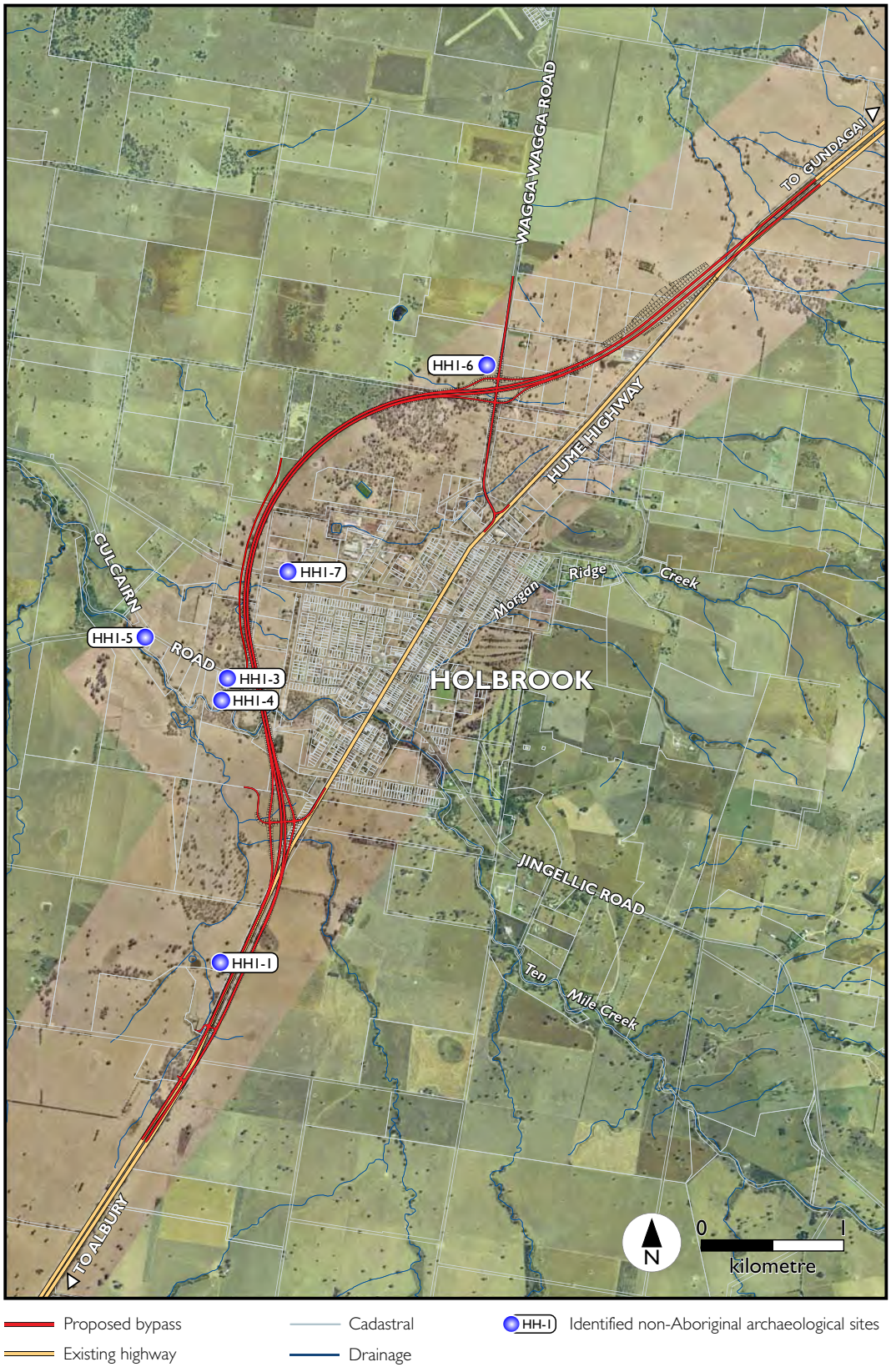

Figure 10-5 **Location of identified non-Aboriginal heritage sites/items in the assessment area**

10.2.4 *Assessment of significance*

An assessment of significance seeks to understand and establish the importance or value that a place, site, or item may have to the community at large. A NSW heritage place, item or site may be assessed as having local, state, national or world significance. An assessment of significance has been carried out for all six items identified in the assessment area. Each item has been assessed against the NSW Heritage Council's seven assessment criteria (A-F), the results of which are summarised here in statements of significance.

HHI-1 — Montpellier shearer's quarters

The Montpellier shearer's quarters are located to the west of the project, south of Ten Mile Creek. It consists of a timber framed structure set on wooden piers to elevate the structure off the ground. The structure includes three doors and four windows on its eastern side, and two windows on its western side. The walls and roof are composed of corrugated iron. The structure is in a state of disrepair. The date of the structure is unknown; however, it is thought to date to the early 1900 period.

The Montpellier shearer's quarters provide information on the nineteenth century and twentieth century building practices and types of building materials used in the local Holbrook area. Specifically the original fabric of the structure is representative of rural shearing structures in the local area. Its internal layout has the potential to indicate any local variation in shearing practices and potentially individual shearer's habits.

The item is of local significance.

HHI-3 — Hereford stud homestead

HHI-3 Hereford stud homestead is located to the west of the project on Culcairn Road. It is dated to approximately 1900. The structure is a single storey multi-roomed red brick building with chimney, angled corrugated metal roof and ground level veranda surrounded with an overhanging shelter.

