State code 16: Native vegetation clearing

Table 16.2.2: General

Performance outcomes	Acceptable outcomes	Response
Clearing avoids or minimises impacts		
PO1 Clearing and adverse impacts of clearing do not occur unless the application has demonstrated that the clearing and the adverse impacts of clearing have been: 1. reasonably avoided; or 2. reasonably minimised where it cannot be reasonably avoided.	No acceptable outcome is prescribed.	Complies. Impacts and mitigation CSIRO (2013) identified a number of risks to the natural environment associated with irrigated agricultural development in the Flinders catchment with key issues as deemed relevant to the project identified as follows: • The risk of rising water table levels (e.g. salinity). • The risk for increased groundwater discharge to rivers in the Flinders catchment. • The risk of increases sediment, nutrients and pesticides loads from irrigation to the Flinders River. • The ecological implications of altered groundwater and surface water flow regimes on riparian ecology. These can be further developed and expanded on with respect to the project site environmental value as follows: • Risk of loss of biodiversity as a result of clearing regional ecosystems, fauna habitat destruction and loss of connectivity. • Direct impacts to conservation significant flora and fauna. • Soil erosion and degradation from broad scale clearing. • Over abstraction of groundwater aquifer and associated flow on ecological and social impacts. • Introduction of invasive species and diseases. The primary mitigation measure associated with these risks has been through incorporating 425 ha of natural features (i.e. watercourses, wetlands and regulated vegetation) with vegetated buffers of 'Least Concern' regional ecosystems generally in accordance with applicable State Codes as well as the outcomes of the NRA

Performance outcomes	Acceptable outcomes	Response
		(2019) land suitability study into the precinct master plan (refer Figure 3 1 of the IAR).Other impacts associated with farming operations will be mitigated through the implementation of widely practised, easily applicable standard conditions, guidelines and codes. These are discussed in detail within the IAR. Project need, justification and site selection The Shire has experienced negative average annual growth rates over the past decade (-1.9%) with an increasing negative trend in the last 5 years (-3.2%) (QGSO 2018). In line with their Guiding Principles, Flinders Shire Council (Council) is committed to taking actions that promote sustainable growth in the Shire and has identified that future development will be in establishing the Shire as an emerging centre for irrigated agriculture. Council consider that this project forms a necessary part of a package of works to encourage development within the Shire and stimulate economic growth. The project arises from the CSIRO report, Agricultural resource assessment for the Flinders catchment (CSIRO 2013) as part of the North Queensland Irrigated Agriculture Strategy (NQIAS). The report identified that the Flinders Catchment has potential to support significant areas of irrigated agricultural development however, there is more soil suited to irrigation than there is water to irrigate it (CSIRO 2013). Further, it determined that the high capital costs of water infrastructure might preclude reliable economic returns on irrigated farming however, with the introduction of third party investment in water infrastructure commercial returns on irrigated agriculture are possible (CSIRO 2013). CSIRO (2013) supported the development of irrigated agriculture in discrete irrigation areas of approximately 500 to 1,000 HA each distributed across the Flinders Catchment and classified the Hughenden area at a macro scale as being moderately suitable land with considerable limitations. These limitations were primarily with respect to access to a reliable source of water, with CSIRO (2013) further stating that analysis of land and water availability is required on a case-by-case basis. NAWS (2017) conducted further preliminary assessments of the potential for irrigated agricultural development on the site with consideration to irrigation water sources including the Flinders Alluvial Aquifer. NAWS (2017) assessment comprised the following components:

Performance outcomes	Acceptable outcomes	Response
		• Site visit to inspect topography and potential irrigation water storage sites • Initial assessment of the landscape and soil resources of the site • Desktop assessments of possible water storage infrastructure • Assessment of the feasibility of flood harvesting into an off-stream storage. • Examination of hydrogeological information to guide future groundwater investigation. NAWS (2017) inspection confirmed that the cracking clay soils in the south western part of the property have limited suitability for irrigated agriculture; however the alluvial soils of the north-east sector are suited to irrigated agriculture, having excellent drainage, good root depth and texture. The soils are also expected to have few chemical limitations NAWS (2017). These soils are therefore suited to a broad range of irrigated agricultural enterprises. NAWS (2017) has been a key driver in site selection. The objective of Council's project is to reduce barriers to entry for new irrigated agriculture investment in the Shire. Council has undertaken significant steps to facilitate the project through acquisition of Lot 168 on SP262319, a 918 HA property that formed part of the Reserve known as "15 Mile". Council consider the site as the most suitable location for the project given its proximity to the Flinders River, which provides water security and the most suitable agricultural soil types and its proximity to Hughenden, which is a major transport hub in the region. No other sites have been consider by Council, as there is a requirement for being in proximity to the river and for access to water and alluvial soils. Other cropping types have been considered by Council i.e. broad acre, high volume, low return crops. However, the preferred option of intensively grown, efficiently irrigated, low volume, high value horticultural crops will result in better returns and outcomes for the Shire. The "do nothing" option is also not suitable. If left as is, the Shire will continue down a path of negative population growth and an increasing median age. Precinct master plan (Clearing Requirements) The precinct master plan has been informed by a land suitability study (NRA, 2019) for the site. The land suitability study included an assessment for avocado in addition to table grapes and citrus. A copy of the land suitability study is provided at Appendix

