46	1,693
Moyne Shire	624	12	2	638
Surf Coast Shire	450	20	6	476
Total	**12,026**	**610**	**437**	**13,073**

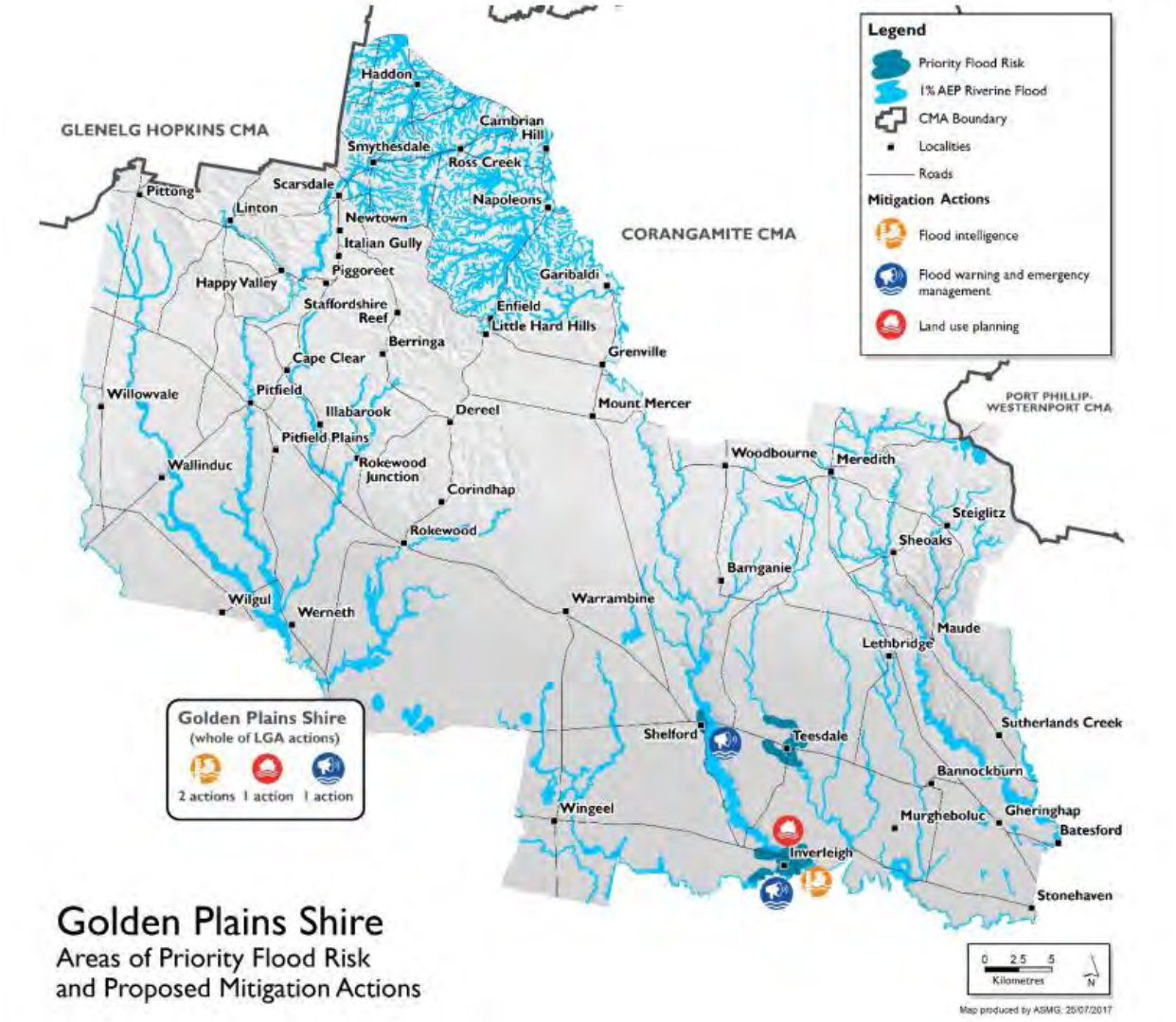
** Parcel information based on Victorian Land Use Information System (VLUIS), 2012 (Source: DEDJTR).*

Several waterways throughout the municipality are subject to varying levels of flooding (i.e. Barwon River and Moorabool River). Areas along the Leigh River and Woady Yaloak Creek are particularly prone to inundation.

The FRMS (Water Technology, 2018) was commissioned given the historical flooding present around Inverleigh. The township of Inverleigh, situated at the confluence of the Leigh and Barwon Rivers has a high risk of flooding due to the low-lying nature of the township and backing up of river system in high rainfall events.

It is also noted that the Teesdale is an area subject to priority flood risk, with a flood study currently being commissioned. Following receival, this should be incorporated into the large analysis and Settlement Strategy accordingly. Figure 9 provides a visual representation of priority flood risk and 1% AEP areas in Golden Plains. Areas under LSIO and FO have also been provided on Figure 3, Appendix A.

Figure 9 – CRFMS Priority Flood Risk Areas in Golden Plains (CCMA, 2016)



4.2.5 Relevant to Assessment

Inundation records provide historical data and knowledge of flooding risk at certain locations. As such existing overlays encompass these areas of greater risk as land subject to inundation (LSIO) and Flood Overlays (FO) that cover areas which have generally greater risk. These overlays are updated once new flooding risk data is compiled (e.g. Inverleigh Flood Study).

The planning framework requires approval from the Corangamite Catchment Management Authority where building permit applications are made in areas that pose a risk of flooding from registered waterways. The LSIO and FO within Golden Plains LGA encompasses areas that, based on specific characteristics, are subject to higher flooding risk. (e.g. portions of the townships of Inverleigh and Teesdale).

Although some existing populations, dwellings and infrastructure are situated on flood prone area, the LSIO and FO areas should generally be avoided for future development.

The Inverleigh Structure Plan (2019) has incorporated the FRMS (Water Technology, 2018) into its assessment of growth and development in the region and should be relied upon at a local level in regard to identifying areas for potential growth and development as per Figure 10 below.

Figure 10 – Potential Growth Areas Inverleigh (Inverleigh Structure Plan 2019)

Much of the remaining LSIO across the municipality away from townships, lies directly along the riparian zone of river system or in a few areas in wetland systems. These areas are generally also constrained by other planning overlays (e.g. environmental significance) and are generally more susceptible to rill and sheet erosion. Together with the higher risk of inundation, consideration should be given to limiting growth into these areas.

5 NATURAL HAZARDS

5.1 Landslip / Erosion Susceptibility

Importance to Assessment: MEDIUM TO HIGH

5.1.1 Overview

Landslips are one of the most common occurring environmental hazards, sometimes causing significant economic damage and risk to human lives. Landslips occur when under the influence of gravity, movement of soils and rocks occurs in a downslope direction. Although they are a process that is key to the geomorphological development of gullies, valleys and coastline, they do have the potential to cause damage to property and lives. Particular landscapes are more susceptible to landslips, with slope angle, drainage, vegetation, geological attributes of soils and bedrock, rainfall, and level of disturbance (i.e. grazing and or land clearing) all influencing factors.

Although erosion often occurs on agricultural land, it is also a potential constraint to growth and development. Erosion has the potential to cause long term damage to infrastructure (i.e. roads) and increased sedimentation in waterways, which can in turn change river and flooding behaviours. The susceptibility of landscapes to erosion is not as associated with topography as landslips, but is a function of factors including ground coverage, level of disturbance, stability of soils, and aggregate stability, as shown in the distribution of landslip and erosion susceptibility across the municipality (Figures 11, 12 and 13), which demonstrate no clear linkage.

5.1.2 Context

Due to the diverse range of landscape, land uses, soil types, topography, the level of disturbance across the municipality from open plains to steep gully systems and climatic conditions, there are varying degrees of landslip and erosion susceptibility.

5.1.3 Guiding Documents

No specific state-based policy guidance was identified by Landserv relating to the management of landslips and erosion.

The Corangamite Catchment Management Authority (CCMA) commissioned a study under the Soil Health Strategy titled *The Identification and Management of Landslips* (CCMA, 2008), which provided an overview within the broader Corangamite catchment (including Golden Plains). This study was completed to assist with the planning, risk identification and management of areas susceptible to landslips and erosion, with a particular focus on the risks posed to catchment health (i.e. water quality). Although it has a catchment health perspective, the data will be a useful tool in identifying areas susceptible to landslips and erosion for future planning.

Table 5.2, taken from CCMA (2008) provides an overview of the broader Corangamite Catchment historical occurrences of erosion and landslip.

Table 5.2 – Erosion and Landslip Occurrences (CCMA, 2008)

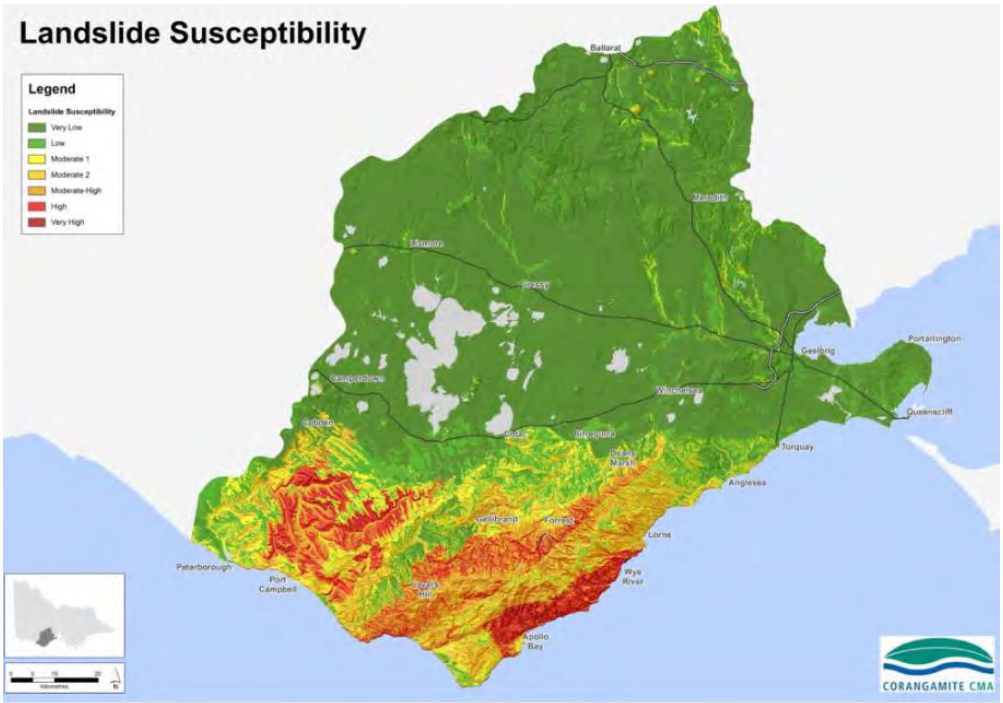
Municipality	Gully & Streambank Erosion	Sheet & Rill Erosion	Landslides
City of Ballarat	93	228	20
City of Geelong	178	288	117
Colac Otway	153	139	3,189
Corangamite	49	27	931
Golden Plains	1,603	777	48
Moorabool	709	1,125	379
Surf Coast	128	119	224
Other shires adjacent to the CCMA region	11	32	36
Totals	**2,924**	**2,735**	**4,944**
Overall total of erosion & landslide features = 10,603			

5.1.4 Relevance to Assessment

As shown in Figure 11 below (CCMA, 2008) the general susceptibility of landslips is weighted towards the immediate areas surrounding water catchment and areas of higher topographic relief. These areas are subject to additional risks (i.e. subject inundation) or steep topography that already limits potential development. Therefore, landslip susceptibility is not considered to be highly important for future strategic growth.

Landslip susceptibility is also displayed on Figure 3, Appendix A.

Figure 11 – Landslip Susceptibility (CCMA, 2008)



Given the potential impact to supporting services such as road, consideration should be given to how landslips may impact provision of these services across the municipality.

Figures 12 and 13 taken from CCMA (2018), show the distribution of susceptibility to sheet and rill erosion and gully erosion. A significant proportion of the shire falls into the category of moderate to high susceptibility to erosion risk. Although erosion susceptibility should be considered in the larger strategic direction of the Council, erosion is generally a slower acting medium that has a lower consequence (the risk to lives and properties is low) and management measures can help reduce risk.

Figure 12 – Susceptibility to Sheet and Rill Erosion (CCMA 2008)

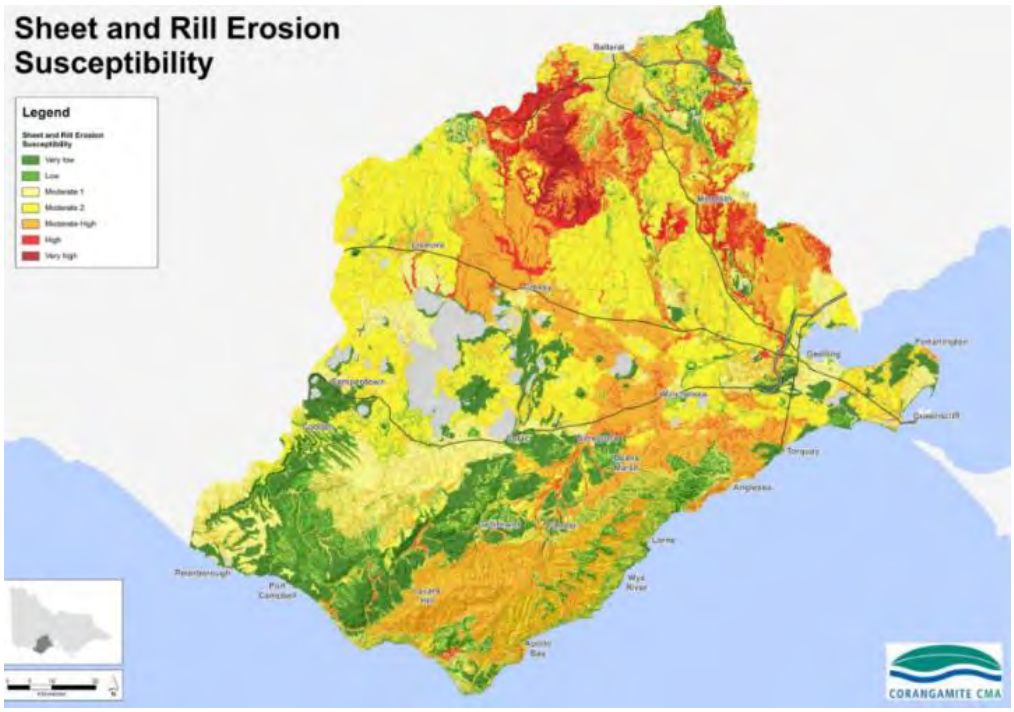
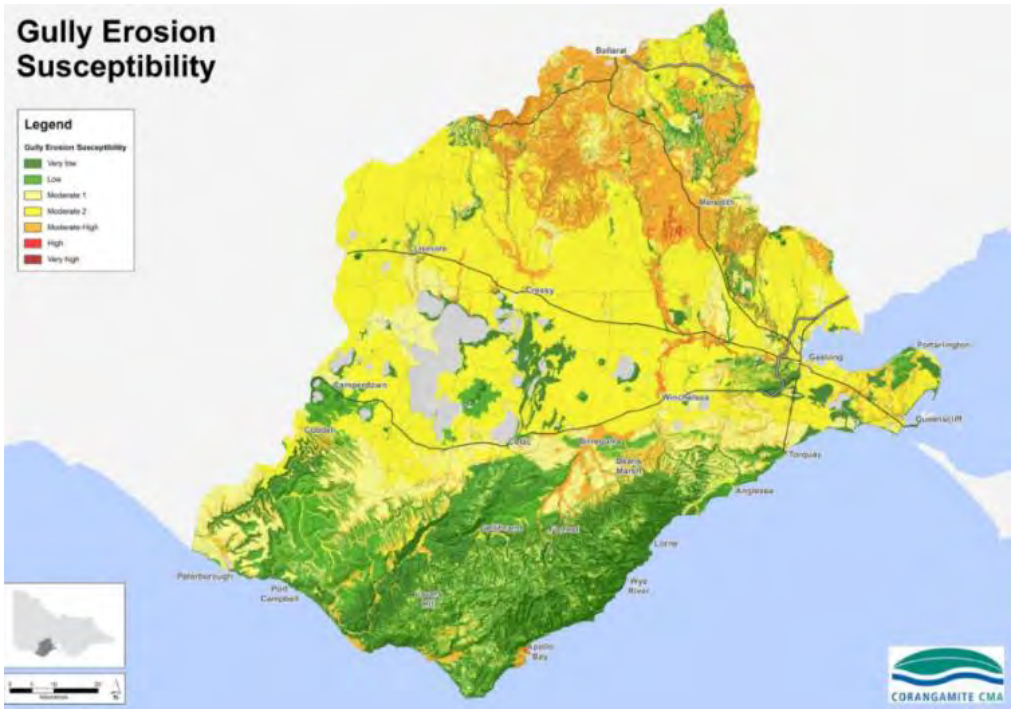


