

M0001 Waterway Locations and Assessments

M0001 – September 2020



BASE/

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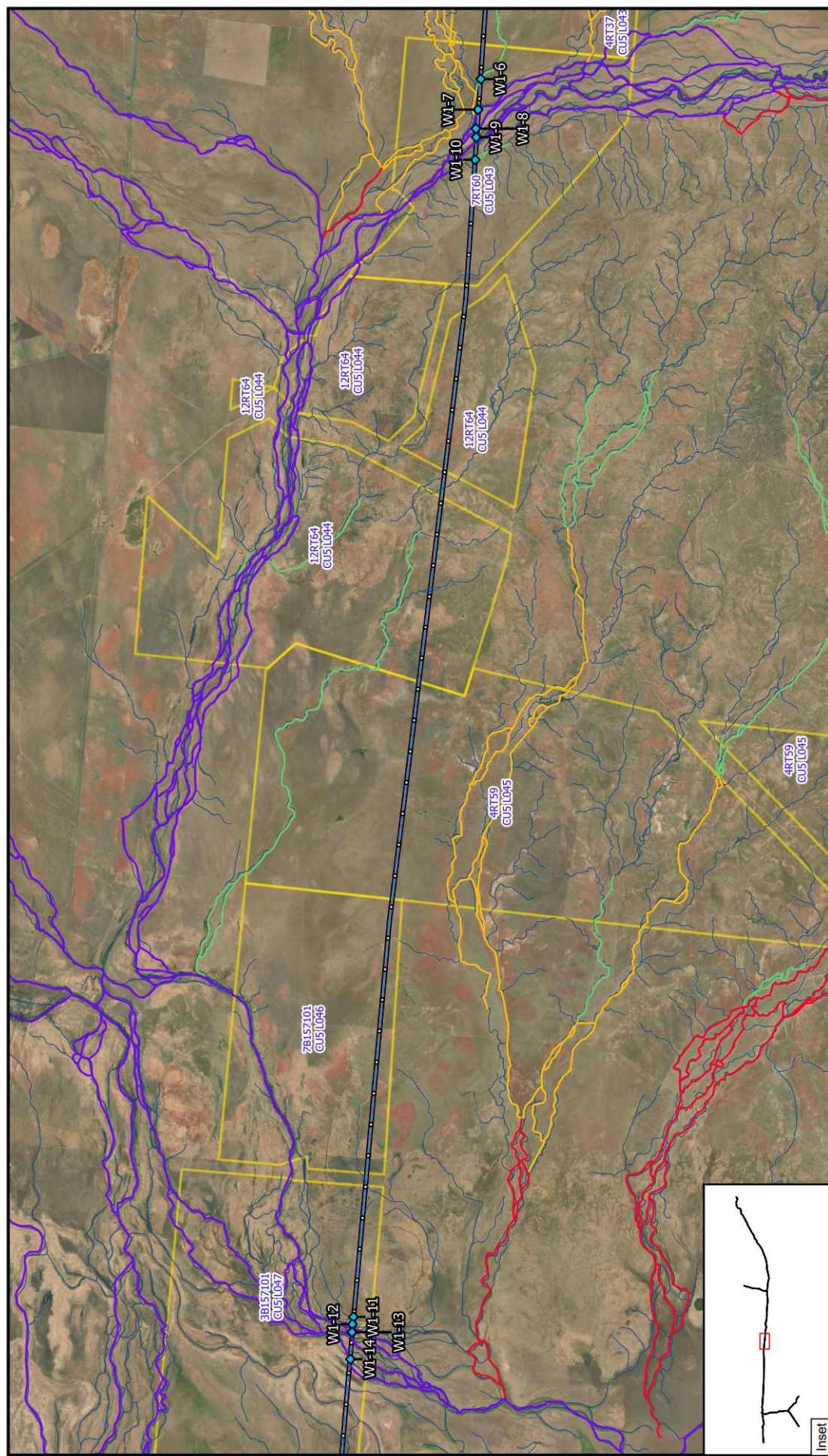
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1.0 Introduction

Waterway assessments were completed along the length of this portion of the alignment. The assessments were completed to characterise a diversity of parameters in order to provide an insight into waterway condition, disturbances and constraints to access. Assessments are based on modified AUSRIVAS (Australian River Assessment System) waterway assessments criteria and includes information regarding:



- Bed structure, substrate composition and width
- Bank structure, composition and height
- Canopy cover and shading
- Riparian vegetation and presence of introduced flora species
- Adjacent land use (upstream and downstream)
- Habitat attributes
- Snags and Large Woody Debris

In addition, data associated with access was collected and cross referenced with GIS based imagery examination. Outlined below in Figures 1 and 2 are the locations of assessments completed along this section of the alignment.







BASE/





1.1 Unnamed Watercourse W1-1

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (Vegetation Management Act, 1999)	
Stream Order	1
Waterway (Fisheries Act, 1994)	
Waterway	High impact (red)
Watercourse Identification (Water Act, 2000)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of an unmapped Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Area slightly undulating providing shallow depression for channelling water after rainfall. No riparian vegetation was observed in association with the watercourse.</p> <p>Weed risk: weed species not observed.</p> <p>Current Aquatic Values: nil</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent. Dry weather farm access track composed of clay is located to the west of the alignment. This track is accessed via Richmond Winton Road 10km to the west. An extension of this track to the alignment could be completed largely without the removal of vegetation. A crossing of this watercourse would not require any earthworks.</p>	
Upstream	Downstream
	
Left Bank No banks present	Right Bank No banks present





1.2 Unnamed Watercourse W1-2

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (Vegetation Management Act, 1999)	
Stream Order	4
Waterway (Fisheries Act, 1994)	
Waterway	Moderate impact (amber)
Watercourse Identification (Water Act, 2000)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of an unmapped Watercourse
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Area slightly undulating providing shallow depression for channelling water after rainfall. No riparian vegetation was observed in association with the watercourse. Severe erosion of watercourse banks from cattle grazing was observed.</p> <p>Weed risk: weed species not observed.</p> <p>Current Aquatic Values: nil</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent. Dry weather farm access track composed of clay is located to the west of the alignment. This track is accessed via Richmond Winton Road 9.5 km to the west. An extension of this track to the alignment could be completed largely without the removal of vegetation. Crossing of this watercourse would require minimal modification to the banks to be trafficable.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	



1.3 Unnamed Watercourse W1-3

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (Vegetation Management Act, 1999)	
Stream Order	2
Waterway (Fisheries Act, 1994)	
Waterway	Absent
Watercourse Identification (Water Act, 2000)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of an unmapped Watercourse
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Area slightly undulating providing shallow depression for channelling water after rainfall. No riparian vegetation was observed in association with the watercourse. Severe erosion from cattle grazing was observed in the watercourse.</p> <p>Weed risk: <i>Vachellia nilotica</i>* dispersed along watercourse edge.</p> <p>Current Aquatic Values: nil</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent. Dry weather farm access track composed of clay is located to the south of the alignment. This track is accessed via Richmond Winton Road 10 km to the east. An extension of this track to the alignment could be completed largely without the removal of vegetation. Crossing of this watercourse would require minimal modification to the banks to be trafficable.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	





1.4 Unnamed Watercourse W1-4

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (Vegetation Management Act, 1999)	
Stream Order	1
Waterway (Fisheries Act, 1994)	
Waterway	Absent
Watercourse Identification (Water Act, 2000)	
Watercourse / Drainage Feature / Unmapped	The watercourse location fits the definition of an unmapped Watercourse
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Area slightly undulating providing shallow depression for channelling water after rainfall. No riparian vegetation was observed in association with the watercourse. Severe erosion from cattle grazing was observed in the watercourse.</p> <p>Weed risk: <i>Vachellia nilotica</i>.*</p> <p>Current Aquatic Values: nil</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent. Dry weather farm access track composed of clay is located to the south of the alignment. This track is accessed via Richmond Winton Road 15 km to the east. An extension of this track to the alignment could be completed largely without the removal of vegetation. Crossing of this watercourse would require minimal modification to the banks to be trafficable.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	

1.5 Unnamed Watercourse W1-5

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (Vegetation Management Act, 1999)	
Stream Order	2
Waterway (Fisheries Act, 1994)	
Waterway	Absent
Watercourse Identification (Water Act, 2000)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of an unmapped Watercourse
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Watercourse feature approximately 2m wide. Riparian vegetation absent. Watercourse feature infested with <i>Vachellia nilotica</i> and heavily grazed by cattle.</p> <p>Weed risk: <i>Vachellia nilotica</i>*</p> <p>Current Aquatic Values: nil</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent. Dry weather farm access track composed of clay is located to the south of the alignment. This track is accessed via Richmond Winton Road 15 km to the east. An extension of this track to the alignment could be completed largely without the removal of vegetation. Crossing of this watercourse would require minimal modification to the banks to be trafficable.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
No watercourse bank present	No watercourse bank present





1.6 Unnamed Watercourse W1-6

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (Vegetation Management Act, 1999)	
Stream Order	2
Waterway (Fisheries Act, 1994)	
Waterway	Low impact (green)
Watercourse Identification (Water Act, 2000)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of an unmapped Watercourse
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Potential drainage feature. Area slightly undulating providing shallow depression for channelling water after rainfall. No riparian vegetation was observed in association with this feature.</p> <p>Weed risk: <i>Vachellia nilotica</i>.*</p> <p>Current Aquatic Values: nil</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent. Dry weather farm access track composed of clay is located to the south of the alignment. This track is accessed via Richmond Winton Road 26.5 km to the east. An extension of this track to the alignment could be completed largely without the removal of vegetation. Crossing of this watercourse would require minimal modification to the banks to be trafficable.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	





1.7 Alick Creek W1-7

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (Vegetation Management Act, 1999)	
Stream Order	4
Waterway (Fisheries Act, 1994)	
Waterway	Major impact (purple)
Watercourse Identification (Water Act, 2000)	
Watercourse / Drainage Feature / Unknown	The watercourse location is defined as a mapped Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Watercourse feature approximately 10m wide. Riparian vegetation dominated by weeds. Watercourse feature heavily grazed by cattle and infested with <i>Vachellia nilotica</i> and <i>Parkinsonia aculeata</i>*</p> <p>Weed risk: <i>Vachellia nilotica</i>* and <i>Parkinsonia aculeata</i>*</p> <p>Current Aquatic Values: nil</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent. Dry weather farm access track composed of clay is located to the southeast and southwest of the alignment. These tracks lead to the property boundaries. An extension of this track to the alignment could be completed largely without the removal of vegetation. Crossing of this watercourse would require minimal modification to the banks to be trafficable.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	

1.8 Alick Creek W1-8

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (Vegetation Management Act, 1999)	
Stream Order	6
Waterway (Fisheries Act, 1994)	
Waterway	Major impact (purple)
Watercourse Identification (Water Act, 2000)	
Watercourse / Drainage Feature / Unknown	The watercourse location is defined as a mapped Watercourse
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Watercourse feature approximately 12m wide. Riparian vegetation includes <i>Alectryon oleifolius</i> and weed species. Watercourse feature heavily grazed by cattle and infested with <i>Vachellia nilotica</i> and <i>Parkinsonia aculeata</i>*</p> <p>Weed risk: <i>Vachellia nilotica</i>* and <i>Parkinsonia aculeata</i>*</p> <p>Current Aquatic Values: nil</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent. Dry weather farm access track composed of clay is located to the southeast and southwest of the alignment. These tracks lead to the property boundaries. An extension of this track to the alignment could be completed largely without the removal of vegetation. Crossing of this watercourse would require minimal modification to the banks to be trafficable.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	

1.9 Alick Creek W1-9





Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (Vegetation Management Act, 1999)	
Stream Order	4
Waterway (Fisheries Act, 1994)	
Waterway	Major impact (purple)
Watercourse Identification (Water Act, 2000)	
Watercourse / Drainage Feature / Unknown	The watercourse location is defined as a mapped Watercourse
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Watercourse feature approximately 10-15m wide with some small overflow channels. Riparian vegetation includes <i>Eucalyptus coolabah</i>, <i>Apophyllum anomalum</i>, <i>Alectryon oleifolius</i>, <i>Ventilago viminalis</i> and weed species. Watercourse feature heavily grazed by cattle and infested with <i>Vachellia nilotica</i>.*</p> <p>Weed risk: <i>Vachellia nilotica</i>*</p> <p>Current Aquatic Values: nil</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent. Dry weather farm access track composed of clay is located to the southeast and southwest of the alignment. These tracks lead to the property boundaries. An extension of this track to the alignment could be completed with minimal removal of vegetation. Crossing of this watercourse would require some modification to the banks to be trafficable, however some areas may require less modification than others.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	

1.10 Alick Creek W1-10





Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (Vegetation Management Act, 1999)	
Stream Order	5
Waterway (Fisheries Act, 1994)	
Waterway	Low impact (green)
Watercourse Identification (Water Act, 2000)	
Watercourse / Drainage Feature / Unknown	The watercourse location is defined as a mapped Watercourse
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Watercourse feature approximately 2m wide. Riparian vegetation absent. Watercourse feature infested with <i>Vachellia nilotica</i> and heavily grazed by cattle.</p> <p>Weed risk: <i>Vachellia nilotica</i>*</p> <p>Current Aquatic Values: nil</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent. Dry weather farm access track composed of clay is located to the southeast and southwest of the alignment. These tracks lead to the property boundaries. An extension of this track to the alignment could be completed with minimal removal of vegetation. Crossing of this watercourse would require minimal modification to the banks to be trafficable.</p>	
Upstream	Downstream
Left Bank	Right Bank