Performance outcomes	Acceptable outcomes	Response
		A of the IAR. Five (5) land suitability classes were nominated in in the land suitability study in accordance with relevant guidelines. NRA (2019) concluded that land in Classes 1, 2 and 3 for a given use is regarded as 'suitable' for this purpose. Suitable land is defined by NRA (2019) as "land that can attain optimum, sustainable production with current technology, while minimising degradation to the land resource and environment in the short to medium and long term". Clearing for irrigated agriculture is limited to those areas identified as been suitable by NRA (2019). Clearing for supporting framing and water infrastructure will be required in addition to that required develop land identified as being suitable for irrigated agriculture. This can be summarised in the following key areas: • Eastern water infrastructure (i.e. Ring tank 1a and 1b, • Eastern farming infrastructure • Realigned access road • Central ring tank (Ring tank 2) • Overland flow dam • Western farm infrastructure and hillside dam As far as reasonably practicable the development and master plan has been located within grassland regional ecosystems whereby clearing exemptions apply. This is primarily reflected in the placement of the western farm infrastructure and hillside dam which is almost exclusively located within regional ecosystem 4.9.1c. Although it appears that there is a similar opportunity to locate the eastern farming infrastructure and / or eastern water infrastructure (ring tank 1a and 1b) within regional ecosystem 4.3.15, this is not feasible for a number of reasons. For the eastern water infrastructure (ring tank 1a and 1b), the proposed location has been selected as it provides the greatest opportunity to take advantage of existing topographical and insitu soils for construction of the facilities. It is anticipated that this location will minimise costs associated with construction through making use of readily available materials and reducing requirements for imported fill. It has also been selected so as to minimise the requirement for construction of lengthy pipelines from the drainage feature where pumps will be installed. For eastern farm infrastructure, the proposed location has been selected given its close proximity to the existing bore infrastructure and suitable agricultural land

Performance outcomes	Acceptable outcomes	Response
		thereby minimising costs associated with construction of power and other utility services. There are also some concerns with the topographical and insitu soil characteristics for infrastructure construction within the area mapped as regional ecosystem 4.3.15. As with the ring tank 1a and 1 b, the central ring tank (ring tank 2) has been located so as to provide the greatest opportunity to take advantage of existing topographical and insitu soils for construction of the facility. It is anticipated that this location will minimise costs associated with construction through making use of readily available materials and reducing requirements for imported fill. It has also been selected so as to minimise the requirement for construction of lengthy pipelines from the Flinders River where pumps will be installed. The location of the overland flow dam is a necessary requirement for it purpose of storing water. There are no feasible alternatives on the site, that would result in a reduce impact to vegetation or land identified as being suitable for irrigated agriculture. Impacts of the overland flow dam have been minimised by avoiding wetland and regulated vegetation within 100 m off a wetland. The realigned access road will have provision for a 12 m reserve and unsealed road off which direct access to site facilities will be provided with the alternative being direct access off Old Richmond Road. The width of the proposed road corridor as mapped is limited to 20 m. In accordance with the Flinders Shire Planning Scheme, the road will be constructed per Institute of Public Works Engineers of Australia (IPWEA) Standard Drawings generally including 7-8 m formation, 75 mm wearing course and table drains. Impacts have been avoided by diverting the realigned access road around the central wetland and regulated vegetation buffer as far as reasonably practicable while minimising impacts to suitable agricultural land and maintaining manageable block sizes. The current plan incorporates 100 m buffer from the defining bank of the Flinders River and mapped wetlands and 50 m buffers to mapped drainage features. The development has reasonably avoided and reasonably minimised the impacts associated with vegetation clearing.
Clearing on land in particular circumstances		
PO2 Clearing is consistent with any notice requiring compliance on the	No acceptable outcome is prescribed.	Not applicable

Performance outcomes	Acceptable outcomes	Response
land subject to the development application, unless a better environmental outcome can be achieved. Note: The discharge of the vegetation management requirements under the notice requiring compliance can only occur in conjunction with the better environmental outcome being legally secured. Further guidance on meeting the requirements of a better environmental outcome can be found in State Development Assessment Provisions Guidance Material: State code 16: Native vegetation clearing, Department of Natural Resources and Mines, 2018.		There are no notices requiring compliance on the land subject to proposed clearing
PO3 Clearing is consistent with vegetation management requirements for particular regulated areas unless a better environmental outcome can be achieved. Note: The discharge of the vegetation management requirements under the notice requiring compliance can only occur in conjunction with the better environmental outcome being legally secured. Further guidance on meeting the requirements of a better environmental outcome can be found in State	No acceptable outcome is prescribed.	Not applicable There are no vegetation management requirements for particular regulated areas on the land subject to proposed clearing

Performance outcomes	Acceptable outcomes	Response
Development Assessment Provisions Guidance Material: State code 16: Native vegetation clearing, Department of Natural Resources and Mines 2018.		
PO4 Clearing of a legally secured offset area: 1. is consistent with the offset delivery plan; or agreement for the offset area on the land subject to the development application; or 2. only occurs if an additional offset is provided that is consistent with the *Environmental Offsets Act 2014* and the relevant policy in the Queensland Environmental Offsets Policy, Department of Environment and Heritage Protection, 2014. Note: Reference to 'agreement' above includes the 'agreed delivery arrangement' for the offset area as well as instruments associated with the legally secured offset area. Clearing should be consistent with any agreement however described.	No acceptable outcome is prescribed.	Not applicable There are no environmental offset agreements or similar agreements on the land subject to clearing.