Figure 13 – Susceptibility to Gully Erosion (CCMA 2008)



6 MAN-MADE HAZARDS

6.1 Historical Mining Activity

Importance to Assessment: MEDIUM

6.1.1 Overview

Victoria is known to have a rich mining history, with many of our larger regional towns having been established and developed around mineral rich zones. Gold mining in particular has shaped much of Victoria, with the gold rush in the 1850's leading to population growth and development. Because of the elapsed time since much of the mining activity occurred, limited information is available on the locations and depths of mining activities. Potential risks posed by historical mining activities include:

- Health risks associated with open or poorly decommissioned mine shafts;
- Health risks associated with mine tailings, such as arsenic, lead and other metals; and
- Potential for ground subsidence following mining activity.

6.1.2 Context

The Golden Plains municipality has been subject to significant levels of historical mining, with the townships of Bannockburn, Scarsdale, Rokewood, Smythesdale and Steiglitz all having grown and benefited economically from the 19th century gold rush. Given the potential issues associated with historical mining activity, consideration should be given to how this may impact future growth and development.

6.1.3 Relevance to Assessment

The *Department of Jobs, Precincts and Region* has compiled a Mine Shaft Location data set of the historic mine workings based on records dating from 1869. The data focusses on areas surrounding Ballarat and Bendigo and is unlikely to present a full record of mining activities within the Golden Plains LGA. The data obtained should only be regarded as an indicative guide.

Based on the DJPR data set, a large proportion of the recorded mining has occurred in the northern section of the municipality based on Figure 14 (an extract from Figure 2, Appendix A) around historic gold mining areas, and townships including Bannockburn, Scarsdale and Smythesdale. The overlay appears to have little data around the township of Steiglitz, which is a known gold mining area, demonstrating the limitations of this data set (see Figure 15).

Although mining activity should be considered within the context of NEHA, the available information is limited, and the mining impacts are largely constrained to small spatial areas. Mining is not considered likely to have substantial impact on growth in the municipality.

Consideration may need to be given to developing a greater understanding of the distribution and status of historical mine sites across the municipality if growth is planned in areas substantially impact from historical mining. This includes ensuring that contaminated mine tailings do not pose an unacceptable human health risk to nearby existing or proposed future site residents and occupants.

Figure 14 – Distribution of mining activity within Golden Plains

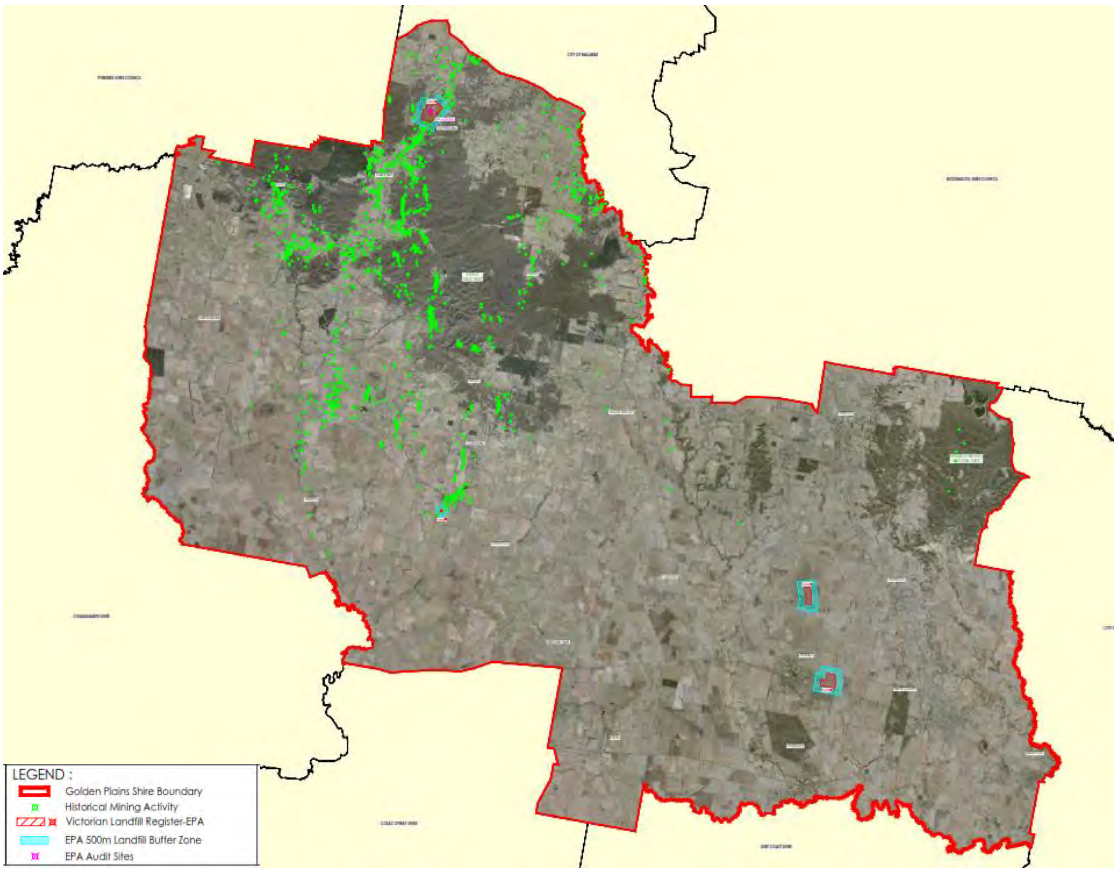
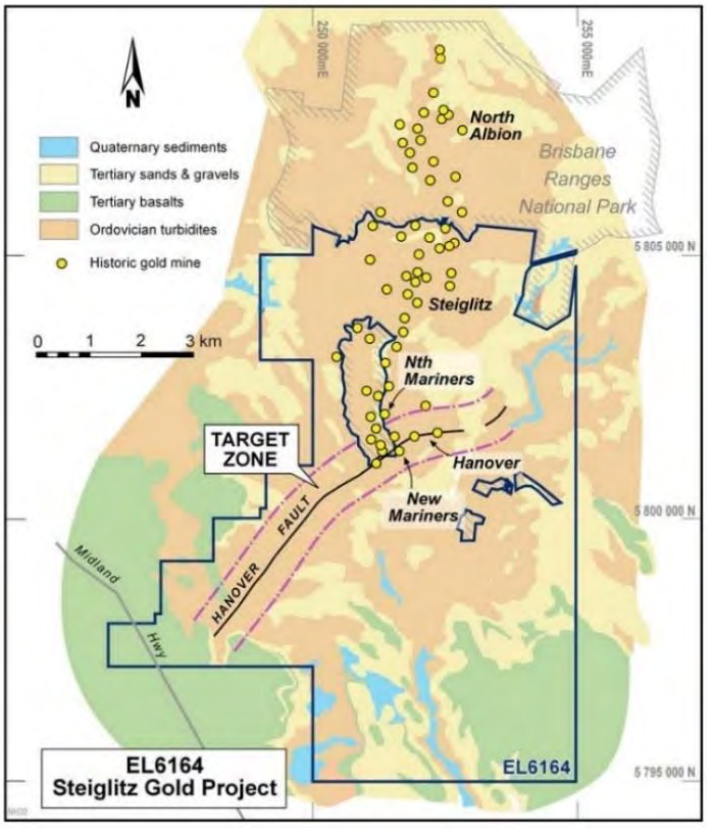


Figure 15 – Steiglitz Gold Project, EL6164 (New Hanover Exploration, 2022)



6.2 Landfills

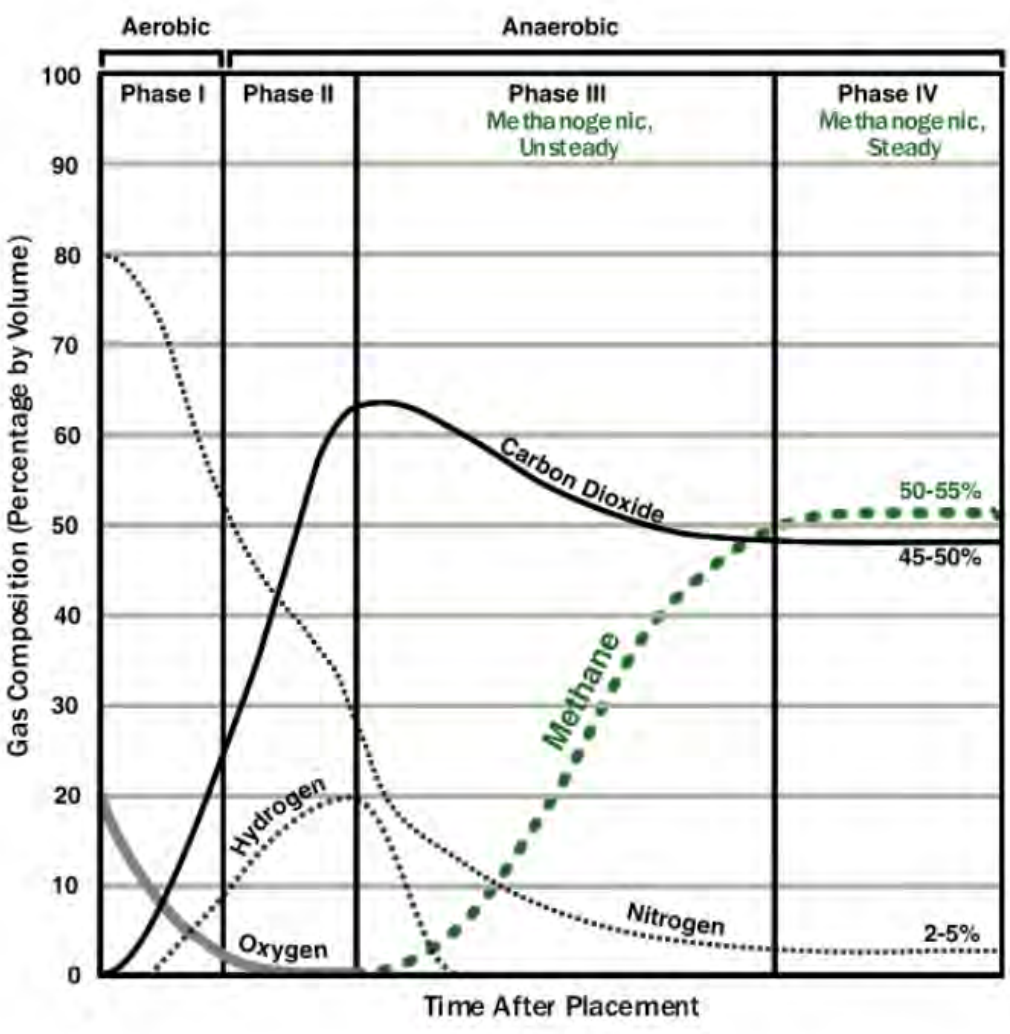
Importance to Assessment: MEDIUM

6.2.1 Overview

Landfills are an important part of waste management infrastructure. However, they impact the surrounding landscape, environment, and communities during their operational life and some ongoing impacts in the form of landfill gas and possible impact to groundwater for a period of time after closure as shown in Figure 16 below.

As waste naturally degrades in landfills, by-products (i.e. methane) and leachate are produced. Although these processes occur naturally within the environment, given the highly concentrated waste mass in landfills, these by-products have the potential to migrate off-site and potentially impacting human health, and the environment. During their operational phase, additional issues such as odours, dust and noise can negatively impact people living in the immediate area of the facility.

Figure 16 – Landfill Degradation Process (ATSDR, 2008)



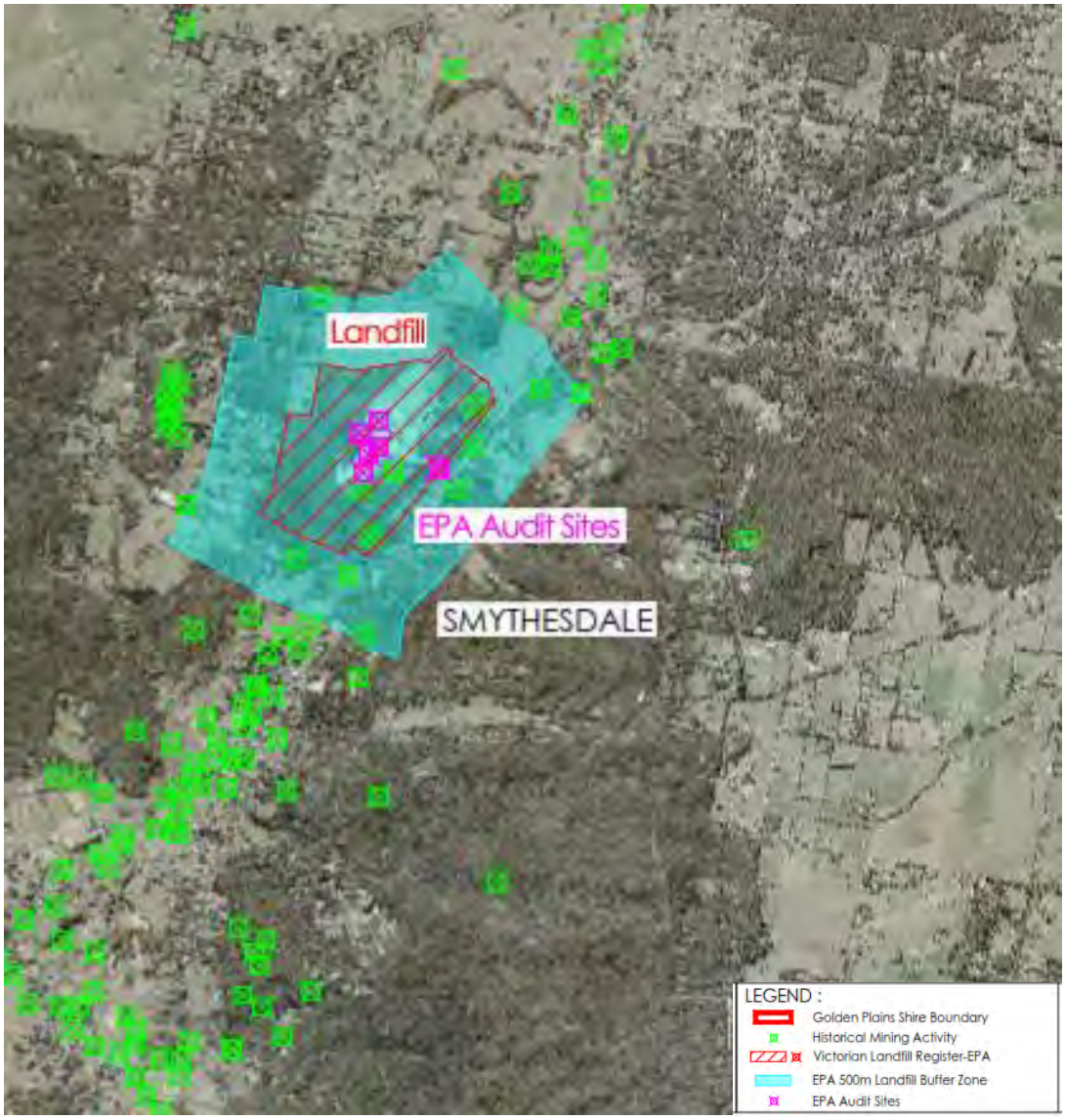
6.2.2 Context

Given the historically low and sparsely distributed population across the municipality there are only a few documented landfills. The key landfills include Smythesdale Landfill (active), Rokewood Landfill (closed) and two landfills at Teesdale (both closed). Although there may be other small undocumented landfills in the region, these have not been included within this assessment given the lack of records.

