Chapter 4

Land

4.0 Land

4.1 Existing Environment

A desktop assessment was undertaken to identify land features along the Draft Alignment, including topography, geology, soil types, acid sulfate soils, resource interests and contaminated land. These desktop databases included:

- Queensland Globe
- Australian Soil Resource Information System (ASRIS)
- Atlas of Australian Sulfate Soils
- Environmental Management Register/Contaminated Land Register
- Department of State Development, Manufacturing, Infrastructure and Planning (DSDMIP) Development Assessment Mapping System.

4.1.1 Topography and geology

The topography along the Draft Alignment ranges from flat low lying land to steep crossings of multiple ranges and mountains, including part of the Pelican Range (70 km west of Mount Fox) and the Great Dividing Range (100 km west of Mount Fox) (Figure 4-1). Elevation throughout the Draft Alignment generally ranges from 400-800 m AHD. Significant landforms in proximity to the Draft Alignment include:

- Mount Fox (810 m)
- Mount Claro (570 m)
- Mount Jimmy (579 m)
- Pelican Range (450 m at intersection with the Draft Alignment)
- The Great Dividing Range (590 m at intersection with the Draft Alignment).

Landslides in Queensland are generally caused by heavy rain when rain saturates the soil on a hillside past the point where any remaining vegetation can support the soil's weight against the force of gravity (Queensland Government, 2017). The Great Dividing Range is identified as a landslide prone region (Geoscience Australia, 2018). Two landslides have been recorded at the Kangaroo Hills Homestead, approximately 6.5 km south of the Draft Alignment, in 1911 and 1935 (Geoscience Australia, 2018).

4.1.2 Waterways

The western extent of the Draft Alignment traverses the Gilbert River Basin for approximately 70 km before crossing into the Burdekin River Basin. The Project crosses 31 watercourses (third order stream or higher), mapped under the *Water Act 2000*. Five crossings occur in the Gilbert Basin and the remaining 26 crossings in the Burdekin River Basin. All watercourses crossed by the Draft Alignment are ephemeral and generally cease to flow shortly after the cessation of rainfall. The Burdekin River represents the largest catchment area crossed by the Draft Alignment and flows in the upper Burdekin can persist several months following the wet season. However flows generally cease in the dry season in this section of the river as well. The existing environment and potential impacts on hydrology are detailed in Chapter 7 Hydrology.

The region includes many watercourses which are mapped as Queensland waterways for waterway barrier works under the *Fisheries Act 1994.* Where bed level crossings for new access tracks are required, design and construction will be required to comply with the '*Accepted Development Requirements for Operational Work that is Constructing or Raising Waterway Barrier Works. Waterway barrier works*' are discussed in Chapter 7 Hydrology.

AECOM
www.aecom.com

N

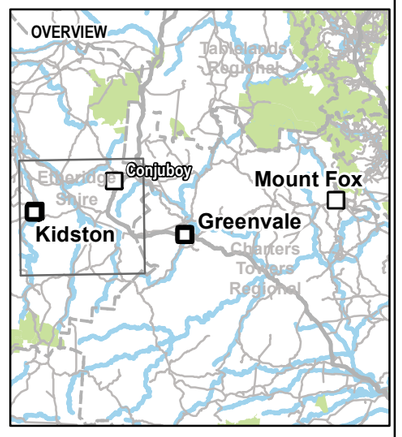
Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

0 2 4 6 8
Kilometers

1:229,000 (when printed at A3)

Legend

- Places
- Watercourses
- Contours, 50m
- Main Roads
- Ranges
- Local Government Area
- Draft Alignment
- Draft Alignment A
- Draft Alignment B



Kidston Connection Project

TOPOGRAPHY

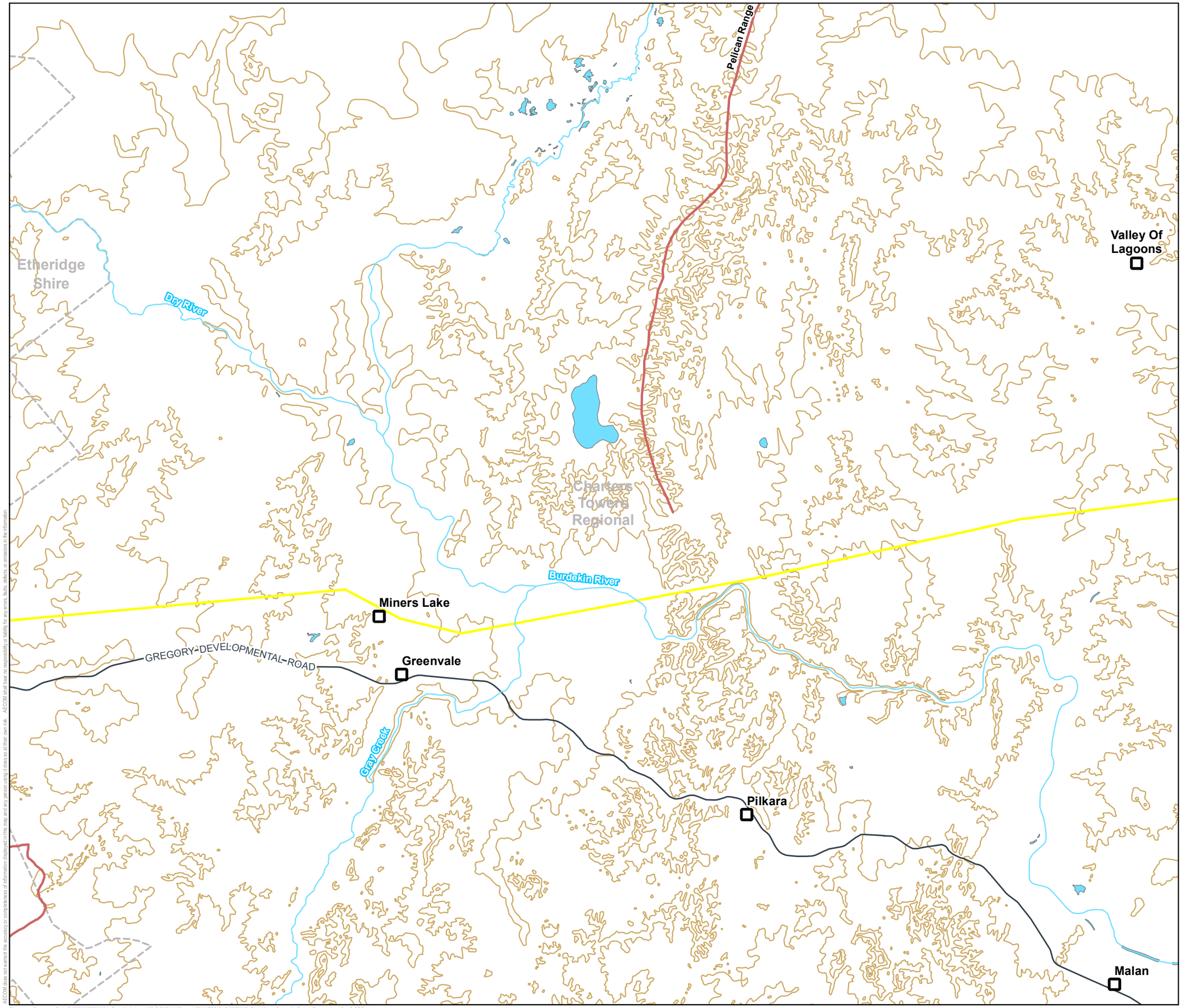
PROJECT ID:	60577456
CREATED BY:	JB
LAST MODIFIED:	CFS - 12-Sep-18
VERSION:	1