Table note: site photos not available due to technical issues





1.11 Unnamed Watercourse W1-11

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (Vegetation Management Act, 1999)	
Stream Order	None
Waterway (Fisheries Act, 1994)	
Waterway	Absent
Watercourse Identification (Water Act, 2000)	
Watercourse / Drainage Feature / Unknown	The watercourse location is not defined.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Potential drainage feature. Area slightly undulating providing shallow depression for channelling water after rainfall. No riparian vegetation was observed in association with this feature.</p> <p>Weed risk: nil</p> <p>Current Aquatic Values: nil</p> <p>Vehicle / Construction access requirements: Currently, a crossing within the alignment is absent. Dry weather farm access track composed of clay is located to the north of the alignment. This track is accessed via Mt Isa Road 12 km to the north. An extension of this track to the alignment could be completed largely without the removal of vegetation. Crossing of this watercourse would require minimal modification to the banks to be trafficable.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	





1.12 Alick Creek W1-12

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (Vegetation Management Act, 1999)	
Stream Order	6
Waterway (Fisheries Act, 1994)	
Waterway	Major impact (purple)
Watercourse Identification (Water Act, 2000)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of Watercourse
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Part of larger braided waterway. Shallow sided banks with a clay dominated bed with few rocks. <i>Eucalyptus coolabah</i> and <i>Lysiphyllum sp.</i> form a limited riparian strip of vegetation.</p> <p>Weed risk: nil</p> <p>Current Aquatic Values: nil</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent. Dry weather farm access track composed of clay is located to the north of the alignment. This track is accessed via Mt Isa Road 12 km to the north. An extension of this track to the alignment could be completed minimal removal of vegetation. Crossing of this watercourse would require modification to the banks to be trafficable.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	

1.13 Alick Creek W1-13

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (Vegetation Management Act, 1999)	
Stream Order	6
Waterway (Fisheries Act, 1994)	
Waterway	Major impact (purple)
Watercourse Identification (Water Act, 2000)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of Watercourse
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Part of larger braided waterway. Shallow sided banks with a clay dominated bed with gravel and rocks. <i>Eucalyptus coolabah</i> and <i>Lysiphyllum sp.</i> form a limited riparian strip of vegetation.</p> <p>Weed risk: nil</p> <p>Current Aquatic Values: nil</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent. Dry weather farm access track composed of clay is located to the north of the alignment. This track is accessed via Mt Isa Road 13 km to the north. An extension of this track to the alignment would require crossing other braided sections of this watercourse. Removal of riparian vegetation would be required. Crossing of this watercourse would require minor modification to the banks to be trafficable.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	

1.14 Alick Creek W1-14

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (Vegetation Management Act, 1999)	
Stream Order	5
Waterway (Fisheries Act, 1994)	
Waterway	Major impact (purple)
Watercourse Identification (Water Act, 2000)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of Watercourse
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Part of larger braided waterway. Shallow sided banks with a clay dominated bed with gravel and rocks. <i>Eucalyptus coolabah</i> and <i>Lysiphyllum sp.</i> form a riparian strip of vegetation. Heavily grazed banks.</p> <p>Weed risk: nil</p> <p>Current Aquatic Values: nil</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent. Dry weather farm access track composed of clay is located to the north of the alignment. This track is accessed via Mt Isa Road 13.5 km to the north. An extension of this track to the alignment would require crossing other braided sections of this watercourse. Removal of riparian vegetation would be required. Crossing of this watercourse would require minor modification to the banks to be trafficable.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	

M0003 Waterway Locations and Assessments

M0003 – November 2020

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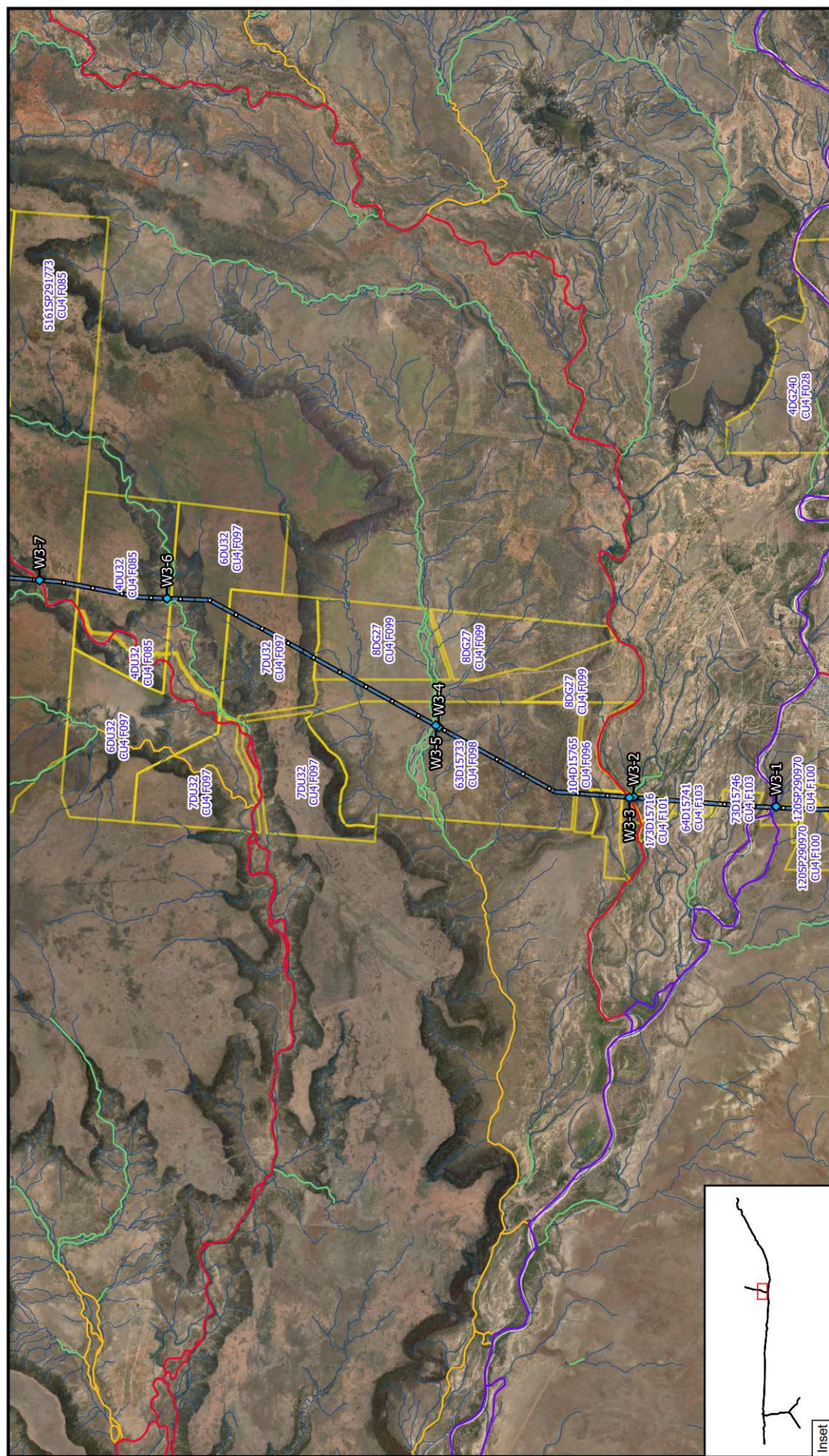
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1.0 Introduction

Waterway assessments were completed along the length of this portion of the alignment. The assessments were completed to characterise a diversity of parameters in order to provide an insight into waterway condition, disturbances and constraints to access. Assessments are based on modified AUSRIVAS (Australian River Assessment System) waterway assessments criteria and includes information regarding:





- Bed structure, substrate composition and width
- Bank structure, composition and height
- Canopy cover and shading
- Riparian vegetation and presence of introduced flora species
- Adjacent land use (upstream and downstream)
- Habitat attributes
- Snags and Large Woody Debris

In addition, data associated with access was collected and cross referenced with GIS based imagery examination. Outlined below in Figure 1 are the locations of assessments completed along this section of the alignment.







BASE/





1.1 Flinders River - Watercourse W3-1

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (Vegetation Management Act, 1999)	
Stream Order	6
Waterway (Fisheries Act, 1994)	
Waterway	Major impact (purple)
Watercourse Identification (Water Act, 2000)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of a Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Watercourse with coarse sandy 95m wide channel bed and eroded banks due to cattle ingress. Fringing riparian vegetation on banks and within central sand bars. Riparian canopy vegetation dominated by <i>Eucalyptus camaldulensis</i>, <i>Allocasuarina</i> sp., with dense coverage of exotic tall shrubs.</p> <p>Weed risk: Shrub layer a dense coverage of <i>Vachellia nilotica</i>* and <i>Prosopis</i> sp.*</p> <p>Current Aquatic Values: nil</p> <p>Vehicle / Construction assess requirements: The southern bank of the river is steep and eroded and would require modification for vehicles to traverse. An existing access track is located 800m to the east. Open paddocks to the south can be crossed in dry weather via Hughenden Riverside Road.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	




1.2 Watercourse W3-2

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (Vegetation Management Act, 1999)	
Stream Order	2
Waterway (Fisheries Act, 1994)	
Waterway	Low impact (green)
Watercourse Identification (Water Act, 2000)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of an unmapped Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Watercourse with 3m wide clay channel bed containing modified banks due to cattle ingress, track and fence upgrades. Alignment co-insides with existing access track. Vegetation on banks with dense coverage of exotic tall shrubs. Scattered <i>Eucalyptus coolibah</i> also occur along the top of banks.</p> <p>Weed risk: <i>Prosopis sp.*</i> and <i>Vachellia nilotica*</i> at top of bank and within bed.</p> <p>Current Aquatic Values: nil</p> <p>Vehicle / Construction assess requirements – An existing access track is located within the alignment which has been upgraded recently. No modifications are required for access.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	




1.3 Porcupine Creek - Watercourse W3-3

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (Vegetation Management Act, 1999)	
Stream Order	6
Waterway (Fisheries Act, 1994)	
Waterway	High impact (red)
Watercourse Identification (Water Act, 2000)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of a Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Steep sided watercourse with 38m wide sandy gravel channel bed containing minimal modification by cattle grazing. Riparian canopy vegetation dominated by <i>Eucalyptus camaldulensis</i> with a dense coverage of exotic tall shrubs.</p> <p>Weed risk: <i>Prosopis sp.*</i> and <i>Vachellia nilotica*</i> at top of bank.</p> <p>Current Aquatic Values: nil</p> <p>Vehicle / Construction assess requirements – Major modifications would be required to span this waterway. Steep sided banks would require bank works to reduce gradient. No major access tracks cross this waterway within the vicinity of the alignment. Accessing the southern bank could be accomplished by utilising the access track associated with the previous waterway assessment (W3-2) which passes within 50m. The northern bank would be accessed via properties along Canterbury Plains Road.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	




1.4 Coolibah Creek - Watercourse W3-4

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (Vegetation Management Act, 1999)	
Stream Order	4
Waterway (Fisheries Act, 1994)	
Waterway	Low impact (green)
Watercourse Identification (Water Act, 2000)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of an unmapped Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: A watercourse with 3m wide cracking clay channel bed containing banks modified by cattle grazing. Adjacent vegetation dominated by <i>Acacia tephрина</i>. Very scattered <i>Eucalyptus coolabah</i> downstream from the alignment.</p> <p>Weed risk: weed species not observed.</p> <p>Current Aquatic Values: nil</p> <p>Vehicle / Construction assess requirements: A crossing within the alignment is absent. The channel is on average 1m in depth. Minor modifications to bank gradients and approaches would enable small vehicular access in the dry season. Minimal removal of vegetation would be required. Nearest vehicular access is off Torver Valley Road.</p>	
Upstream	Downstream
	
Cross section	
	





1.5 Coolibah Creek - Watercourse W3-5

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (Vegetation Management Act, 1999)	
Stream Order	3
Waterway (Fisheries Act, 1994)	
Waterway	Low impact (green)
Watercourse Identification (Water Act, 2000)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of an unmapped Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Watercourse with 3m wide cracking clay channel bed. Seasonal pools up and downstream. Contains banks modified by cattle grazing. Adjacent vegetation dominated by <i>Acacia tephрина</i> and very scattered <i>Eucalyptus coolibah</i>.</p> <p>Weed risk: <i>Parkinsonia aculeata</i> observed nearby.</p> <p>Current Aquatic Values: nil</p> <p>Vehicle / Construction assess requirements: A crossing within the alignment is absent. This channel is on average 1m in depth. Minor modifications to bank gradients and approaches would enable small vehicular access in the dry season. Minimal removal of vegetation would be required. Nearest vehicular access is off Torver Valley Road.</p>	
Upstream	Downstream
	
Cross section	
	

1.6 Horse Creek - Watercourse W3-6

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (Vegetation Management Act, 1999)	
Stream Order	2
Waterway (Fisheries Act, 1994)	
Waterway	Low impact (green)
Watercourse Identification (Water Act, 2000)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of an unmapped Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Watercourse with 11m wide sandy gravel channel bed and pools downstream. Contains banks modified by cattle grazing. Riparian vegetation composed of scattered <i>Eucalyptus camaldulensis</i>, <i>Eucalyptus coolibah</i> and <i>Lysiphyllum hookeri</i>.</p> <p>Weed risk: weed species not observed.</p> <p>Current Aquatic Values: nil</p> <p>Vehicle / Construction assess requirements: A crossing within the alignment is absent. A well-defined dry weather farm access track composed of clay is located 600m to the west of the alignment. This track is accessed via Torver Valley Road and crosses several other watercourses before it terminates at a stock watering point. A extension of this track to the alignment could be completed with some removal of vegetation.</p> <p>This channel is on average 0.5 to 1m in depth. Minor modifications to bank gradients and approaches would enable vehicular access in the dry season. Minimal removal of vegetation would be required.</p>	
Upstream	Downstream
	
