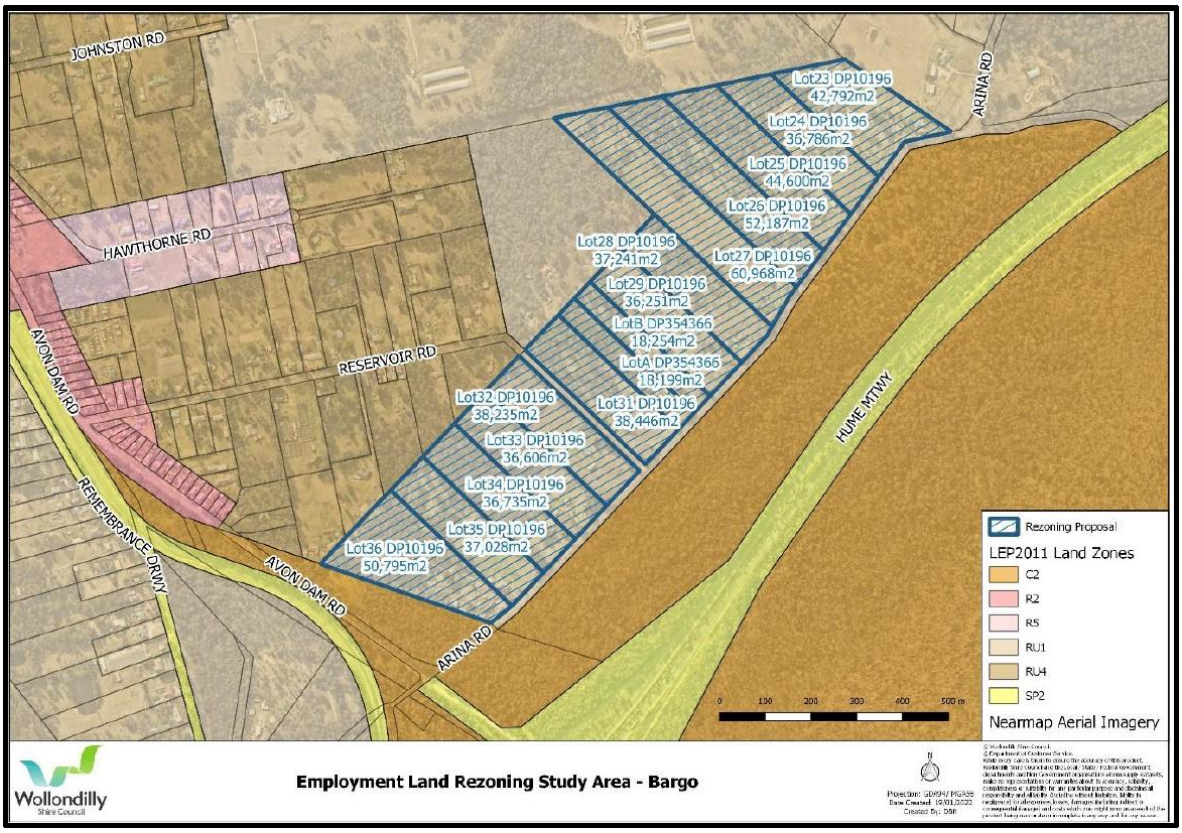
BARGO INVESTIGATION AREA

TECHNICAL STUDY OUTCOMES PAPER

This Technical Study Outcomes Report summarises the findings of the Geotechnical and Contamination, Biodiversity, Bushfire and Heritage Assessments undertaken for the Bargo Investigation Area as part of the Employment Land Rezoning Project.

Assessed Parcels:

Lot DP	Address of the Parcels	Area (m²)
Lot 23 DP 10196	560 Arina Rd	42,792
Lot 24 DP 10196	570 Arina Rd	36,786
Lot 25 DP 10196	580 Arina Rd	44,600
Lot 26 DP 10196	590 Arina Rd	52,187
Lot 27 DP 10196	600 Arina Rd	60,968
Lot 28 DP 10196	610 Arina Rd	37,241
Lot 29 DP 10196	620 Arina Rd	36,251
Lot B DP 354366	630 Arina Rd	18,254
Lot A DP 354366	636 Arina Rd	18,199
Lot 31 DP 10196	115 Reservoir Rd	38,446
Lot 32 DP 10196	120 Reservoir Rd	38,235
Lot 33 DP 10196	660 Arina Rd	36,606
Lot 34 DP 10196	670 Arina Rd	36,735
Lot 35 DP 10196	680 Arina Rd	37,028
Lot 36 DP 10196	690 Arina Rd	50,795



GEOTECHNICAL ASSESSMENT

Potential Constraints

Based on the results of the desk Investigation and site walkover, the following potential constraints have been identified within the Investigation area and are discussed in the following sections.