HHI-3 has heritage significance as an example of late nineteenth and early twentieth century homestead farm and domestic structure. Its intact nature demonstrates quality in early building in Holbrook and it has the potential to contribute to knowledge relating to farming settlement in the area.

The item is of local significance.

HHI-4 — Historic dairy and well

The historic dairy and well is located approximately 100 metres south of Hereford stud homestead HHI-3, on the same property. The date of the dairy and well is unknown; however, the dairy is constructed of the same red brick material as the homestead, and therefore, is likely to be contemporary. The depth of the well could not be safely determined.

HHI-4 is associated with the Hereford stud homestead HHI-3 and likely dates to c.1900, it has significance as an example of a late nineteenth and early twentieth century rural domestic structure. It has the potential to contribute to knowledge relating to farming settlement in the area, including management and water procurement.

The item is of local significance.

HHI-5 — Potential site of the old homestead

HH1-5 is the potential site for an earlier (and/or former) homestead building, on the same property as the Hereford stud homestead. It is an area of archaeological potential located west of the project. There are domestic historical surface artefacts in this area and these are likely to be associated with any potential archaeological homestead structure.

The potential archaeological remains at this site have the potential to provide information on the nineteenth century and twentieth century building practices and types of building materials used in the area. The cultural deposits associated with any ruins have the potential to provide information on the types of domestic and farming implements used on the property.

The item has archaeological research potential and is likely to be of local significance.

HHI-6 — Historic artefact scatter and mound

The historic artefact scatter and mound is located on the Wagga Wagga Road, in the north of the project. The artefact scatter extends over an area of approximately 50 metres in diameter. Surface artefacts were recorded, including one clear glass bottle circa 1880 – 1935, clearly marked with the name 'Germantown' on its side. Associated with this artefact scatter is a grassed over raised mound. The artefacts lie on top of this mound. It is likely that additional artefacts and other archaeological deposits and remnant structures exist within the mound. Anecdotally the landowner identified this mound as a former Cobb & Co. station. There is no direct historical documentation to verify the landowner's interpretation of the site.

Site HHI-6 has the potential to contribute to our understanding of the late nineteenth and early twentieth century manufacturing and distribution techniques used in Holbrook. Items identified include locally produced Codd bottles associated with E. W. Nolan. The potential association this scatter has with a Cobb and Co. station means it has the potential to provide insight into both transport and distribution of goods and people to and from Holbrook and the resultant development of the local and regional economy.

The artefact scatter is of local significance. The mound has archaeological research potential.

HHI-7 — Culcairn to Holbrook rail line (non-operational)

The non-operational Culcairn to Holbrook rail line forms part of the rail line built in 1902. The rail line was in use until 1975 and the metal rail line has since remained in situ. It generally runs east to west, with a portion under an existing paved road. No known associated built heritage structures are located in the assessment area. Items such as wooden sleepers and signal posts are likely to be present along its length.

HHI-7 contributes to our understanding of regional NSW transportation history as an example of early twentieth century rail building techniques. This branch line was important for moving people and goods and developing the local and regional economy.

The item is of local significance.

10.2.5 *Non-Aboriginal heritage impacts*

Items HHI-1, HHI-3, HHI-4 and HH1-5

Montpellier shearer's quarters (HHI-1), Hereford stud homestead (HHI-3), Historic dairy and well (HHI-4), and the potential site of the old homestead (HH1-5) are all located outside of the construction site boundary. They would not be directly impacted during construction or operation of the project. However, given their proximity to the project, there is potential for accidental construction and ancillary work impacts if they are not adequately protected.

Indirect impacts to these non-Aboriginal heritage items include the potential loss of visual landscape.

Items HHI-6 and HHI-7

The project would directly impact two non-Aboriginal heritage items. These are the Historic artefact scatter and mound (HHI-6) and the non-operational Culcairn to Holbrook rail line (HHI-7).

The non-operational rail line is considered to be of local heritage significance and does not pose a significant heritage constraint to the project. The project would impact on a small proportion of the rail line, leaving the majority in situ elsewhere.

The artefact scatter (HHI-6) is of local heritage significance; however, the associated mound represents an area of potential archaeological deposit. A program of archaeological testing across HHI-6 is proposed to determine the extent, condition and significance of any archaeological resource present.

10.2.6 *Management of impacts*

Table 10-6 identifies mitigation and management measures that would be implemented for non-Aboriginal heritage impacts of the project. These measures have been incorporated into the draft statement of commitments in Chapter 11.

Table 10-6 Non-Aboriginal heritage mitigation and management measures

Potential impact	Mitigation and management measure
Pre-construction	
Direct and indirect impacts to non-Aboriginal heritage	▪ Manage impact to non-Aboriginal heritage through the CEMP for the project. A non-Aboriginal heritage management plan would be developed in consultation with the Heritage Branch, Department of Planning. ▪ Prior to the commencement of construction engage an appropriately qualified archaeologist to prepare a detailed research design and excavation methodology for the historic artefact scatter and mound (HHI-6), in consultation with Heritage Branch, Department of Planning. Carry out archaeological excavation on site HHI-6 to determine the nature, extent and condition of its archaeological potential. ▪ Implement relevant mitigation for impact on the historic artefact scatter and mound (HHI-6), prior to the commencement of construction works. Mitigation would be developed in consultation with Heritage Branch, Department of Planning. ▪ Implement relevant mitigation (archival record and archaeological monitoring) for impact on the non-operational Culcairn to Holbrook rail line (HHI-7), prior to the commencement of construction works and during the course of its removal. Lodge the archival record with the Heritage Branch, Department of Planning, Greater Hume Shire Council and the RTA Archives. ▪ Prior to the commencement of construction activities, fence all identified historic items within the construction site boundary.
Construction	
Construction works uncovering previously unidentified non-Aboriginal heritage	▪ If any previously unidentified non-Aboriginal heritage items are encountered, immediately stop all works that would potentially impact the find. Notify Heritage Branch, Department of Planning of find (under Section 146 of *Heritage Act 1977*). Do not recommence works until unexpected finds procedure has been followed.