Figure F4-1A

A3 size

Filename: Document Path: P:\605X\60577456\4. Tech Work Area\4.99 GIS\02_MXDs___NEW VERSIONS\60577456_F4-1_KidstonConnectionProject_Topography_A3L_v2_DDP.mxd

Gregory Developmental Road
Kennedy Developmental Road
Great Dividing Range
Spring Creek
Lagoon Creek
Dry River
Kidston
Conjuboy
The Lynd
Etheridge Shire
Charters Towers Regional
GIRRINGUN NATIONAL PARK
Einasleigh River
Copperfield River
Lee (Mckinnons) Creek
Great Dividing Range



Filename: Document Path: P:\605X\605774456\4. Tech Work Area\4.99 GIS\02_MXDs___NEW VERSIONS\60577456_F4-1_KidstonConnectionProject_Topography_A3L_v2_DDP.mxd

AECOM
www.aecom.com

N

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

0 2 4 6 8
Kilometers

1:229,000 (when printed at A3)

Legend

- Places
- Watercourses
- Contours, 50m
- Main Roads
- Ranges
- Local Government Area
- Lakes
- Draft Alignment

Data sources:
DCDB, Roads, Watercourses - DNRM 2017
Site Features and Layout - AECOM 2018
© SISP Imagery 2017

Disclaimer:
While every care is taken to ensure the accuracy of the Information Product, the State of Queensland makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and disclaims all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damage) and costs which you might incur as a result of the product being inaccurate or

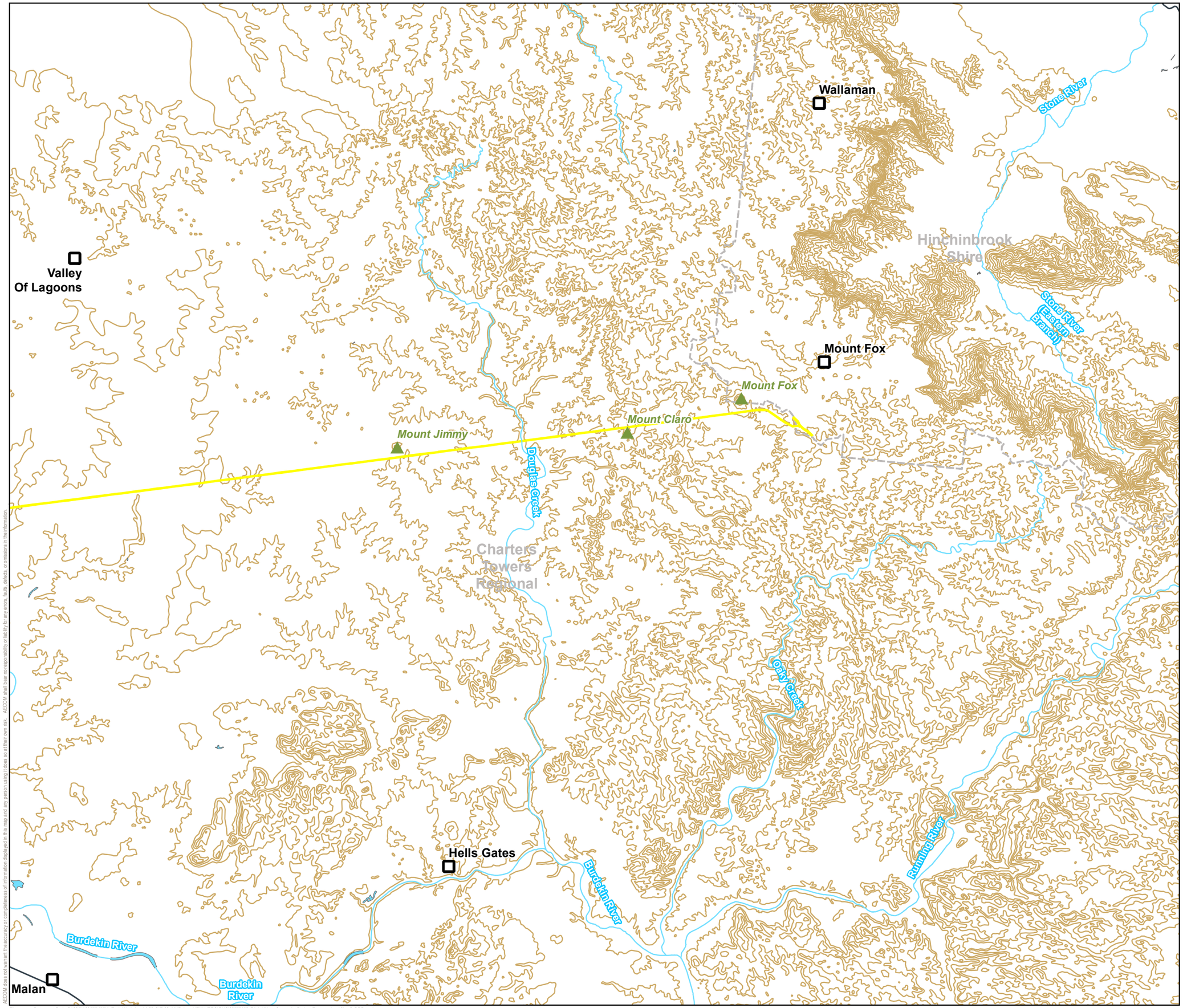
Kidston Connection Project

TOPOGRAPHY

PROJECT ID:	60577456
CREATED BY:	JB
LAST MODIFIED:	CFS - 12-Sep-18
VERSION:	1

Figure F4-1B

A3 size



AECOM does not warrant the accuracy or completeness of information displayed in this map and any person using it does so at their own risk. AECOM shall bear no responsibility or liability for any errors, faults, defects, or omissions in the information.

Filename: Document Path: P:\605X\60577456\4. Tech Work Area\4.99 GIS\02_MXDs___NEW VERSIONS\60577456_F4-1_KidstonConnectionProject_Topography_A3L_v2_DDP.mxd

AECOM
www.aecom.com

N

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

0 2 4 6 8
Kilometers

1:229,000 (when printed at A3)

Legend

- Mountains
- Places
- Watercourses
- Contours, 50m
- Main Roads
- Local Government Area
- Lakes
- Draft Alignment

Data sources:
DCDB, Roads, Watercourses - DNRM 2017
Site Features and Layout - AECOM 2018
© SISP Imagery 2017

Disclaimer:
While every care is taken to ensure the accuracy of the Information Product, the State of Queensland makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and disclaims all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damage) and costs which you might incur as a result of the product being inaccurate or

Kidston Connection Project

TOPOGRAPHY

PROJECT ID:	60577456
CREATED BY:	JB
LAST MODIFIED:	CFS - 12-Sep-18
VERSION:	1

Figure F4-1C

A3 size

4.1.3 Soils

The Australian Soil Classification is the classification system currently used to describe and classify soils in Australia. It is a general-purpose, hierarchical classification system, and consists of five categorical levels from the most general to the most specific: order, suborder, great group, subgroup, and family. Table 4-1 and Figure 4-2 present the Australian Soil Resource Information System (ASRIS) soil types, and corresponding soil orders, mapped along the Draft Alignment (from Kidston towards Mount Fox).