Table 16.2.3: Specific

Performance outcomes	Acceptable outcomes	Response
Clearing associated with wetlands (public safety, relevant infrastructure activities consequential development of IPA approval, a coordinated project, extractive industry)		

Performance outcomes	Acceptable outcomes	Response
PO7 Clearing maintains the current extent of vegetation associated with any natural wetland to protect: 1. bank stability by protecting against bank erosion; and 2. water quality by filtering sediments, nutrients and other pollutants; and 3. aquatic habitat; and 4. terrestrial habitat.	AO7.1 Clearing does not occur in a natural wetland or within 100 metres of the defining bank of any natural wetland. OR	Not applicable Refer AO7.2
	AO7.2 Clearing within 100 metres of the defining bank of any natural wetland: 1. does not occur within 50 metres of the defining bank of any natural wetland; and 2. does not exceed widths in table 16.3.1 in this code. OR	Complies As shown on the precinct master plan (refer Figure 3-1 of the IAR), there is limited clearing required within 100 metres of the defining bank of the oxbow wetland (for the proposed road realignment) however, • It does not occur within 50 metres of the defining bank; and • It does not exceed widths in table 16.3.1 of this code (i.e. 20 metres). The realigned access road will have provision for a 12 m reserve and unsealed road off which direct access to site facilities will be provided with the alternative being direct access off Old Richmond Road. The width of the proposed road corridor as mapped is limited to 20 m. In accordance with the Flinders Shire Planning Scheme, the road will be constructed per Institute of Public Works Engineers of Australia (IPWEA) Standard Drawings generally including 7-8 m formation, 75 mm wearing course and table drains. Impacts have been avoided by diverting the realigned access road around the central wetland and regulated vegetation buffer as far as reasonably practicable while minimising impacts to suitable agricultural land and maintaining manageable block sizes. Note, Bore #3 is existing infrastructure with an existing access track.
	AO7.3 Where clearing cannot be reasonably avoided, and clearing has been reasonably minimised, an offset is provided for any acceptable significant residual impact from clearing of vegetation associated with a natural wetland (matter of state environmental significance).	Not applicable Refer AO7.2

Performance outcomes	Acceptable outcomes	Response
Clearing associated with watercourses and drainage features (public safety, relevant infrastructure activities, consequential development of IPA approval, coordinated project, extractive industry)		
PO11 Clearing maintains the current extent of vegetation associated with any watercourse or drainage feature to protect: 1. bank stability by protecting against bank erosion; and 2. water quality by filtering sediments, nutrients and other pollutants; and 3. aquatic habitat; and 4. terrestrial habitat.	AO11.1 Clearing does not occur in any of the following areas: 1. inside the defining bank of a watercourse or drainage feature; and 2. within the relevant distance of the defining bank of any watercourse or drainage feature in table 16.3.2 of this code. OR	Not applicable Refer AO11.3
	AO11.2 Clearing within any watercourse or drainage feature, or within the relevant distance of the defining bank of any watercourse or drainage feature in table 16.3.2 of this code: 1. does not exceed the widths in table 16.3.1 of this code; and 2. does not occur within 10 metres of the defining bank, unless clearing is required into or across the watercourse or drainage feature. OR	Not applicable Refer AO11.3
	AO11.3 Where clearing cannot be reasonably avoided, and clearing has been reasonably minimised, an offset is provided for any acceptable significant residual impact from clearing of vegetation associated with any watercourse or drainage feature (a matter of state environmental significance).	Complies As shown on the precinct master plan (refer Figure 3-1 of the IAR), there is no clearing required within 100 metres of the defining bank of the Flinders River and 50 metres of the defining bank of any other drainage features. However, there will be some disturbance (up to 25 ha) through inundation associated with the proposed overland flow dam primarily associated with very sparse RE 4.3.4 (Eucalyptus coolabah open woodland on drainage lines and/or plains) / 4.3.10 Corymbia terminalis +/- Lysiphyllum gilvum and Acacia victoriae low open woodland on alluvium and grassland RE 4.9.1

Performance outcomes	Acceptable outcomes	Response
		(Astrebla lappacea +/- Aristida latifolia +/- Panicum decompositum grassland on Cretaceous sediments). The overland flow dam would unlikely retain water year round and is expected to create an environment similar to that of the existing oxbow lake wetland and small wetland downstream of the proposed overland flow dam. This is not expected to result in a significant residual impact to the MSES.
Connectivity areas (coordinated project)		
PO17 In consideration of vegetation on the land subject to the development application and on adjacent land: 1. sufficient vegetation is retained to maintain ecological processes and remains in the landscape despite threatening processes; or 2. where this not reasonably possible, the applicant provides an offset.	AO17.1 Clearing occurs in accordance with table 16.3.3 of this code. OR	Complies As shown on the precinct master plan (refer Figure 3-1 of the IAR), clearing occurs in accordance with table 16.3.3 of this code as follows, with 425 ha of vegetation associated with water courses and wetland and land identified as not being suitable for irrigated agriculture: • Clearing does not occur in areas of vegetation that are less than 50 hectares • Clearing does not reduce the extent of vegetation to less than 50 hectares • Clearing does not occur in areas of vegetation less than 200 metres wide • Does not reduce the width of vegetation to less than 200 metres; and • Does not occur where the extent of vegetation on the subject lot(s) is reduced to, or less than, 30 percent of the total area of the lot(s).
	AO17.2 Where clearing cannot be reasonably avoided; and clearing has been reasonably minimised; an offset is provided for any acceptable significant residual impact from clearing of vegetation that forms a connectivity area (a matter of state environmental significance).	Not applicable Refer AO17.1
Soil erosion (public safety, relevant infrastructure activities, consequential development of IPA approval, coordinated project, necessary environmental clearing)		
PO20 Clearing does not result in accelerated soil erosion within or outside the land the subject of the development application.	AO20.1 Clearing only occurs if an erosion and sediment control plan is developed and implemented to: 1. prevent accelerated soil erosion; or 2. where prevention is not possible, minimise accelerated soil erosion.	Not applicable Refer AO20.2