Potential impact	Mitigation and management measure
Operation	
Indirect impacts on non-Aboriginal heritage	▪ Consider the heritage values of Montpellier Shearer's quarters (HHI-1), historic house (HHI-3) and historic dairy and well (HHI-4) in consultation with relevant landowner(s) and a suitably qualified heritage specialist as part of the landscaping and urban design.

10.3 Soils and water quality

10.3.1 Assessment approach

The assessment of soils and water quality included the following:

- A desk-based soils assessment to gain an understanding of the soil conditions, the erosion and sedimentation potential of the soil, to identify risks and constraints and appropriate erosion and sedimentation control.
- Surface water quality sampling for turbidity, suspended solids, major dissolved cations and anions, dissolved and total metals, nutrients, BTEX and total petroleum hydrocarbons (TPH). The results of water quality sampling were compared to the *ANZECC Guidelines for Marine and Freshwater Quality* (ANZECC 2000) (ANZECC guidelines) for the three key water uses in the area (aquatic ecosystems, irrigation and livestock water supply).
- Groundwater borehole sampling for temperature, electrical conductivity (EC, salinity), pH, dissolved oxygen, total dissolved solids and redox potential. The results of water quality sampling were compared to the ANZECC Guidelines and the *Australian Drinking Water Guidelines* (ADWG) (NHMRC 2004).

10.3.2 Existing environment

Soils

Four soil landscape units (Doughty 2003) were identified in the assessment area (shown in Figure 10-7):

- Yarra Yarra soil landscape unit.
- Cookardinia soil landscape unit.
- Billabong Creek soil landscape unit.
- Mountain Creek soil landscape unit.

Table 10-7 provides a summary of the geology, soil type and soil characteristics of the three soil landscape units.

Table 10-7 Summary of soil landscape units in the assessment area

Geology	Soil types[1]	Soil characteristics[2]
Yarra Yarra soil landscape unit		
Colluvium and slope wash originating from adjacent granite/gneiss geology.	▪ Upper slopes: deep imperfectly drained red, brown and yellow Chromosols (Podzolic soils). ▪ Lower slopes: deep, imperfectly drained brown and grey Sodosols and Kurosols (Soloths and Solodized Solonetz soils). ▪ Open drainage depressions: Bleached mottled brown and yellow Sodosols (Yellow Solodics and Solodized Solonetz soils). ▪ Fans: very deep (to 5 metres) well drained Orthic Tenosols (Earthy Sands).	▪ Soil loss class 3 (low to moderate erosion hazard). ▪ High clay content (highly dispersible 'Type D' soils). ▪ Highly erodible (K-factor 0.04). ▪ Soil texture: topsoils are clayey sands to sandy loams. The subsoils are light-medium to sandy clays. ▪ Soil hydrologic group 'Class D' — very high runoff potential. ▪ Subsoils exhibit moderate to slow permeability with localised water logging. These soils have very high run off potential.
Cookardinia soil landscape unit		
Based on Ordovician-Silurian age granite. At depth these soils grade into a weak substrate of highly weathered granite.	▪ Crests and upper slopes: red Chromosols and Kurosols (red Podzolics). ▪ Mid-slopes: brown Chromosols and Kurosols (yellow Podzolics). ▪ Drainage depressions: yellow and brown Sodosols (Solodics).	▪ Soil loss class 3 (low to moderate erosion hazard). ▪ High clay content (highly dispersible 'Type D' soils). ▪ Highly erodible (K-factor 0.04 to 0.06). ▪ Soil texture: topsoils are clay loams. Subsoils are clay loams grading to sandy clay loams. ▪ Soil hydrologic group 'Class D' — very high runoff potential. ▪ Subsoils have the potential to be unstable if left uncovered. The very high K-factor value indicates a higher level of invert protection should be applied.

Geology	Soil types[1]	Soil characteristics[2]
Billabong Creek soil landscape unit		
Alluvial deposits of sediments derived from upstream Ordovician metasediments and granite and gniess geologies. The alluvium consists of inter-banded layers of clay, silt, sand and gravels in the floodplain and ancient channel deposits and alluvial terraces of the Billabong Creek landscape to the north of Holbrook.	▪ Brown Sodosols (Soloths).	▪ Soil loss class 3 (low to moderate erosion hazard). ▪ High clay content (highly dispersible 'Type D' soils). ▪ Highly erodible (K-factor 0.05). ▪ Soil texture: topsoils are sandy loams. The A2 horizon soils are silty loams, and subsoils are light clays. ▪ Soil hydrologic group 'Class D' — very high runoff potential. ▪ Subsoils have the potential to produce significant quantities of sediment once soils are exposed. The very high K-factor value indicates a higher level of invert protection should be applied.
Mountain Creek soil landscape unit		
Similar alluvial deposits as that found in the Billabong Creek soil landscape unit.	▪ Higher, older terraces: very deep (>1.5 metre) brown, yellow and grey Sodosols (Soloths). ▪ Younger, lower terraces: yellow and brown Dermosols (yellow and brown Earths). ▪ Recent alluvial channels: Stratic Rudosols (Alluvial soils).	▪ Soil loss class 3 (low to moderate erosion hazard). ▪ Highly erodible (K-factor 0.04 to 0.06). ▪ Soil hydrologic group 'Class D' — very high runoff potential. ▪ Topsoils show signs of sodicity and are hydrophobic (water repellent) potentially leading to increased runoff rates. ▪ Subsoils have the potential to produce significant quantities of sediment once soils are exposed. The very high K-factor value indicates a higher level of invert protection should be applied.