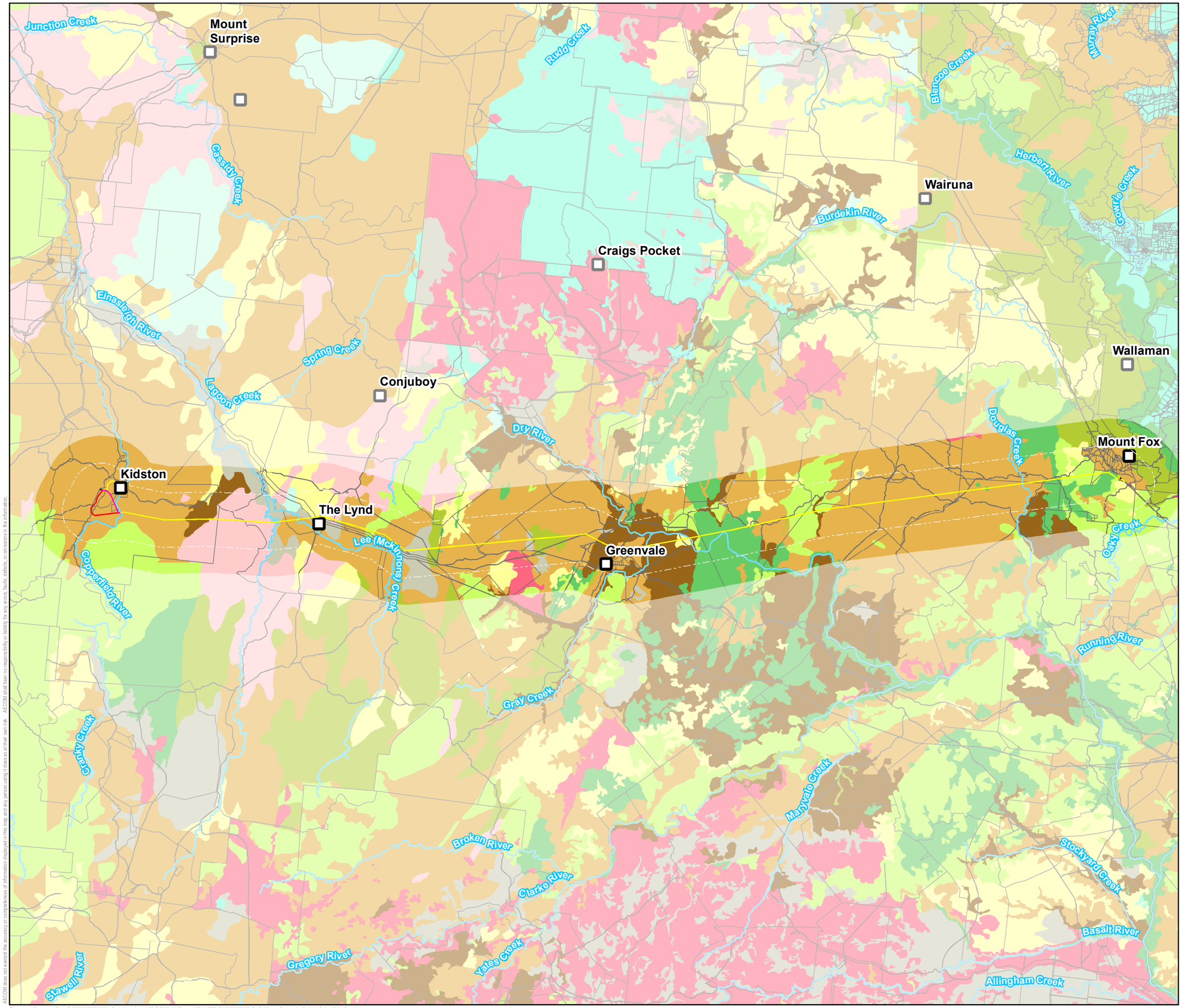
A description of soil orders relevant to the Project is provided below.

- Vertosols: are the most common soil in Queensland. These soils display shrink-swell features and are known as cracking clay soils.
- Chromosols: are texture-contrast soils. Chromosols are not very acidic.
- Sodosols: are texture-contrast soils with extremely low permeable subsoils due to the concentration of sodium. This soil type often has a low-nutrient status and is highly vulnerable to erosion and dryland salinity when vegetation is removed.
- Tenosols: are poorly developed but widespread and can be shallow and stony. These soils generally have a low fertility and low water-holding capacity.
- Kandosols: Kandosols are red, yellow and grey massive earths. They generally have a sandy to loamy-surface soil, grading to porous sandy-clay subsoils with low fertility and poor water-holding capacity.

Table 4-1 Soil classification in the Draft Alignment (ASRIS, 2013)

ASRIS Map Unit	Soil Order	Description	Dominant Soil Class/Codominant Soil Class
Qb41	Chromosols	Hard pedal red duplex soils Moderately to strongly undulating lands often with many quartz reef outcrops	Dr2.22/Dr2.21/Dr2.12
Se4	Chromosols	Hard pedal yellow duplex soils Gently undulating to undulating lands with long gentle slopes & rounded ridge crests	Dy2.22/Dy2.21
Ui4	Sodosols	Hard pedal mottled-yellow duplex soils Gently undulating lands with long gentle slopes rounded ridge crests & broad flat drainage lines	Dy3.32/Dy2.22/Dr2.22
Qb42	Chromosols	Hard pedal red duplex soils Low hilly lands with some strongly undulating marginal slopes	Dr2.22/Dr2.21/Dr2.12
Kf11	Vertosols	Black self-mulching cracking clays Alluvial plains with low levees & braided distributary channels	Ug5.16/Ug5.15
Ca33	Tenosols	Bleached sands with a colour B horizon Gently undulating to undulating lands occasionally low rocky hills-Tor outcrops occur on areas of lesser relief	Uc2.22/Uc2.21/Uc2.12

ASRIS Map Unit	Soil Order	Description	Dominant Soil Class/Codominant Soil Class
Qb40	Chromosols	Hard pedal red duplex soils Gently undulating to undulating lands with broad rounded ridge crests & long even slopes	Dr2.22
Qb38	Chromosols	Hard pedal red duplex soils Moderately to strongly undulating lands with short steep slopes	Dr2.22
Qa24	Chromosols	Hard pedal red duplex soils Very gently undulating lands with some level plains	Dr2.12/Gn3.12/Gn3.22
Tb136	Sodosols	Hard pedal mottled-yellow duplex soils Moderately undulating lands with some low hilly to hilly areas	Dy3.41/Dy3.31
Va85	Sodosols	Hard pedal mottled-yellow duplex soils Level alluvial plains rising to short gently sloping pediments & foot-slopes	Dy3.43/Dy3.42
Qb37	Chromosols	Hard pedal red duplex soils Gently undulating to undulating lands	Dr2.22/Dy3.43/Dy3.42
JK26	Tenosols	Pale sands with a colour B horizon Low hilly to hilly lands with short steep slopes	Uc4.21/Uc2.12/Um4.2
Va83	Sodosols	Hard pedal mottled-yellow duplex soils Moderately to strongly undulating lands with occasional low hills	Dy3.43
LK26	Tenosols	Pale loams Low hilly lands with short steep slopes & much rock outcrop	Um4.12/Um4.23/Uc4
JK28	Tenosols	Pale sands with a colour B horizon Hilly to high hilly lands with very steep slopes	Uc4.21/Uc4.22/Uc4.12
Mz31	Kandosols	Red massive earths Low hilly to hilly lands with very occasional conical basalt peaks	Gn2.11,Gn2.14
Mt7	Kandosols	Mottled-yellow massive earths Strongly undulating lands often with granite tor outcrop on higher slopes	Gn2.64/Gn2.74/Gn2.84



AECOM does not warrant the accuracy or completeness of information displayed in this map and any person using it does so at their own risk. AECOM shall bear no responsibility or liability for any errors, faults, defects, or omissions in the information.