Performance outcomes	Acceptable outcomes	Response
	OR	
	AO20.2 The local government is the assessment manager for the development application. Note: For guidance on developing a sediment and erosion control plan, please refer to the Best Practice Erosion and Sediment Control Document, IECA, 2008.	Complies Council is the Assessment Manager for the application and such all works will be required to comply with the requirements of the Flinders Shire Planning Scheme inclusive of the wetland and water corridor overlay code which requires stormwater management (quality and quantity) during construction and operational phases. Notwithstanding, Council are committed to ensuring that appropriate provisions are in place for input into these controls from the State. To achieve this, Council propose as a condition of the Coordinator General's approval and prior to commencement of clearing works, a construction phase Erosion and Sediment Control Plan and operational phase Soil Conservation Management Plan will be developed by a suitable qualified and experience person and submitted to the Department for review. All temporary construction works will generally be managed in accordance with the International Erosion Control Association Best Practice Erosion & Sediment Control Guidelines and Catchment & Creeks Construction Site Managers Field Guide and Builders Field Guide, Environmental Protection (Water) Policy 2009 (EPP Water) and any other relevant approval and statutory requirement. These include requirements for: • Vegetation management • Soil management • Site rehabilitation • Drainage control (i.e. catch drains, diversion banks chutes, etc.) • Erosion control (i.e. mulching dust suppression, geo-fabrics and cellular confinement systems)

Performance outcomes	Acceptable outcomes	Response
		• Sediment control (i.e. stockpiles, entry/exit, filter dams, weirs and basins). Ultimately, a Soil Conservation Management Plan will be developed in accordance with the above referenced guidelines (as applicable) and more specifically Carey et al (2015) *Soil conservation guidelines for Queensland*. This will focus on the implementing best practice soil conservation measures for the life of the project. This is expected to include such measures as prescribed within Chapter 12 (Soil conservation in horticulture) for maintaining ground cover, managing run-off and environmental monitoring. If considered appropriate by the State, a consolidated construction phase Erosion and Sediment Control Plan and operational phase Soil Conservation Management Plan can be provided.
Salinity (public safety, relevant infrastructure activities, consequential development of IPA approval, coordinated project, extractive industry, necessary environmental clearing, fodder harvesting)		
PO22 Clearing does not contribute to or accelerate land degradation through waterlogging, or through the salinisation of groundwater, surface water or soil.	AO22.1 Clearing does not occur within 100 metres of a salinity expression area.	**Complies** Existing issues with soil salinity and sodicity within the precinct have been considered in site planning through the completion of the land suitability assessment (NRA, 2019). Clearing for irrigated agriculture is limited to those areas identified as having characteristics as follows: • Root zone salinity: Median salinity levels that are very low (Cl<50 mg/kg) throughout and effective rooting depth (ERD) > 1.5 m. Salinity curves in these area do not demonstrate a “salt bulge” and salinity characteristics confirm the landscape is subject to regular leaching and deep drainage towards the incised stream channel of the Flinders River (NRA, 2019). • Soil profiles: Profiles are non-saline [electrical conductivity (ECe) < ds/m, Cl<50 mg/kg], non-sodic [exchangeable sodium (ESP) <1%] moderately well-drained and moderately permeable. However, salinity and sodicity risks may be exacerbated through the application of poor quality irrigation water and / or accumulation of salts within the root zone as a result of the low volume trickle irrigation. To mitigate this issue, Council intend on developing a site specific Salinity Management Plan for the precinct. Council are committed to ensuring that appropriate provisions are in place for regulatory review. To

Performance outcomes	Acceptable outcomes	Response
		achieve this, Council propose the Coordinator General include as a condition of approval the requirement for a Salinity Management Plan to be developed by a suitably qualified and experienced person and submitted to the State for review prior to the commencement of clearing. The Salinity Management Plan will be developed with reference to relevant guidance material including but not limited the Salinity management Handbook (DERM, 2011). Notwithstanding this requirement, based on currently available information the risk of salinity to the project is considered low. Existing site soil conditions (i.e. not saline or sodic and moderately well-drained and permeable) and groundwater characteristics (with gradient of 0.008 northwards to the Flinders River) provide opportunity for leaching through well planned irrigation management and during rainfall events. The primary mitigation will be application of good quality irrigation water to cropping sourced from the Flinders River Alluvium and Flinders River during flow events supplemented in the dry season from the GAB Hutton formation. Water samples obtained from the recently constructed production bores and observation bores for water quality determination with results of laboratory analysis demonstrating that water quality (conductivity) varies from 332 - 960 µS/cm-1, (approximately 212 - 614 mg/l for total dissolved salts) and pH is in the neutral range of 6.3 to 7.5 (NAWS, 2019). This quality water would generally be considered low to medium salinity water (DPIF, 2005) as follows: • Low (EC <650 µS/cm-1) - generally suitable for use on all crops with all methods of water application, with little probability of salinity problem developing. • Medium (EC 650-1,300 µS/cm-1) - suitable for use on all but very low salt tolerance crops. Water can be used if a moderate amount of leaching occurs. Plants with medium salt tolerance can be grown, usually without special practices for salinity control. There is a slightly elevated risk with respect to water quality within the GAB Hutton formation. NAWS (2019) included a review of literature and found that water is typically less than 1,000 mg/l total dissolved salts. It is intended the water from the GAB bore will be mixed with the better quality alluvial or river water sources to produce irrigation water supply of acceptable quality for the intended crops (NAWS, 2019).