Should any undocumented landfills be identified in future works, consideration should be given to the impact of development, given potential risk from contamination, landfill gas (if any), groundwater and potential subsidence over the waste mass.

Smythesdale is the most relevant landfill applicable to the NEHA, in the context of future growth and development. Located to the north-west of Smythesdale, the Smythesdale Regional Landfill provides waste facilities for Golden Plains Shire, but also the City of Ballarat, Pyrenees Shire Council, Hepburn Shire and Central Goldfields. Anticipated to be operational for another approximately 20 years, this facility will be the primary landfill in the region and place constraints on growth in the immediate area.

Figure 17 – Smythesdale Landfill Audit Overlay and approximate 500 m buffer



6.2.3 Guiding Documents

The Victorian State Government is responsible for the policy development and regulation around the management of landfills, with the direct waste collection / landfilling the responsibility of the local Council. The guiding document for the management of landfills EPA Victoria Publication 788.3, *Best Practice Environmental Management – Siting, Design, Operation and Rehabilitation of Landfills (BPEM 2015)*. The BPEM sets out policy to establish a framework to promote best practice management for active and closed landfills, and ongoing improvements in how waste is managed.

Specified within the BPEM are default landfill post closure buffers to manage any potential risk associated with the landfill gas migration, with Type 1 (200 m buffer) being for inert waste and Type 2 (500 m buffer) for municipal waste. Within the context of Golden Plains LGA, the 500 m buffer is applicable to three of the landfills within the municipality given they were likely to accepting of municipal waste. Development can still occur within the 500 m buffer zone, under EPA Victoria Publication 1642, October 2017, *Assessing planning proposals within the buffer of a landfill* (EPA 1642) providing that a risk assessment is completed in regard to the landfill gas risk assessment (LFGRA), and there is an acceptable level of risk.

The individual structure plans at Smythesdale and Teesdale incorporate the active and closed landfills within their strategic growth plans and have addressed the concerns around landfills. These plans should be referred to for localised growth directive, noting that landfill gas risk assessments have been completed around both of the Teesdale former landfills (Landserv, 2010 and Landserv 2021).

6.2.4 Relevance to Assessment

Smythesdale Landfill the site is currently under Environmental Audit as one of its licence conditions, with monitoring and management measures in place to manage risk. Several properties currently exist within the designated 500 m buffer and another 63 properties within 1000 m of site and pressure to grow sections of Smythesdale. Consideration needs to be given in the context of future growth and rezoning in relation to the required buffer, including taking into account impacts from operating landfill, such as odour.

Smythesdale Landfill will continue as an operating landfill, therefore specific long-term plans need to be appropriately considered in future development and growth and incorporated into future planning in this area. EPA guidance requires a LFGRA for planning applications within 500 m of Smythesdale landfill whether or not the landfill is operational. LFGRA outcomes might plausibly support individual development permits in some buffer areas while the landfill is operational. However, it is considered unlikely that substantial infill development in the buffer area would be appropriate while the landfill is operational considering the potential for odour, noise, truck movements, litter and amenity impacts in addition to landfill gas considerations. After Smythesdale landfill is closed landfill gas will become the main residual potential impact and it would be plausible for a LFGRA to find low / acceptable levels of landfill gas risk in at least some portions of the buffer area, therefore potentially indicating suitability for infill development.

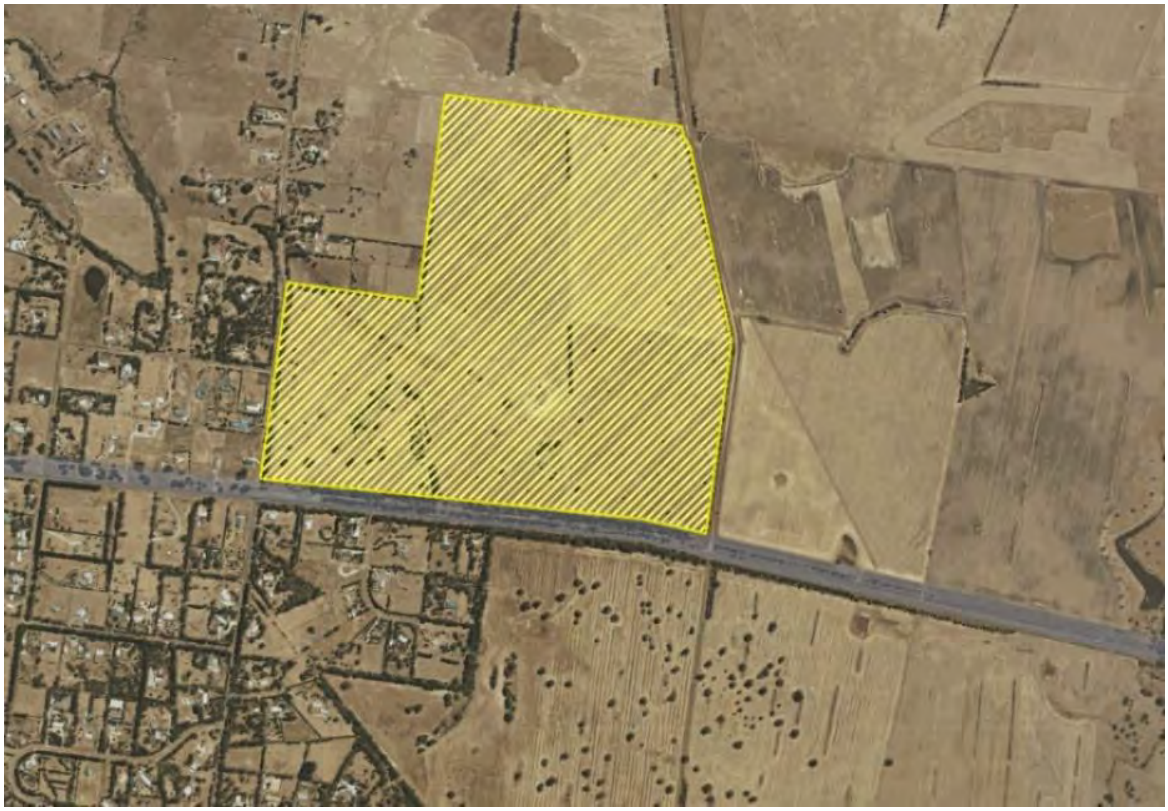
The details identified within the Background Smythesdale Structure Plan (2021) should be read in full within the context of this assessment. Once released, the Smythesdale Structure Plan should also be referred to when planning for growth in this area.

To guide the Teesdale Structure Plan (2020), a LFGRA was completed (Landserv 2021) which, based on a quantitative risk assessment, reported a very low risk categorisation. The planning system allows for approval of development within the 500 m buffer (see Figure 2, Appendix A). An EPA environmental audit in 2010 was completed on the Tawarri Landfill to the east of the Teesdale township as provided in Figure 18 below. Conditions applicable to this audit should be read in full if considering future growth in this specific area, although the audit statement is commensurate with low risk and does not prevent residential buildings in relatively close proximity to the landfill. Based on the low levels of risk reported, the former Teesdale landfills are considered unlikely to constrain development up to the landfill property boundaries. Further investigation would be required if development was proposed across the landfills themselves.

Depending on the size, age and landfill gas risk associated with the former Rokewood landfill (currently used as Rokewood Transfer Station), development is unlikely to be prevented within most of the 500 m buffer area. However, a LFGRA will be required.

Given there are only one active and three closed known landfills across the municipality, they are not considered to have a large impact on future settlement and growth and should only require consideration in the direct areas of the landfill sites.

Figure 18 – Tawarri Landfill at Teesdale (completed EPA Audit site)



6.3 EPA Audits / Licenced Activities / Contaminated Land

Importance to Assessment: MEDIUM

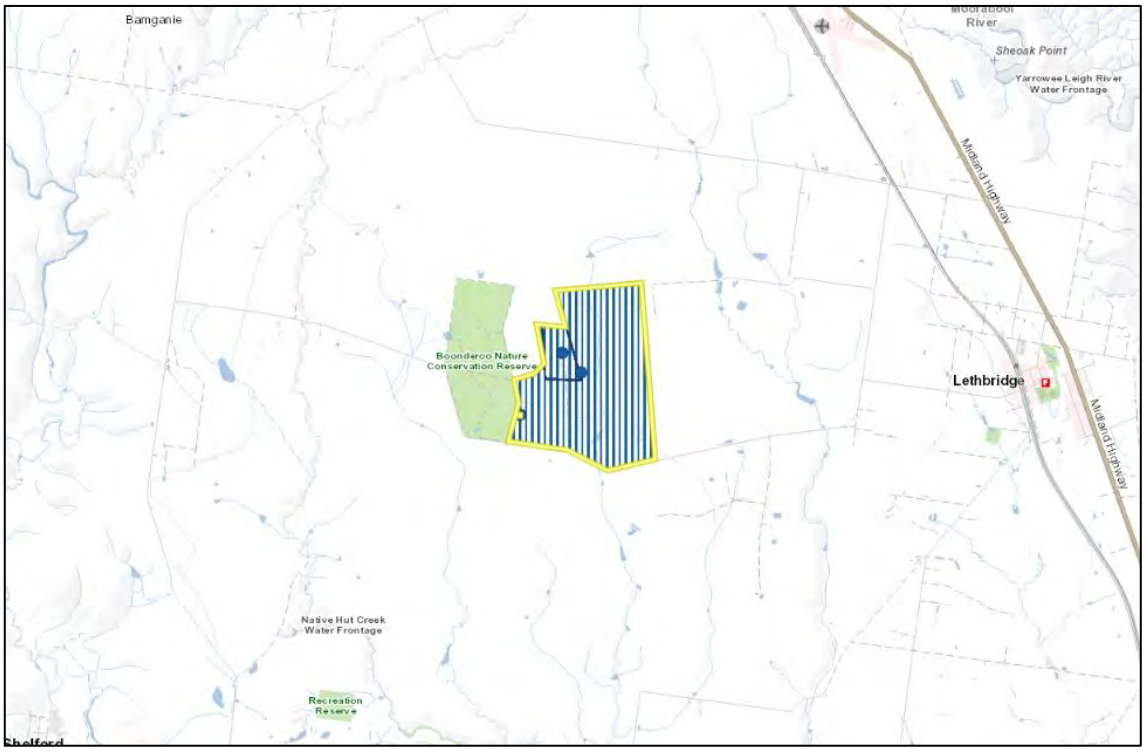
6.3.1 Overview

The environmental audit system within Victoria is a framework applied through the EPA which assesses sites in relation to the potential risk they pose to the environment and or human health. This may be in regard to aspects such as contaminated land or water, pollution and may be triggered by change of use at the site and (i.e. changing from commercial to residential zoning and contaminated land) or where there are ongoing risks posed at sites (e.g. operational landfills).

The purpose of an environmental audit is to assess the nature and extent of risk and recommend management measures. Environmental audits can also be required to show adherence to licence conditions, planning system requirements or to prove compliance to an EPA notice.

Operational licences are required for prescribed activities, applying the highest level of regulatory control due to the potential risks to human health or the environment. Within Golden Plains these include activities such as Smythesdale Landfill, waste water treatment plants, an incinerator and an organic waste processing facility. These licensed facilities have specific regulatory requirements to ensure risks are managed.

Figure 19 – High Temperature Incinerator (Victorian Unearthed, 2022)



Other activities such as broilers and piggeries are located throughout the municipality that do not require an EPA licence but have specific conditions under the relevant codes of conduct and guidelines (i.e. buffers) that should be considered for planning.

The Golden Plains Intensive Animal Husbandry Precinct aims to concentrate these activities within an area into the future, and thus reduce the extent of required buffers. Existing intensive animal husbandry facilities that exist outside this proposed precinct and will require adherence to buffers in regard to growth.

In the broader context of contaminated sites that fall outside the EPA audit system, under the *Environmental Protection Act 2017*, is the General Environmental Duty (GED) that specifies the obligation of site owners in regard to the management risk on their site. It is likely that sites exists across the municipality that would trigger assessment under the GED but have not been currently identified or assessed.

Given the relatively sparse population throughout the municipality, and limited industrial history these sites are anticipated to be in limited numbers and should require only localised consideration where they are identified, for long term planning purposes.

6.3.2 Context

Within the municipality only one site is currently subject to an environmental audit overlay (Smythesdale Landfill), which has been addressed above in Section 5.

Multiple sites across the municipality (listed above) are subject to EPA licences and have specific condition to manage risk. Within the context of the NEHA buffers may apply as individual licence conditions or specific industry requirements. Specific long term audit conditions may also be applicable to individual sites, such as the audited former Tawarri landfill to the west of Teesdale. Individual audits should be read in full.

Additional sites that may not be subject to EPA licences (i.e. broilers) also have specific buffers under the applicable guidelines in regard to proximity to sensitive receptors, that must be adhered to within the context of future development.

6.3.3 Guiding Documents

Examples of guideline documents for the relevant activities include:

- The Victorian Code of Practice for Broiler Farm (2001);
- Victorian Code of Practice for Piggeries (1992); and
- Landfill Siting, Design, Operation and Rehabilitation of Landfills BPEM (2015).

All of these provide recommended buffer distances from residential areas.

6.3.4 Relevance to Assessment

Development within the applicable buffer of 1000 m for broiler or piggery activities should be adhered to. These individual sites need to be assessed both in their current state of operation, but also with the view of potential future expansion.