AECOM
www.aecom.com

N

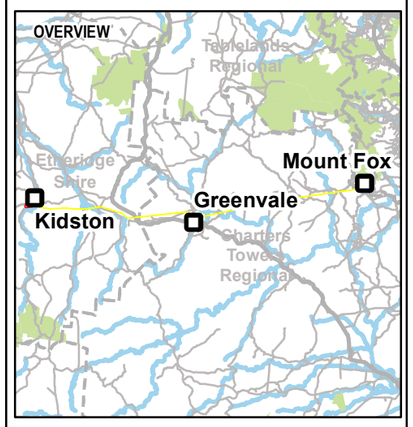
Coordinate System: GDA 94 MGA Zone 55
0 5 10 15 20
Kilometers
1:650,000 (when printed at A3)

Legend

- Places
- Watercourses
- Draft Alignment
- Draft Alignment A
- Draft Alignment B
- Draft Alignment
- Project 10 km Buffer
- Project 5 km Buffer

L4 ASC Soil Order

- Anthroposols
- Calcarosols
- Chromosols
- Dermosols
- Ferrosols
- Hydrosols
- Kandasols
- Kurosols
- Organosols
- Podosols
- Rudosols
- Sodosols
- Tenosols
- Vertosols



Data sources:
DCDB, Roads, Watercourses - DNRM 2017
Site Features and Layout - AECOM 2018
© SISP Imagery 2017

Disclaimer:
While every care is taken to ensure the accuracy of the Information Product, the State of Queensland makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and disclaims all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damage) and costs which you might incur as a result of the product being inaccurate or

Kidston Connection Project

Soils

PROJECT ID:	60577456
CREATED BY:	JB
LAST MODIFIED:	CFS - 18-Sep-18
VERSION:	1

Figure F4-2

A3 size

Filename: Document Path: P:\605X\60577456\4. Tech Work Area\4.99 GIS\02_MXDs___NEW VERSIONS\60577456_F4-2_KidstonConnectionProject_Soils_A3L_v2.mxd

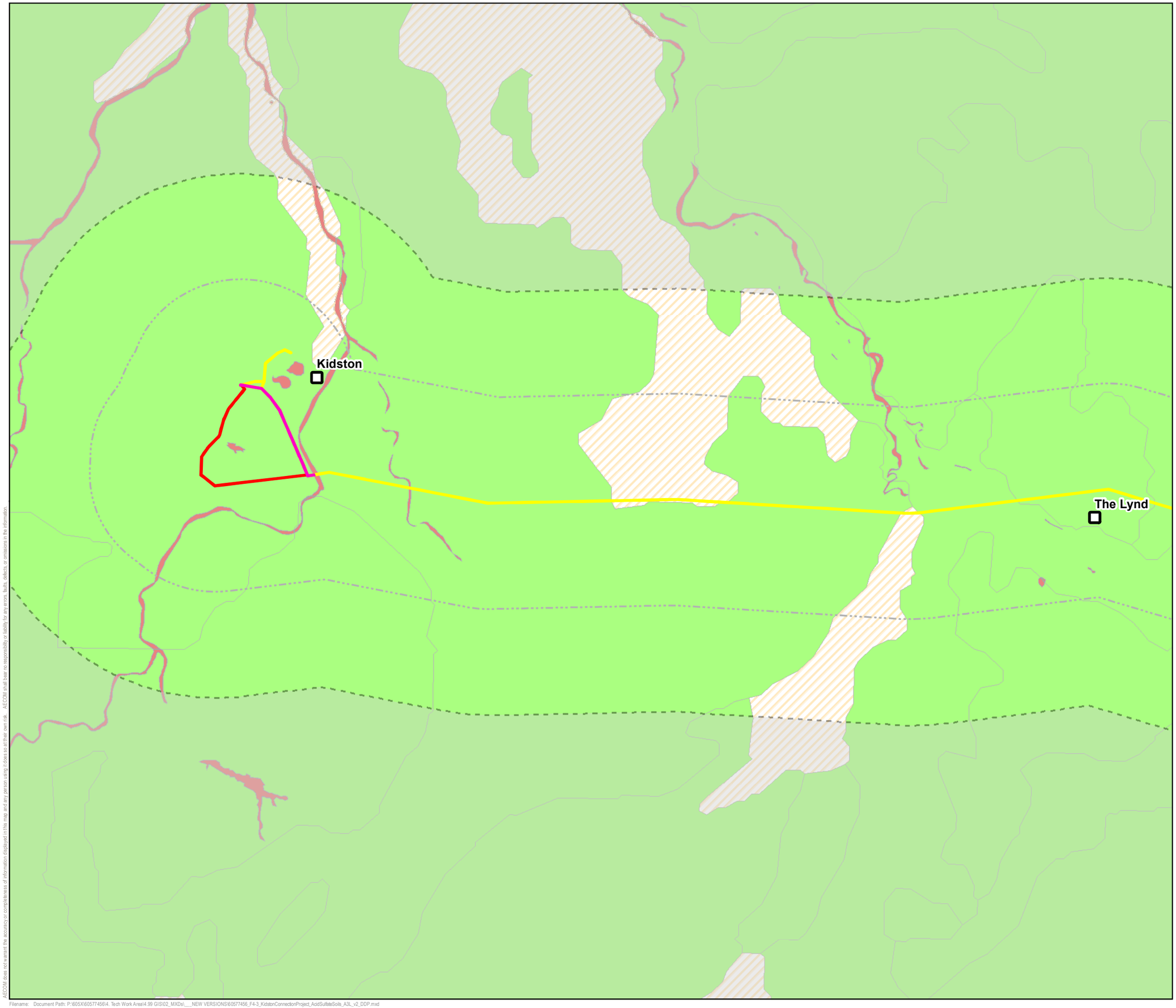
4.1.4 Acid sulfate soils

Acid sulfate soils (ASS) are soils that contain iron sulfides and are generally found in low-lying coastal areas below Australian Height Datum (AHD) 5.0 m (ASRIS, 2013). ASS are mapped on the Atlas of Australian Sulfate Soils, available on ASRIS. The probability of occurrence of ASS is categorised on the mapping as follows:

- high probability of occurrence: >70% chance of occurrence in mapping unit
- low probability of occurrence: 6-70% chance of occurrence in mapping unit
- extremely low probability of occurrence: 1-5% chance of occurrence in mapping unit
- no probability of occurrence: <1% chance of occurrence in mapping unit.

ASS can form in parts of inland Queensland where there are appropriate conditions. This is reflected where the Draft Alignment is mapped as having a “high probability” of containing ASS; where the Draft Alignment crosses the Copperfield River and East Creek, near Kidston, and the Burdekin River near Greenvale (Figure 4-3). Further investigations will be undertaken to determine the presence of ASS in these locations during detailed design.

As the elevation of the Draft Alignment varies from 400 m to 800 m AHD it is unlikely for ASS to be present within the remainder of the Draft Alignment. This is consistent with ASRIS mapping which identifies the remainder of the Draft Alignment as being mapped as “no known occurrence” and “low probability” of containing ASS. The eastern (Mount Fox) extent of the Draft Alignment is predominantly mapped as “low probability” with section of “no known occurrence”. The western (Kidston) extent of the Draft Alignment is predominately mapped as having “no known occurrence” with minor sections of “low probability” of containing ASS.