Performance outcomes	Acceptable outcomes	Response
		Managing irrigation water quality will be an important aspect of the Salinity Management Plan however, further investigative work including additional Flinders River Alluvium groundwater and subsequent GAB Hutton formation sampling and analysis will be required to inform any specific irrigation management requirements (i.e. blending water sources). Other key factors that will require consideration in developing irrigation management protocols within the Salinity Management Plan will include (DERM, 2017): • Considering characteristics of the soils in the area proposed for irrigation—in particular, soil structural stability and permeability. This information has been collated within the land suitability assessment (NRA, 2019). • Consider characteristics of plant species proposed for the irrigated area—in particular, salt tolerance. Some of this information has been collated within the land suitability assessment (NRA, 2019) including salinity thresholds for proposed cropping however, further analysis may be required to inform specific management options with respect to potential productivity decreases [per dS/m increase (%)] and percent (%) yields at various soil salinity (ECse) values. • Determine the likely leaching fraction of the soil and the consequent root zone salinity and amount of drainage below the root zone. This will inform the requirements for specific management options with respect to preventing excessive salt accumulation in the root zone. This may be achieved through application of excess good quality irrigation water following large rain events. • Estimate the effects of irrigation water sodicity on soil behaviour. RLA (2017) includes some one-off major ion analysis of Flinders River Alluvium groundwater. Sodium Adsorption Ratio (SAR) and Residual Alkalinity (RA) calculations should also be considered within the Salinity Management Plan to inform requirements for the management of the accumulation of sodium in soil and potential impacts to physical properties and cropping requirements. • Develop a comprehensive soil and groundwater monitoring program including • Soil quality (physical, chemical and biological indicators) inclusive of, soil moisture pH, EC and major ions.

Performance outcomes	Acceptable outcomes	Response
		• Groundwater at existing production and monitoring wells (refer table 3-6 of the IAR) inclusive of pH, EC and major ions. Consideration of these factors will provide for a comprehensive and integrated salinity Management Plan in accordance with best environmental and agricultural practice.
Conserving endangered and of concern regional ecosystems (public safety and relevant infrastructure activities, consequential development of IPA approval, coordinated project, extractive industry)		
PO23 Clearing maintains the current extent of endangered regional ecosystems and of concern regional ecosystems.	AO23.1 Clearing does not occur in an endangered regional ecosystem or an of concern regional ecosystem. OR	Complies The development does not include clearing within an endangered regional ecosystem or an of concern regional ecosystem.
	AO23.2 Total clearing of endangered regional ecosystems and of concern regional ecosystems combined does not exceed the widths prescribed in table 16.3.1 of this code. OR	Not applicable Refer AO23.1
	AO23.3 Total clearing of endangered regional ecosystems and of concern regional ecosystems combined does not exceed areas prescribed in table 16.3.1 of this code. OR	Not applicable Refer AO23.1
	AO23.4 Where clearing cannot be reasonably avoided, and clearing has been reasonably minimised, an offset is provided for any acceptable significant residual impact from clearing of endangered regional ecosystems and of concern regional ecosystems (a matter of state environmental significance).	Not applicable Refer AO23.1
Essential habitat (public safety, relevant infrastructure activities, consequential development of IPA approval, coordinated project, extractive industry, fodder harvesting)		

Performance outcomes	Acceptable outcomes	Response
PO24 Clearing maintains the current extent of essential habitat.	AO24.1 Clearing does not occur in essential habitat. OR	Complies The development does not include clearing within any essential habitat areas.
	AO24.2 Clearing in essential habitat does not exceed the widths prescribed in table 16.3.1 of this code. OR	Not applicable Refer AO24.1
	AO24.3 Clearing in essential habitat does not exceed the areas prescribed in table 16.3.1 of this code. OR	Not applicable Refer AO24.1
	AO24.4 Where clearing cannot be reasonably avoided, and clearing has been reasonably minimised, an offset is provided for any acceptable significant residual impact from clearing of essential habitat (a matter of state environmental significance).	Not applicable Refer AO24.1
Acid sulfate soils (public safety, relevant infrastructure activities, consequential development of IPA approval, coordinated project, extractive industry, necessary environmental clearing, necessary to control non-native plants or declared pests, managing thickened vegetation, encroachment)		
PO27 Clearing does not result in, or accelerate, disturbance of acid sulfate soils or changes to the hydrology of the location that will result in either of the following: 1. aeration of horizons containing iron sulphides; or 2. mobilisation of acid or metals.	AO27.1 Clearing does not occur in land zone 1, land zone 2 or land zone 3. OR	Not applicable Refer AO27.2
	AO27.2 Clearing in land zone 1, land zone 2 or land zone 3 in areas below the five metre Australian Height Datum only occurs where: 1. mechanical clearing does not disturb the soil to a depth greater than 30 centimetres; and 2. acid sulfate soils are managed consistent with the State Planning	Complies The Project area land zone has been derived from both geological mapping and field observations. The Project area is located in Land Zone 3 – recent Quaternary alluvial systems, including closed depressions, paleo-estuarine deposits currently under freshwater influence, inland lakes and associated wave-built lunette. Site topography ranges from approximately 300m AHD in the South-East to approximately 290m AHD in the North-West.