- Soft/loose or filled ground
- Potential shrinkable clay soils
- Shallow/variable bedrock depths
- Poorly drained areas
- Existing vegetation
- Potential Mine Subsidence

Of the six identified potential constraints listed above, two were assessed as having the highest impact on the proposed rezoning scheme due to their distribution within the Investigation area and potential implications for commercial type developments. These constraints are summarised below:

Expansive Clay Soils

The majority of the site is underlain by the Hawkesbury Sandstone according to the Wollongong – Port Hacking 1:100,000 Geological Series sheet which will likely have an overlying clay/sandy clay weathered upper horizon within the uppermost 1-2m therefore moisture reactivity is a limited issue. Where shrinkable clay soils are identified underlying a site, an estimation of the potential magnitude of movement should be undertaken as part of preliminary subsurface investigations. The magnitude of shrink swell movements and variation may significantly increase where the effect of mature trees and wet areas create abnormal moisture content profiles below structures.

Based on the determined magnitude of shrink swell movements, a variety of measures can be adopted to prevent structural damage to new buildings including:

- Designing new structures to be tolerant of potential movements via flexible building materials, expansion/slip joints etc.
- Reinforcement, thicker floor slab, deeper footings
- Fully suspended floor slab
- Replacement of expansive clay below floor slabs with inert, granular fill

Regardless of the proposed design to accommodate movement, protection of the new structures requires the prevention of abnormal moisture contents developing below structures therefore ongoing maintenance, landscaping, surface/subsurface drainage and proposed vegetation must all be designed to control water throughout the design life of the building.

Due to the climate in Bargo, the depth of seasonal moisture variation is unlikely to exceed 2.0m below ground level which reduces the magnitude of likely shrink swell movements in comparison to other states in Australia. Additionally, due to the nature of the probable structures some tolerance to movement may be accommodated however where high shrink swell movements are anticipated, construction of some structure types (brick/masonry, low movement tolerant structures) may not be economically feasible.

The impact of the expansive clay is likely to vary significantly from the within the Investigation area resulting from the anticipated variation in clay soil composition and thickness and determination of this variation should form part of further assessment of the scheme.

Drainage

Surface water appears to flow generally from the south to the north of the Investigation area to the lower lying areas. Based on the topography, anticipated soil types and discussions with lot residents, it appears drainage is a problem within the area leading to soft/waterlogged ground. Significant erosion/drainage gullies were not observed, and it is considered the drainage may be a result of relatively flat/gently dipping topography which is not conducive to rapidly shedding surface water into established drainage channels.

Due to the clay soils underlying the site, drainage systems need to be sufficient to prevent abnormal moisture conditions in the vicinity of structures constructed on expansive clay soils. Inadequate drainage in conjunction with expansive clays can lead to significant long-term problems therefore an adequate drainage system will need to be in-place prior to development in individual lots such that adverse impacts to buildings in adjacent lots is controlled.

Conclusion

It is considered that the constraints identified within the Investigation do not represent particularly onerous geotechnical conditions which are likely to be prohibitive to a change of use, however no subsurface investigation has been undertaken to confirm the preliminary findings.

It is recommended that broadscale mapping/subsurface investigation be undertaken at an early stage such that the constraints identified can be managed/mitigated at concept plan stage by the selection of suitable subdivision extents, appropriate structures type, road and drainage layout, earthworks design etc.

CONTAMINATION ASSESSMENT

A Preliminary Site Investigation was undertaken for the purpose of evaluating the potential risk of the Investigation Area (or part thereof) to be affected by contamination that may pose a constraint to the suitability for the proposed use and to determine whether further detailed site investigation is required to confirm the suitability of the land.