Source: Wild and Jenkins (2003), *The Soil Landscapes of the Tarcutta 1:100,000 sheet*, Unpublished Soil Landscape Report. Department of Land and Water Conservation

Notes: 1. Australian Soil Classification System (Great Soil Groups).

2. K-factor is a measure of the susceptibility of soil particles to detachment and transport by rainfall and runoff. K-factor ranges from 0.005 to 0.075, where anything above 0.04 can be considered highly erodible. The K values identified in the table relate to the top of the B horizon (assuming that topsoil is stripped and stockpiled), as this will be the soil profile most exposed to rainfall.

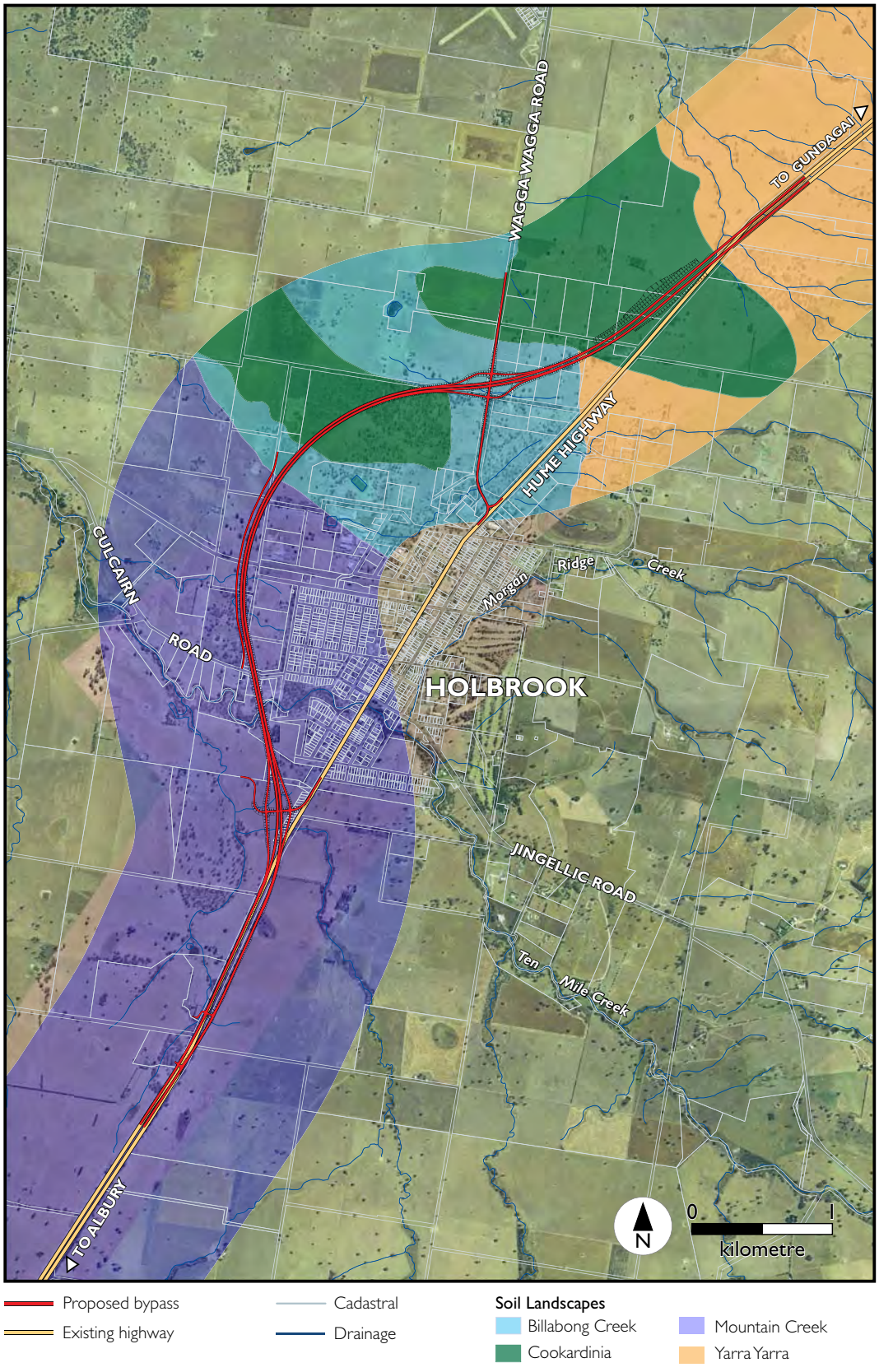

Figure 10-6 **Distribution of soil landscape units in the assessment area**

Water quality

Surface water

There are no long-term detailed water quality records for the locality. Electrical conductivity (EC, µs cm^{-1}) is regularly recorded by DECCW at its stream gauge networks in Ten Mile Creek, located approximately 1.5 kilometres upstream of the existing Hume Highway crossing in Holbrook. Since January 2002, the mean EC recorded in Ten Mile Creek at gauge 410187 was 564.33 µs cm^{-1}, with a maximum value of 1709.7 µs cm^{-1} and a minimum value of 0 µs cm^{-1} (http://www.waterinfo.nsw.gov.au, accessed 14 May 2009). The mean EC value is over the ANZECC (2000) water quality guidelines for fresh water.