Cross section	
	

1.7 Betts Gorge Creek - Watercourse W3-7

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (Vegetation Management Act, 1999)	
Stream Order	4
Waterway (Fisheries Act, 1994)	
Waterway	Red - Present
Watercourse Identification (Water Act, 2000)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of an unmapped Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Watercourse with 22m wide sandy gravel channel bed, regular bedrock exposed pools separated by sandy riffles. Elsewhere gravel and cobble banks modified by cattle grazing. Riparian vegetation composed of scattered <i>Melaleuca bracteata</i> with clumps of <i>Juncus</i> and other rushes.</p> <p>Weed risk: Rubber vine (<i>Cryptostegia grandiflora</i>) observed in riparian vegetation.</p> <p>Current Aquatic Values: macrophytes and bank reeds present. <i>Melaleuca</i> riparian species scattered along southern bank</p> <p>Vehicle / Construction assess requirements: A crossing within the alignment is absent. A very steep southern bank would require major modifications to provide a crossing point within the alignment. A potential crossing point may be possible 500m to the west. This would still require the establishment of access tracks across rocky basalt plateaus and modification of the stream bank downstream.</p> <p>Access tracks for this site are via the Kennedy Development Road to the east. The access track crosses the Flinders River within a kilometre of the main road (-20.658402, 144.384846). A second access track crossing (-20.624624, 144.276114) may also require upgrading to allow access.</p>	
Upstream	Downstream
	
Left bank	Right bank
	

M0004 Waterway Locations and Assessments

M0004 – January 2021



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1.0 Introduction

Waterway assessments were completed along the length of this portion of the alignment. The assessments were completed to characterise a diversity of parameters in order to provide an insight into waterway condition, disturbances and constraints to access. Assessments are based on modified AUSRIVAS (Australian River Assessment System) waterway assessments criteria and includes information regarding:

- Bed structure, substrate composition and width
- Bank structure, composition and height
- Canopy cover and shading
- Riparian vegetation and presence of introduced flora species
- Adjacent land use (upstream and downstream)
- Habitat attributes
- Snags and Large Woody Debris

In addition, data associated with access was collected and cross referenced with GIS based imagery examination. Outlined below in Figures 1-4 are the locations of assessments completed along this section of the alignment.

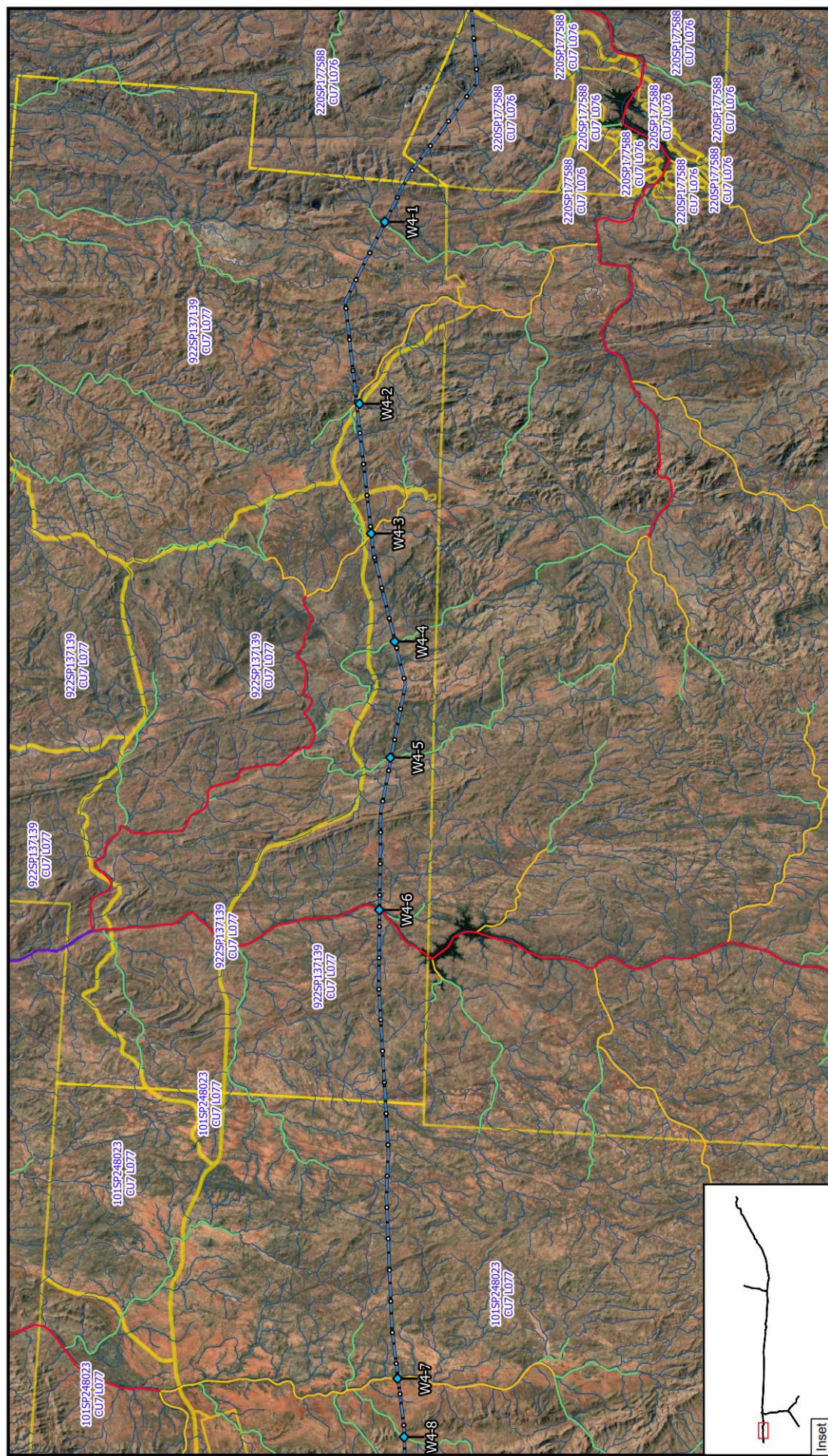


Figure 1 - M0004 Waterway Assessment Sites

Legend

- | | CuString 2.0 KP's | Waterway Barrier Works | CuString 2.0 Corridor Properties Containing |
|---|------------------------|------------------------|---|
| ◦ | Waterway Survey Sites | Low | |
| ◆ | CuString 2.0 Alignment | Moderate | |
| — | VM Act Watercourse | High | |
| | | Major | |

Scale @ A3:
Date:
Drawn:
1 : 100000
15/04/2021
Jack C

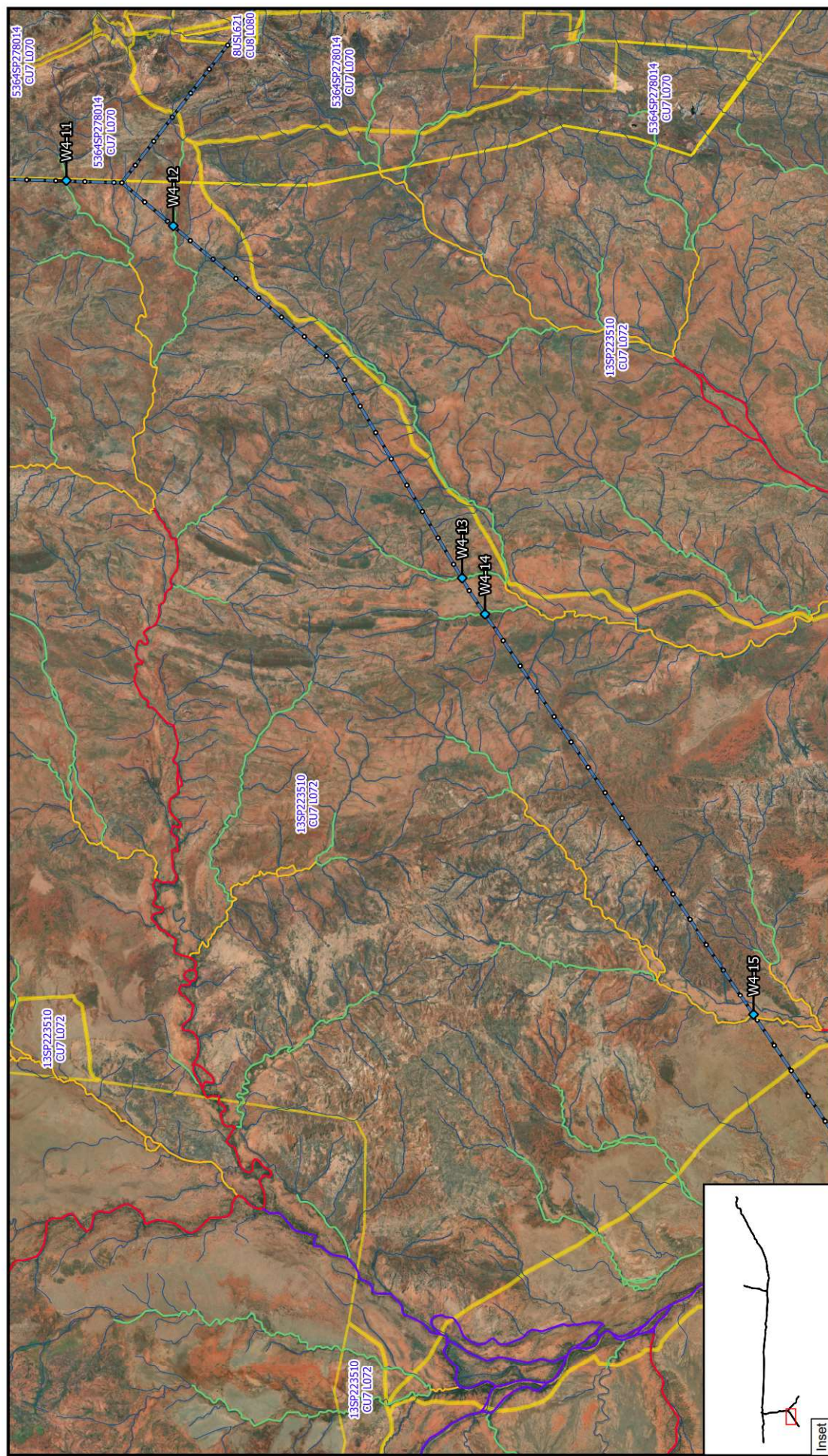
DATA SOURCE: BASE CONSULTING GROUP 2021; Q&P/ATN 2021; The State of Queensland (Department of Natural Resources and Mines) 2021; Source: Earl, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

BASE/



Figure 2 - M0004 Waterway Assessment Sites

BASE/



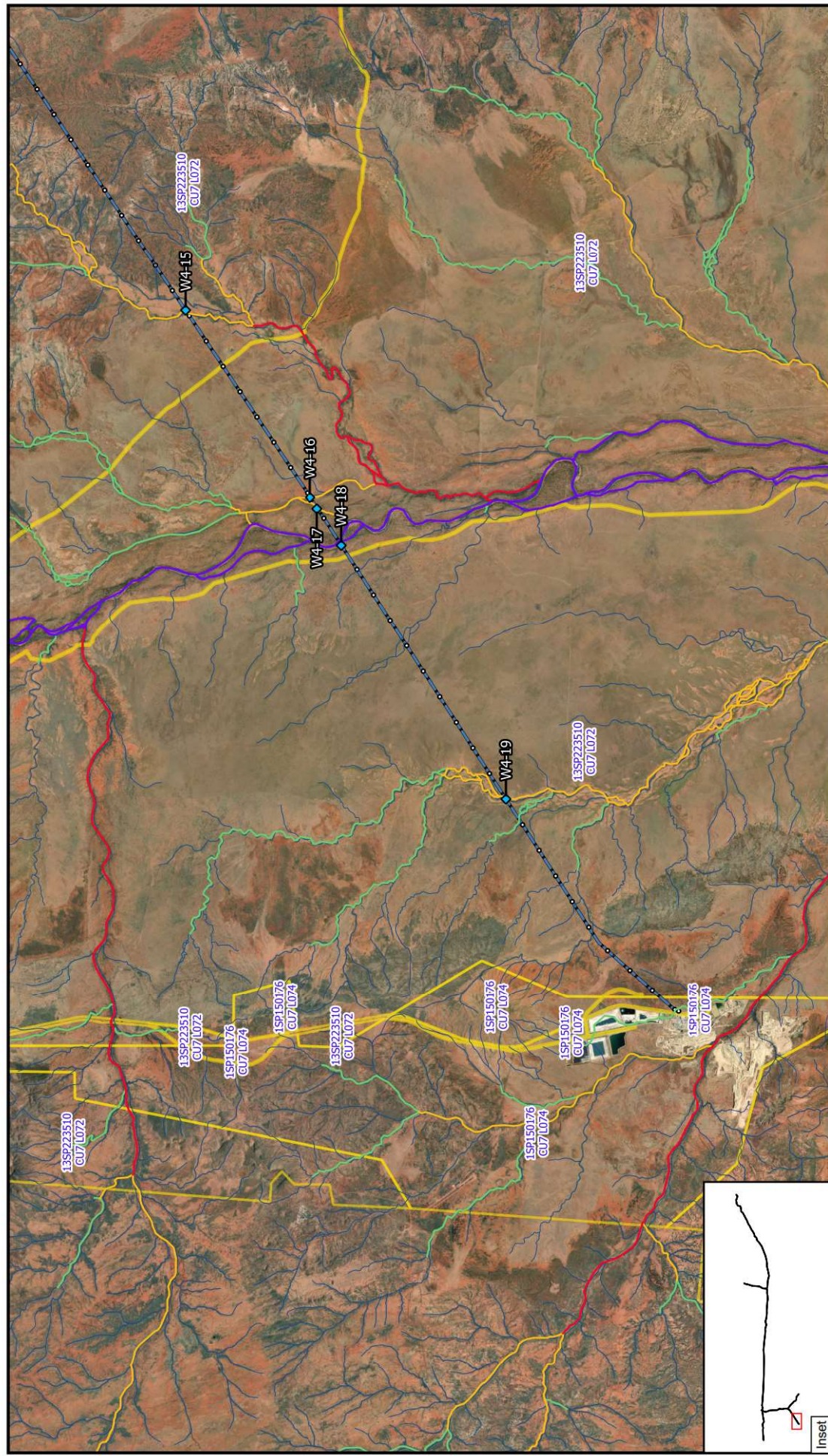


Figure 4 - M0004 Waterway Assessment Sites

Legend

	CuString 2.0 KP's	Waterway Barrier Works	CuString 2.0 Corridor Properties Containing CuString 2.0 Project
○		Low	
◆		Moderate	
—		High	
—		Major	