For Smythesdale operating landfill it is considered unlikely that substantial infill development in the 500 m buffer area would be appropriate while the landfill is operational. After this landfill is closed (possibly in 20 years' time) it would be plausible that low / acceptable levels of landfill gas risk exist in some portions of the buffer area, but LGRA investigations would be required in the future to confirm this.

For the former Teesdale landfills (x 2) LFGRA's have been completed which show that future development should not be affected beyond the boundary of the landfill properties.

For the former Rokewood landfill a LFGRA should be completed to confirm whether future development in the 500 m buffer area is constrained by landfill gas risk.

Given the long-term approach of the Council to direct intensive animal husbandry to the section of land west of Lethbridge, potentially competing growth should be limited into these areas (i.e. residential).

For individual potentially contaminated sites across the municipality, consideration needs to be given to areas or sites with a history of potentially contaminating activities, such fuel stations. It is considered unlikely for any historically contaminating activity to exclude an area from growth given the low industrial activity present in the municipality.

7 NATURAL ENVIRONMENT

7.1 Salinity and Depth to Groundwater

Importance to Assessment: MEDIUM

7.1.1 Overview

Salinity is the process in which salts accumulate in the soils and water. When salts accumulate in the near surface (i.e. shallow groundwater), they can cause significant damage to the natural and built environment (i.e. foundations). Although many parts of Australia have naturally high salt levels, anthropogenic changes to the landscape (i.e. deforestation and farming practices) has led to the rise in salt levels in many landscapes.

Accumulating from sources including rainfall, weathering of minerals, aeolian deposit, and connate salt, salts build up over time in landscapes and can have negatively impact catchments, drinking water supplies and well as damage to infrastructure (i.e. building foundation, pipes, and roads). When salts move from shallow groundwater into building materials (i.e. concrete, bricks and stone) and crystallise, the salt crystals can expand and place internal pressure on the material causing it to crumble and degrade. Additional building protection measure can be required to alleviate impacts.

Management measures can also be implemented to limit the impact of salinity on the landscape (such as revegetating and maintaining soil health).

7.1.2 Context

Sections of Golden Plains Shire have been identified since the 1950's as having salinity concerns, with potential threats to infrastructure and buildings. Much of the salinity impact and risk across the municipality has resulted from land use changes (i.e. land clearing) impacting the groundwater hydrology and bringing naturally occurring salts to the near surface. Within the municipality, there are some naturally occurring saline environments that require protection (i.e. Wingeel Swamp and Mia Mia Creek).

7.1.3 Guiding Documents

Mapping by Victorian state government has been used as a basis for assessing salinity within Golden Plains and has been incorporated into the *Golden Plains Salinity Management Overlay – salinity, occurrences and mapping, 2006*) report. Completed for the Department of Primary Industries (DPI) in 2006, geological, topographic and aerial photography along with ground truthing was used to identify areas where salinity may pose a risk to assets. This assessment included a buffer to accommodate a one metre in rise in groundwater levels over a 30-year time period.

These sites (399 sites ranging between 10 m^2 to 158 ha) have been geospatially mapped as Salinity Management Overlays (SMO) and incorporated under the Golden Plains Planning Scheme. The SMO's are applied to particular areas for environmental, economic, social and legal reasons, to prevent development and growth in areas that may pose a risk to infrastructure.

7.1.4 Relevance to Assessment

Based on regional groundwater flow paths, mapped salinity, and probability of shallow groundwater tables being present within the landscape, Figure 20 below shows areas that may pose risk for land use changes due to impacts from salinity. Changes to land uses (i.e. large-scale development) can impact hydrology leading to increased salinity and this should also be considered within the context of growth.

Figure 20 –SMO overlays in northern portion of municipality (Figure 5, Appendix A)

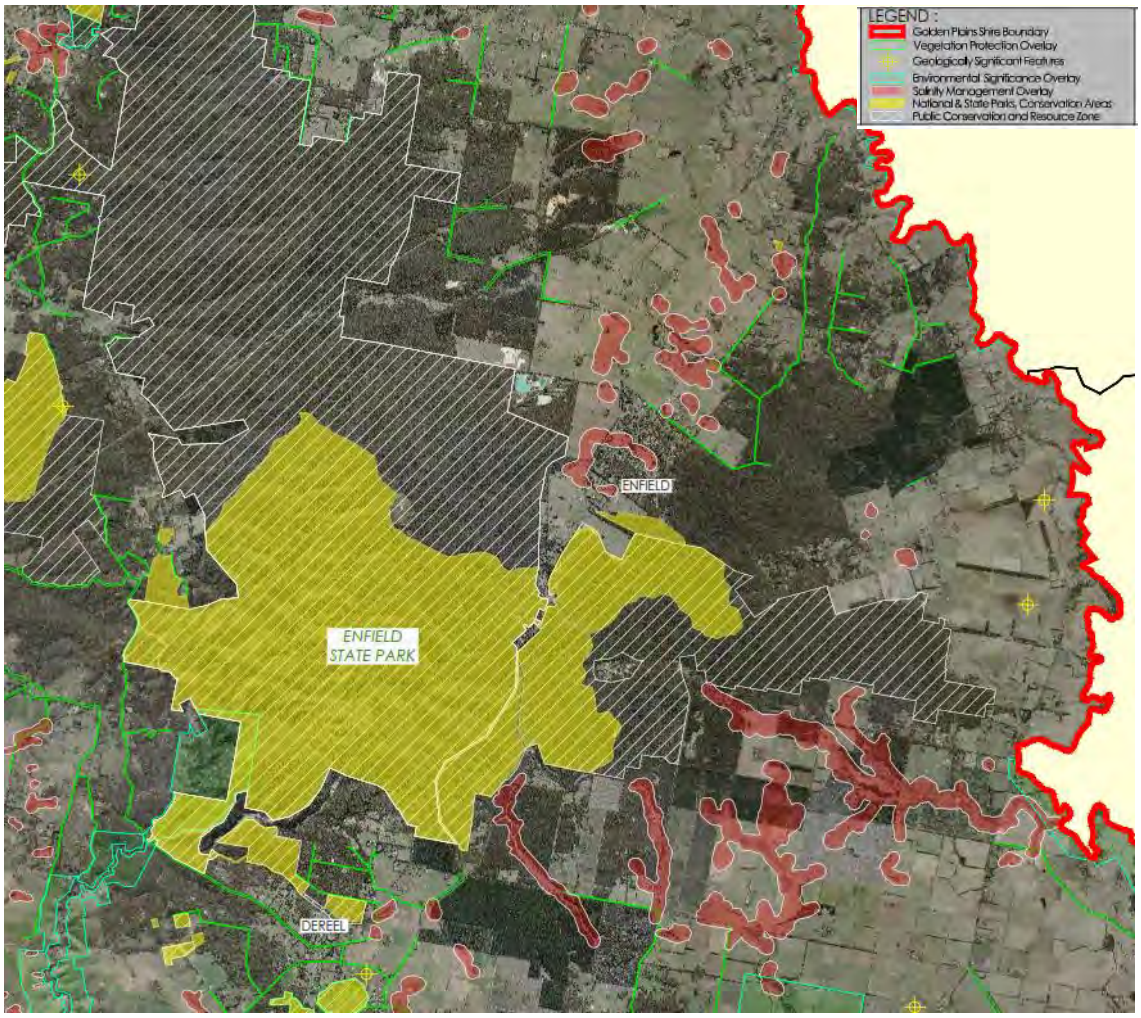


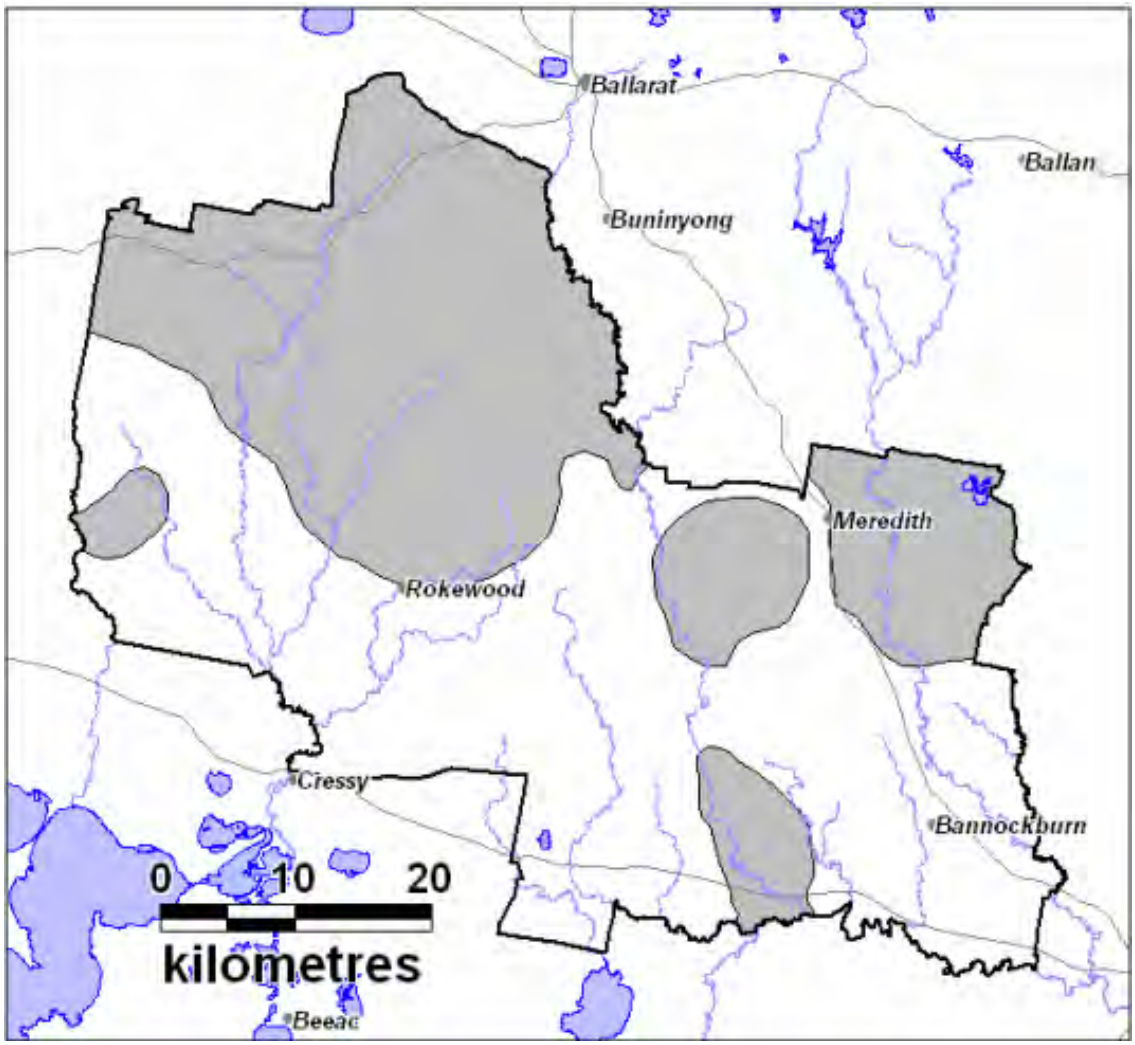
Figure 21, below taken from the *Golden Plains Salinity Management Overlay – salinity, occurrences and mapping (2006*) report shows areas within the municipality that where land uses changes occur could be susceptible to impacts of salinity.

Mitigation and management measures can reduce the likelihood and severity of salinity impact (i.e. revegetating). However, given the distributed nature of salinity management overlay zones throughout the municipality, consideration should be given to avoiding areas susceptible to salinity impacts.

The majority of SMO zones are away from existing development and salinity is not anticipated to largely impact expansion of Golden Plains' townships. However, consideration should be given to SMO areas when assessing future planning and zoning decisions and the potential detrimental impact of salinity. SMO zones are also likely to be reflective of groundwater level in discrete areas and these areas may be more susceptible to inundation as shown below in Figure 21 taken from the report.

Sometime has elapsed since the salinity assessment was completed (2006) and consideration should be given to having the SMO data reviewed. A greater understanding of changing climatic conditions in recent years may contribute should a SMO review proceed, in terms of influences on salinity distribution and management throughout the municipality.

Figure 21 – General areas where land-uses changes may impact salinity



7.2 Geologically Significant Features

Importance to Assessment: MEDIUM

7.2.1 Overview

The Geological Society of Australia (GSA) identified and mapped out a set of sites across Australia which display unique geological, geomorphological significance or that include an outstanding or unique geological or geomorphic characteristics.

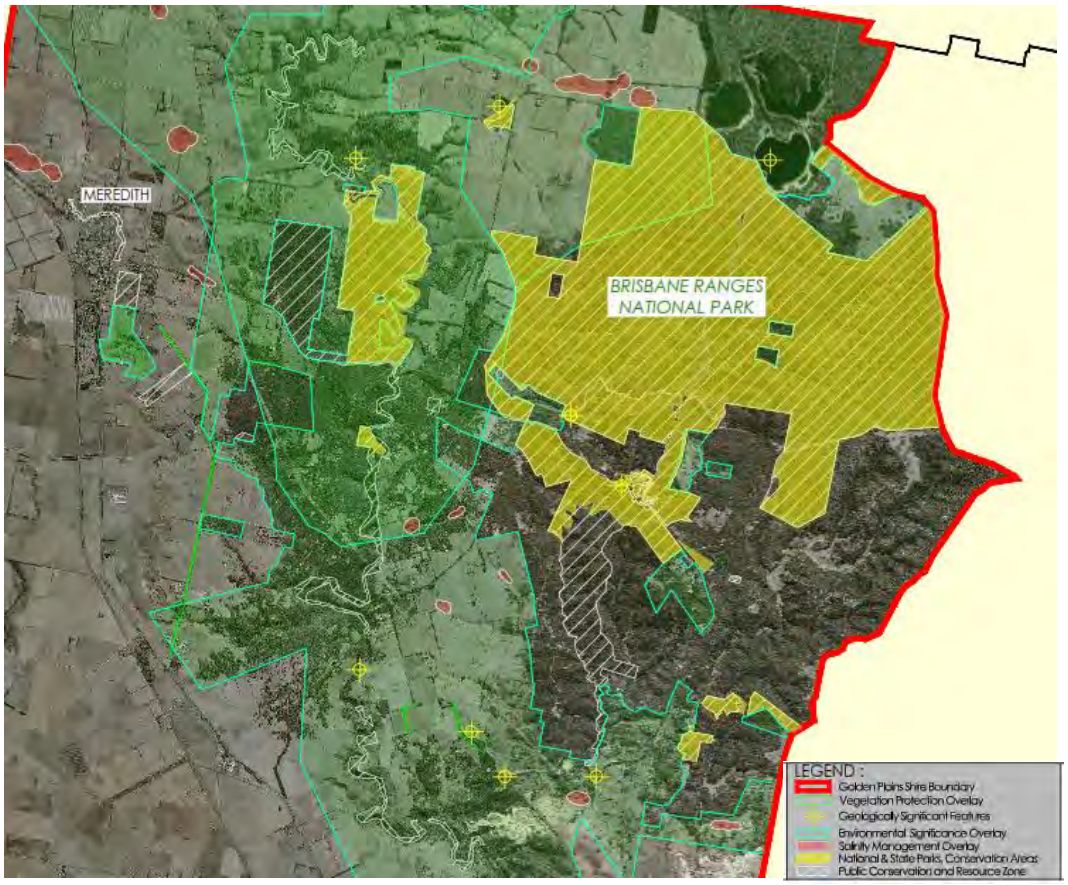
The data set has been compiled to provide a list of areas and site that based on the above are recommended for preservation due to the interest and future research or sciences. The level of geological significance is classified at local, regional, state, national or international level by documentation, assessment and comparison based on a set of defined criteria. These include the rarity, representation of the formation, and potential vulnerability of the site to damage.