AECOM

www.aecom.com

N

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

0 2 4 6 8

Kilometers

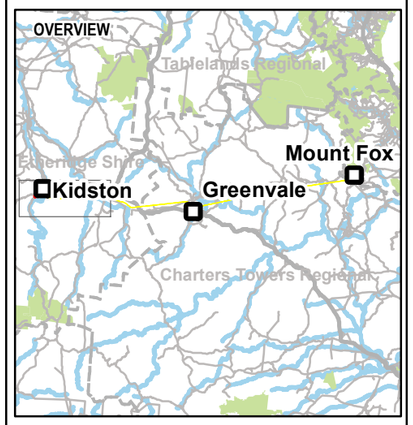
1:165,000 (when printed at A3)

Legend

- Places
- Draft Alignment
- Draft Alignment A
- Draft Alignment B
- Project 5 km Buffer
- Project 10 km Buffer

Acid Sulfate Soils

- High probability of occurrence
- Low probability of occurrence
- Extremely low probability of occurrence



Data sources:
DCDB, Roads, Watercourses - DNRM 2017
Site Features and Layout - AECOM 2018
© SISP Imagery 2017

Disclaimer:
While every care is taken to ensure the accuracy of the Information Product, the State of Queensland makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and disclaims all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damage) and costs which you might incur as a result of the product being inaccurate or

Kidston Connection Project

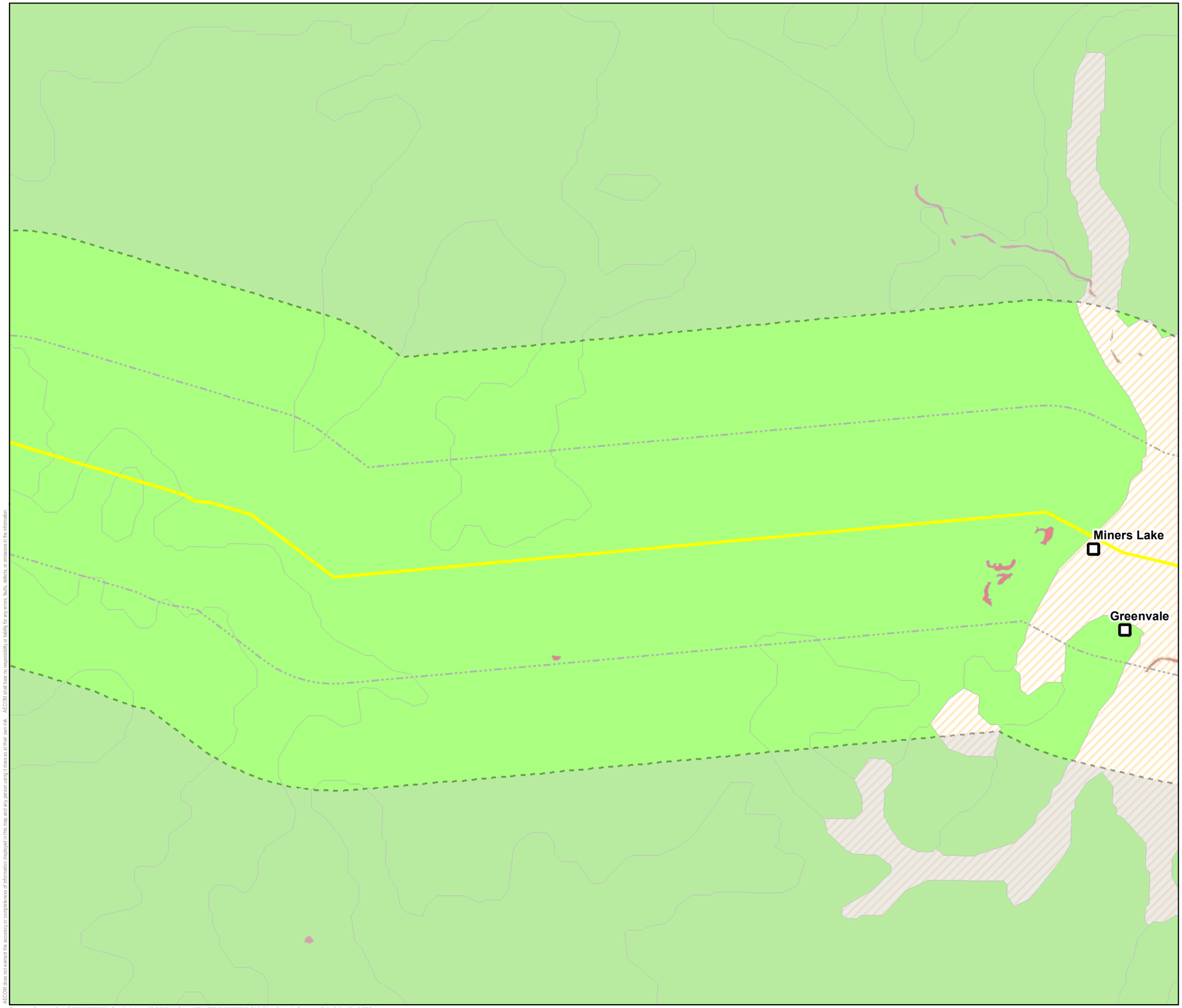
ACID SULFATE SOILS

PROJECT ID:	60577456
CREATED BY:	JB
LAST MODIFIED:	CFS - 12-Sep-18
VERSION:	1

Figure
F4-3A

A3 size

Filename: Document Path: P:\605X\60577456\4. Tech Work Area\4.99 GIS\02_MXDs___NEW VERSIONS\60577456_F4-3_KidstonConnectionProject_AcidSulfateSoils_A3L_v2_DDP.mxd



AECOM does not warrant the accuracy or completeness of information displayed in this map and any person using it does so at their own risk. AECOM shall bear no responsibility or liability for any errors, faults, defects, or omissions in the information.

Filename: Document Path: P:\605X\60577456\4. Tech Work Area\4.99 GIS\02_MXDs___NEW VERSIONS\60577456_F4-3_KidstonConnectionProject_AcidSulfateSoils_A3L_v2_DDP.mxd

AECOM
www.aecom.com

N

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

0 2 4 6 8
Kilometers

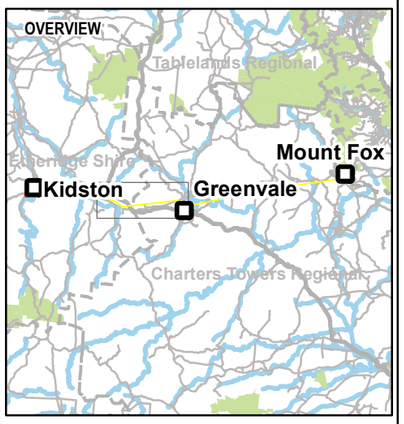
1:165,000 (when printed at A3)

Legend

- Places
- Draft Alignment
- Project 5 km Buffer
- Project 10 km Buffer

Acid Sulfate Soils

- High probability of occurrence
- Low probability of occurrence
- Extremely low probability of occurrence



Data sources:
DCDB, Roads, Watercourses - DNRM 2017
Site Features and Layout - AECOM 2018
© SISP Imagery 2017

Disclaimer:
While every care is taken to ensure the accuracy of the Information Product, the State of Queensland makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and disclaims all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damage) and costs which you might incur as a result of the product being inaccurate or