BASE/





0 5 km

Scale @ A3:
Date:
Drawn: Jack C





DATA SOURCE:
BASE CONSULTING GROUP 2021; QSPATIAL 2021; The State of Queensland (Department of Natural Resources and Mines) 2021; Source: Esri, Mapbox, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community







1.1 Watercourse W4-1

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (<i>Vegetation Management Act, 1999</i>)	
Stream Order	3
Waterway (<i>Fisheries Act, 1994</i>)	
Waterway	Low impact (green)
Watercourse Identification (<i>Water Act, 2000</i>)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of an unmapped Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Ephemeral watercourse 50m wide with 12m wide low flow channel. Riparian vegetation on banks and within central sand bars.</p> <p>Weed risk: nil</p> <p>Current Aquatic Values: nil</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent. This channel is on average less than 1m in depth. Minor modifications to bank gradients and approaches would enable vehicular access in the dry season. Removal of riparian vegetation would be required. Existing unsealed access track 680m to the west.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	





1.2 Watercourse W4-2

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (<i>Vegetation Management Act, 1999</i>)	
Stream Order	3
Waterway (<i>Fisheries Act, 1994</i>)	
Waterway	Moderate impact (amber)
Watercourse Identification (<i>Water Act, 2000</i>)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of an unmapped Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Ephemeral watercourse 45m wide with narrow braided low flow channels. Riparian vegetation on sandy banks and within central sand bars. Trees to 15m in height.</p> <p>Weed risk: nil</p> <p>Current Aquatic Values: nil</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent. A shallow channel with gradual bank slopes. Minor modifications to bank slopes and approaches would enable vehicular access during the dry season. Removal of riparian vegetation would be required. Existing unsealed access track 50m to the west and the Barkly Highway is 150m to the south.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	





1.3 Watercourse W4-3

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (<i>Vegetation Management Act, 1999</i>)	
Stream Order	4
Waterway (<i>Fisheries Act, 1994</i>)	
Waterway	Moderate impact (amber)
Watercourse Identification (<i>Water Act, 2000</i>)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of an unmapped Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Ephemeral watercourse 45m wide with narrow braided low flow channels. Riparian vegetation on sandy banks and within central sand bars. Trees to 16m in height. Numerous hollows observed.</p> <p>Weed risk: nil</p> <p>Current Aquatic Values: nil</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent. A shallow channel with gradual bank slopes. Minor modifications to bank slopes and approaches would enable vehicular access during the dry season. Removal of riparian vegetation would be required. Existing unsealed access track 50m to the west and the Barkley Highway is 220m to the south.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	





1.4 Watercourse W4-4

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (<i>Vegetation Management Act, 1999</i>)	
Stream Order	3
Waterway (<i>Fisheries Act, 1994</i>)	
Waterway	Low impact (green)
Watercourse Identification (<i>Water Act, 2000</i>)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of an unmapped Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Ephemeral watercourse 20m wide with narrow braided low flow channels. Riparian vegetation on rock/sandy banks and within central sand bars. Trees to 16m in height. Numerous hollows in <i>Eucalyptus camaldulensis</i> observed.</p> <p>Weed risk: Minimal weed risk</p> <p>Current Aquatic Values: nil</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent. A shallow channel over a small bench continuing to moderately inclined slopes. Minor modifications to bank slopes and approaches would enable vehicular access during the dry season. Removal of riparian vegetation would be required. The nearest recorded access track is 500m to the north with the Barkly Highway an additional 400m onwards from the access track.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	





1.5 Watercourse W4-5

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (<i>Vegetation Management Act, 1999</i>)	
Stream Order	3
Waterway (<i>Fisheries Act, 1994</i>)	
Waterway	Low impact (green)
Watercourse Identification (<i>Water Act, 2000</i>)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of an unmapped Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Ephemeral watercourse 33m wide with narrow braided low flow channels. Riparian vegetation on rock/sandy banks and within central sand bars. Trees to 12m in height. Numerous hollows in <i>Eucalyptus camaldulensis</i> observed.</p> <p>Weed risk: minimal weed risk</p> <p>Current Aquatic Values: nil</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent. A shallow channel with shallow steep banks transitioning to gentle/moderate slopes. Minor modifications to bank slopes and approaches would enable vehicular access during the dry season. Removal of riparian vegetation would be required. The nearest recorded access track is 550m to the north with the Barkly Highway an additional 500m onwards from the access track. Access to the alignment may necessitate crossing this watercourse on several occasions.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	





1.6 Leichhardt River (east branch) - Watercourse W4-6

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (<i>Vegetation Management Act, 1999</i>)	
Stream Order	5
Waterway (<i>Fisheries Act, 1994</i>)	
Waterway	High impact (red)
Watercourse Identification (<i>Water Act, 2000</i>)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of a mapped Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Large flowing watercourse 85m wide containing large pool and flowing rocky runs up and downstream. Fringing riparian vegetation containing 18m high <i>Eucalyptus camaldulensis</i>. Major watercourse with scattered rocky bed sections.</p> <p>Weed risk: <i>Vachellia nilotica</i> observed.</p> <p>Current Aquatic Values: Aquatic flora, algae and macrophyte absent. Small fish observed.</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent. Removal of a wide riparian corridor would be required if crossing at the alignment. However, an existing crossing is located 400m to the south allowing access to both sides of the watercourse within the alignment. Selective widening and minor tree clearing may be required to improve access using the existing access crossing.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	





1.7 Gorge Creek -Watercourse W4-7

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (<i>Vegetation Management Act, 1999</i>)	
Stream Order	4
Waterway (<i>Fisheries Act, 1994</i>)	
Waterway	Moderate impact (amber)
Watercourse Identification (<i>Water Act, 2000</i>)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of an unmapped Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Watercourse 35m wide containing large pool and rocky run downstream. Fringing riparian vegetation on banks and within central sand bars. Some sections of bed and bank with large, exposed rock.</p> <p>Weed risk: nil</p> <p>Current Aquatic Values: Aquatic flora, algae and macrophyte absent. Small fish observed.</p> <p>Vehicle / Construction access requirements: An existing crossing is located 400m to the north allowing access to both sides of the watercourse within the alignment. Selective widening and minor tree clearing may be required to improve access at the existing crossing.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	





1.8 Watercourse W4-8

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (<i>Vegetation Management Act, 1999</i>)	
Stream Order	2
Waterway (<i>Fisheries Act, 1994</i>)	
Waterway	Low impact (green)
Watercourse Identification (<i>Water Act, 2000</i>)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of an unmapped Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Ephemeral watercourse 30m wide with narrow low flow channel. Fringing riparian vegetation on banks and within central sand bars. Some hollows associated with <i>Eucalyptus camaldulensis</i>.</p> <p>Weed risk: minimal weed species presence.</p> <p>Current Aquatic Values: nil</p> <p>Vehicle / Construction access requirements: An existing crossing is located 30m north of the alignment. Selective tree removal and minor earthworks may be required to improve access at the existing crossing.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	





1.9 Watercourse W4-9

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (<i>Vegetation Management Act, 1999</i>)	
Stream Order	3
Waterway (<i>Fisheries Act, 1994</i>)	
Waterway	Low impact (green)
Watercourse Identification (<i>Water Act, 2000</i>)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of an unmapped Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Ephemeral watercourse with wide low flow channel. A shallow channel over a small bench continuing to moderately inclined slopes with some exposed rock/boulders. Sparse riparian vegetation along watercourse banks and within sandy side bars.</p> <p>Weed risk: minimal weed species presence.</p> <p>Current Aquatic Values: nil</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent. Modifications to the eastern bank and approaches would enable vehicular access during the dry season. Riparian vegetation on the banks and within the watercourse would require removal. The nearest recorded access track is 250m to the west.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	





1.10 Lagoon Creek - Watercourse W4-10

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (<i>Vegetation Management Act, 1999</i>)	
Stream Order	3
Waterway (<i>Fisheries Act, 1994</i>)	
Waterway	Low impact (green)
Watercourse Identification (<i>Water Act, 2000</i>)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of an unmapped Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Watercourse contains large pool fringed by <i>Eucalyptus camaldulensis</i>. Cattle were seen watering in the location resulting in turbid brown water. Trees where 12-16m in height.</p> <p>Weed risk: Minimal weed species presence.</p> <p>Current Aquatic Values: Aquatic flora, algae and macrophyte absent.</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent and may not be required given the proximity to an existing access track 270m to the north. Minor earthworks are likely required to cross a tributary of this watercourse to the east with selective vegetation clearing also likely. Access to the western side of the watercourse can be gained from the existing access track by minor clearance of native vegetation.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	





1.11 Watercourse W4-11 (Phosphate CU7 L072 Start)

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (<i>Vegetation Management Act, 1999</i>)	
Stream Order	2
Waterway (<i>Fisheries Act, 1994</i>)	
Waterway	Low impact (green)
Watercourse Identification (<i>Water Act, 2000</i>)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of an unmapped Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: 15m wide watercourse containing deep pool upstream flowing across rock and pebble riffle downstream. Riparian vegetation on banks containing <i>Eucalyptus camaldulensis</i> to 12m.</p> <p>Weed risk: Minimal weed species presence.</p> <p>Current Aquatic Values: Aquatic flora, algae and macrophyte absent.</p> <p>Vehicle / Construction access requirements: Existing crossing situated adjacent to the alignment. Minimal earthworks are required at this crossing. Selective vegetation clearing may be required to improve vehicular access.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	




1.12 Watercourse W4-12

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (<i>Vegetation Management Act, 1999</i>)	
Stream Order	2
Waterway (<i>Fisheries Act, 1994</i>)	
Waterway	Low impact (green)
Watercourse Identification (<i>Water Act, 2000</i>)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of an unmapped Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: 18m wide watercourse, with bed width of 4m, flowing across rock and pebble riffle. Riparian vegetation on banks containing <i>Eucalyptus camaldulensis</i> to 10m.</p> <p>Weed risk: Minimal weed risks, banks dominated by buffel grass (<i>Cenchrus ciliaris</i>*)</p> <p>Current Aquatic Values: nil</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent. Northern bank is steep and would require earthworks to reduce the gradient. Minor earthworks would be needed on the southern bank. Riparian vegetation removal also likely to be required. In addition, other minor watercourses may require crossings to enable to access this point. The nearest major access track/road is the Selwyn Chatsworth Road 2km to the south.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	




1.13 Watercourse W4-13

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (<i>Vegetation Management Act, 1999</i>)	
Stream Order	2
Waterway (<i>Fisheries Act, 1994</i>)	
Waterway	Low impact (green)
Watercourse Identification (<i>Water Act, 2000</i>)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of an unmapped Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: 12m wide watercourse flowing across pebble and sand riffle. Riparian vegetation on banks containing <i>Eucalyptus coolibah</i> to 9m.</p> <p>Weed risk: Minimal weed risks, banks dominated by buffel grass (<i>Cenchrus ciliaris</i>*)</p> <p>Current Aquatic Values: nil</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent. Both banks are steep/incised and would require earthworks to reduce the gradient. Riparian vegetation removal also likely to be required. In addition, other minor watercourses may require crossings to enable to access this point. An access track is located 200m to the west. This access track is reached from the Selwyn Chatswood Road but crosses a separate waterway which may require earthworks and vegetation removal to allow improved access.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	



1.14 Watercourse W4-14

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (<i>Vegetation Management Act, 1999</i>)	
Stream Order	2
Waterway (<i>Fisheries Act, 1994</i>)	
Waterway	Low impact (green)
Watercourse Identification (<i>Water Act, 2000</i>)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of an unmapped Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: 11m wide watercourse with bed with of 5m flowing across gravel / pebble and sand riffle. Sparse riparian vegetation on banks containing <i>Eucalyptus leucophylla</i> and <i>Corymbia terminalis</i> to 6m.</p> <p>Weed risk: minimal weed invasion.</p> <p>Current Aquatic Values: nil</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent. Minor earthworks required to improve the slopes of the banks. Vegetation clearing unlikely to be required. A minor access track located adjacent.</p>	
Upstream	Downstream
	
Cross section	
	




1.15 Watercourse W4-15

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (<i>Vegetation Management Act, 1999</i>)	
Stream Order	4
Waterway (<i>Fisheries Act, 1994</i>)	
Waterway	Moderate impact (amber)
Watercourse Identification (<i>Water Act, 2000</i>)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of an unmapped Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: 37m wide watercourse (top of bank) with bed with of 15m flowing across gravel / pebble and sand riffle with pools up and downstream. Riparian vegetation on banks containing <i>Eucalyptus camaldulensis</i> to 14m. Banks covered in native grasses.</p> <p>Weed risk: minimal weed invasion.</p> <p>Current Aquatic Values: nil</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent. A potential crossing point is located 300m north and minor earthworks would be required to improve the slopes of the western and eastern banks at this point. In addition, only minimal riparian vegetation clearing is likely to be required. The nearest formed access track is 2km to the west.</p>	
Upstream	Downstream
	