The assessment was undertaken by evaluating a range of information sources to comprehensively understand the history of land use activities undertaken across the Investigation Area and to determine the environmental setting of the land. This review was supported by a detailed inspection of accessible properties to verify the findings of the desktop evaluation, to identify the current land use activities and to identify any signs of existing contamination.

The information review determined that:

- The majority of the properties that form the Investigation Area are currently used for rural / residential purposes, with little activities undertaken that are considered to pose a risk of causing contamination.

- The primary activities undertaken across the Investigation area are limited to residential, grazing and horse paddocks.

- Structures such as residential dwellings, garages and sheds are generally constructed from brick and corrugated iron / Colorbond materials that pose a negligible contamination risk.
- Limited potential for extensive filling across the Investigation Area was identified. Several small stockpiles / localised areas of filling were identified across the Investigation Area where the source(s) of these materials is unknown, but probably indicative of site-won material from cut and fill activities.
- No significant areas of fuel storage were identified across the Investigation Area.

Limited potentially contaminating activities were identified to have been undertake either historical or currently, which include:

- Orchards and / market gardens.
- Storage of materials and equipment.
- Fill materials of unknown origin.
- Potential mechanical equipment maintenance.
- Undefined commercial activities.
- Inground septic systems and discharge areas.

A limited number of properties were identified to comprise old and dilapidated buildings and structures that may potentially contain hazardous building materials such as asbestos and lead-based paints.

A limited number of properties were identified to potential involve commercial activities, however due to access limitations at the time of the site inspections, the nature of the activities could not be confirmed, and therefore have been assessed to pose a potential contamination risk due to the generally higher risk of works under such a land use setting.

A conceptual site model was subsequently developed to assess the framework for identifying how the Investigation Area (or parts thereof) may have become contaminated and how potential receptors may be exposed to contamination either in the present or the future. Based on the outcomes of the conceptual site model, which took into consideration details of the known and potential sources of contamination, contaminants of concern, mechanism of contamination, potentially affected media, human and ecological receptors, potential for migration and exposure pathways, it was identified that there are six (6) areas of environmental concern across the Investigation Area that require further assessment to determine the degree of contamination that may be present, and the associated level of risk under the proposed land use setting.

Conclusions

Based on these key findings of the investigation, the following conclusions are made:

- There is a low risk for the Investigation Area to be affected of contamination. Where contamination may be present, it would most likely be in localised areas attributed to a specific point-source of contamination.
- Considering that the land use setting of the proposed rezoning and redevelopment is to a less sensitive use than currently present, it is unlikely that contamination would pose a significant constraint to the Employment Land Rezoning proposal.

- Any contamination that may be present within the Investigation Area is likely to be manageable and could be feasibly integrated into the construction program for the property redevelopment.
- Further detailed site investigation of the identified areas of environmental concern is required to assess the nature and extent of contamination (if present) attributed to the identified potential sources of contamination. These works will enable the identification of the extent of works (if any) needed to mitigate contamination risk during construction and to ensure the long-term suitably of the Investigation Ara of the proposed use.
- A hazardous building materials assessment is also required to be undertaken for all structures within the Investigation Area prior to commencement of any construction activities, given the identified risk of these structures to contain hazardous materials such as asbestos and lead-based paints.

BIODIVERSITY ASSESSMENT

A desktop review and field survey of the Investigation area were undertaken to identify ecological constraints. Ecological constraints are features in the natural environment that are considered to be valuable, due to their rarity, their risk of decline or their potential to provide a habitat or food resource to native fauna. Ecological constraints may pose challenges to development due to laws and restrictions which protect these important natural features. An example of this is hollow-bearing trees, these are trees with trunks or limbs with cavities that fauna can use for shelter, nesting, breeding and feeding. If a development is planning on removing a hollow-bearing tree, surveys and reporting must be conducted to minimise and manage environmental impacts throughout the development process.