A further one off sampling event was undertaken in October 2008 to provide additional information regarding existing water quality.

Samples were collected from two locations on Ten Mile Creek and from four farm dams located in the assessment area. During the sampling event, Ten Mile Creek was noted to primarily consist of a series of pools with minimal surface flow.

The sampling results were compared to guideline values for the three key water uses in the area (aquatic ecosystems, irrigation and livestock water supply) provided in both the DECCW catchment water quality objectives and the ANZECC guidelines.

In summary, the results of the sampling indicated:

- Physical parameters:
  - pH — all samples were within guideline values for protection of aquatic ecosystems.
  - EC (a measure of salinity) — samples were within guideline values in dams. Samples collected in Ten Mile Creek indicated elevated EC, with values recorded exceeding the guideline values for protection of aquatic ecosystems, yet within guideline values for irrigation and livestock water supply.
  - Dissolved oxygen — all samples were within guideline values for protection of aquatic ecosystems.
  - Turbidity — samples exceeded guideline values for protection of aquatic ecosystems at all locations except one site in Ten Mile Creek.
- Nutrients:
  - Total nitrogen — all samples exceeded guideline values for protection of aquatic ecosystems. Two samples exceeded guideline values for irrigation water supply.
  - Total phosphorus — all samples exceeded guideline values for protection of aquatic ecosystems and irrigation water supply.
- Metals —cobalt and lead levels were within guideline values. Zinc concentrations exceeded the guideline value for ecosystem protection, but were within guideline values for irrigation and livestock water supply.

Increased nutrient levels could be attributed to the land use in the area. The surrounding area around Holbrook is used for grazing and cropping. Fertilisers are commonly used to improve pastures and increase the fertility of land for crops, with runoff during higher rainfall into local dams and creeks contributing to increased nutrient levels.

Groundwater

Groundwater bores were sampled for water quality field parameters to establish baseline values of water quality. The results indicate groundwater quality was generally within ANZECC guidelines and ADWG, with the exception of three bores, which had EC values over the ANZECC (2000) guidelines. Groundwater in the alluvial granite aquifers ranges from fresh to brackish.

Oxygen saturation levels were outside the ANZECC (2000) and ADWG (2004) guidelines range at the majority of bores.

The water type indicated a dominance of sodium chloride in the chemical composition. This indicates that there is possible recharge from fresh water sources, including rainfall recharge and surface water. A bicarbonate component was also present, indicating that the chemistry of the water is being affected by the surrounding geology. Dissolved manganese concentrations exceeded ADWG (2004) aesthetic guidelines at one bore location. Dissolved iron concentrations were within ADWG (2004) guidelines.

Dryland salinity mapping in the area indicated no areas of salinity hazard around Holbrook. The steep granite intrusions to the north, north-west and east of Holbrook are not prone to saline discharges (PB 2008b). While not mapped as a salinity hazard, some water logging caused by the existing Hume Highway has been recorded in the Upper Billabong Creek catchment (near Holbrook) and this has contributed to small isolated patches of dryland salinity.

10.3.3 Construction impacts

Soils and surface water

The primary potential impact to surface water quality during construction would result from sedimentation as a result of land disturbance. Table 10-8 identifies that soils have a high erosion potential. Water moves into and through these soils very slowly when thoroughly wetted. They shed runoff from most rainfall events. This, in combination with the high erosion potential, could result in sediment and construction materials and pollutants being transported into dams and watercourses, affecting surface water quality.

These finer particle type soils tend to remain in suspension for longer periods of time, and hence there is a greater risk of sediment loads spreading further downstream from the construction area than if the sediments were larger. Increased sedimentation of waterways can smother benthic habitats and organisms, and can increase levels of nutrients, metals and other potential toxicants that attach to the sediment particles.

Construction works would be undertaken within Ten Mile Creek. This work would have potential short-term impacts on surface water quality.

Other pollutants that could potentially impact surface water quality during construction include:

- Hydrocarbons and chemical as a result of spills and leaks from construction vehicles or fuels/chemicals stores on construction sites.
- Oils and greases from construction equipment.
- Nutrients attached to sediment particles from fertilisers used in landscaping works.
- Waste water generated from construction sites.
- Gross pollutants/general litter from construction sites.

Groundwater

Accidental spills or leakage from construction vehicles and equipment have the potential to contaminate groundwater aquifers if appropriate controls are not put in place. Groundwater could potentially become contaminated with road construction materials, such as fuels, lubricants and hydraulic oils. This may impact adjacent users including the town water supply.

10.3.4 Operational impacts

The project would result in one small cut batter and a number of fill embankments as the project passes through low hills and the Ten Mile Creek floodplain (refer Section 5.3.5). Given the high erosion potential of soils affected by the project, these slopes would require effective stabilisation.

The operation of the project may facilitate the movement of polluted stormwater runoff into the adjacent environment. The primary stormwater pollutants associated with the operation of freeways and rural roads include:

- Gross pollutants and litter.
- Sediment (eg pavement wear, vehicles, maintenance activities).
- Nutrients (eg fertiliser applied to landscaping).
- Heavy metals from vehicle wear and tear.
- Petroleum hydrocarbons from vehicle spills and leaks.

The pollutants identified above would have the greatest impacts during small rainfall events following prolonged dry periods. Such situations allow pollutants to accumulate on the road surface during dry weather with the small rainfall event washing a concentrated 'first flush' of pollutants to receiving waterways while stream flow is low. It is noted that typical flows in the Ten Mile Creek catchment are small. This indicates a higher risk of pollutants generated from road runoff impacting local waterways as small flows result in less dilution within the waterways.