This data set may not be a complete and comprehensive list of all significant geological sites, as the list is constantly being reviewed and updated.

7.2.2 Guiding Documents

There is not specific legislation protecting sites identified within this geospatial layer, however some areas may fall within pre-existing areas of environmental significant or other protected area, offering a level of protection as shown below in Figure 22 In the eastern portion of the Golden Plains LGA.

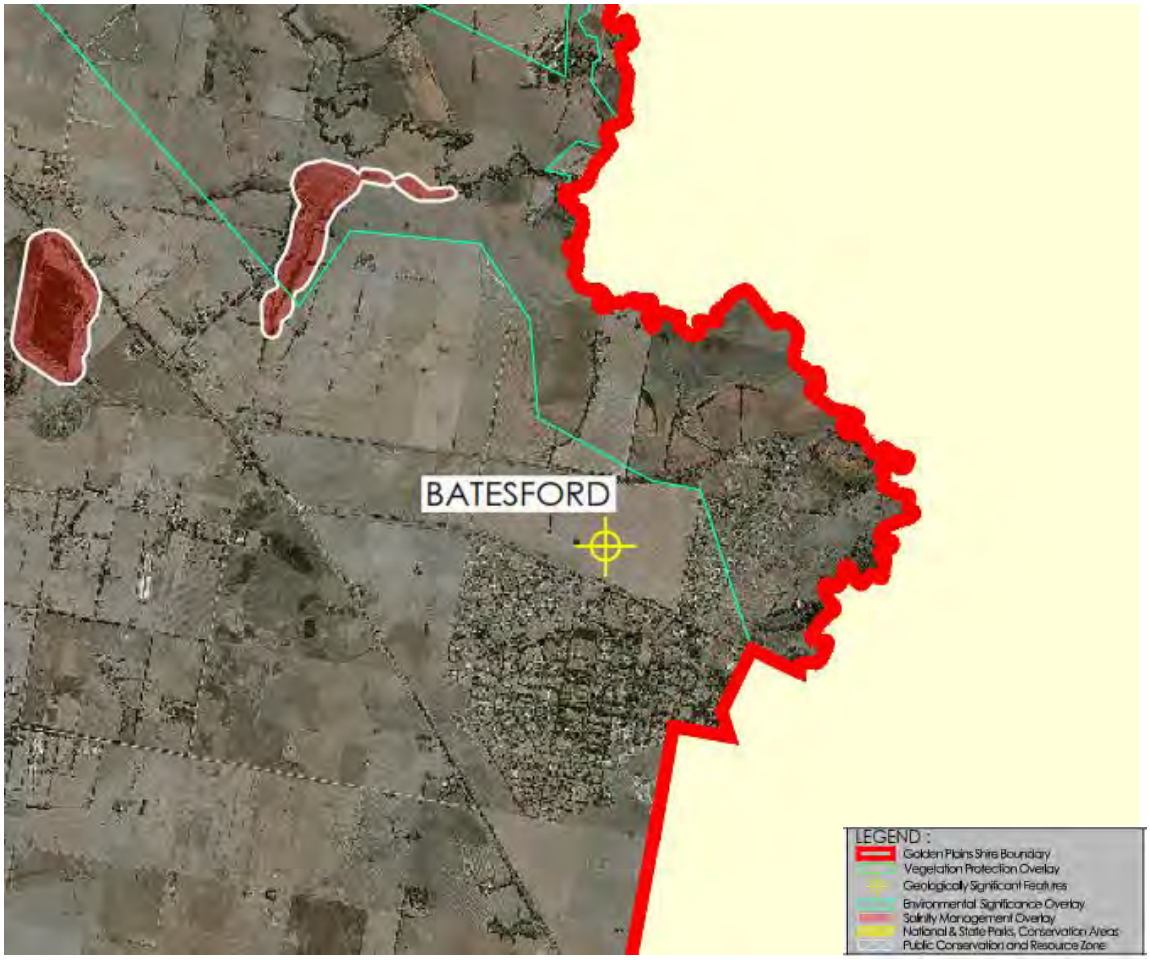
Figure 22 – Extract of Geologically Significant Sites (Figure 4, Appendix A)



7.2.3 Relevance to Assessment

Although a number of sites of geological significance exist across the municipality, they occupy a small spatial extent on the landscape and a large proportion are situated within other protection overlays. The majority of these sites are generally away from the major townships, and areas unlikely to see significant future growth. For those sites of geological significance within close proximity to townships (e.g. Batesford as per Figure 23 below) where there is anticipated future growth, consideration should be given to consultation with the Geological Society of Australia in relation to protections required. It is unlikely that they will impact to any greater degree future growth planning.

Figure 23 – Extract of Geologically Significant Sites (Figure 4, Appendix A)



7.3 Vegetation Protection

Importance to Assessment: HIGH

7.3.1 Overview

Native vegetation indigenous to Victoria includes a broad range of species and forms, such as trees, shrubs, herbs and grasses, providing a habitat for fauna and delivering a biodiverse ecosystem.

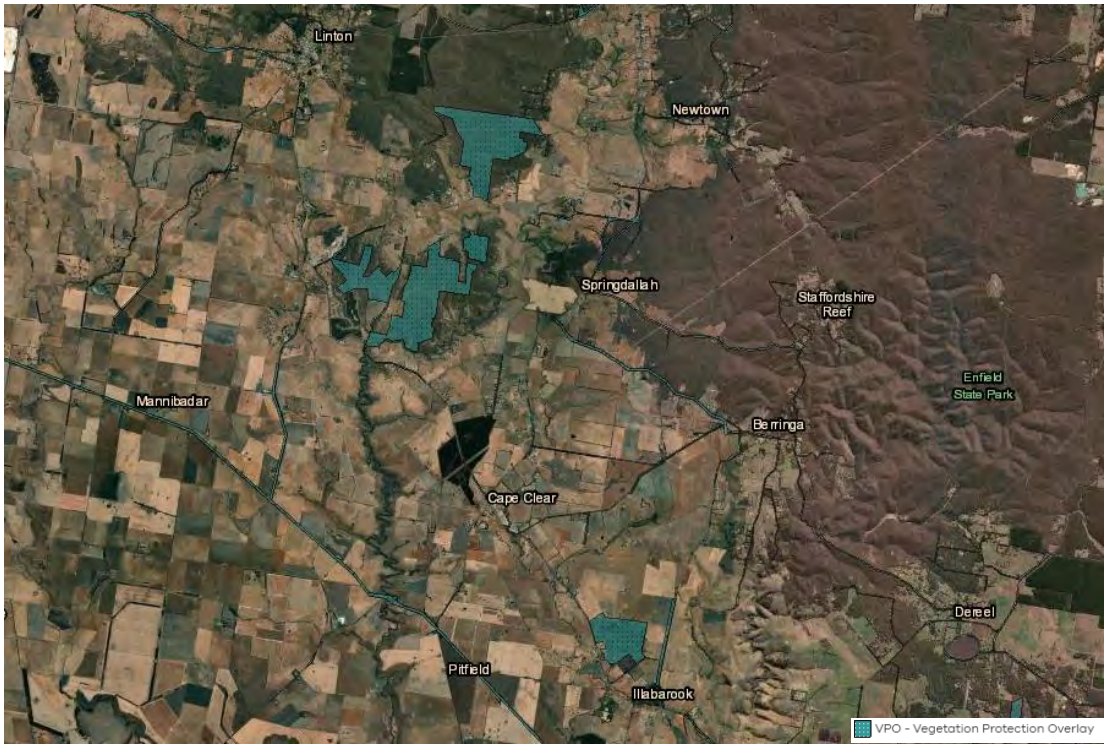
Since European settlement, an estimated two thirds of Victoria's native vegetation has been cleared due to growth and economic development, with the vast majority of remaining native vegetation present on public land. Areas which have been heavily developed for pastoral and agricultural activities are generally the greatest affected and include the ongoing urban expansion and industrial activities. There are clear linkages between the removal of vegetation and other environmental issues (i.e. salinity, erosion, water quality, and increased rates of severe flooding).

Given the large amount of clearing that has occurred across the state, there is increasing concern as to the ongoing reduction and destruction of these vegetation communities and how best to protect them moving forward.

7.3.2 Context

Golden Plains Shire Council is generally comprised of two bioregions, the Central Victorian Uplands and Victorian Volcanic Plains each with distinctive geomorphic characteristics and vegetation types. The Volcanic Plains has been extensively farmed (i.e. cropping and grazing) due to its nutrient rich soil and generally flat topography. This has led to a loss of a significant proportion of native grassland and woodlands and some grasslands are listed as critically endangered and requiring protection measures.

Figure 24 – Areas of Vegetation Protection in Northern Municipality (VPO)



The northern section of the municipality largely contains stringybark open eucalypt forests, which are found predominantly on Crown Land reserves and privately owned properties. The majority of land along the river catchments, has further been cleared for farming and development, with only remnant vegetation communities remaining.

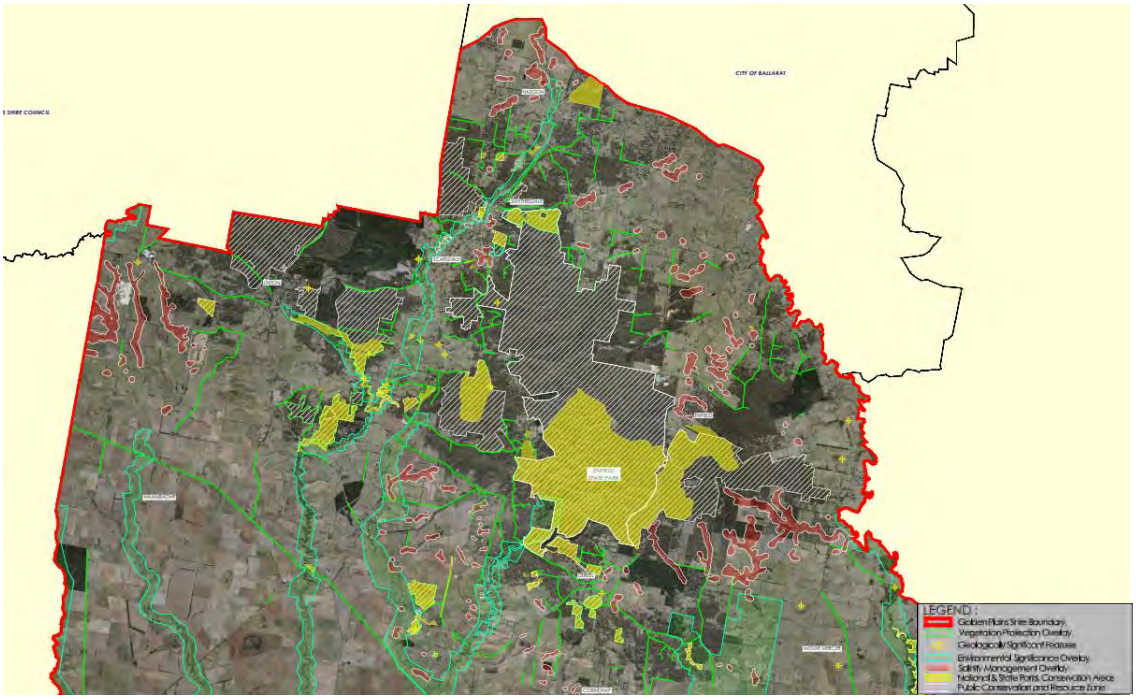
Ongoing threats to the long-term viability of native vegetation across the municipality include fragmentation of land, changing fire regime, weed invasion, and clearing. An additional threat to native vegetation is urban growth within the municipality, where expansion of townships and greater subdivision and development has the potential to detrimentally impact the native vegetation communities. Given the potential consequences from loss and degradation of native vegetation (i.e. biodiversity decline, dryland salinity, decline in catchment health, increased erosion, and decline in ecosystem productivity), it is important to maintain the existing and remnant native vegetation communities.

7.3.3 Guiding Documents

A range of national, state and local frameworks, policies and initiatives are in place to manage the long-term protection of native vegetation. Portions of the municipality are also under State and Federal conservation protection that encompass a level of vegetation protection (i.e. Enfield State Park and Brisbane Ranges National Park).

The Golden Plains Planning Scheme identifies roadside and bushland reserves throughout the municipality which are protected under Vegetation Protection Overlays (VPO). The VPO's are designed to protect significant vegetation and can be applied to individual trees, stands of trees or areas of significant vegetation. A large proportion of remnant vegetation is located on public land within the municipality. Varying types of VPO exist within the municipality that have specific objectives (e.g. VPO1 protection of remnant grasslands of significance within the Western Plains Grassland). Many of the woodlands and native perennial native grass communities throughout the municipality are heavily fragmented and limited to roadsides and public reserves.

Figure 25 – Extract of Natural Constraints (Figure 5, Appendix A)



7.3.4 Relevance to Assessment

Identifying vegetation communities at risk is important step within the context of future strategic growth, so as to limit potential impact and retain and protect values. Given that much of the high value vegetation has been historically cleared from within the Golden Plains municipality and generally limited VPO overlay, consideration should be given to protect and conserve these areas – as is already provided for in the VPO's.

Development around Golden Plains' townships should consider the specific VPO's and bushland reserves in regard to development and growth within their individual Structure Plans and ensure the ongoing protection. As a large amount of the VPO's are along roadside reserves, future subdivisions should consider their protection if disturbance of the roadside reserves is required to construct or expand roads and add in services.

Alignment with the Councils internal policy on protection of native vegetation should be adhered to and future planning should account for the impacts to vegetation from changing land uses. Future planning should also consider the cumulative and secondary impacts such as the spread of weeds and pathogens into the ecosystem. If growth is planned into areas under VPO's individual studies will be required to assess, minimise and offset any potential impact. If additional sites are added to the VPO at a later date, these must also be acknowledged in the context of this review and future strategic growth.

Figure 26 – VPO to South of Rokewood

7.4 Environmental Significance

Importance to Assessment: HIGH

7.4.1 Overview

Although similar to that of vegetation protection, areas of environmental significance overlays (ESO) are broader planning tools to protect environmental values and significance. Areas of environmental significance can be derived from national, state or local government criteria and include areas set aside to protect listed threatened species, migratory protected species, RAMSAR wetlands, and Commonwealth marine areas. The NEHA is not an assessment of individual areas of environmental significance across the municipality, but a review of the existing ESO areas that have been identified as having environmental values warranting protection.

7.4.2 Context

Although significant historic land degradation has occurred throughout the municipality, there are areas that have been deemed of environmental significance under the Golden Plains Planning Scheme. Areas with significant biodiversity are largely situated in the northern extent of the municipality (i.e. Brisbane Ranges National Park and Enfield State Park). Some areas within the municipality are also under Public Conservation Zone overlay (PCRZ), which enables protection and conservation of environmental and natural values. A large proportion of ESO overlays within the LGA exist along the catchments and adjacent land as a protection of waterway and river health.