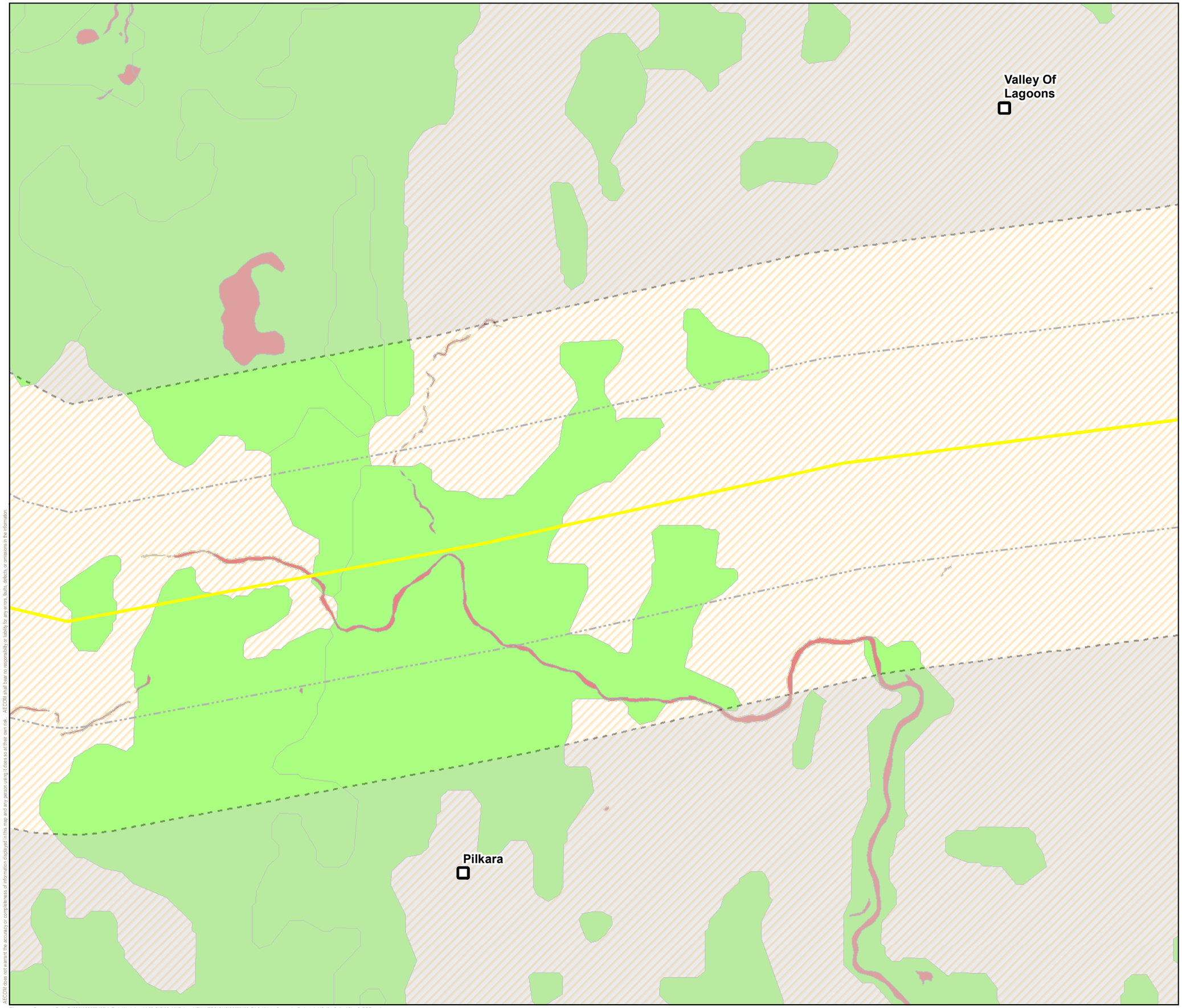
Kidston Connection Project

ACID SULFATE SOILS

PROJECT ID:	60577456
CREATED BY:	JB
LAST MODIFIED:	CFS - 12-Sep-18
VERSION:	1

Figure
F4-3B

A3 size



AECOM

www.aecom.com

N

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

0 2 4 6 8

Kilometers

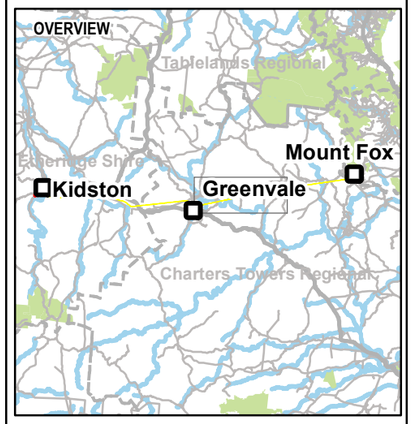
1:165,000 (when printed at A3)

Legend

- Places
- Draft Alignment
- Project 5 km Buffer
- Project 10 km Buffer

Acid Sulfate Soils

- High probability of occurrence
- Low probability of occurrence
- Extremely low probability of occurrence



Data sources:
DCDB, Roads, Watercourses - DNRM 2017
Site Features and Layout - AECOM 2018
© SISP Imagery 2017

Disclaimer:
While every care is taken to ensure the accuracy of the Information Product, the State of Queensland makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and disclaims all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damage) and costs which you might incur as a result of the product being inaccurate or

Kidston Connection Project

ACID SULFATE SOILS

PROJECT ID:	60577456
CREATED BY:	JB
LAST MODIFIED:	CFS - 12-Sep-18
VERSION:	1

Figure
F4-3C

A3 size

Filename: Document Path: P:\605X\60577456\4. Tech Work Area\4.99 GIS\02_MXDs___NEW VERSIONS\60577456_F4-3_KidstonConnectionProject_AcidSulfateSoils_A3L_v2_DDP.mxd

Mount Fox

Ewan

AECOM does not warrant the accuracy or completeness of information displayed in this map and any person using it does so at their own risk. AECOM shall bear no responsibility or liability for any errors, faults, defects, or omissions in the information.

Filename: Document Path: P:\605X\60577456\4. Tech Work Area\4.99 GIS\02_MXDs___NEW VERSIONS\60577456_F4-3_KidstonConnectionProject_AcidSulfateSoils_A3L_v2_DDP.mxd

AECOM
www.aecom.com

N

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

0 2 4 6 8
Kilometers

1:165,000 (when printed at A3)

Legend

- Places
- Draft Alignment
- Project 5 km Buffer
- Project 10 km Buffer

Acid Sulfate Soils

- High probability of occurrence
- Low probability of occurrence
- Extremely low probability of occurrence

Data sources:
DCDB, Roads, Watercourses - DNRM 2017
Site Features and Layout - AECOM 2018
© SISP Imagery 2017

Disclaimer:
While every care is taken to ensure the accuracy of the Information Product, the State of Queensland makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and disclaims all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damage) and costs which you might incur as a result of the product being inaccurate or

Kidston Connection Project

ACID SULFATE SOILS

PROJECT ID:	60577456
CREATED BY:	JB
LAST MODIFIED:	CFS - 12-Sep-18
VERSION:	1

Figure
F4-3D

A3 size

4.1.5 Resource interests

Resource interests in Queensland are generally governed by the *Petroleum and Gas (Production and Safety) Act 2004* and *Mineral Resources Act 1989*. No interests under the *Petroleum and Gas (Production and Safety) Act 2004* have been identified within the Project area. Several resource interests governed by the *Mineral Resources Act 1989* have been identified (Table 4-2, Figure 4-4). It is noted that the primary resource interests identified are for exploration purposes.