Performance outcomes	Acceptable outcomes	Response
	Policy, Department of Infrastructure, Local Government and Planning, July 2017, and with the soil management guidelines in the Queensland Acid Sulfate Soil Technical Manual, Department of Science Information Technology Innovation and the Arts, 2014. OR	
	AO27.3 The local government is the assessment manager for the development application.	Not applicable Refer AO27.2
Coordinated project – involving clearing for agriculture		
PO29 Clearing only occurs where the land is suitable for agriculture having regard to topography, climate and soil attributes.	No acceptable outcome is prescribed.	Complies Initial development crops planned for the precinct will comprise 150 ha of primarily citrus (75 ha) and table grapes (50 ha) and potential for avocado (25 ha). These will fulfil current market opportunities within Council's initial third party investor supply chains for major supermarkets within Australia and internationally. Cropping within the remaining developable area will ultimately be determined by future investors/growers and market demands. Council's requirements for future development will be intensively grown, efficiently irrigated, low volume, high value agricultural crops as these types of enterprises meet Council's goals of providing employment prospects for residents as well as encouraging migration of skilled workers to the Shire. To facilitate the IAR and address specific requirements of the SDAP *State Code 16: Native Vegetation Clearing*, Council commissioned a land suitability study (NRA, 2019) for the site. The land suitability study included an assessment for avocado in addition to table grapes and citrus. A copy of the land suitability study is provided at Appendix A of the IAR.

<table>
<tr><th>Performance outcomes</th><th>Acceptable outcomes</th><th>Response</th></tr>
<tr><td></td><td></td><td>Five (5) land suitability classes were nominated in in the land suitability study in accordance with relevant guidelines as described in table 3-2. NRA (2019) concluded that land in Classes 1, 2 and 3 for a given use is regarded as ‘suitable’ for this purpose. Suitable land is defined by NRA (2019) as “land that can attain optimum, sustainable production with current technology, while minimising degradation to the land resource and environment in the short to medium and long term”.

Table 3-2 NRA (2019) Adopted land suitability classes
<table><tr><th>Class</th><th>Definition</th><th>Description</th></tr><tr><td>1</td><td>Suitable land with negligible limitations</td><td>Highly productive land requiring only simple management practices to maintain sustainable production</td></tr><tr><td>2</td><td>Suitable land with minor limitations</td><td>Land with minor limitations that either constrain production or require more than the simple management practices of Class 1 land to maintain sustainable production.</td></tr><tr><td>3</td><td>Suitable land with moderate limitations</td><td>Land with moderate limitations that further constrain production or require more than the management practices of Class 2 land to maintain sustainable production.</td></tr><tr><td>4</td><td>Unsuitable land with severe limitations</td><td>Currently unsuitable land with severe limitation that preclude successful or sustained use under existing condition. Further changes in knowledge, economics or technology may alter this.</td></tr><tr><td>5</td><td>Unsuitable land with extreme limitations</td><td>Land with extreme limitation that preclude any possibility of successful or sustained use, either now or in the future.</td></tr></table></td></tr>
</table>

Performance outcomes	Acceptable outcomes	Response

		NRA (2019) established land use limitations to assess land suitability for the proposed uses (i.e. table grapes, citrus and avocado). The limitations were established with guidance from DNRME representatives and relevant published literature. For each land use (i.e. table grapes, citrus and avocado), NRA (2019) established eighteen (18) limitations as follows:
		• Climatic limitations: climate stress – heat, frost, temperature (minimum).
		• Landscape limitation: wind erosion, water erosion, flooding, salinity, discharge potential, microrelief, wetness, soil complexity, topographic complexity.
		• Soil profile limitations: infiltration – soil profile recharge, soil water availability, soil depth to physical root barrier, rockiness.
		• Soil physical limitations: surface soil conditions.
		• Soil nutrient limitations: nutrient balance – pH soil reaction trend.
		
		Decision rules were developed for each land use (i.e. table grapes, citrus and avocado) and each of the above references limitations with the framework used to assess irrigated agriculture suitability for the site (NRA, 2019).
		
		The land suitability assessment (NRA, 2019) found 370.4 ha of the site is suitable for irrigated table grapes and citrus and 311.0 ha is suitable for irrigated avocado production (refer Figure 3-2 through 3-4 and table 3-3). The following provides a brief summary NRA (2019) with respect to site land suitability for table grapes, citrus and avocadoes:
		• Table grapes and citrus:
		  ○ Production is not constrained by unsuitable climatic conditions (severe heat stress, frequent frost or insufficient or excessive chill factor) however, heat stress is a moderate limitation.
		  ○ Soil unit A1 and elevated occurrences of Soil Unit A2 (refer table 2-5) have soil and land characteristics suitable for agronomy and production.
		  ○ These soil units are deep, rarely flooded, non-saline, rock free and moderately well drained, with negligible to moderate subsoil constraints.

Performance outcomes	Acceptable outcomes	Response
		A2 variation relates primarily to differences in location and landscape position whereby lower elevations are subject to flooding, salinity and sodicity constraints. ○ A1 and A2 limitations for production include flooding, water erosion (A2), infiltration, plant available water capacity (PAWC) (A1 only) soil surface condition, discharge potential (A2 only) and wetness (drainage). • Avocado: ○ Production is not constrained by unsuitable climatic conditions (severe heat stress, frequent frost or insufficient or excessive chill factor) however, heat stress is a moderate limitation and would be expected to affect fruit set and harvest of the crop. ○ Soil unit A1 (refer table 2-5) has edaphic characteristics suitable for agronomy and production. ○ These soil units are deep, rarely flooded, non-saline, rock free and moderately well drained, with negligible to moderate subsoil constraints ○ A1 limitations for production include flooding, infiltration, soil surface condition and wetness. **Table 3-3 NRA (2019) Summary of the extent (ha) of suitable (Classes 1, 2 and 3) and unsuitable land (Classes 4 and 5) within the 15 Mile project area** Land suitability class / Table grapes (ha) / Citrus (ha) / Avocado (ha) Class 1 / 0 / 0 / 0 Class 2 / 0 / 0 / 0 Class 3 / 370.4 / 370.4 / 311.0 Class 4 / 220.5 / 220.5 / 194.7 Class 5 / 297.3 / 297.3 / 382.4