7.4.3 Guiding Documents

A range of national, state and local frameworks, policies and initiatives are in place to manage the long-term protection of areas of environmental significance.

At a local level ESO's are appliable under the Golden Plains Planning Scheme. The ESO described in Victorian Planning Provision specifies that ESO's are applicable where there are environmental constraints on development, or other ecological values are identified.

7.4.4 Relevance to Assessment

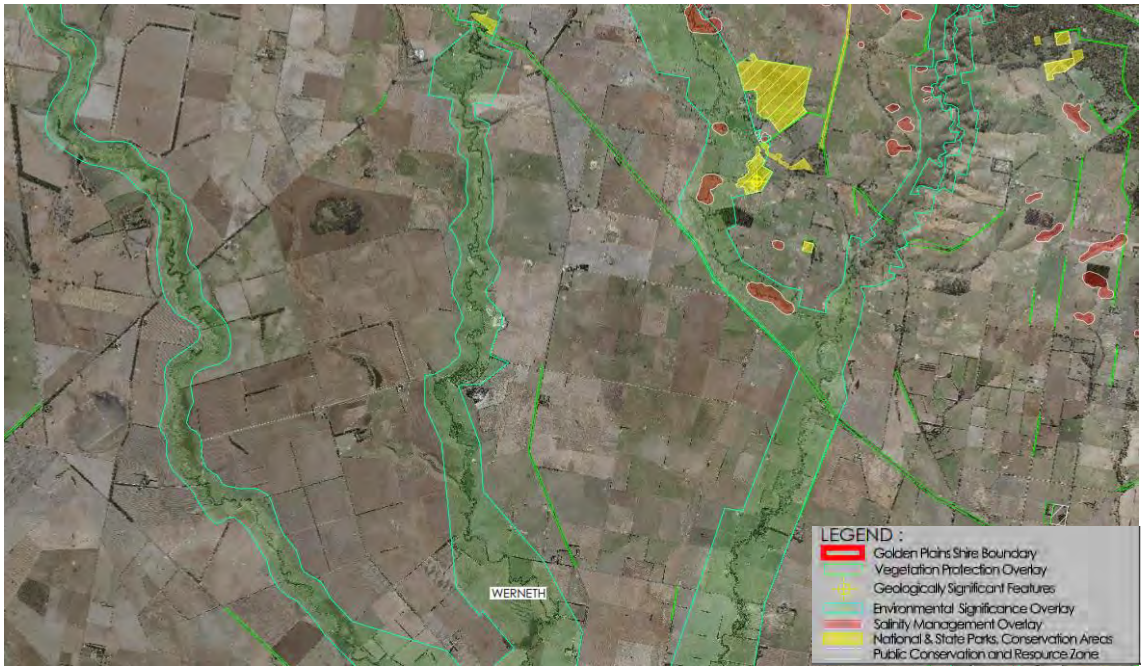
Given the majority of catchments within the municipality are in marginal or poor condition due to historical vegetation clearance, polluted runoff, and increase water demand from users (i.e. irrigators), ESO's are applied to ensure long term protection. Other ESO's are applied to areas of remnant vegetation, unspoiled habitat, scientific importance, natural heritage and unique geological formations.

Given the importance of environmental significance factors such as catchment health, erosion management and salinity, areas that have ESO's or broader protection (i.e. National Parks), require a level of protection from growth to limit impact to environmental values. As such these areas will be a limiting factor to future growth and development.

Many areas under ESO and PCRZ within the municipality also have additional susceptibility to risks associated with flooding, fire, landslips or erosion, contributing to them generally not being suitable for growth. The protection of water supplies is also an important long-term consideration.

The local structure plans applicable to each of the major townships have taken into account the ESO applicable within their growth plans.

Figure 27 – Extract of ESO Overlay Central to Municipality (Appendix A, Figure 5)



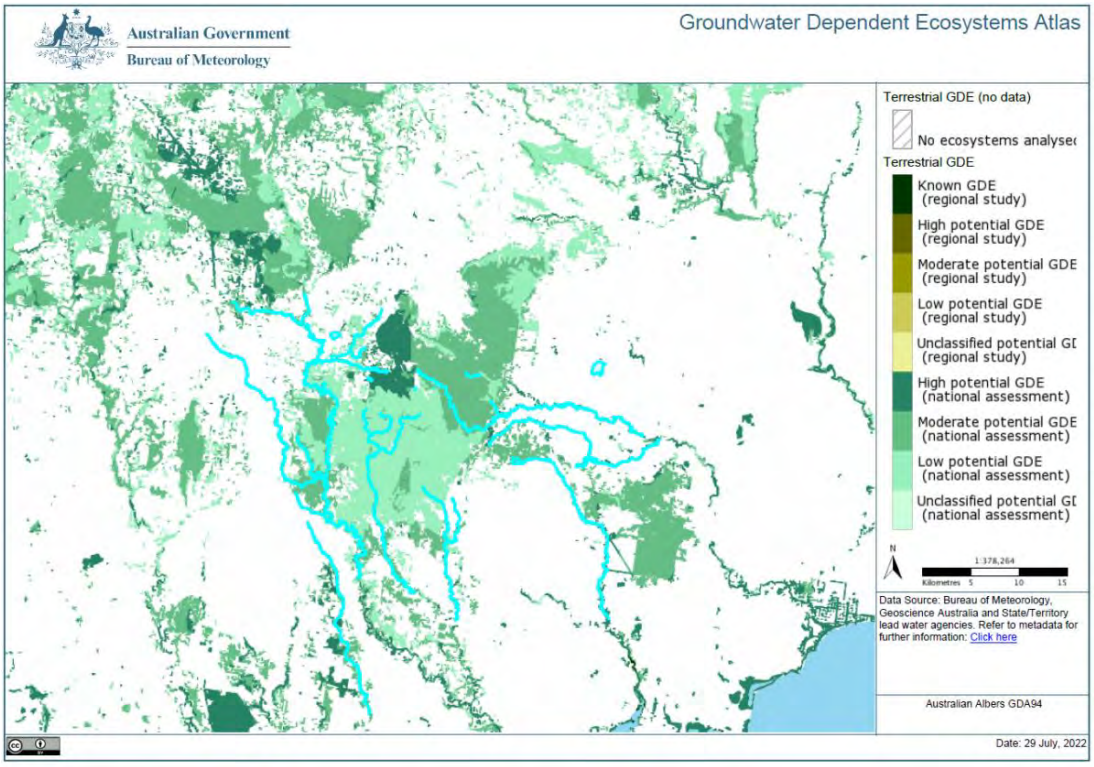
7.5 Other Relevant Factors

7.5.1 Groundwater Dependant Ecosystems / Groundwater

Groundwater Dependant Ecosystems (GDEs) are ecosystems that partly or fully rely on underground water, such as wetlands. Given the often-isolated nature of these ecosystems, they can support rare and endangered flora and fauna. Based on GDE Atlas (BOM) the majority of the river catchment within the municipality rely on surface expression of groundwater, but several of the terrestrial environments also reply on the presence of groundwater. GDE systems can be at risk due to decreases in water table level and change of land use in surrounding area.

Most of the GDEs are likely to be alongside catchments and wetlands already afforded protection from ESOs and VPOs. However, consideration should be given the potential impact on groundwater resources, where development might overlie groundwater recharge, for example along the base of the Brisbane Ranges.

Figure 28 – Groundwater Dependent Ecosystems (GDE Atlas, 2022)



7.5.2 Soils / Geology

Geological conditions and soil types are important factors in residential growth, impacting the type of foundations required, installation of services and septic system on individual sites.

The NEHA has not examined the specific qualities or distribution of soils across the municipality within this context in relation to suitability for growth and development.

7.5.3 Climate Change

The *Climate Change Act 2017* requires that any decision, policy, program or process that is developed by the Government appropriately considers climate change if relevant. Specifically within the context of the NEHA the Act aims to:

- 'Build the resilience of the infrastructure, built environment and communities through effective adaptation and disaster preparedness action'; and
- 'Manage natural resources, ecosystems and biodiversity to promote their resilience'

The NEHA is not an assessment or modelling of the potential impacts of climate change on the landscape and how they may impact each of the above natural hazards or events. Consideration needs to be given as to what extent a changing climate will particularly have on natural hazards (i.e. bushfires and flooding frequency and magnitude).

8 GENERAL PLANNING LIMITATIONS

8.1 Intensive Animal Husbandry

8.1.1 Context

The Council has been proactive in ensuring Golden Plains continues to grow as a strong and viable region for farming and agriculture. Key to the Council's long term economic development and planning strategies has been the protection of agricultural land to enable agribusiness to confidently invest for the long-term development.

To support growth and build on demonstrated strengths Golden Plains supports intensive agriculture, extensive research and planning to facilitate the establishment of the Golden Plains Food Production Precinct under the *Golden Plains Food Production Precinct Concept Plan* (June 2017). This has resulted in the identification and allocation of around 4,000 hectares of land with significant potential for intensive agriculture adjacent to Lethbridge. Council has identified limiting factors to growth in this region and facilitated partnerships to support the growth, including potable secure water, wastewater facilities, secure power, telecommunications, roads and transport infrastructure and workforces.

8.1.2 Relevance to Assessment

Although the allocation of this land as *a* Food Production Precinct is not a direct natural environment or natural hazard, the individual farming operation and practices that will adopted and supported in this sector (i.e. broiler farms) will act as limiters to growth given the potential for amenity impacts such as noise, odour and dust.

Given the focus of the Council in allocation of this area to intensive animal husbandry, this area is unlikely to be developed for other land uses.

We note that there are other animal husbandry facilities outside of the allocated area that require consideration when planning growth areas, with locations of these facilities are approximate buffers provided on Figure 4 in Appendix A.

8.2 Airport

8.2.1 Overview

Airports are integral component of modern societies, acting as key transport hubs for the import and export of goods, people and services into regions and providing significant regional economic benefit through direct and indirect spending. They do, however, have a limiting impact on potential growth in the immediate area, can impact amenity (i.e. noise) and require flight path buffers for safety.

8.2.2 Context

Lethbridge is the only regional airport located within the municipality. Located between Geelong and Ballarat and within close proximity to the township of Lethbridge, the airport is a privately owned facility, supporting numerous local businesses (i.e. joy flights, flying lessons, and clubs) at a small regional scale.

Under the G21 Geelong Regional Alliance, Lethbridge Airport has been earmarked with support from the state government as a light aircraft aviation hub, with potential for expansion to support commercial operations and expansions into flying schools, aircraft maintenance, agricultural spaying, and tourism operations. G21 has identified that development of the facility could also provide support as a regional link for emergency services (i.e. CFA, Victoria Police, and Ambulance Victoria).

8.2.3 Guiding Documents

Based on the size and use of Lethbridge Airport and its private ownership, planning, development and approvals at the facility are likely to fall under the Planning and Environment Act 1987, Building Act 1993 and possibly (for major expansion if it were contemplated) the Environment Effects Act 1978.

Under the current Golden Plains Planning Scheme, Lethbridge Airport is classified as Special Use Zone (Schedule 3), to provide a safe and efficient airport for light aircraft, and associated activities. This SUZ3 zoning applies to the immediate area around Lethbridge Airport and restricts other uses.

8.2.4 Relevance to Assessment

Avalon and Tullamarine airports are in reasonable proximity to Golden Plains Shire and Landserv understands that there are no current expansion plans for Lethbridge airport.

Under the current Golden Plains Planning Scheme the SUZ3 zone covers the immediate area surrounding the airport / runway. Consideration should be given to any future growth plans for the airport and within the SUZ3 area.

8.3 Windfarms

8.3.1 Overview

There is a trend towards the development of renewable energy throughout Victoria to achieve a reduced carbon footprint and reduce reliance on fossil fuels. Wind energy is becoming increasingly relied upon as an energy source for Victoria, with significant development occurring state-wide.

8.3.2 Context

With the Council's commitment to this sector, there are extensive existing and proposed windfarms in parts of the municipality. Windfarms that have been constructed, are under construction or are planned in the near future include the following:

- Berrybank Windfarm (43 turbines)
- Mt Mercer Windfarm (64 turbines) - 2,600 ha
- Golden Plains Wind Farm (proposed 228 turbines) – 16,739 ha

Although part of a directional strategy by the Council, consideration should be given as to how these influence future growth and development.

8.3.3 Relevance to Assessment

Although specific permit conditions are applied to the approvals for windfarms (e.g. relating to noise and setback from residential dwellings), consideration should be given to how the windfarms affect future development. For this assessment, the relevance and impacts on growth aspirations for Golden Plains Shire are likely to be limited to the permit areas for the existing and proposed windfarms.

As part of the Settlement Strategy, Council may also choose to consider areas suitable for additional future windfarms at its discretion.

8.4 Industrial Zones / Employment Precinct

Existing and planned industrial zones and employment precincts as determined by the Council are present in areas of the municipality, as depicted in Figure 1 Appendix A.

Future growth of industrial areas is at the discretion of the Council.

8.4.1 Relevance to Assessment

If future expansion of industrial areas is intended, consideration should be given to the types of industries and whether buffers are applicable to them. Consideration should also be given to potential amenity issues (e.g. noise and odour) relative to residential growth and development around these areas.

9 DISCUSSIONS

The majority of future growth predicted within the municipality is anticipated to be in around key townships throughout the municipality. Existing structure plans have been developed for most of these townships which take into account environmental and natural hazards to an extent. Consideration of natural environment and hazards and their relative importance should be ongoing whenever planning for future growth. The changing climate and its influences on natural hazards such as fire and flooding should also be an input to the Settlement Strategy and any other long-term strategic planning initiatives for Golden Plains Shire.

The following is a summary of natural environment and hazards as possible constraints and opportunities for growth, in nominated portions of the municipality:

Northern Portion of Golden Plains

In the northern portion of Golden Plains high fire risk zones generally mirror the distribution of heavily vegetated areas surrounding Enfield State Park, Bamganie State Forest and Brisbane Ranges National Park. The surrounding heavily vegetated private properties are also the key restrictions to potential growth (GPSSBA 2022).

Priority is placed on the protection of lives and the elevated fire risk ranking in these areas should be seen as a key limiting factor to growth unless specific controls can mitigate risk to a more manageable level (GPSSBA 2022). The GPSSBA states that it would be difficult to direct growth into settlements in these areas under the applicable bushfire planning guidelines given that alternatives are available. Much of northern Golden Plains is in the protection of parks and overlays, which further restricts development into these areas.

The majority of riparian zones are subject to inundation and flooding overlays. These areas are generally subject to ESO overlays and have a greater susceptibility to erosion and therefore are unlikely to be suitable for growth.

Consideration should be given to salinity management zones within this proportion of the municipality and how they may constrain future development and / or require engineering solutions where built infrastructure is proposed.

The Smythesdale Landfill is under environmental audit and is anticipated to be operational for another 20 years. While this landfill is operational, growth may be constrained within a 500 m buffer due to landfill gas and amenity concerns. However, after the landfill is closed, some areas within the buffer may be suitable, depending on the outcomes of landfill gas risk assessments that would be required should development be considered within the buffer.

Significant historical mining activity is evident in this section of the municipality. Further assessment for soil contamination, mineshaft safety and geotechnical impacts would be advised if growth areas are contemplated in historical mining areas.