Crashes involving vehicles transporting chemicals and/or other dangerous goods may result in spills, which may impact the quality of the surrounding waterways.

There is potential for sedimentation impacts to occur during operation of the project at the twin bridges across Ten Mile Creek, and at culvert crossings. Piers on the bridges would provide potential locations for local sedimentation and scour. Sedimentation and scour may also occur at the entrance and exit of culverts. As with construction impacts, the fine-particle silts and clays present in the soils affected by the project would have the potential to spread further downstream as suspended sediments transported via flow.

10.3.5 Management of impacts

Table 10-8 identifies mitigation and management measures that would be implemented for soils and water quality. These measures have been incorporated into the draft statement of commitments in Chapter 11. Measures associated with the management of hazardous materials are provided in Section 10.6.

Table 10-8 Soils and water quality mitigation and management measures

Potential impact	Mitigation and management measure
Construction	
Erosion of soils	▪ Stabilise exposed areas progressively.
Reduction in surface water quality	▪ Develop and implement primary and progressive erosion and sediment control plans through the CEMP for the project in accordance with *Soils and Construction: Managing Urban Stormwater* (Landcom 2006) and *Managing Urban Stormwater: Soils and Construction, Volume 2D, Main Road Construction* (DECC 2008b). ▪ Engage a soil conservation specialist to provide advice on erosion and sedimentation control. ▪ Contain spills immediately. Use bunded areas for storage of potentially hazardous and/or contaminating materials and activities.
Operation	
Reduction in surface water quality	▪ Install structural and non-structural measures to control road runoff into environmentally sensitive areas (Ten Mile Creek). ▪ Implement scour protection works at proposed bridge abutments and piers, and watercourse crossings.

10.4 Visual amenity and landscape

10.4.1 Assessment approach

The visual amenity and landscape assessment built on the *Hume Highway Holbrook Bypass Preliminary Urban/Landscape Design and Visual Issues Investigation* (RTA 2008f). The assessment was undertaken in accordance with the objectives, principles and recommendations of the *Hume Highway Urban Design Framework, Prestons (WM7) to Albury* (RTA 2009b) (refer Section 5.2.2), and the RTA's urban and regional design practice notes, *Beyond the Pavement* (RTA 1999b) and *Guidelines for Landscape Character and Visual Impact Assessment* (RTA 2009c). The assessment included:

- The objectives of the *Hume Highway Urban Design Framework* were adopted and used as the primary basis for evaluating the project.
- The visual impact area extended one kilometre from the outside boundary of the construction site boundary. This was considered the most sensitive area for visual change to both the existing landscape character and viewpoints. The main viewpoints within this one kilometre boundary were identified:
  - The 'sensitivity' and 'magnitude of change' was assessed for each identified viewpoint and was ranked either low, low to moderate, moderate, moderate to high or high.
- The visual catchment for the project was divided into six landscape character units: the northern rural landscape unit, the former Town Common landscape unit, the industrial landscape unit, the Holbrook urban area landscape unit, the Ten Mile Creek landscape unit and the southern rural landscape unit (see Figure 10-7).
  - The 'sensitivity' and 'magnitude of change' was assessed for each identified landscape unit and these were combined to provide an overall ranking of the impact to the landscape character.

10.4.2 Existing landscape and views

Landform, land use and scenic quality

The Hume Highway is the primary road transport corridor route between Sydney and Melbourne. It passes through rural landscapes characterised by sheep and cattle grazing, bushland and cropping areas. The landform along the section of highway that includes Holbrook is predominantly undulating, with low-lying hills and is dominated by cleared agricultural land with scattered paddock trees.

The existing highway provides a wide streetscape in the centre of Holbrook with few street trees. Along the highway are a variety of shops, cafes, historic churches, community facilities, motels and a caravan park. The town's main residential area extends both east and west of the highway creating a central residential precinct.

The scenic quality of the landscape around Holbrook is generally moderate and is typical of the landscape along much of the Hume Highway. There are views of distant hills to the south and north. The Cromer Hills and Morgans Ridge are clearly seen to the east and provide a visual reference point for those travelling along the existing highway. Mount McKenzie to the south is also a strong local landmark that can be seen when travelling south along the existing highway.

The most visually sensitive areas along this section of the highway are the residential areas within the immediate town area and Ten Mile Creek.

Key viewpoints

A total of 20 key viewpoints (outlined in Table 10-9) were identified within one kilometre of the construction site boundary. These viewpoints are identified in the visual environment analysis plan shown in Figure 10-7.

Northern rural landscape unit

This landscape unit is located to the north of the Wagga Wagga Road. The landform varies from undulating to rolling, with sparse vegetation cover. Many of the residential properties in this unit are situated on local highpoints. The unit includes a section of the existing highway, including a corridor of native vegetation, some houses and a truck stop. To the east, Morgan's Ridge can be seen from most of this unit.

The scenic quality of this landscape unit is moderate. The visual sensitivity is low, as it is a common landscape, and is not dominated by vegetation. There are no dramatic landscape features or landform changes.