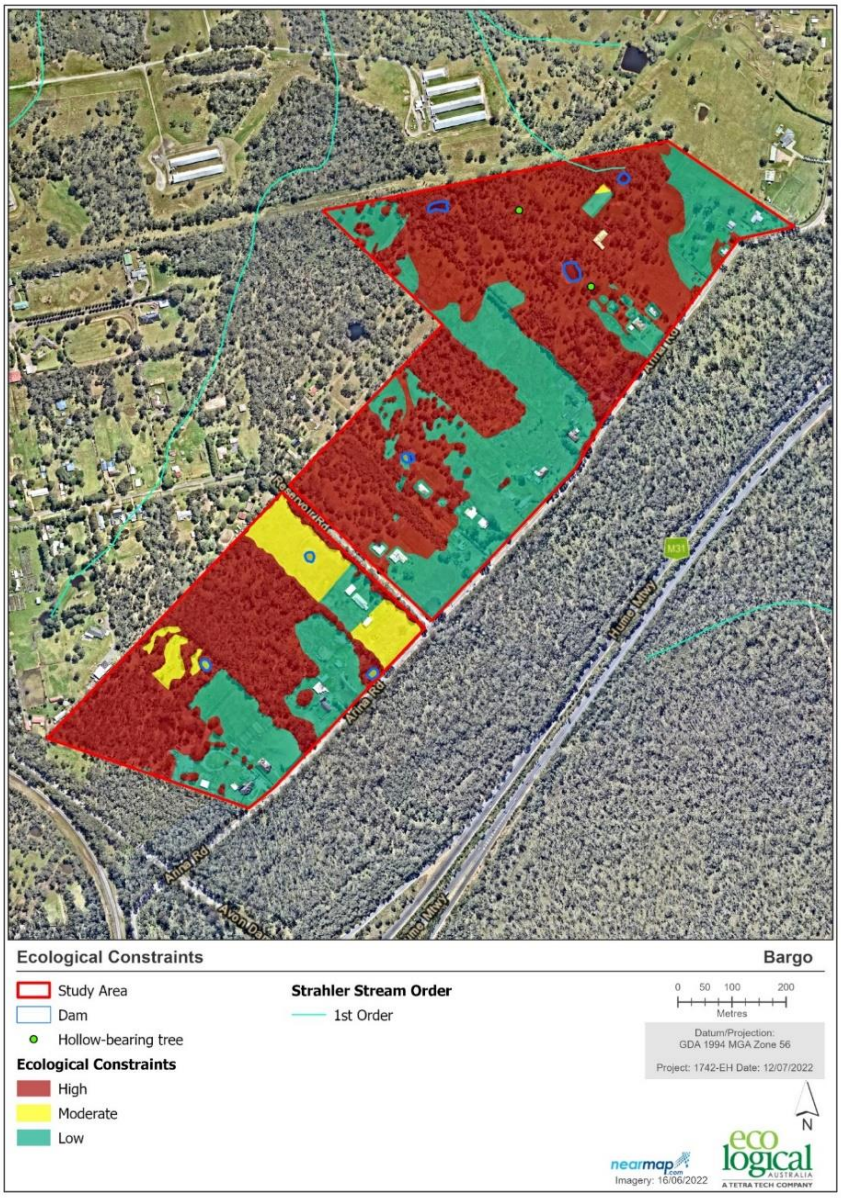
Developments may also pose risks to threatened species. In this instance, targeted surveys, reporting and offsetting may be required, ultimately leading to a longer development process and increased cost for the developer.

An ecological constraints map was produced to categorise the different ecological features which are defined in Table 1.

Table 1: Ecological constraint classes

Ecological Constraint	Ecological feature/values
Low	• Exotic and non-native vegetation • Cleared land and houses
Moderate	• Minor watercourses • Farm dams (potential foraging habitat for threatened species)
High	• Vegetation mapped as a Threatened Ecological Community with State or Federal protection. • Vegetation identified as an entity at risk of Serious and Irreversible Impacts (Identified as most at risk of extinction from potential development) • Land mapped on the NSW Biodiversity Values Map (Land that has been identified with high biodiversity value by the NSW Department of Planning and Environment) • Hollow-bearing trees • Vegetation considered to be Koala Habitat • Major watercourses

Ecologically low constraint areas



Ecological constraint map for Bargo Investigation Area

The area mapped as low constraints represents the most suitable locations to re-zone land for development, from an ecological impact perspective. These are areas that have historically been cleared of native vegetation and replaced with either exotic vegetation or built structures. The environmental risks and reports will be minimal when developing these areas.