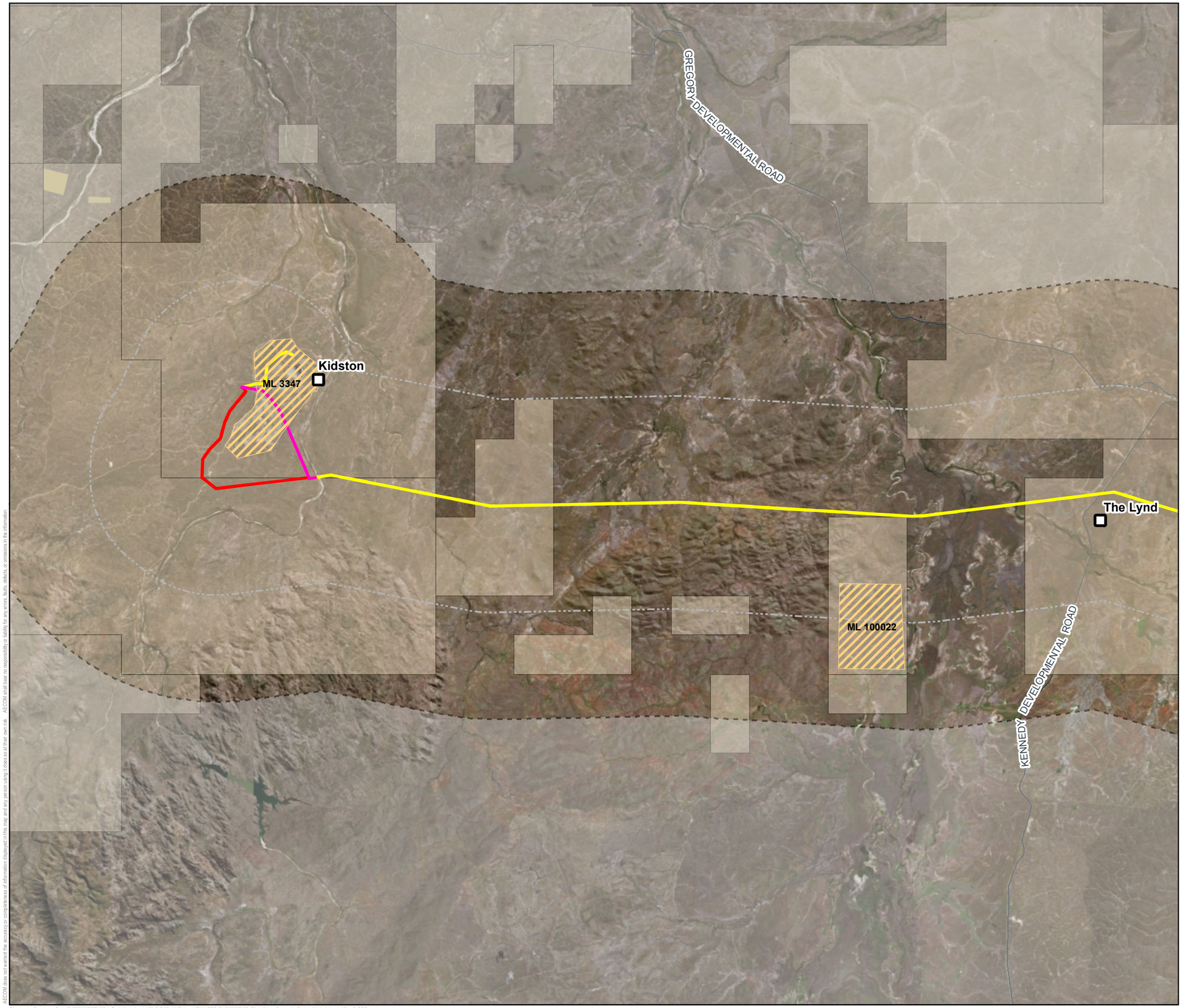
Table 4-2 Resource interests (Queensland Government, 2018)

Allocation Type	Relevance to Project
Mining Lease (ML)	• Two MLs are traversed by the Draft Alignment: - Lot 1 SP289310 and Lot 2 SP289310 (ML 3347) - Lot 547 SP242570 (ML 6750). • Historical permits are present on: - Lot 3 WU48 (ML 4527, ML 10037, ML 10095, ML 6111 and MDL470) - Lot 501 SP232789 (ML 1371 and MDL410).
Exploration permits for minerals (EPM)	15 EPMs are traversed by the Draft Alignment. Table 4-3 details the lots containing an EPM.
Mineral occurrence	The mineral occurrences mapped nearest to the Draft Alignment are: • Gold, approximately 100 m from the Draft Alignment on Lot 3 WU48 (EPM26637; EPM26632) • Copper, approximately 100 m from the Draft Alignment on Lot 501 SP232789 (EPM25865) • Gold, approximately 350 m from the Draft Alignment on Lot 547 SP242570 (EPM18987).
Quarries	None identified

Table 4-3 EPM traversed by the Draft Alignment (Queensland Government, 2018)

Lot on Plan	Permits Number	Status	Expiry
Lot 3198 PH2177	EPM 26652	Application	N/A
	EPM 26637	Application	N/A
Lot 3 WU48	EPM 26637	Application	N/A
	EPM 26632	Application	N/A
Lot 6 WU50	EPM 26637	Application	N/A
	EPM 26632	Application	N/A
Lot 1 OC64	EPM 26360	Granted	11/06/2023
Lot 5234 SP275834	EPM 26360	Granted	11/06/2023
Lot 11 CLK26	EPM 26559	Granted	3/12/2022
Lot 5 CLK23	EPM 26559	Granted	3/12/2022
	EPM 25691	Granted	7/04/2020
Lot 501 SP232789	EPM 25834	Granted	5/01/2021

Lot on Plan	Permits Number	Status	Expiry
	EPM 25865	Granted	14/12/2020
	EPM 26559	Granted	3/12/2022
Lot 3 CLK34	EPM 26165	Granted	29/01/2022
Lot 547 SP242570	EPM 26559	Granted	3/12/2022
	EPM 26165	Granted	29/01/2022
	EPM 18987	Granted	24/09/2018
Lot 4 CD35	EPM 25259	Granted	7/04/2019
	EPM 14107	Granted	25/08/2019
	EPM 25498	Granted	10/11/2019
Lot 1 CD25	EPM 25498	Granted	10/11/2019
Lot 3 CD12	EPM 12513	Granted	4/10/2019
Lot 182 PH995	EPM 12513	Granted	4/10/2019
	EPM 26854	Application	N/A



AECOM

www.aecom.com

N

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

0 2 4 6 8
Kilometers

1:165,000 (when printed at A3)

Legend

- Places
- Main Roads
- Mining Leases
- Exploration Permits for Minerals
- Project 5 km Buffer
- Project 10 km Buffer
- Draft Alignment
- Draft Alignment A
- Draft Alignment B

Mineral Occurrence

- Gold

Data sources:
DCDB, Roads, Watercourses - DNRM 2017
Site Features and Layout - AECOM 2018
© SISP Imagery 2017

Disclaimer:
While every care is taken to ensure the accuracy of the Information Product, the State of Queensland makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and disclaims all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damage) and costs which you might incur as a result of the product being inaccurate or

Kidston Connection Project

MINING INTERESTS

PROJECT ID:	60577456
CREATED BY:	JB
LAST MODIFIED:	CFS - 12-Sep-18
VERSION:	1

Figure
F4-4A

A3 size

Filename: Document Path: P:\605X\60577456\4. Tech Work Area\4.99 GIS\02_MXDs___NEW VERSIONS\60577456_F4-4_KidstonConnectionProject_MiningInterest_A3L_v2_DDP.mxd

AECOM
www.aecom.com

N

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

0 2 4 6 8
Kilometers

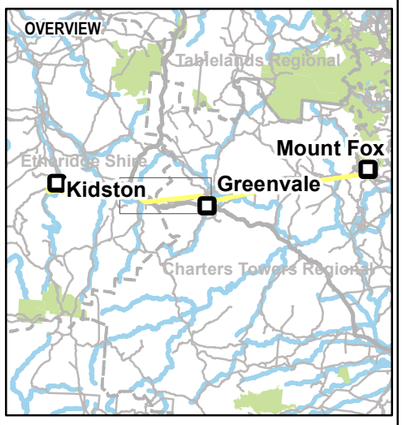
1:165,000 (when printed at A3)

Legend

- Places
- Main Roads
- Mining Leases
- Exploration Permits for Minerals
- Project 5 km Buffer
- Project 10 km Buffer
- Draft Alignment

Mineral Occurrence

- Unknown
- Silver, Gold, Copper, Lead, Zinc



Data sources:
DCDB, Roads, Watercourses - DNRM 2017
Site Features and Layout - AECOM 2018
© SISP Imagery 2017

Disclaimer:
While every care is taken to ensure the accuracy of the Information Product, the State of Queensland makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and disclaims all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damage) and costs which you might incur as a result of the product being inaccurate or

Kidston Connection Project

MINING INTERESTS

PROJECT ID:	60577456
CREATED BY:	JB
LAST MODIFIED:	CFS - 12-Sep-18
VERSION:	1

Figure F4-4B

A3 size

Filename: Document Path: P:\605X\60577456\4. Tech Work Area\4.99 GIS\02_MXDs___NEW VERSIONS\60577456_F4-4_KidstonConnectionProject_MiningInterest_A3L_v2_DDP.mxd

Valley Of Lagoons

ML 4528

ML 10367

ML 1445

Pilkara

ML 1360

ML 1360

ML 1375

AECOM does not warrant the accuracy or completeness of information displayed in this map and any person using it does so at their own risk. AECOM shall bear no responsibility or liability for any errors, faults, defects, or omissions in the information.