Cross section	
	





1.16 Watercourse W4-16

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (<i>Vegetation Management Act, 1999</i>)	
Stream Order	4
Waterway (<i>Fisheries Act, 1994</i>)	
Waterway	Moderate impact (amber)
Watercourse Identification (<i>Water Act, 2000</i>)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of an unmapped Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: 1m wide watercourse with a bed depth of 0.2m flowing across gravel / pebble and sand riffle with pools up and downstream. Scattered tree lined edges containing <i>Eucalyptus coolabah</i> to 8 m. Banks covered in native grasses.</p> <p>Weed risk: Minimal weed risk</p> <p>Current Aquatic Values: nil</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent. Very limited modifications required for access. Dry weather only</p>	
Upstream	Downstream
	
Cross section	
Due to the small size of the feature, the cross section is not readily distinguishable in photos	





1.17 Watercourse W4-17

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (<i>Vegetation Management Act, 1999</i>)	
Stream Order	4
Waterway (<i>Fisheries Act, 1994</i>)	
Waterway	Moderate impact (amber)
Watercourse Identification (<i>Water Act, 2000</i>)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of an unmapped Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: 10m wide watercourse (top of bank) with a bed width (5m) and depth of 1.1 m. Flows across sandy clay riffle with pools downstream. Riparian vegetation on banks containing <i>Eucalyptus coolibah</i> to 11m. Banks covered in native grasses including <i>Leptochloa digitata</i>.</p> <p>Weed risk: Minimal weed risk</p> <p>Current Aquatic Values: nil</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent. Minor earthworks required to improve the slopes of the banks. Minor vegetation clearing required. A minor access track located 400m to the east.</p>	
Upstream	Downstream
	
Cross section	
	

1.18 Burke River - Watercourse W4-18

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (<i>Vegetation Management Act, 1999</i>)	
Stream Order	6
Waterway (<i>Fisheries Act, 1994</i>)	
Waterway	Major impact (purple)
Watercourse Identification (<i>Water Act, 2000</i>)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of a mapped Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: 120m wide watercourse with bank heights up to 6m. Flows across sandy gravel riffle with pools downstream. Riparian vegetation on banks containing <i>Eucalyptus camaldulensis</i> and <i>Lophostemon grandiflorus</i> to 18m. Vegetated central and side bars often containing <i>Eucalyptus camaldulensis</i>.</p> <p>Weed risk: Minimal weed risk</p> <p>Current Aquatic Values: nil</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent. Earthworks required to the western bank to reduce bank angle to allow vehicular access. Minor earthworks required to improve the slope of the eastern bank. Vegetation clearing required. A minor access track located 350m to the west.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	

1.19 Watercourse W4-19

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (<i>Vegetation Management Act, 1999</i>)	
Stream Order	4
Waterway (<i>Fisheries Act, 1994</i>)	
Waterway	Moderate impact (amber)
Watercourse Identification (<i>Water Act, 2000</i>)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of an unmapped Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: 11m wide watercourse approximately 1.5m in depth. Flows across sandy cobble riffle with pools downstream. Riparian vegetation on banks containing <i>Eucalyptus coolibah</i> and <i>Lysiphyllum gilvum</i> to 9m. Banks covered in native grasses.</p> <p>Weed risk: Minimal weed risk</p> <p>Current Aquatic Values: nil</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent. Earthworks required to reduce bank angle to allow vehicular access. Vegetation clearing unlikely to be required. A minor access track located 200m to the west. This access track links with the Chatsworth Phosphate Road 2km to the south and cross another watercourse which may require earthworks to improve access.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	

M0006 Waterway Locations and Assessments

M0006 – March 2021



BASE/

Client: CuString 2.0
Reference: J0105

Document Control

Title:	Waterway Locations and Assessment for M0006 – March 2021
Address:	
Job Number:	J0105
Client:	CuString 2.0

Document Issue

Issue	Date	Prepared By
1.0	20/04/2021	Jack Caleo

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1.0 Introduction

Waterway assessments were completed along the length of this portion of the alignment. The assessments were completed to characterise a diversity of parameters in order to provide an insight into waterway condition, disturbances and constraints to access. Assessments are based on modified AUSRIVAS (Australian River Assessment System) waterway assessments criteria and includes information regarding:

- Bed structure, substrate composition and width
- Bank structure, composition and height
- Canopy cover and shading
- Riparian vegetation and presence of introduced flora species
- Adjacent land use (upstream and downstream)
- Habitat attributes
- Snags and Large Woody Debris

In addition, data associated with access was collected and cross referenced with GIS based imagery examination. Outlined below in Figures 1-3 are the locations of assessments completed.

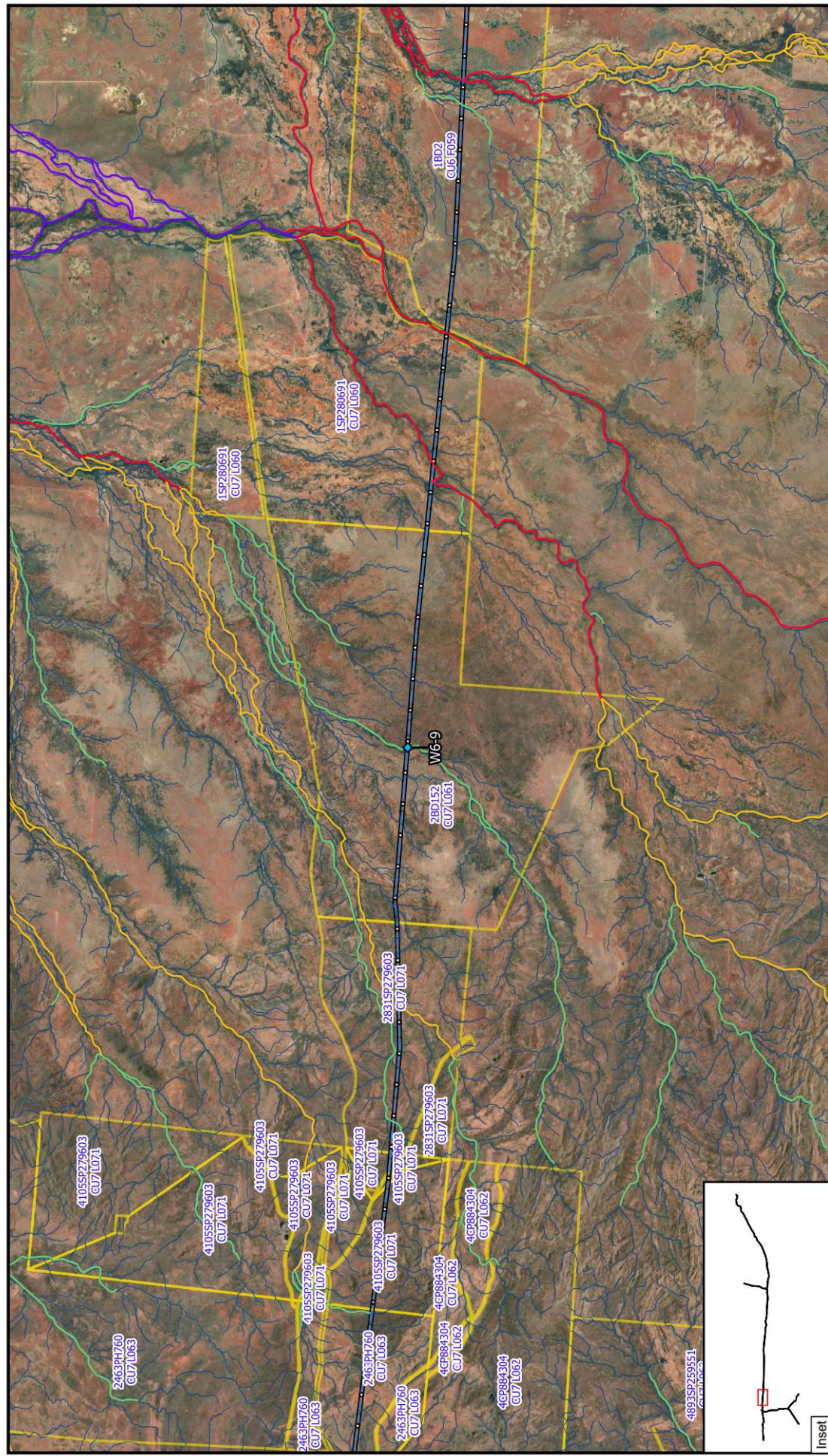


Figure 2 - M0006 Waterway Assessment Sites

Legend

- | | CuString 2.0 KP's | Waterway Survey Sites | CuString 2.0 Alignment | VM Act Watercourse | Waterway Barrier Works | CuString 2.0 Corridor Properties Containing CuString 2.0 Project |
|---|-------------------|-----------------------|------------------------|--------------------|------------------------|--|
| ○ | | | | | Low | |
| ◆ | | | | | Moderate | |
| — | | | | | High | |
| — | | | | | Major | |

Scale @ A3:

Scale @ A3:
Date: 16/04/2021





Date: 16/04/2021
Drawn: Jack C

DATA SOURCE:
BASE CONSULTING GROUP 2021; QIPATNL 2021; The
State of Queensland (Department of Natural Resource
and Mines) 2021; Source: Earl, Navar, Gedeña,
Earlster Geographica, CHESIMBUS DS, USDA, USGS,
AerGRID, IGN, and the GIS User Community





0 5 km







1.1 Alick Creek- Watercourse W6-1

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (<i>Vegetation Management Act, 1999</i>)	
Stream Order	7
Waterway (<i>Fisheries Act, 1994</i>)	
Waterway	Major impact (purple)
Watercourse Identification (<i>Water Act, 2000</i>)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of a mapped Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: 25m wide watercourse containing large pool and braided low flow channel. Riparian vegetation on banks. Clay banks and likely bed. <i>Grevillea parallela</i> dominated canopy layer to 5-7m in height.</p> <p>Weed risk: <i>Vachellia nilotica</i> observed.</p> <p>Current Aquatic Values: Aquatic flora, algae and macrophyte absent.</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent. This channel is on average less than 2m in depth. Minor modifications to bank gradients and approaches would enable vehicular access in the dry season. Removal of riparian vegetation would be required. Existing unsealed access track 360m to the west.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	





1.2 Alick Creek- Watercourse W6-2

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (<i>Vegetation Management Act, 1999</i>)	
Stream Order	6
Waterway (<i>Fisheries Act, 1994</i>)	
Waterway	Major impact (purple)
Watercourse Identification (<i>Water Act, 2000</i>)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of a mapped Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Ephemeral watercourse 2m wide with a 0.5m deep silt / clay dry channel. Wetland species absent. Banks covered in <i>Astrebla spp.</i>, <i>Sesbania spp.</i>, exotic and native grasses.</p> <p>Weed risk: <i>Vachellia nilotica</i> observed.</p> <p>Current Aquatic Values: nil</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent. Very limited modifications required for access. Dry weather only.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	




1.3 Alick Creek- Watercourse W6-3

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (<i>Vegetation Management Act, 1999</i>)	
Stream Order	6
Waterway (<i>Fisheries Act, 1994</i>)	
Waterway	Major impact (purple)
Watercourse Identification (<i>Water Act, 2000</i>)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of a mapped Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Ephemeral watercourse 10.5m wide with 1.5m narrow low flow channel. Riparian vegetation on silt / clay banks. Scattered <i>Eucalyptus coolabah</i> dominates canopy layer to 5m in height, with <i>Cyperus spp.</i> ground cover.</p> <p>Weed risk: <i>Vachellia nilotica</i> observed.</p> <p>Current Aquatic Values: Aquatic flora, algae and macrophyte absent.</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent. A shallow channel with shallow bank slopes. Minor modifications to bank slopes and approaches would enable vehicular access during the dry season. Removal of riparian vegetation would be required. Existing unsealed access track 700m to the west and 400m to the east.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	





1.4 Alick Creek- Watercourse W6-4

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (<i>Vegetation Management Act, 1999</i>)	
Stream Order	4
Waterway (<i>Fisheries Act, 1994</i>)	
Waterway	Major impact (purple)
Watercourse Identification (<i>Water Act, 2000</i>)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of a mapped Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Ephemeral watercourse 27m wide with 1.2m narrow dry channel. Riparian vegetation on silt / clay banks. Trees to 5m in height. Scattered <i>Eucalyptus coolabah</i> dominated canopy layer, with <i>Grevillea parallela</i>. Mixed layer of <i>Cyperus spp.</i>, <i>Sesbania spp.</i>, <i>Themeda spp.</i>, and other exotic and native grasses.</p> <p>Weed risk: <i>Vachellia nilotica</i> and <i>Xanthium pungens</i> observed.</p> <p>Current Aquatic Values: nil</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent. A shallow channel with shallow slopes. Minor modifications to bank slopes and approaches would enable vehicular access during the dry season. Removal of riparian vegetation would be required. The nearest recorded access track is 140m to the west. Access to the alignment may necessitate crossing this watercourse on several occasions.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	





1.5 Alick Creek- Watercourse W6-5

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (<i>Vegetation Management Act, 1999</i>)	
Stream Order	5
Waterway (<i>Fisheries Act, 1994</i>)	
Waterway	Major impact (purple)
Watercourse Identification (<i>Water Act, 2000</i>)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of a mapped Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Ephemeral watercourse 70m wide with narrow 5m braided dry channels. Riparian vegetation on silt / clay and rocky / pebbly banks and within central sandy / gravel bars. Trees to 4-6m in height. Scattered <i>Eucalyptus coolabah</i> dominates canopy layer. <i>Excoecaria parvifolia</i> up to 5m in height and <i>Lysiphyllum spp.</i> up to 6m in height were observed.</p> <p>Weed risk: <i>Vachellia nilotica</i> and <i>Xanthium pungens</i> observed.</p> <p>Current Aquatic Values: nil</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent. A shallow channel with shallow sloped banks transitioning to gentle slopes. Minor modifications to bank slopes and approaches would enable vehicular access during the dry season. Removal of riparian vegetation would be required. The nearest recorded access track is 310m to the south west.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	