Ecologically Moderate constraint areas

May be suitable for construction but may require biodiversity offsets or additional approvals. These are areas that have historically been altered but still maintain some ecological value with vegetation that could be utilised by or contain habitat features for threatened fauna. These areas are recognised as native vegetation and the removal of certain amounts could require further assessments and potential offsetting under the NSW Biodiversity Offsets Scheme.

The dams and the stream intersecting with the property on the northern end of the Investigation area are also a moderate constraint. The dam could provide foraging habitat for threatened fauna species, like microbats in the area, which would trigger impact assessment requirements. Streams are protected under the *Water Management Act 2000*, and any works within the riparian corridor will require consent from the Department of Planning and Environment - Water.

Ecologically High constraint areas

Impacts to highly constrained areas should be avoided, as they represent the rarest vegetation types at most risk of decline and best quality habitat for native fauna. In addition, impacts to these areas may require biodiversity impact assessment reports, offsets and a referral to the Commonwealth to investigate impacts to Federally listed vegetation types or threatened species.

Any impacts to these areas will likely trigger entry into the NSW Biodiversity Offset Scheme. This will require rigorous reporting, targeted field surveys and may require offsets for residual impacts on biodiversity. The costs associated with biodiversity offsetting may be high.

All the native vegetation in the Investigation area with a canopy is listed as Critically Endangered under either NSW or Federal legislation, or both. The native vegetation in the Investigation area, which is recognised as *Shale Sandstone Transition Forest in the Sydney Basin Bioregion,* is also a recognised entity at risk of extinction from potential development. Developments proposing to impact large areas of this vegetation can be refused due to these protections.

The vegetation meets the criteria for koala habitat and acts as a koala corridor for movement through the area. Any impacts on koala habitat requires the preparation of a Koala Assessment Report.

HERITAGE ASSESSMENT

An Aboriginal Objects Due Diligence Assessment (ADDA) and a Historic Heritage Constraints Assessment (HHCA) were undertaken for THE Investigation Area.

The purpose of the ADDA was to assess whether:

- Aboriginal Objects and/or places are present or are likely to occur within or near the Investigation Area;
- where those Aboriginal Objects and/or places are; and
- if those Aboriginal Objects and/or places may be impacted by the proposed works.

The purpose of the HHCA was to provide a preliminary assessment to determine whether:

- the historic heritage values and significance of the Investigation Area and its internal components, including any identified heritage listed items, would potentially be impacted by the proposed works.

The outcomes of both heritage studies were to determine whether further investigation is required.

Key issues, opportunities, and challenges identified

<u>Aboriginal Objects Due Diligence Assessment (ADDA)</u>

The background research for the ADDA did not identify any Aboriginal cultural heritage sites within the Investigation Area. The ADDA included site inspections of the Investigation Area to verify the background research.

The following observations were made:

- The site inspection did not identify any Aboriginal Objects within the Investigation Area.
- Some areas of the Investigation Area have been impacted by historic ground surface disturbances including vegetation clearance and the use of land for housing development and farming. These disturbances have lowered the potential for undisturbed archaeological remains to be found in most of the Investigation Area.
- Other areas within the Investigation Area have not been less impacted by historic ground surface disturbances. This means undisturbed archaeological remains have a higher potential to be discovered in those areas within the Investigation Area.

Recommendations

Based on the ADDA, it has been recommended to prepare an Aboriginal Cultural Heritage Assessment (ACHA):

- An ACHA should be prepared by a suitably qualified archaeologist in accordance with the *Guide to Investigating, assessing reporting on Aboriginal cultural heritage in NSW* and the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* guidelines.
- The preparation of an ACHA is important because, should Aboriginal Objects and/or places be identified within the Investigation Area, an ACHA would be required to support an application for an Aboriginal Heritage Impact Permit (AHIP) under s.90 of the *National Parks and Wildlife Act 1974*.
- The proposed ACHA would also document consultation with the local Aboriginal community in accordance with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents* 2010 guidelines.

<u>Historic Heritage Constraints Assessment (HHCA)</u>

As part of the HHCA, background research and a site inspection were conducted to identify any physical evidence that could indicate archaeological resources, structures, or other works within or next to the Investigation Area.