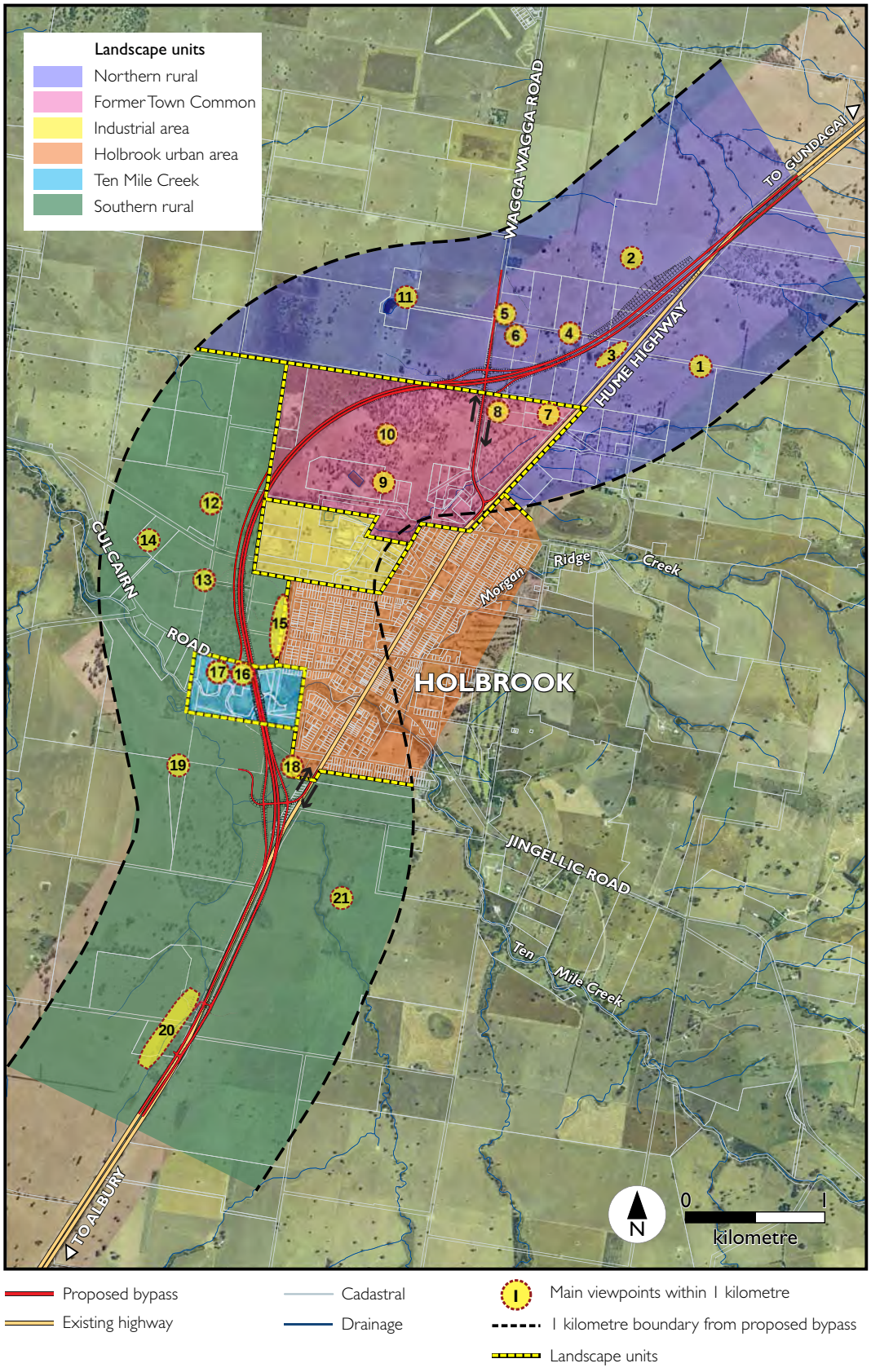

Figure 10-7 **Visual environment analysis plan**

Former Town Common landscape unit

This landscape unit includes the former Town Common, an area of land historically used as a common grazing area. The unit includes these grazing paddocks, the Holbrook Cemetery, water treatment plant and the Holbrook tip. The landform is gently undulating to flat. The majority of the unit consists of paddocks used for grazing, with a high percentage of tree cover.

The scenic quality of this landscape unit is moderate with the vegetation cover making most views enclosed. The visual sensitivity is moderate, due to the extent of native vegetation present.

Industrial area landscape unit

This landscape unit includes the industrial area of Holbrook, situated between the town's western residential edge and the project. The area includes a number of large industrial land uses, including a sawmill and concrete works. The landform is flat and there is little vegetation.

The scenic quality and visual sensitivity of this landscape unit are low. Views to this landscape unit are limited to local roads immediately around it and the eastern edge of the former Town Common.

Holbrook urban area landscape unit

This landscape includes the residential streets of Holbrook. It has a flat landform.

The visual sensitivity of this landscape unit is high due to the large number of viewers and the residential land use.

Ten Mile Creek landscape unit

This landscape unit includes the Ten Mile Creek crossing, and is typical of an urban fringe area. It includes a number of small industrial and residential properties immediately south of Culcairn Road. The landscape along the creek is relatively flat with dense vegetation. There is a high degree of disturbance, rubbish accumulation and weed invasion.

This landscape unit has a high to moderate sensitivity due to the creek line.

Southern rural landscape unit

This landscape unit includes the southern end of the project. The landform varies from gently undulating to flat, with sparse vegetation cover. It includes part of the existing highway south of the town, including patches of native vegetation. The Cromer Hills and Morgan's Ridge to the east are visible from the southern parts of this landscape unit, with some views to Mount McKenzie to the south.

The scenic quality of this landscape unit is moderate, with low visual sensitivity.

10.4.3 Construction visual impacts

Potential visual impacts during the construction phase of the project would result from the following:

- Operation of plant and equipment.
- Temporary construction work sites and ancillary facilities.
- Temporary stockpiles.
- Removal of vegetation.