1.6 Watercourse W6-6

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (<i>Vegetation Management Act, 1999</i>)	
Stream Order	4
Waterway (<i>Fisheries Act, 1994</i>)	
Waterway	Low impact (green)
Watercourse Identification (<i>Water Act, 2000</i>)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of an unmapped Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Ephemeral watercourse 3m wide with a narrow 0.3m deep dry channel. Silt / clay banks covered in native forbs and scattered grasses. Evidence of heavy grazing showing little ground layer.</p> <p>Weed risk: <i>Vachellia nilotica</i> observed.</p> <p>Current Aquatic Values: nil</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent. Very limited modifications required for access. Dry weather only.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	



1.7 Watercourse W6-7

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (<i>Vegetation Management Act, 1999</i>)	
Stream Order	3
Waterway (<i>Fisheries Act, 1994</i>)	
Waterway	Low impact (green)
Watercourse Identification (<i>Water Act, 2000</i>)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of an unmapped Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Ephemeral watercourse 10m wide with a narrow 2m dry channel. Silt / clay banks with slight traces of pebble covered in <i>Iseilema spp.</i>, <i>Cyperus spp.</i>, and <i>Sesbania spp.</i> up to 1.4m in height.</p> <p>Weed risk: <i>Vachellia nilotica</i>, <i>Xanthium pungens</i> observed.</p> <p>Current Aquatic Values: nil</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent. Very limited modifications required for access. Dry weather only.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	





1.8 Watercourse W6-8

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (<i>Vegetation Management Act, 1999</i>)	
Stream Order	5
Waterway (<i>Fisheries Act, 1994</i>)	
Waterway	High impact (red)
Watercourse Identification (<i>Water Act, 2000</i>)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of an unmapped Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Ephemeral watercourse 25m wide with narrow 4m isolated flow channel. Fringing riparian vegetation on banks. Scattered <i>Eucalyptus coolabah</i> up to 4-6m in height dominates canopy layer. <i>Cyperus spp.</i> covers ground layer. Regional ecosystem described as 4.3.4f.</p> <p>Weed risk: <i>Vachellia nilotica</i> observed.</p> <p>Current Aquatic Values: Aquatic flora, algae and macrophyte absent.</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent. A shallow channel with moderate sloped banks. Minor modifications to bank slopes and approaches would enable vehicular access during the dry season. Removal of minor sections riparian vegetation would be required. The nearest recorded access track is 800 m to the west.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	





1.9 Watercourse W6-9

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (<i>Vegetation Management Act, 1999</i>)	
Stream Order	3
Waterway (<i>Fisheries Act, 1994</i>)	
Waterway	Low impact (green)
Watercourse Identification (<i>Water Act, 2000</i>)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of an unmapped Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: 90m wide watercourse containing large pool and 14.4m wide low flow channel. An unknown depth of channel with a steep bench (3m in height) to main channel water surface at time of survey. Main banks are moderately to steeply inclined slopes. Riparian vegetation 12-15m wide along watercourse silt / clay banks. <i>Eucalyptus camaldulensis</i> up to 15m in height dominate canopy layer with scattered <i>Lophostemon grandiflorus</i>.</p> <p>Weed risk: <i>Vachellia nilotica</i> and <i>Cenchrus ciliaris</i> observed.</p> <p>Current Aquatic Values: Aquatic flora, algae and macrophyte absent.</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent. This channel is an unknown depth. Moderate modifications to bank gradients and approaches would enable vehicular access in the dry season. Removal of riparian vegetation would be required. Existing unsealed access track 385m to the west.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	

1.10 Leichhardt River- Watercourse W6-10

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (<i>Vegetation Management Act, 1999</i>)	
Stream Order	6
Waterway (<i>Fisheries Act, 1994</i>)	
Waterway	High impact (red)
Watercourse Identification (<i>Water Act, 2000</i>)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of a mapped Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: 230m wide watercourse with a steep bench watercourse channel 68m wide and a smaller steep 17m wide braided dry channels up to 2.6-4.6m deep with slight pooling. Sand / cobble and gravel banks common. Riparian vegetation along watercourse predominately <i>Eucalyptus camaldulensis</i> canopy layer up to 7-17m in height with scattered <i>Leptospermum grandifolium</i>, <i>Eucalyptus leucophylla</i> and <i>Acacia torulosa</i>.</p> <p>Weed risk: <i>Vachellia nilotica</i> and <i>Cenchrus ciliaris</i> observed.</p> <p>Current Aquatic Values: Aquatic flora, algae and macrophyte absent.</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent. Channels are up to 2.6-4.6m in depth. Moderate modifications to bank gradients and approaches would enable vehicular access in the dry season. Removal of riparian vegetation would be required. Mt Isa – Duchess Road 300m to the east and an existing unsealed access track 50m to the west</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	

1.11 Mica Creek- Watercourse W6-11

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (<i>Vegetation Management Act, 1999</i>)	
Stream Order	5
Waterway (<i>Fisheries Act, 1994</i>)	
Waterway	Moderate impact (amber)
Watercourse Identification (<i>Water Act, 2000</i>)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of an unmapped Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: 89m wide watercourse with 3.4m deep dry channel. Left bank is a steep sloped bench and right bank is a gradual inclined sloped. Riparian vegetation occurs on sandy and cobble / pebble and gravelly banks and on central sand beds. <i>Eucalyptus camaldulensis</i> up to 9-12m in height dominates the canopy layer with scattered <i>Leptospermum grandifolium</i>. <i>Aristida spp.</i> dominated on high points of left bank with scattered exotic and native grasses.</p> <p>Weed risk: <i>Cenchrus ciliaris</i> observed.</p> <p>Current Aquatic Values: nil.</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent. This channel is up to 3.4m in depth. Modifications to the eastern bank gradients and approaches would enable vehicular access in the dry season. Removal of riparian vegetation on banks and sand beds would be required. Existing unsealed access track 230m to the east and the Mt Isa – Boulia Road is 1.6 km to the west.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	

M0008 Waterway Locations and Assessments

M0008 – April 2021



BASE/

Client: CuString 2.0
Reference: J0105

Document Control

Title:	Waterway Locations and Assessment for M0008 – April 2021
Address:	
Job Number:	J0105
Client:	CuString 2.0

Document Issue

Issue	Date	Prepared By
1.0	16/06/2021	Brandon Hourigan

Contents

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1.2	Watercourse W8-2	6
1.3	Watercourse W8-3	7
1.4	Watercourse W8-4	8
1.5	Watercourse W8-5	9
1.6	Watercourse W8-6	10

1.0 Introduction

Waterway assessments were completed along the length of this portion of the alignment. The assessments were completed to characterise a diversity of parameters to provide an insight into waterway condition, disturbances and constraints to access. Assessments are based on modified AUSRIVAS (Australian River Assessment System) waterway assessments criteria and includes information regarding:

- Bed structure, substrate composition and width
- Bank structure, composition, and height
- Canopy cover and shading
- Riparian vegetation and presence of introduced flora species
- Adjacent land use (upstream and downstream)
- Habitat attributes
- Snags and Large Woody Debris

In addition, data associated with access was collected and cross referenced with GIS based imagery examination. Outlined below in Figures 1 and 2 are the locations of assessments completed along this section of the alignment.

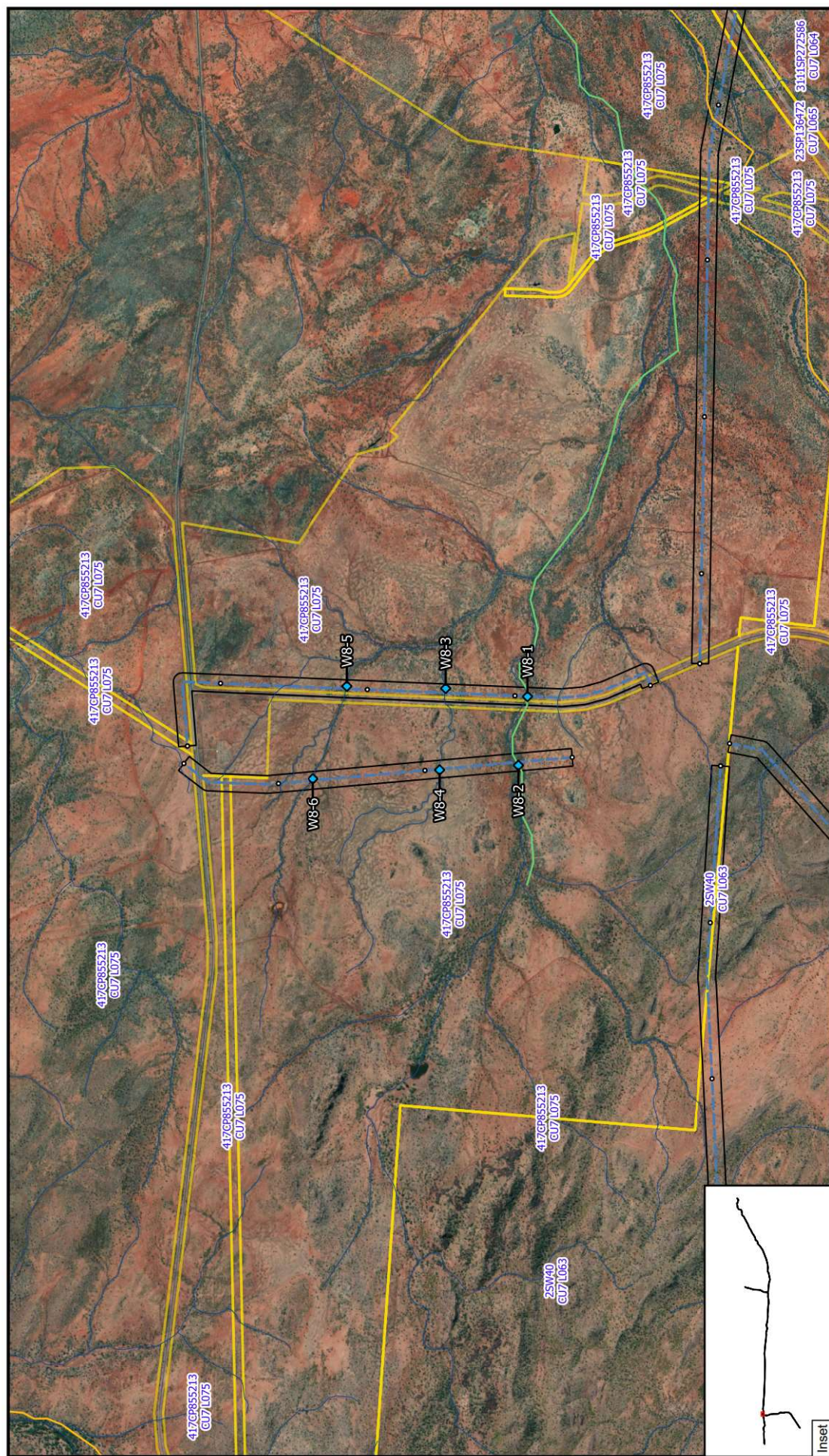


Figure 1 - M0008 Waterway Assessment Sites

Legend





- | | CuString 2.0 KP's | Waterway Survey Sites | CuString 2.0 Alignment | VM Act Watercourse | Waterway Barrier Works | CuString 2.0 Corridor Properties Containing CuString 2.0 Project |
|---|-------------------|-----------------------|------------------------|--------------------|------------------------|--|
| ○ | | | | | Low | |
| ◆ | | | | | Moderate | |
| — | | | | | | |
| — | | | | | | |

Scale @ A3:
Date: 1:20000
Drawn: 23/07/2021
Jack C





DATA SOURCE:
BASE CONSULTING GROUP 2021; OSPITAL 2021; The
State of Queensland (Department of Natural Resources
and Mines) 2021; Source: Eni, Maxar, GeoEye,
Earthstar Geographics, CHESLWAT DS, USDA, USGS,
Aerogrid, IGN, and the GIS User Community

BASE/




1.1 Watercourse W8-1

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (<i>Vegetation Management Act, 1999</i>)	
Stream Order	3
Waterway (<i>Fisheries Act, 1994</i>)	
Waterway	Low impact (green)
Watercourse Identification (<i>Water Act, 2000</i>)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of an unmapped Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Ephemeral watercourse with banks and bed of laomy sand over clay, with surface rocks (pebbles, cobbles, and boulders). Banks lightly covered with a ground layer dominated by buffel grass (<i>Cenchrus ciliaris</i>). Riparian canopy extends to 12m high and is dominated by <i>Corymbia terminalis</i> and <i>Lysiphyllum carronii</i>.</p> <p>Weed risk: None recorded.</p> <p>Current Aquatic Values: None present.</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is present as an access track parallel to the main road.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	





1.2 Watercourse W8-2

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (<i>Vegetation Management Act, 1999</i>)	
Stream Order	3
Waterway (<i>Fisheries Act, 1994</i>)	
Waterway	Low impact (green)
Watercourse Identification (<i>Water Act, 2000</i>)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of a mapped Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Ephemeral watercourse 12m wide with 1-1.5m high banks. Bed and banks are clay based with loamy sand surface layer and occasional rocks (pebbles and cobbles). Riparian vegetation has trees to 10m in height; scattered <i>Eucalyptus coolabah</i> dominates canopy layer. <i>Lysiphyllum carronii</i> up to 6m in height were observed.</p> <p>Weed risk: <i>Vachellia</i> sp. Observed.</p> <p>Current Aquatic Values: None present.</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent; however, due to the channel profile, minor modifications to bank slopes and approaches would enable vehicular access during the dry season. Removal of riparian vegetation may be required. The nearest recorded access track is 330m to the east alongside the main road.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	