Performance outcomes	Acceptable outcomes	Response
PO30 For applications for irrigated crops, the owner of the land has, or may have, access to enough water for establishing, cultivating and harvesting the crops to which the clearing relates.	No acceptable outcome is prescribed.	**Complies** NAWS (2019) water resource development strategy describes the infrastructure required to harness current and proposed water sources for initial development and investigations required to support additional water sources to increase reliability of water supply for future development. NAWS (2019) strategy has been developed in the context of the NRA (2019) land suitability study in particular with consideration to climatic limitations including frost and heat stress. The following sections provide a summary of the NAWS (2019) water resource development strategy which assumed ultimate development of the site consisting of 110 ha of table grapes, 150 ha of citrus and 50 ha of avocado for a total developable area of 310 ha. This was based on the outcomes of the land suitability assessment (NRA, 2019) and environmental buffer requirements to watercourses and wetlands with the precinct. As outlined within section 3.1 of the IAR, further review the total developable area following subsequent master plan development has resulted in a minor reduction to the total available area of developable land to 305.7 ha. Therefore, annual irrigation requirements outlined within the following sections are to be considered slightly conservative. <u>Annual irrigation requirements</u> NAWS (2019) reviewed monthly Class A pan evaporation data to estimate the potential evapotranspiration for the proposed crops and made a range of assumptions to develop annual irrigation requirements for table grapes, citrus and avocado. A copy of the NAWS (2019) water resource development strategy is provided at Appendix A. Table grapes, citrus and avocado will be irrigated by well managed trickle or under tree, low-pressure micro-irrigation irrigation systems consisting of dual drip lines and mini sprinklers for climate control (NAWS, 2019).

<table>
<tr><th>Performance outcomes</th><th>Acceptable outcomes</th><th>Response</th></tr>
<tr><td></td><td></td><td>NAWS (2019) calculated annual irrigation and climate control rates for proposed cropping is summarised in Table 3 5. The total development annual water requirement is expected to be in the order of 3,395 ML/yr

Table 3-5 Cropping irrigation and climate control water requirements
<table><tr><th>Aspect</th><th>Table grapes</th><th>Citrus</th><th>Avocado</th></tr><tr><td>Irrigation (ML/ha/yr)</td><td>7.0</td><td>9.0</td><td>10.2</td></tr><tr><td>Climate control (ML/ha/yr)</td><td>6.5</td><td>0</td><td>1.0</td></tr><tr><td>Total (ML/ha/yr)</td><td>13.5</td><td>9.0</td><td>11.2</td></tr><tr><td>Initial development area (ha)</td><td>50</td><td>75</td><td>25</td></tr><tr><td>Initial development annual water requirement (ML/yr)</td><td>675</td><td>675</td><td>280</td></tr><tr><td>Total development area (ha)</td><td>110</td><td>150</td><td>50</td></tr><tr><td>Total development annual water requirement (ML/yr)</td><td>1,485</td><td>1,350</td><td>560</td></tr></table>
<u>Water sources</u>

There are four main water sources currently proposed for the project and to be considered within the scope of this IAR as follows:

• Flinders River Alluvium:
  ○ Flinders River Alluvium <1 km from Flinders River (450 ML/yr).
  ○ Flinders River Alluvium >1 km from Flinders River (1,038 ML/yr).
• Great Artesian Basin (720 ML/yr).
• Flinders River Surface Water (5,000 ML/yr).

These are discussed in the following sections in order of development precedence (i.e. order of establishment on the site in line initial and ultimate development of the site).</td></tr>
</table>

Performance outcomes	Acceptable outcomes	Response
		Flinders River Alluvium Extensive groundwater investigations in the south-eastern part of the site in 2015-2017 (RLA, 2017) and 2018 (RLA, 2018) have been completed on behalf of Council. This has included installation of a number of exempt groundwater bores for the purposes of testing the water production capacity, water production quality and hydraulic properties of the aquifer. Investigations have shown a relatively confined, shallow sand/gravel aquifer of good quality water that lies beneath the upper left bank of the Flinders River (NAWS, 2019). The aquifer is regulated in two ways generally being, < 1 km from the Flinders River, or > 1 km from the Flinders River. This delineation relates generally to the requirements of the Gulf Water Plan (refer section 6.3 of the IAR for regulatory assessment details) which prescribes groundwater in the aquifer under the Flinders River, or under land within 1 km of the Flinders River, is declared to be water in the watercourse requiring a water licence. Council hold an existing water licence 609134 for the take of 450 ML from the aquifer from within < 1 km of the Flinders River. No water licence is required for bores within the aquifer > 1 km from the Flinders River however, development approval in the form of operational works will be required as the network does not currently comply with the critical distances prescribed for exempt bores. RLA (2018) assessment of pump-test results indicates that the long-term, safe annual yield from the production bores located >1 km from the Flinders River is 1,038 ML per year. The groundwater bore network within the Flinders River Alluvium is shown on Figure 3 1 and described in Table 3 6 of the IAR. Copies of the RLA (2017 and 2018) reports are provided at Appendix A of the IAR. NAWS (2019) reported that samples were obtained from the recently constructed production bores and observation bores for water quality determination with results of laboratory analysis demonstrating that water