Consideration should be given to Mt Mercer Windfarm buffers on growth in this area.

Eastern Portion of Golden Plains

The townships of Inverleigh and Teesdale are susceptible to flooding risk. The *Flood Risk Management Study - Leigh and Barwon Rivers at Inverleigh* (2018) provides a summary of flooding scenarios around the township of Inverleigh.

Some existing dwellings and infrastructure are situated on flood prone areas. LSIO and FO areas should generally be avoided for growth if alternatives are available. The Inverleigh Structure Plan (2019) should be referred to for localised growth planning.

Once the Teesdale Flood Study is completed (estimated 2023) any findings should be incorporated into future growth planning and overlays. As with the northern extent of Golden Plains, other existing overlays and susceptibly to erosion will limit growth potential within these flood-prone areas of the municipality.

A former landfill west of Tawarri Drive in Teesdale has undergone an environmental audit and key planning restriction should be adopted from this audit. The low risk determined by the LFGRA at the former Teesdale Landfill should be considered in relation to future zoning.

Consideration should also be given to salinity management zones within this proportion of the municipality and how they may act as a constraint to future development.

Overlays and buffers applicable within the Golden Plains Intensive Animal Precinct and for Lethbridge Airport will likely constrain growth in these areas.

Western Portion of Golden Plains

Portions of this region are high fire risk zones particularly in the northern section. The elevated fire risk ranking in these areas should be seen as a key limiting factor to growth unless specific controls can mitigate risk to a more manageable level (GPSSBA 2022). As is the case for the northern portion of Golden Plains, directing growth into these areas would be difficult under the applicable bushfire planning guidelines given that alternatives are available (GPSSBA 2022). Additional environmental and vegetation overlays further restrict development into these areas.

Waterways including Woady Yallock River, Naringhil Creek and Mt Misery Creek all have LSIO and ESO overlays along their lengths. These protections along with risk of inundation are likely to act as a constraint to growth into these areas.

Depending on the size, age and landfill gas risk associated with the former Rokewood landfill development is unlikely to be prevented within most of the 500 m buffer area. However, a landfill gas risk assessment (LFGRA) is required to confirm this.

With evidence of substantial mining activity in this region, further assessment and review of the impacts from mining activity (such as contamination and mineshaft safety) may be warranted for future planning and potential impacts if growth is proposed in the affected areas.

Consideration should also be given to salinity management zones within this proportion of the municipality and how they may act as a constraint to future development.

The planned Golden Plains Wind Farm development buffers will mean that this area is not suitable for future growth (assuming the wind farm proceeds).

Southern and Central Portion of Golden Plains

Waterways including Kuruc A Ruc Creek and Ferrers Creek all have LSIO and ESO overlays along their lengths. These protections along with risk of inundation are likely to act as a constraint to growth into these areas.

As with some other parts of Golden Plains, there are salinity management zones in the southern / central portion that may constrain growth or require engineering solutions.

Wind farm development buffers would also constrain growth in some parts of this area.

10 LIMITATIONS

This report has been prepared only for internal use by Golden Plains Shire Council. No other parties should rely on the information in this report without prior written consent from Golden Plains Shire Council or Landserv Pty Ltd.

Landserv has performed its services in accordance with a scope of work commissioned by Golden Plains Shire Council in a manner consistent with the level of quality and skill generally exercised by members of its profession.

It should be noted that geological, environmental conditions often vary from those observed at the locations where data and mapping have been obtained. Landserv is reliant on the maps and data available to compile this NEHA. Limited data can result in uncertainty in the interpretation of environmental conditions. Interpreting the environmental conditions and hazards for this project has been limited to a desktop review. Environmental conditions also often vary with the passing of time after the data is obtained, as do regulatory requirements, laws and guideline criteria.

Despite Landserv's due professional care, all these uncertainties should be considered in relying and acting on the information contained in this report, especially if this report is used after a significant delay in time, if regulations and guideline criteria are known to have changed, or if a change is proposed to the land use for the site.

Opinions and recommendations in our reports are based on the information available to Landserv at the time of completing this NEHA. No warranty of site conditions is intended.

11 REFERENCES

ATSDR 2008, Landfill Gas Basics. In Landfill Gas Primer - An Overview for Environmental Health Professionals.

Corangamite Catchment Management Authority, *Corangamite Regional Floodplain Management Strategy*, 2018.

Corangamite Catchment Management Authority, *Identification and Management of Landslips, Corangamite CMA Soil Health Strategy*, 2006.

Dahlhaus Environmental Geology, *Golden Plains Salinity Management Overlay – salinity, occurrences and mapping*, 2006.

Department of Environment, Land, Water and Planning, Victorian Floodplain Management Strategy, 2016.

Department of Environment, Land, Water and Planning, *Grampians Bushfire Management Strategy 2020 – Fuel Management and Bushfire Risk* Engagement Areas, 2020.

Department of Environment, Land, Water and Planning, Planning Permit Application Bushfire Management Overlays – Technical Guide, 2017.

Environment Protection Authority Victoria, *Assessing planning proposals within the buffer of a landfill*, Publication 1642, October 2017.

Environment Protection Authority Victoria, *Best Practice Environmental Management: Siting, design, operation and rehabilitation of landfills*, Publication 788.3, August 2015.

Groundwater Dependent Ecosystems Atlas
http://www.bom.gov.au/water/groundwater/gde/map.shtml, accessed 29 July 2022

Kevin Hazell Bushfire Planning, *Golden Plains Shire Strategic Bushfire Assessment,* 2022.

Landserv Pty Ltd, *Landfill Gas Risk Assessment – Former Teesdale Landfill*, 2021.

Landserv Pty Ltd, *Environmental Assessment, Former Landfill Site; Teesdale, Victoria, Rev A,* August 2011.

New Hanover Exploration Pty Ltd, http://www.newhanover.com.au/projects.html, accessed 1/7/2022.

Water Technology Pty Ltd, *Flood Risk Management Study – Leigh and Barwon Rivers at Inverleigh*, 2018.

Visualising Victoria's Groundwater, https://www.vvg.org.au/, accessed 23/7/2022.

Attachment A

FIGURES

PYRENEES SHIRE COUNCIL

CITY OF BALLARAT

MOORABOOL SHIRE COUNCIL

CORANGAMITE SHIRE

COLAC OTWAY SHIRE

SURF COAST SHIRE

CITY OF GREATER GEELONG

CORIO BAY

HADDON

SMYTHESDALE

SCARSDALE

ENFIELD STATE PARK

ENFIELD

MANNIBADAR

MOUNT MERCER

MEREDITH

BRISBANE RANGES NATIONAL PARK

WERNEIL

ROKEWOOD

SHELFORD

LETHBRIDGE

BARUNAH PARK

TEESDALE

BANNOCKBURN

INVERLEIGH

BATESFORD

LISSE

Landserv
Environment
GEELONG OFFICE
14 Albert Street,
Geelong West Vic 3218
T 03 5222 4172
PO Box 1628 Geelong VIC 3220

MELBOURNE OFFICE
293A Bay Street, Port Melbourne
T 03 9646 0833
Email admin@landserv.com.au
www.landserv.com.au

DATA SOURCES:
- VICMAP Planning Overlay, 29 Mar 2022
- VICMAP Planning Zones, 29 Mar 2022
- GPSC Aerial Photography, 12 Apr 2019

LEGEND :
- Golden Plains Shire Boundary
- Commercial Zone
- Farming Zone
- General Residential Overlay
- Industrial Zone
- Low Density Residential
- Public Use Zone
- Special Use Zone
- Victorian Land Register-EPA
- Heritage Overlay
- Transport Corridor

ZONE 54 MGA

Project Number : G0967	Figure : 1	Date : 27/7/2022	CLIENT : GOLDEN PLAINS SHIRE COUNCIL - GPSC
Drawn By : P.Basalicki	Revision : A	Format : A0	
Checked By : L.Judd & D.Chappell	Vertical Datum : Australian Height Datum		LOCATION : GOLDEN PLAINS SHIRE, VIC
Scale : 0 1000 2000 3000 4000 5000 Scale in kilometres	Horizontal Datum : MGA Zone 54 based on GDA94 Datum		FIGURE TITLE : KEY LAND USE ZONING MAP

G0967_Fig1_Key Land Use Zoning.dwg

PYRENEES SHIRE COUNCIL

CITY OF BALLARAT

MOORABOOL SHIRE COUNCIL

CORANGAMITE SHIRE

COLAC OTWAY SHIRE

SURF COAST SHIRE

CITY OF GREATER GEELONG

CORIO BAY

EPA Audit Site

EPA Audit Site

EPA Audit Site

EPA Audit Site

SMYTHESDALE

SCARSDALE

TUROA

ENFIELD STATE PARK

ENFIELD

MANNIBADAR

MOUNT MERCER

CORINDHAP

MERRIMAN

BRISBANE RANGES NATIONAL PARK

WINCHELSEA

ROKEWOOD

SHELFORD

LETHBRIDGE

BARUNAH PARK

TEESDALE

BANNOCKBURN

INVERLEIGH

BATESFORD

HESSE

DEREEL

Landserv Environment

MELBOURNE OFFICE
293A Bay Street, Port Melbourne
T: 03 9646 0833
Email: admin@landserv.com.au
www.landserv.com.au

GEELONG OFFICE
14 Advert Street,
Geelong West Vic 3218
T: 03 5222 4172
PO Box 1628 Geelong VIC 3220

DATA SOURCES:
- Datashare EPA Audit Sites, 4 Jun 2022
- Datashare Historical Mining Sites, 24 Apr 2022
- GPSC & EPA Victorian Landfill Register, 26 Apr 2022
- GPSC Aerial Photography , 12 Apr 2019

LEGEND :
- Golden Plains Shire Boundary
- Historical Mining Activity
- Victorian Landfill Register-EPA
- EPA 500m Landfill Buffer Zone
- EPA Audit Sites

Zone 54 MGA

Project Number : G0967	Figure : 2	Date : 27/7/2022	CLIENT : GOLDEN PLAINS SHIRE COUNCIL - GPSC
Drawn By : P.Bzoalicki	Revision : A	Format : A0	
Checked By : L.Judd & D.Chappell	Vertical Datum : Australian Height Datum		LOCATION : GOLDEN PLAINS SHIRE, VIC
Scale : 0 1000 2000 3000 4000 5000 Scale in Kilometres	Horizontal Datum: MGA Zone 54 based on GDA94 Datum		FIGURE TITLE : HUMAN HAZARDS MAP

G0967_Fig2_Human Hazards.dwg

Landserv Environment

GEELONG OFFICE
14 Albert Street,
Geelong West Vic 3218
T: 03 5222 4173
PO Box 1628 Geelong VIC 3220

MELBOURNE OFFICE
293A Bay Street, Port Melbourne
T: 03 9646 0833
Email admin@landserv.com.au
www.landserv.com.au

DATA SOURCES:
- VICMAP Land Subject to Inundation and Floodway Overlay, 29 Mar 2022
- GPSC Bushfire Landscape Type, 13 May 2020
- CCMA Landslide Grid, 7 Jun 2022
- GPSC Aerial Photography , 12 Apr 2019

LEGEND :
Golden Plains Shire Boundary
Land Subject to Inundation
Bushfire Landscape Type 3
Bushfire Landscape Type 4
Floodway Overlay

Landslip Susceptibility
Very Low to Low
Moderate 1
Moderate 2
Moderate-High
High
Very High

Zone 54 MGA

Project Number : G0967	Figure : 3	Date : 27/7/2022	CLIENT : GOLDEN PLAINS SHIRE COUNCIL - GPSC
Drawn By : P.Bazalicki	Revision : A	Format : A0	LOCATION : GOLDEN PLAINS SHIRE, VIC
Checked By L.Judd & D.Chappell	Vertical Datum : Australian Height Datum		FIGURE TITLE : NATURAL HAZARDS MAP
Scale : 0 1000 2000 3000 4000 5000 Scale in kilometres	Horizontal Datum: MGA Zone 54 based on GDA94 Datum		

G0967_Fig3_Natural Hazards.dwg

PYRENEES SHIRE COUNCIL

CITY OF BALLARAT

MOORABOOL SHIRE COUNCIL

CORANGAMITE SHIRE

COLAC OTWAY SHIRE

SURF COAST SHIRE

CITY OF GREATER GEELONG

CORIO BAY

HADDON

SMYTHESDALE

SCARSDALE

ELDON

ENFIELD STATE PARK

ENFIELD

MANNIBADAR

SCARTH

Mount Mercer Wind Farm

MOUNT MERCER

SCOTCHMAN

MORRISON

BRISBANE RANGES NATIONAL PARK

WERNETH

Berrybank Wind Farm

Golden Plains Wind Farm

ROKEWOOD

Boral

Planning Permit Approved for Eggs

SHELFORD

Planning Permit Approved for Eggs

Eggs

LETHBRIDGE

Waste Incinerator

Eggs

Boral

Boral

Boral

Boral

Boral

Boral

BARUNAH PARK

TEESDALE

BANNOCKBURN

HESSE

INVERLEIGH

BATESFORD

DATA SOURCES:
- DELWP Features of Interest, 29 Mar 2022
- GPSC Aerial Photography - 12 Apr 2019
- GPSC Golden Plains Wind Farm Exhents, 30 Jun 2022

LEGEND :
- Golden Plains Shire Boundary
- Wind Farm Towers
- Telecommunication Towers and Telephone Exchanges
- Existing Intensive Agriculture
- Waste Incinerator
- Golden Plains Wind Farm
- Ten (10) KM Wind Farm Buffer Zone

Zone 54 MGA

Project Number :	G0967	Figure :	4
Drawn By :	P.Bazalicki	Revision :	A
Checked By :	L.Judd & D.Chappell	Vertical Datum :	Australian Height Datum
Scale :	1000 2000 3000 4000 5000 Scale in kilometres	Horizontal Datum :	MGA Zone 54 based on GDA94 Datum

Date :	27/7/2022
Format :	A0

CLIENT : GOLDEN PLAINS SHIRE COUNCIL - GPSC

LOCATION : GOLDEN PLAINS SHIRE, VIC

FIGURE TITLE : EXISTING AND PLANNED INFRASTRUCTURE MAP

G0967_Fig4_Existing & Planned Infrastructure.dwg

Landserv Environment

GEELONG OFFICE
14 Advart Street,
Geelong West VIC 3218
T: 03 5222 4172
PO Box 1628 Geelong VIC 3220

MELBOURNE OFFICE
293A Bay Street, Port Melbourne
T: 03 9646 0833
Email admin@landserv.com.au
www.landserv.com.au

PYRENEES SHIRE COUNCIL

CITY OF BALLARAT

MOORABOOL SHIRE COUNCIL

CORANGAMITE SHIRE

COLAC OTWAY SHIRE

SURF COAST SHIRE

CITY OF GREATER GEELONG

CORIO BAY

BADDAGINNIE

SMYTHESDALE

EGANSDALE

ENFIELD

ENFIELD STATE PARK

MANNIBADAR

STEIGLITZ

MOUNT MERCER

MISTYGLEN

BRISBANE RANGES NATIONAL PARK

CORINDHAP

WINCHELSEA

ROKEWOOD

SHELFORD

LETHBRIDGE

BARUNAH PARK

TEESDALE

BANNOCKBURN

INVERLEIGH

BATESFORD

DATA SOURCES:
- VICMAP Vegetation Protection Overlay, 29 Mar 2022
- Data have Geologically Significant Features, 28 June 2022
- GPSC Aerial Photography - 12 Apr 2019
- VICMAP Environmental Significance Overlay, 29 Mar 2022
- VICMAP Salinity Management Overlay, 29 Mar 2022