1.3 Watercourse W8-3

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (<i>Vegetation Management Act, 1999</i>)	
Stream Order	2
Waterway (<i>Fisheries Act, 1994</i>)	
Waterway	N/A
Watercourse Identification (<i>Water Act, 2000</i>)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of a mapped Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Dry ephemeral watercourse 3.5m wide with 0.4m tall banks. Bed and banks of clay with loamy sand surface layer. Riparian trees to 3m in height, scattered <i>Acacia cambagei</i> dominated canopy layer. Ground layer dominated but <i>Cenchrus ciliaris</i>.</p> <p>Weed risk: None observed.</p> <p>Current Aquatic Values: None present.</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is present 40m away as an access track parallel to main road.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	




1.4 Watercourse W8-4

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (<i>Vegetation Management Act, 1999</i>)	
Stream Order	2
Waterway (<i>Fisheries Act, 1994</i>)	
Waterway	N/A
Watercourse Identification (<i>Water Act, 2000</i>)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of a mapped Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Ephemeral watercourse with narrow low flow channel, yet wholly shallow. Riparian vegetation is dominated by weed species. Banks and bed are deep clays with loamy sand surface layer.</p> <p>Weed risk: <i>Vachellia</i> sp. observed.</p> <p>Current Aquatic Values: None present.</p> <p>Vehicle / Construction access requirements: A formed crossing within the alignment is absent; however, due to the shallow banks and bed it is currently possible to traverse via 4WD. Minor modifications to bank would enable easier vehicular access during the dry season.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	

1.5 Watercourse W8-5

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (<i>Vegetation Management Act, 1999</i>)	
Stream Order	1
Waterway (<i>Fisheries Act, 1994</i>)	
Waterway	N/A
Watercourse Identification (<i>Water Act, 2000</i>)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of a mapped Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Ephemeral watercourse 4m wide with a 2m sand/clay dry channel and occasional areas of surface rock (pebbles and cobbles). Wetland species absent. Bank vegetation dominated by <i>Cenchrus ciliaris</i> and <i>Acacia chisholmii</i>. Sparse canopy of <i>Corymbia terminalis</i> up to 6m.</p> <p>Weed risk: None observed.</p> <p>Current Aquatic Values: None present.</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is present along roadside access track. Little to no modifications required for access.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	

1.6 Watercourse W8-6

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (<i>Vegetation Management Act, 1999</i>)	
Stream Order	1
Waterway (<i>Fisheries Act, 1994</i>)	
Waterway	N/A
Watercourse Identification (<i>Water Act, 2000</i>)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of a mapped Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: 3m wide watercourse with sparse riparian vegetation on banks. Clay base with sandy top layer and rocks (pebbles and cobbles) on banks. <i>Corymbia termialis</i> dominated canopy layer to 5m in height, while <i>Acacia chisholmii</i> dominated the shrub layer.</p> <p>Weed risk: None observed.</p> <p>Current Aquatic Values: None present.</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent, however would be possible to traverse. Minor modifications to bank vegetation, i.e. removal of some <i>A. chisholmii</i>, would enable vehicular access in the dry season.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	

M0010 Waterway Locations and Assessments

M0010 – May 2021



BASE/

Client: CuString 2.0
Reference: J0105

Document Control

Title:	Waterway Locations and Assessment for M0010 – May 2021
Address:	
Job Number:	J0105
Client:	CuString 2.0

Document Issue

Issue	Date	Prepared By
1.0	25/05/2021	Jack Caleo

Contents

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1.1	Scrubby Creek W10-1	5
1.2	Watercourse W10-2	6
1.3	Watercourse W10-3	7
1.4	Watercourse W10-4	8
1.5	Watercourse W10-5	9
1.6	Gorge Creek W10-6	10

1.0 Introduction

Waterway assessments were completed along the length of this portion of the alignment. The assessments were completed to characterise a diversity of parameters in order to provide an insight into waterway condition, disturbances and constraints to access. Assessments are based on modified AUSRIVAS (Australian River Assessment System) waterway assessments criteria and includes information regarding:

- Bed structure, substrate composition and width
- Bank structure, composition and height
- Canopy cover and shading
- Riparian vegetation and presence of introduced flora species
- Adjacent land use (upstream and downstream)
- Habitat attributes
- Snags and Large Woody Debris

In addition, data associated with access was collected and cross referenced with GIS based imagery examination. Outlined below in Figures 1-3 are the locations of assessments completed along this section of the alignment.

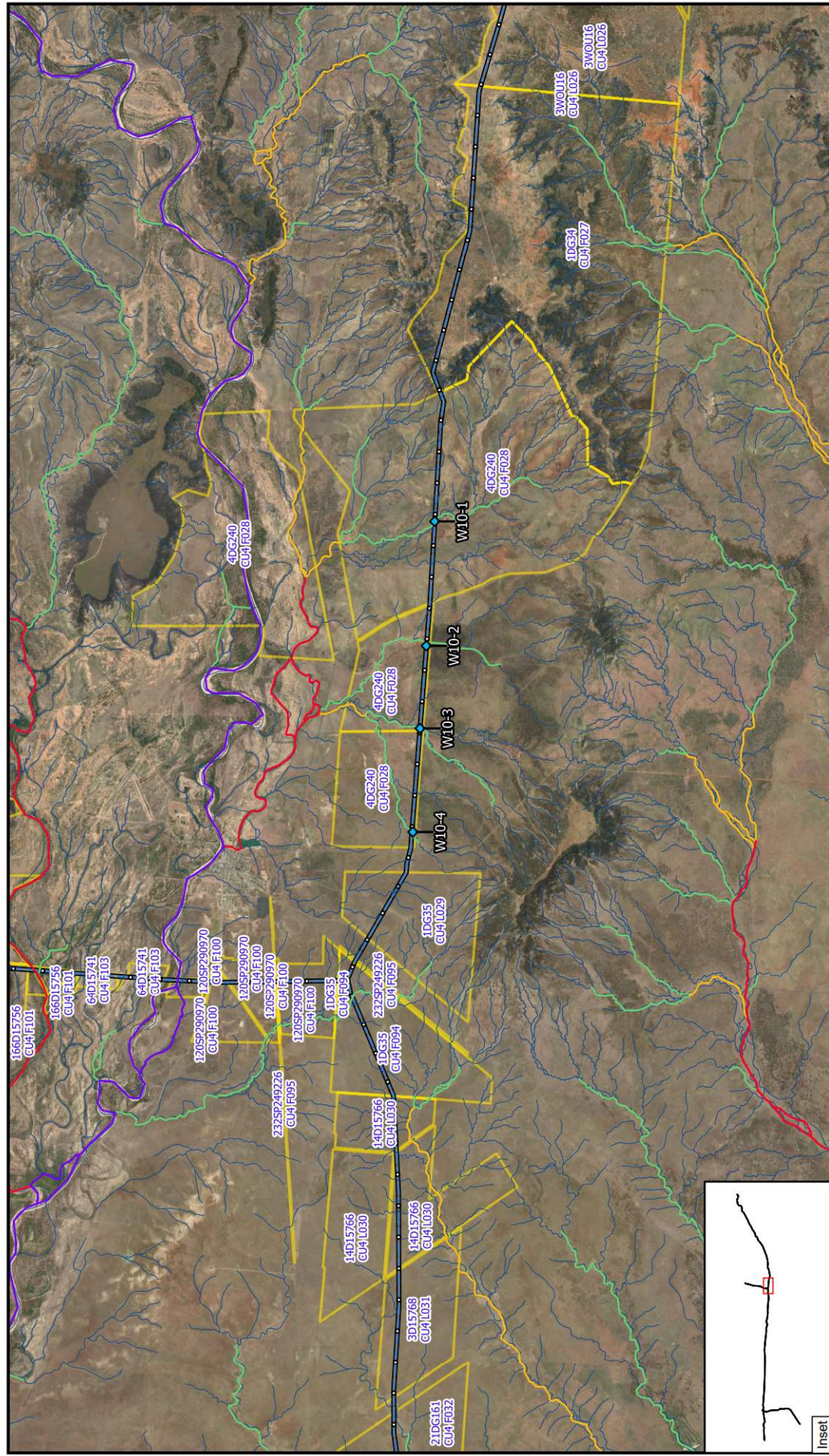
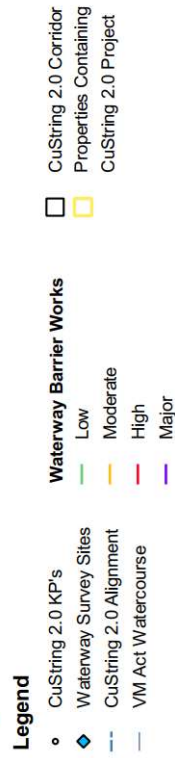


Figure 1 - M0010 Waterway Assessment Sites

BASE/



Scale @ A3:
Date:
Drawn: Jack C

DATA SOURCE: BASE CONSULTING GROUP 2021; QBPATROL 2021; The State of Queensland (Department of Natural Resources and Mines) 2021; Source: Earl, Mavor, Geofey, Earthstar Geographics, CHESIMBUS DB, USDA, USGS, Aeroglo, KIN, and the GIS User Community

Earthstar Geographics, CHES/Arbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Key messages: • The prevalence of mental health problems in the community is high. • The prevalence of mental health problems in the community is high. • The prevalence of mental health problems in the community is high.