With the exception of the vegetation removal, these impacts would be short-term and minor in nature. Adjacent residents would likely be most affected. The loss of vegetation would be a medium-term impact, but would be mitigated over time as re-established vegetation grows and matures.

10.4.4 Operational visual and landscape impacts

The project would have potential impacts on the 20 identified viewpoints as outlined in Table 10-9. Measures would be provided to mitigate impacts on those viewpoints assessed as having a high or moderate to high potential impact (see Section 10.4.6).

Table 10-9 Summary of visual impacts of the project for identified viewpoints

Viewpoint[1]	Landscape unit	Overall visual impact rating
1 (rural residential property)	Northern rural	Low to moderate
2 (rural residential property)	Northern rural	Moderate to high
3 (rural residential property)	Northern rural	High
4 (rural residential property)	Northern rural	High
5 (rural residential property)	Northern rural	High
6 (rural residential property)	Northern rural	High
7 (rural residential property)	Former Town Common	High
8 (two rural residential properties)	Former Town Common	High
9 (Holbrook Cemetery)	Former Town Common	Low
10 (former Town Common)	Former Town Common	Moderate to high
11 (rural residential property)	Northern rural	Moderate
12 (rural residential property)	Southern rural	High
13 (rural residential property)	Southern rural	High
14 (rural residential property)	Southern rural	Moderate to high
15 (three rural residential properties)	Southern rural	High
16 (commercial premises)	Ten Mile Creek	Moderate to high
17 (rural residential property)	Ten Mile Creek	High
18 (caravan park)	Southern rural	High
19 (rural residential property)	Southern rural	Moderate
20 (three rural residential properties)	Southern rural	Moderate

Note: 1. Refer to Figure 10-7 for viewpoint location

The visual changes and landscape character impacts associated with the project for the affected landscape units are summarised in Table 10-10.

Table 10-10 Summary of visual changes and landscape character impacts for landscape units

Landscape unit	Visual change to landscape	Landscape character impacts	Overall ranking of impacts
Northern rural landscape unit	The project would tie into the existing highway then head west to curve around the western side of Holbrook. There would be a cutting (approximately 10 metres deep), followed by a low fill embankment. A full diamond interchange would be provided at Wagga Wagga road. This would include an overpass for Wagga Wagga Road. There would be minimal vegetation removal through this unit due to the open rural landscape.	▪ Introduction of a highway structure into a predominantly rural setting ▪ Construction of a grade-separated interchange with Wagga Wagga Road. ▪ Light spill from interchange. ▪ Removal of a limited amount of native vegetation. ▪ Minimal earthworks, limited to low embankments and a relatively shallow cutting. ▪ Some minor watercourse/drainage line crossings.	Moderate
Former Town Common landscape unit	The project would be on low embankment through this landscape unit. Some vegetation would be removed in the former Town Common.	▪ Introduction of a highway structure into a semi-rural/urban environment. Views from the centre of town would be prevented by an existing low ridge west of the cemetery. ▪ Removal of a considerable amount of native vegetation. ▪ Some minor watercourse/drainage line crossings.	Moderate to high
Ten Mile Creek landscape unit	Twin bridges would be constructed over Ten Mile Creek. The project would be constructed on an embankment throughout most of this unit. Some vegetation (including weed species) would be removed in the riparian corridor.	▪ Introduction of a highway structure to a semi-rural/urban environment. ▪ Introduction of twin bridges over Ten Mile Creek. ▪ Removal of native vegetation along Ten Mile Creek.	Moderate to high
Southern rural landscape unit	The project would be constructed on an embankment throughout most of this unit. Twin bridges would be constructed over Culcairn Road, with Culcairn Road remaining on its current alignment. Some vegetation would be removed including a corridor of trees along the edge of the Culcairn Road Travelling Stock Route and a copse of large elms south of Ten Mile Creek. The southern interchange would provide a full diamond interchange for access to Holbrook and residential properties west of the project.	▪ Introduction of a highway structure to a semi-rural to rural environment, where there is currently no such element (except in the southernmost section). ▪ Construction of a grade-separated southern interchange. ▪ Light spill from interchange. ▪ Removal of a limited amount of native vegetation. ▪ Minimal earthworks, limited to mostly low embankments. ▪ Some minor watercourse/drainage line crossings.	Moderate

Landscape unit	Visual change to landscape	Landscape character impacts	Overall ranking of impacts
Holbrook urban area landscape unit	Not impacted by the project	-	-
Industrial landscape unit	Not impacted by the project	-	-

10.4.5 Management of visual and landscape impacts

A draft urban and landscape design strategy has been developed for the project to mitigate visual and landscape character impacts. This is illustrated in Figure 10-8. The strategy would be finalised during detailed design. In addition, Table 10-11 identifies mitigation and management measures that would be implemented for specific visual and landscape impacts of the project. These measures have been incorporated into the draft statement of commitments in Chapter 11.

Table 10-11 Mitigation and management measures for visual and landscape impacts

Potential impact	Mitigation and management measure
Construction	
Visual changes during the construction phase.	▪ Rehabilitate disturbed areas as soon as possible after completion of construction.
Operation	
Overall visual and landscape character impacts of the project.	▪ Implement the design objectives of the urban and landscape design strategy for the project in the development of built elements and landscaping treatments. ▪ Include native plant species endemic to the local area in landscaping treatments.
Introduction of lighting at interchanges and overpasses.	▪ Design lighting to minimise light spill and in accordance with RTA standards.