LEGEND :
- Golden Plains Shire Boundary
- Vegetation Protection Overlay
- Geologically Significant Features
- Environmental Significance Overlay
- Salinity Management Overlay
- National & State Parks, Conservation Areas
- Public Conservation and Resource Zone

Landserv Environment Pty Ltd
14 Albert Street
Geelong West Vic 3218
T 03 5222 4173
PO Box 1628 Geelong VIC 3220

Melbourne Office
3/924 Dandenong Rd, Port Melbourne
T 03 9646 0833
Email admin@landserv.com.au
www.landserv.com.au

Zone 54 MGA

Project Number : G0967	Figure : 5	Date : 27/7/2022	CLIENT : GOLDEN PLAINS SHIRE COUNCIL - GPSC
Drawn By : P.Bazalicki	Revision : A	Format : A0	
Checked By : D.Chappell and L.Judd	Vertical Datum : Australian Height Datum		LOCATION : GOLDEN PLAINS SHIRE, VIC
Scale : 0 1000 2000 3000 4000 5000 Scale in Kilometres	Horizontal Datum : MGA Zone 54 based on GDA94 Datum		FIGURE TITLE : NATURAL CONSTRAINTS MAP

G09671_Fig5_Natural Constraints.dwg

PYRENEES SHIRE COUNCIL

CITY OF BALLARAT

MOORABOOL SHIRE COUNCIL

CORANGAMITE SHIRE

COLAC OTWAY SHIRE

SURF COAST SHIRE

CITY OF GREATER GEELONG

CORIO BAY

HADDON

SMYTHESDALE

GARIBALDI

ILTHON

ENFIELD STATE PARK

ENFIELD

MANNIBADAR

SCARSDALE

MOUNT MERCER

MERRIMU

BRISBANE RANGES NATIONAL PARK

WINCHAM

ROKEWOOD

SHELFORD

LETHBRIDGE

BARUNAH PARK

TEESDALE

BANNOCKBURN

INVERLEIGH

BATESFORD

Landserv Environment

GEELONG OFFICE
14 Advert Street,
Geelong West Vic 3218
T 03 5221 7900
PO Box 1628 Geelong VIC 3220

MELBOURNE OFFICE
293A Bay Street, Port Melbourne
T 03 9646 0833
Email admin@landserv.com.au
www.landserv.com.au

DATA SOURCES:
- VICMAP Planning Overlay, 29 Mar 2022
- VICMAP Planning Zones, 29 Mar 2022
- GPSC Aerial Photography , 12 Apr 2019

LEGEND :
- Golden Plains Shire Boundary
- Food Production Precinct
- Agricultural Activity Point

Zone 54 MGA

Project Number :	G0967	Figure : 6	Date : 27/7/2022
Drawn By :	P.Bazalicki	Revision : A	Format : A0
Checked By :	D.Chappell and L.Judd	Vertical Datum :	Australian Height Datum
Scale :	0 1000 2000 3000 4000 5000 Scale in kilometres	Horizontal Datum :	MGA Zone 54 based on GDA94 Datum

CLIENT : GOLDEN PLAINS SHIRE COUNCIL - GPSC

LOCATION : GOLDEN PLAINS SHIRE, VIC

FIGURE TITLE : ADDITIONAL ZONES MAP

G0967_Fig6_Additional Zones.dwg

Attachment B

Data Source Table

GOLDEN PLAINS SHIRE- NATURAL ENVIRONMENT & HAZARDS ANALYSIS (GEOSPATIAL DATA SOURCES)

Dataset Name	Data Custodian	Dataset Description	Layer Description	Issuing Authority	Data Format	Date of Issue	Scale or Resolution	Projection/Datum	Data Supplier	Data Completeness
Aerial Photography	Golden Plains Shire	Aerial Photography	Aerial Photography	Golden Plains Shire	ECW	26-Apr-22	15cm resolution	ZONE 54/MGA/GDA94	Golden Plains Shire	Entire Shire
FOI-Point -Vicmap Featrures of Interest	DELWP	Points of Interest	School	VICMAP	ESRI Shape File	23-Mar-22	n/a	ZONE 54/MGA/GDA94	Golden Plains Shire	Entire Shire
FOI-Point -Vicmap Featrures of Interest	DELWP	Points of Interest	Wind Farm	VICMAP	ESRI Shape File	24-Mar-22	n/a	ZONE 54/MGA/GDA95	Golden Plains Shire	Entire Shire
FOI-Point -Vicmap Featrures of Interest	DELWP	Points of Interest	Towers	VICMAP	ESRI Shape File	25-Mar-22	n/a	ZONE 54/MGA/GDA96	Golden Plains Shire	Entire Shire
FOI-Point -Vicmap Featrures of Interest	DELWP	Points of Interest	Skate Parks	VICMAP	ESRI Shape File	26-Mar-22	n/a	ZONE 54/MGA/GDA97	Golden Plains Shire	Entire Shire
FOI-Point -Vicmap Featrures of Interest	DELWP	Points of Interest	Fire Stations	VICMAP	ESRI Shape File	27-Mar-22	n/a	ZONE 54/MGA/GDA98	Golden Plains Shire	Entire Shire
FOI-Point -Vicmap Featrures of Interest	DELWP	Points of Interest	Radio Communication Facility	VICMAP	ESRI Shape File	28-Mar-22	n/a	ZONE 54/MGA/GDA99	Golden Plains Shire	Entire Shire
FOI-Point -Vicmap Featrures of Interest	DELWP	Points of Interest	Emergency Marker	VICMAP	ESRI Shape File	29-Mar-22	n/a	ZONE 54/MGA/GDA100	Golden Plains Shire	Entire Shire
FOI-Point -Vicmap Featrures of Interest	DELWP	Points of Interest	Hall	VICMAP	ESRI Shape File	30-Mar-22	n/a	ZONE 54/MGA/GDA101	Golden Plains Shire	Entire Shire
FOI-Point -Vicmap Featrures of Interest	DELWP	Points of Interest	Trail Bike Area	VICMAP	ESRI Shape File	31-Mar-22	n/a	ZONE 54/MGA/GDA102	Golden Plains Shire	Entire Shire
FOI-Point -Vicmap Featrures of Interest	DELWP	Points of Interest	Picnic Area	VICMAP	ESRI Shape File	1-Apr-22	n/a	ZONE 54/MGA/GDA103	Golden Plains Shire	Entire Shire
VMPLAN_PLAN_OVERLAY	DELWP	Land Use Overlays	Bushfire Management Overlay	VICMAP	ESRI Shape File	23-Mar-22	n/a	ZONE 54/MGA/GDA94	Golden Plains Shire	Entire Shire
VMPLAN_PLAN_ZONE	DELWP	Land Use Zones	Commercial Zone	VICMAP	ESRI Shape File	23-Mar-22	n/a	ZONE 54/MGA/GDA94	Golden Plains Shire	Entire Shire
VMPLAN_PLAN_ZONE	DELWP	Land Use Zones	Design and Development Overlay	VICMAP	ESRI Shape File	23-Mar-22	n/a	ZONE 54/MGA/GDA94	Golden Plains Shire	Entire Shire
VMPLAN_PLAN_ZONE	DELWP	Land Use Zones	Development Plan Overlay	VICMAP	ESRI Shape File	23-Mar-22	n/a	ZONE 54/MGA/GDA94	Golden Plains Shire	Entire Shire
VMPLAN_PLAN_ZONE	DELWP	Land Use Zones	Environmental Significance Overlay	VICMAP	ESRI Shape File	23-Mar-22	n/a	ZONE 54/MGA/GDA94	Golden Plains Shire	Entire Shire
VMPLAN_PLAN_ZONE	DELWP	Land Use Zones	Erosion Management Overlay	VICMAP	ESRI Shape File	23-Mar-22	n/a	ZONE 54/MGA/GDA94	Golden Plains Shire	Entire Shire
VMPLAN_PLAN_ZONE	DELWP	Land Use Zones	Farming Zone	VICMAP	ESRI Shape File	23-Mar-22	n/a	ZONE 54/MGA/GDA94	Golden Plains Shire	Entire Shire
VMPLAN_PLAN_ZONE	DELWP	Land Use Zones	Floodway Overlay	VICMAP	ESRI Shape File	23-Mar-22	n/a	ZONE 54/MGA/GDA94	Golden Plains Shire	Entire Shire
VMPLAN_PLAN_ZONE	DELWP	Land Use Zones	Food Production Precinct	Outline based on Prescinct Plan	-	-	-	-	Golden Plains Shire	Entire Shire
VMPLAN_PLAN_ZONE	DELWP	Land Use Zones	General Residential Overlay	VICMAP	ESRI Shape File	23-Mar-22	n/a	ZONE 54/MGA/GDA94	Golden Plains Shire	Entire Shire
SIGFEAT	Department of Jobs, Precincts and Regions	-	Geologically Significant Features	Geological Society of Australia	ESRI Shape File	28-Apr-22	n/a	ZONE 54/MGA/GDA94	Datashare	Entire Shire
VMPLAN_PLAN_ZONE	DELWP	Land Use Zones	Heritage Overlay	VICMAP	ESRI Shape File	23-Mar-22	n/a	ZONE 54/MGA/GDA94	Golden Plains Shire	Entire Shire
VMPLAN_PLAN_ZONE	DELWP	Land Use Zones	Incorporated Plan Overlay	VICMAP	ESRI Shape File	23-Mar-22	n/a	ZONE 54/MGA/GDA94	Golden Plains Shire	Entire Shire
VMPLAN_PLAN_ZONE	DELWP	Land Use Zones	Industrial Zone	VICMAP	ESRI Shape File	23-Mar-22	n/a	ZONE 54/MGA/GDA94	Golden Plains Shire	Entire Shire
VMPLAN_PLAN_ZONE	DELWP	Land Use Zones	Land Subject to Inundation Overlay	VICMAP	ESRI Shape File	23-Mar-22	n/a	ZONE 54/MGA/GDA94	Golden Plains Shire	Entire Shire
VMPLAN_PLAN_ZONE	DELWP	Land Use Zones	Landslip Susceptibility	CCMA	ESRI Shape File	20-Jun-22	n/a	-	CCMA	Entire Shire
VMPLAN_PLAN_ZONE	DELWP	Land Use Zones	Low Density Residential Zone	VICMAP	ESRI Shape File	23-Mar-22	n/a	ZONE 54/MGA/GDA94	Golden Plains Shire	Entire Shire
SHAFT	Department of Jobs, Precincts and Regions	-	Historical Mining Activity		ESRI Shape File	28-Apr-22	n/a	ZONE 54/MGA/GDA94	Datashare	Entire Shire
VMPLAN_PLAN_ZONE	DELWP	Land Use Zones	Plan Overlay	VICMAP	ESRI Shape File	23-Mar-22	n/a	ZONE 54/MGA/GDA94	Golden Plains Shire	Entire Shire
VMPLAN_PLAN_ZONE	DELWP	Land Use Zones	Public Acqusition Overlay	VICMAP	ESRI Shape File	23-Mar-22	n/a	ZONE 54/MGA/GDA94	Golden Plains Shire	Entire Shire
VMPLAN_PLAN_ZONE	DELWP	Land Use Zones	Public Conservation and Resource Zone	VICMAP	ESRI Shape File	23-Mar-22	n/a	ZONE 54/MGA/GDA94	Golden Plains Shire	Entire Shire
VMPLAN_PLAN_ZONE	DELWP	Land Use Zones	Public Park and Recreation Zone	VICMAP	ESRI Shape File	23-Mar-22	n/a	ZONE 54/MGA/GDA94	Golden Plains Shire	Entire Shire
VMPLAN_PLAN_ZONE	DELWP	Land Use Zones	Public Use Zone	VICMAP	ESRI Shape File	23-Mar-22	n/a	ZONE 54/MGA/GDA94	Golden Plains Shire	Entire Shire
VMPLAN_PLAN_ZONE	DELWP	Land Use Zones	Restructure Overlay	VICMAP	ESRI Shape File	23-Mar-22	n/a	ZONE 54/MGA/GDA94	Golden Plains Shire	Entire Shire
VMPLAN_PLAN_ZONE	DELWP	Land Use Zones	Rural Acivity Zone	VICMAP	ESRI Shape File	23-Mar-22	n/a	ZONE 54/MGA/GDA94	Golden Plains Shire	Entire Shire
VMPLAN_PLAN_ZONE	DELWP	Land Use Zones	Rural Conservation Zone	VICMAP	ESRI Shape File	23-Mar-22	n/a	ZONE 54/MGA/GDA94	Golden Plains Shire	Entire Shire
VMPLAN_PLAN_ZONE	DELWP	Land Use Zones	Rural Living Zone	VICMAP	ESRI Shape File	23-Mar-22	n/a	ZONE 54/MGA/GDA94	Golden Plains Shire	Entire Shire
VMPLAN_PLAN_ZONE	DELWP	Land Use Zones	Salinity Management Overlay	VICMAP	ESRI Shape File	23-Mar-22	n/a	ZONE 54/MGA/GDA94	Golden Plains Shire	Entire Shire
VMPLAN_PLAN_ZONE	DELWP	Land Use Zones	Significant Landscape Overlay	VICMAP	ESRI Shape File	23-Mar-22	n/a	ZONE 54/MGA/GDA94	Golden Plains Shire	Entire Shire
VMPLAN_PLAN_ZONE	DELWP	Land Use Zones	Special Use Zone	VICMAP	ESRI Shape File	23-Mar-22	n/a	ZONE 54/MGA/GDA94	Golden Plains Shire	Entire Shire
VMPLAN_PLAN_ZONE	DELWP	Land Use Zones	Specific Controls Overlay	VICMAP	ESRI Shape File	23-Mar-22	n/a	ZONE 54/MGA/GDA94	Golden Plains Shire	Entire Shire
VMPLAN_PLAN_ZONE	DELWP	Land Use Zones	Township Zone	VICMAP	ESRI Shape File	23-Mar-22	n/a	ZONE 54/MGA/GDA94	Golden Plains Shire	Entire Shire
VMPLAN_PLAN_ZONE	DELWP	Land Use Zones	Transport Zones 1 and 2	VICMAP	ESRI Shape File	23-Mar-22	n/a	ZONE 54/MGA/GDA94	Golden Plains Shire	Entire Shire
VMPLAN_PLAN_ZONE	DELWP	Land Use Zones	Urban Growth Zone	VICMAP	ESRI Shape File	23-Mar-22	n/a	ZONE 54/MGA/GDA94	Golden Plains Shire	Entire Shire
VMPLAN_PLAN_ZONE	DELWP	Land Use Zones	Vegetation Protection Overlay	VICMAP	ESRI Shape File	23-Mar-22	n/a	ZONE 54/MGA/GDA94	Golden Plains Shire	Entire Shire
VMPLAN_PLAN_ZONE	DELWP	Land Use Zones	Victorian Landfill Register - EPA	EPA	Mapinfo	26-Apr-22	n/a	ZONE 54/MGA/GDA94	Golden Plains Shire	Entire Shire