From the background research and site inspections, no listed historical items were identified in the Investigation Area. Therefore, it is unlikely that the proposed rezoning will have an impact on the historical value within the Investigation Area.

Recommendations

The following is a summary of the recommendation outlined in the HHCA:

Rezoning can proceed with caution:

Should unexpected finds be encountered during the proposed re-zoning or subsequent works, works are required to cease until it is assessed by a qualified heritage professional. Should relics be discovered, the Heritage Council of NSW is to be informed immediately and their advice followed before works re-commence.

Conclusion

Based on the recommendations of these heritage studies, it is advised that further investigation of the Aboriginal cultural heritage values of the Investigation Area is required. No further assessment of the historic heritage values within the Investigation Area is needed, but caution is advised in the event of unexpected finds.

BUSHFIRE ASSESSMENT

Site and bushfire risk context

The site is on designated Bushfire Prone Land which is located south of the main Bargo township parallel to the M31 motorway and has significant areas of bushland immediately adjoining to the south and southeast sides of the site, including National Park and water catchment to the south separated by the motorway and local roads. The site is not connected to a larger urban area, with only bushland and larger lot rural development to the north and west and is considered isolated development. The Investigation area is connected to the wider local and regional road network by roads that are likely to be impacted by bushfire.

The location of the land and adjoining unmanaged bushland provides a significant risk that the site may be impacted by high intensity fire. The significant areas of bushland that will remain undeveloped mean the site is likely to be heavily impacted by landscape scale bushfires being driven by strong winds. There is potential for the site to be impacted from four sides with prolonged bushfire attack in the form of ember attack, smoke, radiant heat, and direct flame contact.

The Biodiversity Technical Investigation has identified most of the site as having high ecological value with very limited opportunities to undertake the significant clearing needed to create large areas suitable for commercial/industrial development, including the asset protection zones.

Major fires in the Sydney basin are driven by hot and dry winds from the west to northwest, with major flareups and damage associated with strong south to southwest wind changes. The potential for extreme bushfire weather driving large scale and intense bushfires into the local area is significant as evidenced by the Green Wattle Creek fire in 2019/20.

The site has potential to be impacted by bushfires igniting from any direction and is located on bushfire prone land with significant forest vegetation onsite and nearby. Bushfire intensity after ignition is related to the combination of fuel, slope, Fire Danger Weather and the extent of bushfire prone vegetation allowing the fire to fully develop.

There is little likelihood of the major bushland areas adjoining and nearby being rezoned or cleared and there are large areas of heavy fuel adjacent to the site.

Whilst slopes are modest they are also related to local riparian areas which must be retained.

Large extents of bushland extend for kilometres to the northwest, west, south and east allowing landscape scale fires to develop from multiple directions.

The site is highly likely to be impacted by significant bushfires into the future.

Conclusion

The site is exposed to high bushfire risk and is likely to be difficult to evacuate during a bushfire due to location and the likely impact of bushfires on the local road network across large areas. Any bushfire impacting on the site is likely to have a major impact on the residential areas in and around Bargo and any additional development on the site is likely to add complication to managing both local and landscape scale fires.

There is a history of significant bushfires in the local area, most recently the Green Wattle Creek fire that came to approximately 5 kilometres of the site in the 19/20 fire season. There is also a significant history of fires in the National Park and catchment areas to the south and east.

As Bushfire Prone Land, the proposal is subject to the requirements of Section 9.1 of the *Environmental Planning and Assessment Act 1979* which requires Council to consult with the Commissioner of the NSW RFS and to consider any comments by the RFS Commissioner. Chapter 4 – Strategic Planning of the RFS document *Planning for Bushfire Protection 2019* specifically looks at the requirements to support the rezoning of land. For industrial development, the APZs are minimal and could result in buildings being within the Flame Zone.

When assessed against best practice bushfire risk management, the planning principles outlined in the *National Strategy for Disaster Resilience*, and against the detailed requirements of the NSW Planning system the site does not have suitable characteristics to justify further pursuing a planning proposal with respect to bushfire.

Based on an assessment of current and future bushfire impacts on this site, the site is not considered suitable for further investigation and is unlikely to be supported by the NSW Rural Fire Service Commissioner.