Performance outcomes	Acceptable outcomes	Response
		quality (conductivity) varies from 332 - 960 µS/cm-1, (approximately 212 - 614 mg/l for total dissolved salts) and pH is in the neutral range of 6.3 to 7.5. Great Artesian Basin Under the Water Plan (Great Artesian Basin and Other Regional Aquifers) 2017, unallocated water may be granted from the State reserve for a coordinated project declared under the SDPWO Act. Following coordinated project determination, council made application for an entitlement of 1,020 ML per year from the Great Artesian Basin (GAB). DNRME have advised that their current groundwater impact assessments required as part of the fixed price sale indicated a sustainable allocation of 720 ML/yr from the Hutton formation. These Terms of Sale have been accepted by Council. The 720 ML GAB water allocation will be accessed by means of a production bore designed to exploit the Hutton formation. GAB bore 1, will be constructed in close proximity to the initial development. Obtaining a significant entitlement from the GAB is was paramount to the success of the project, as all other available sources rely on river flow or run-off and are therefore subject to seasonal variation and may be negatively affected by prolonged droughts (NAWS, 2019). The groundwater bore network within the GAB is shown on Figure 3 1 of the IAR. NAWS (2019) included a review of literature with respect to water quality within the GAB Hutton formation and found that they are generally less than 1,000 mg/l total dissolved salts. It is intended the water from the GAB bore will be mixed with the better quality alluvial or river water sources to produce irrigation water supply of acceptable quality for the intended crops (NAWS, 2019). Flinders River surface water and ring tank dams Council hold a water licence 618019 for extraction of up to 5,000 ML/yr from the Flinders River when flow at the Richmond gauging-station, (DNRME station.

Performance outcomes	Acceptable outcomes	Response
		915008A), exceeds 1,500 ML per day. NAWS (2019) undertook a review of long term publically available DNRME data, with the mean and median number of days these conditions are met is 29 days and 24 days respectively. An extraction rate of about 208 ML per day (or 2407 L/s) would be required in order to access the 5,000 ML annual entitlement. NAWS (2019) considers it unlikely that investment in a pump-station of such capacity could be justified, as the 80% reliable pumping opportunity is only about 8 days per year. The IAS proposed a 450 ML off-stream storage, or ring-tank, in close proximity to the bore-field and the initial development. NAWS (2019) proposes that a 500 ML fully-enclosed ring-tank (1a) dam be constructed in the early years of the project's development, as irrigation water demands ramp-up. This facility would be supplied during Flinders River flow events (that exceeding the water-harvesting trigger level) by a typical water-harvesting installation comprising dual pump-units with a combined capacity of approximately 60 ML per day capable of extracting 500 ML per year with 80 % reliability (NAWS, 2019). As initial development crops mature and irrigation water demands reach peak levels or with further development of the site, a second similarly-sized storage cell will be added to the ring-tank (1b) dam to provide a combined capacity of approximately 1,000 ML. Water-harvesting capacity will be augmented by duplication of the original pump-station (i.e. 120 ML per day). The location of the proposed ring tank dam (1a and 1b) is shown on Figure 3 1 of the IAR. Additional provision is provided for future development of the balance of suitable agricultural land on the central and western portions of the block. This would likely include similarly sized 500 ML ring tank (2) and associated pumping infrastructure along with a 500ML Hillside Dam and associated pumping infrastructure. Indicative dimensions for water storage infrastructure is provided in Table 3 6 of the IAR. Ring-tank embankments will be in the order 3.5 m mean height, with 4 m crest

<table>
<tr><th>Performance outcomes</th><th>Acceptable outcomes</th><th>Response</th></tr>
<tr><td></td><td></td><td>and 3:1 (h:v) batters. The hillside dam embankments will be in the order of 4.5 m maximum and 3.75 m mean height with 4 m crest and 3:1 (h:v) batters.

Preliminary site investigations indicate that on-site materials appear to be suitable for dam construction however, permeable sub-soils at depth will need to be addressed. Requirements for imported material will determined during detailed design and subsequent secondary approval phases (i.e. operational works).

Table 3-6 Indicative dimensions for ring tanks and hillside dam
<table><tr><th>Structure</th><th>Area</th><th>Storage volume</th></tr><tr><td>Ring tank dam 1a</td><td>18.68 ha</td><td>500 ML</td></tr><tr><td>Ring tank dam 1b</td><td>18.76 ha</td><td>500 ML</td></tr><tr><td>Ring tank 2</td><td>18.74 ha</td><td>500 ML</td></tr><tr><td>Hillside dam</td><td>17.53 ha</td><td>500 ML</td></tr></table>
<u>Overland flow dam</u>

NAWS (2019) conducted a preliminary investigation of a potential dam-site on a drainage feature in the north-western part of the site (refer Figure 3 1 of the IAR). NAWS (2019) concluded that the drainage feature appears to have potential for development of a gully-dam to collect overland flow from a 2,200 ha catchment. Based on NAWS (2017a) preliminary site assessment and information contained with the NRA (2019) land suitability assessment, NAWS (2019) concluded that on-site materials appear to be suitable for earth-dam construction.

Development of the site is limited by its proximity to Old Richmond Rd and the presence of permeable, sandy loam in the upper gully banks which may limit the available storage depth however, it is considered that a volume of 220 to 250 ML is achievable (NAWS, 2019). Requirements for imported material will determined during</td></tr>
</table>

Performance outcomes	Acceptable outcomes	Response
		detailed design and subsequent secondary approval phases (i.e. operational works). The indicative area of the overland-flow dam is 18.13 ha.