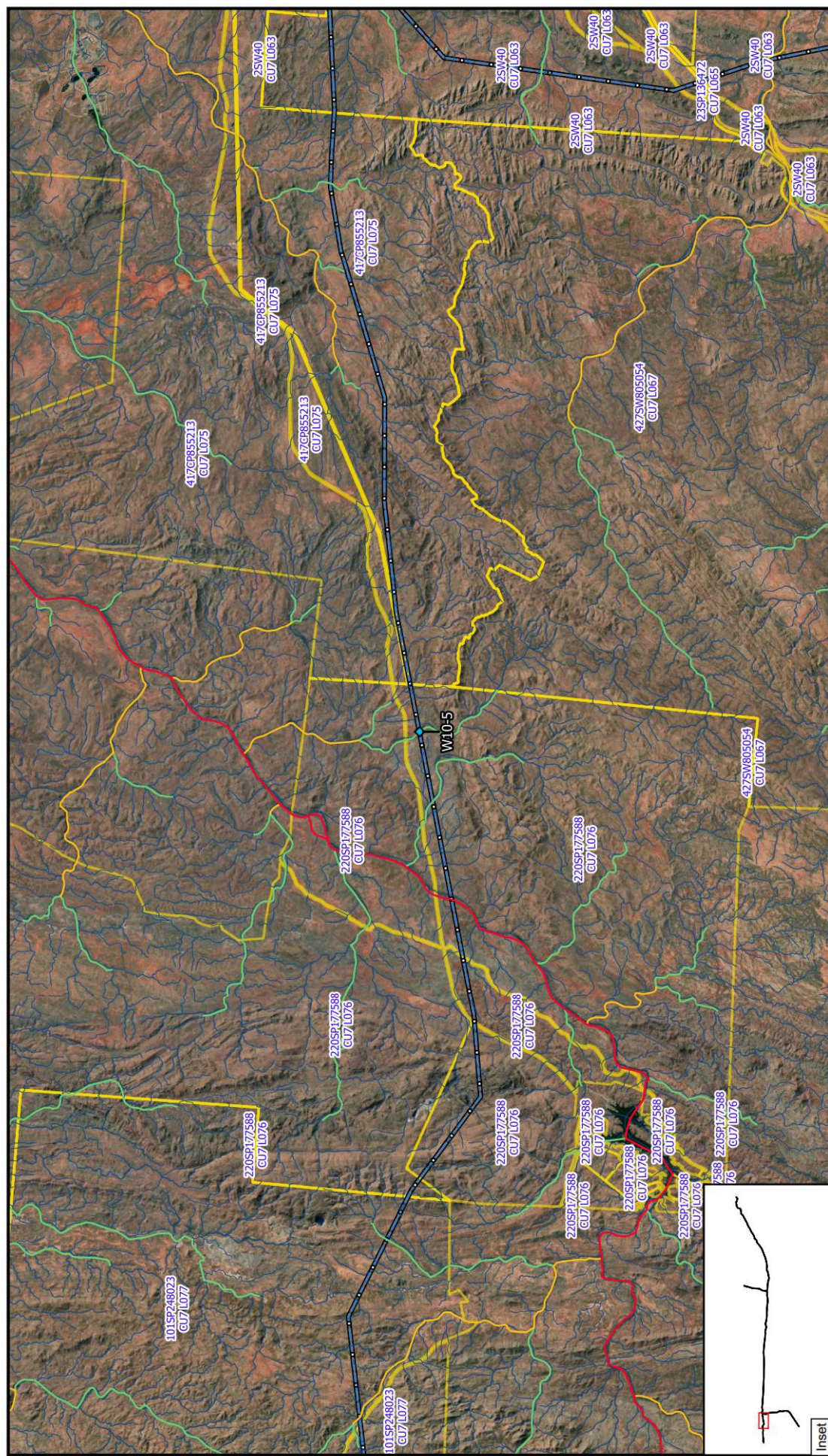


Figure 2 - M0010 Waterway Assessment Sites

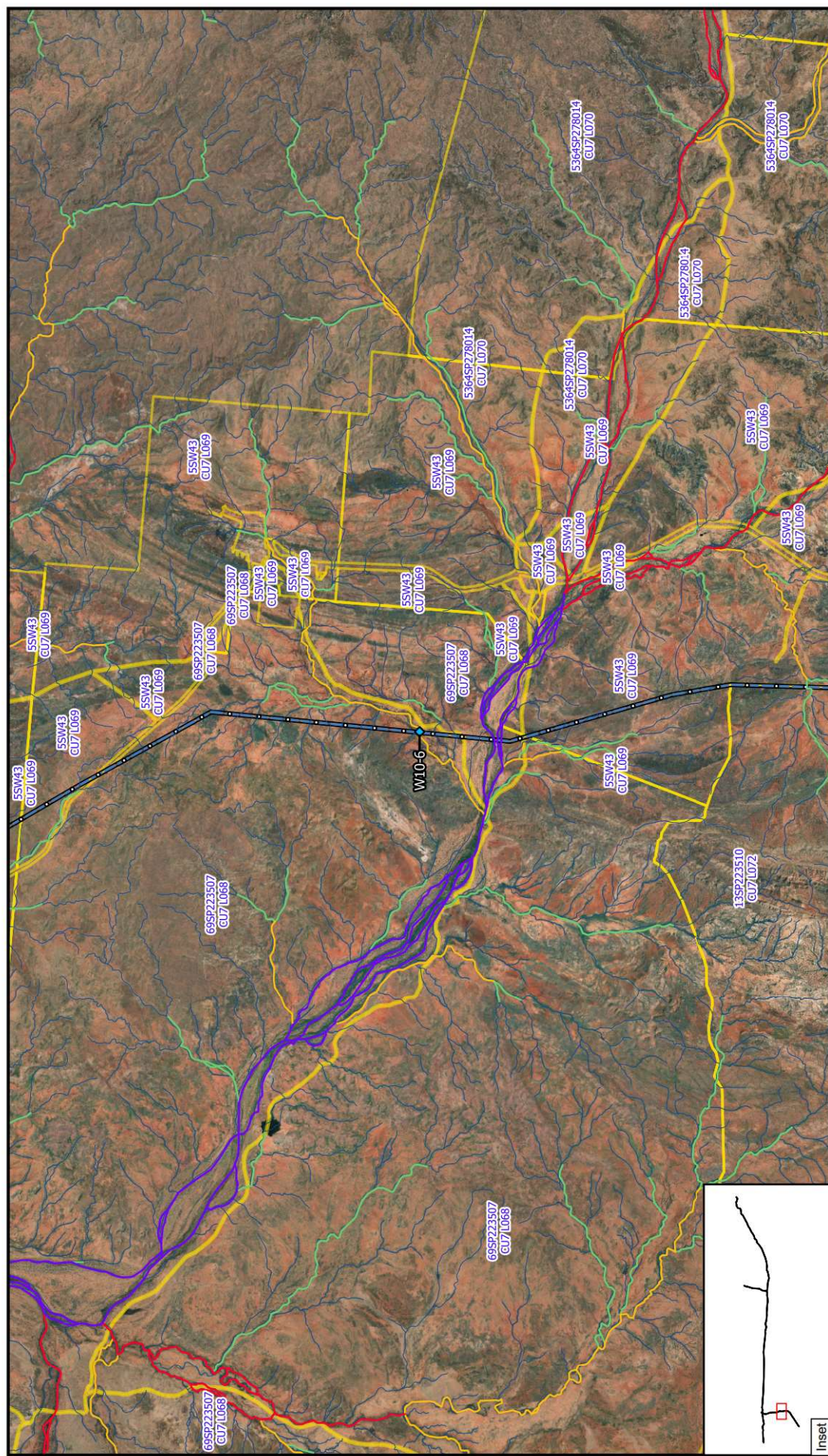
Legend

- | | | |
|---|---|--|
| <ul style="list-style-type: none"> ◦ CuString 2.0 KPs JC ◆ Waterway Survey Sites — CuString 2.0 Alignment JC — VM Act Watercourse | <p>Waterway Barrier Works</p> <p>Low</p> <p>Moderate</p> <p>High</p> | <p>☐ CuString 2.0 Corridor Properties Containing</p> <p>☐ CuString 2.0 Project</p> |
|---|---|--|

Scale @ A3:
Date:
Drawn:





DATA SOURCE:
BASE CONSULTING GROUP 2021; OSPITAL 2021; The State of Queensland (Department of Natural Resources and Mines) 2021; Source: Eni, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

BASE/







BASE/





1.1 Scrubby Creek W10-1

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (<i>Vegetation Management Act, 1999</i>)	
Stream Order	4
Waterway (<i>Fisheries Act, 1994</i>)	
Waterway	Low impact (green)
Watercourse Identification (<i>Water Act, 2000</i>)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of a mapped Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Ephemeral watercourse 17m wide with 0.9m narrow low flow main clay-based dry channel. Riparian vegetation on silt / clay banks. Remnant grassland vegetation with small riparian corridor retained. Scattered <i>Acacia cambagei</i> dominates canopy layer with very scattered <i>Eucalyptus coolabah</i> to 5-12m in height. <i>Cenchrus ciliaris</i>* dominant ground cover.</p> <p>Weed risk: <i>Cenchrus ciliaris</i>* observed.</p> <p>Current Aquatic Values: nil</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent. A shallow 0.6m deep channel with a slight 0.3m rise on the right bank. Minor modifications to bank slopes and approaches would enable vehicular access during the dry season. Removal of riparian vegetation would be required. A rarely used farm track follows the fenceline 100m to the south. The Hughenden Muttaborra Road within 1500m to the west and 2000m to the east.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	





1.2 Watercourse W10-2

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (<i>Vegetation Management Act, 1999</i>)	
Stream Order	3
Waterway (<i>Fisheries Act, 1994</i>)	
Waterway	Low impact (green)
Watercourse Identification (<i>Water Act, 2000</i>)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of a mapped Drainage Feature.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Ephemeral watercourse 7m wide with 0.4m narrow low flow clay-based dry channel. Riparian vegetation on silt / clay banks. Non remnant area. Scattered <i>Acacia cambagei</i> dominates canopy layer with sparse <i>Lysiphyllum</i> sp. to 6m in height, with <i>Cenchrus ciliaris</i> dominant ground cover.</p> <p>Weed risk: <i>Cenchrus ciliaris</i> observed.</p> <p>Current Aquatic Values: nil</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent. A shallow channel with shallow banks. Minor modifications to bank slopes and approaches would enable vehicular access during the dry season. Removal of riparian vegetation would be required. The nearest recorded access track within 100m to the south and main road within 1500m to the east. Access to the alignment may necessitate crossing this watercourse on several occasions.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	





1.3 Watercourse W10-3

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (<i>Vegetation Management Act, 1999</i>)	
Stream Order	4
Waterway (<i>Fisheries Act, 1994</i>)	
Waterway	Low impact (green)
Watercourse Identification (<i>Water Act, 2000</i>)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of a mapped Drainage Feature.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Ephemeral watercourse 6m wide with 1.3m narrow low flow clay-based dry channel. Riparian vegetation on silt / clay banks. Scattered sparse <i>Acacia cambagei</i> dominates canopy layer to 5m in height, with <i>Cenchrus ciliaris</i> dominant and scattered <i>Bothriochloa sp.</i> ground cover.</p> <p>Weed risk: <i>Cenchrus ciliaris</i> and <i>Vachellia farnesiana</i> observed.</p> <p>Current Aquatic Values: nil</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent. A shallow channel with steep slopes on banks. Minor modifications to bank slopes and approaches would enable vehicular access during the dry season. Removal of sparse riparian vegetation would be required. The nearest recorded access track is 100m to the south and main roads within 4000m to the west and east.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	





1.4 Watercourse W10-4

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (<i>Vegetation Management Act, 1999</i>)	
Stream Order	2
Waterway (<i>Fisheries Act, 1994</i>)	
Waterway	Low impact (green)
Watercourse Identification (<i>Water Act, 2000</i>)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of a mapped Drainage Feature.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Ephemeral watercourse 7m wide with 1m narrow low flow clay-based dry channel. Riparian vegetation on silt / clay banks. Scattered <i>Acacia cambagei</i> dominates canopy layer to 6m in height, with <i>Cenchrus ciliaris</i> dominant and scattered <i>Cyperus sp.</i> ground cover.</p> <p>Weed risk: <i>Cenchrus ciliaris</i> and <i>Xanthium pungens</i> observed.</p> <p>Current Aquatic Values: nil</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent. A shallow 1m deep channel with shallow bank slopes. Minor modifications to bank slopes and approaches would enable vehicular access during the dry season. Removal of riparian vegetation would be required. Existing unsealed access track within 100m to the south and the main road 700m to the west. Access to the alignment may necessitate crossing this watercourse on several occasions.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	

1.5 Watercourse W10-5

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (<i>Vegetation Management Act, 1999</i>)	
Stream Order	3
Waterway (<i>Fisheries Act, 1994</i>)	
Waterway	Low impact (green)
Watercourse Identification (<i>Water Act, 2000</i>)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of an unmapped Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Ephemeral watercourse 86m wide with 1.2m narrow braided low flow dry rock / gravel channels and 2-4m deep outer banks. Riparian vegetation on rock / gravel banks. <i>Lophostemon grandifolium</i> dominates canopy layer with <i>Eucalyptus cameldulensis</i> to 16m in height. <i>Acacia torulosa</i> observed in tree canopy and shrub layers. <i>Cenchrus ciliaris</i> dominates edges of banks with scattered <i>Cyperus sp.</i> <i>Aristida sp.</i> in the ground layer.</p> <p>Weed risk: <i>Cenchrus ciliaris</i> and <i>Vachellia farnesiana</i> observed.</p> <p>Current Aquatic Values: nil</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent. This channel is on average less than 1.2m in depth with 2-4m deep outer banks. Moderate modifications to bank gradients and approaches would enable vehicular access in the dry season. Removal of riparian vegetation would be required. Existing unsealed access track and waterway crossing within 100m to the north west.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	

1.6 Gorge Creek W10-6

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (<i>Vegetation Management Act, 1999</i>)	
Stream Order	5
Waterway (<i>Fisheries Act, 1994</i>)	
Waterway	Moderate impact (amber)
Watercourse Identification (<i>Water Act, 2000</i>)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of an unmapped Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Ephemeral watercourse 24m wide with a 4m deep sand / gravel dry channel with steep banks. <i>Eucalyptus cameldulensis</i> dominates canopy layer with scattered <i>Eucalyptus coolabah</i> to 15m in height. Banks covered in <i>Cenchrus ciliaris</i>.</p> <p>Weed risk: <i>Cenchrus ciliaris</i> observed.</p> <p>Current Aquatic Values: nil</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent. This channel is on average 4m deep. Moderate modifications to bank gradients and approaches would enable vehicular access in the dry season. Removal of riparian vegetation would be required. Existing unsealed access track 250m to the south east. Access to the alignment may necessitate crossing this watercourse on several occasions.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	

M0012 Waterway Locations and Assessments

M0012 – May 2021



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1.0 Introduction

Waterway assessments were completed along the length of this portion of the alignment. The assessments were completed to characterise a diversity of parameters in order to provide an insight into waterway condition, disturbances and constraints to access. Assessments are based on modified AUSRIVAS (Australian River Assessment System) waterway assessments criteria and includes information regarding:



- Bed structure, substrate composition and width
- Bank structure, composition and height
- Canopy cover and shading
- Riparian vegetation and presence of introduced flora species
- Adjacent land use (upstream and downstream)
- Habitat attributes
- Snags and Large Woody Debris

In addition, data associated with access was collected and cross referenced with GIS based imagery examination. Outlined below in Figure 1 are the locations of assessments completed along this section of the alignment.

1.1 Torrens Creek - Watercourse W12-1

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (<i>Vegetation Management Act, 1999</i>)	
Stream Order	6
Waterway (<i>Fisheries Act, 1994</i>)	
Waterway	Major impact (purple)
Watercourse Identification (<i>Water Act, 2000</i>)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of a mapped Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: 83m wide watercourse containing an in-stream bar with riparian vegetation (10m wide). Riparian vegetation on banks. Steep, rocky eastern bank (8m tall) with sloped western bank (4m tall). <i>Eucalyptus camaldulensis</i> dominated canopy layer.</p> <p>Weed risk: None observed.</p> <p>Current Aquatic Values: Aquatic flora, algae and macrophyte absent.</p> <p>Vehicle / Construction access requirements: A crossing within the alignment is absent. Modifications to the eastern bank and approaches would enable vehicular access in the dry season, although would be difficult due to rocky ravines. Access may be possible further south or north beyond the reaches of the rocky structures. Removal of riparian vegetation may also be required.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
	

1.2 Prairie Creek - Watercourse W12-2

Desktop Mapping	Comment / Description
Vegetation Management Watercourse / Drainage (<i>Vegetation Management Act, 1999</i>)	
Stream Order	2
Waterway (<i>Fisheries Act, 1994</i>)	
Waterway	Low impact (green)
Watercourse Identification (<i>Water Act, 2000</i>)	
Watercourse / Drainage Feature / Unknown	The watercourse location fits the definition of a mapped Watercourse.
Other Comments	
<p>Creek bed characteristics and vegetation characteristics: Ephemeral watercourse 4m wide with a 1.2m deep dry sand channel. Wetland species absent. Banks covered in <i>E. coolabah</i> and <i>Carissa lanceolata</i>, and several grass species; <i>Aristida</i> sp., <i>Enneapogon</i> sp., <i>Eragrostis</i>., <i>Iseilema vaginiflorum</i>, <i>Eulalia aurea</i>, <i>Cenchrus</i> sp. and <i>Chloris pectinata</i>.</p> <p>Weed risk: <i>Vachellia farnesiana</i> observed.</p> <p>Current Aquatic Values: nil</p> <p>Vehicle / Construction access requirements: No crossing present within the alignment. Very limited modifications required for access. Dry weather only.</p>	
Upstream	Downstream
	
Left Bank	Right Bank