Filename: Document Path: P:\605X\60577456\4. Tech Work Area\4.99 GIS\02_MXDs___NEW VERSIONS\60577456_F4-4_KidstonConnectionProject_MiningInterest_A3L_v2_DDP.mxd

AECOM
www.aecom.com

N

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

0 2 4 6 8
Kilometers

1:165,000 (when printed at A3)

Legend

- Places
- Main Roads
- Mining Leases
- Exploration Permits for Minerals
- Project 5 km Buffer
- Project 10 km Buffer
- Draft Alignment

Mineral Occurrence

- Unknown
- Tin
- Tungsten

Data sources:
DCDB, Roads, Watercourses - DNRM 2017
Site Features and Layout - AECOM 2018
© SISP Imagery 2017

Disclaimer:
While every care is taken to ensure the accuracy of the Information Product, the State of Queensland makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and disclaims all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damage) and costs which you might incur as a result of the product being inaccurate or

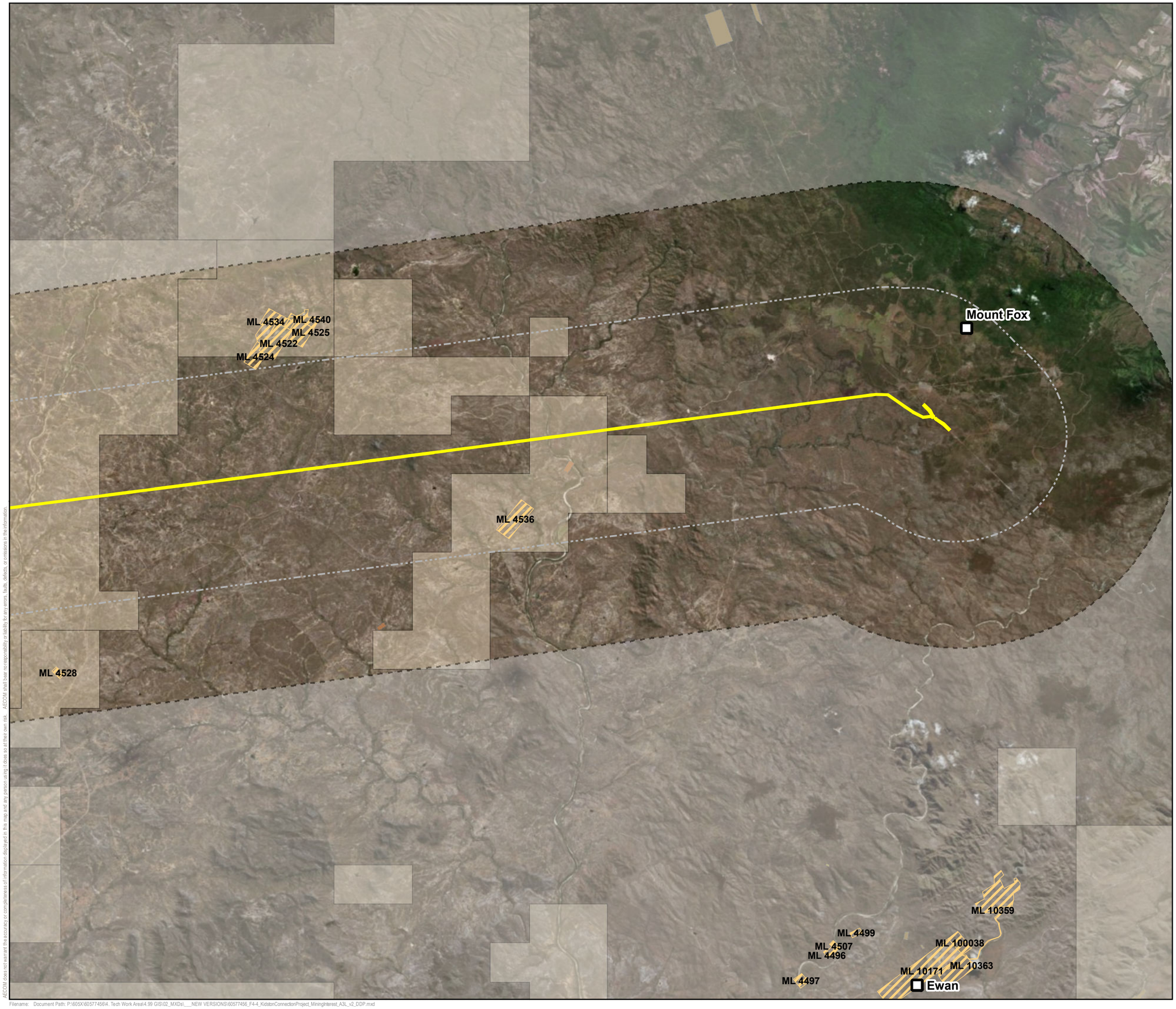
Kidston Connection Project

MINING INTERESTS

PROJECT ID:	60577456
CREATED BY:	JB
LAST MODIFIED:	CFS - 12-Sep-18
VERSION:	1

Figure
F4-4C

A3 size



AECOM does not warrant the accuracy or completeness of information displayed in this map and any person using it does so at their own risk. AECOM shall bear no responsibility or liability for any errors, faults, defects, or omissions in the information.

Filename: Document Path: P:\605X\60577456\4. Tech Work Area\4.99 GIS\02_MXDs___NEW VERSIONS\60577456_F4-4_KidstonConnectonProject_MiningInterest_A3L_v2_DDP.mxd

AECOM
www.aecom.com

N

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

0 2 4 6 8
Kilometers

1:165,000 (when printed at A3)

Legend

- Places
- Mining Leases
- Exploration Permits for Minerals
- Project 5 km Buffer
- Project 10 km Buffer
- Draft Alignment

Mineral Occurrence

- Antimony, Silver, Gold
- Tin
- Tungsten

Data sources:
DCDB, Roads, Watercourses - DNRM 2017
Site Features and Layout - AECOM 2018
© SISP Imagery 2017

Disclaimer:
While every care is taken to ensure the accuracy of the Information Product, the State of Queensland makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and disclaims all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damage) and costs which you might incur as a result of the product being inaccurate or

Kidston Connection Project

MINING INTERESTS

PROJECT ID:	60577456
CREATED BY:	JB
LAST MODIFIED:	CFS - 17-Sep-18
VERSION:	1

Figure
F4-4D

A3 size

4.1.6 Contaminated land

A search of the Department of Environment and Science (DES) Environmental Management Register (EMR) and the Contaminated Land Register (CLR) was undertaken in June 2018. No lots traversed by the Draft Alignment were identified on the CLR during the search. Ten lots were identified on the EMR for a 'notifiable activity' (activities that have the potential to cause land contamination). The notifiable activities listed are associated with agricultural and mining activities. Table 4-4 and Figure 4-5 identify the lots containing notifiable activities along the Draft Alignment.

For the majority of rural properties only a small area may be affected by the chemicals used in livestock dips and spray races. For those properties listed for mineral processing, a Mining Lease may affect only a limited area of the lot. In many instances with rural properties, only a small area may be potentially affected by the mining activities and the ongoing land use is unaffected.

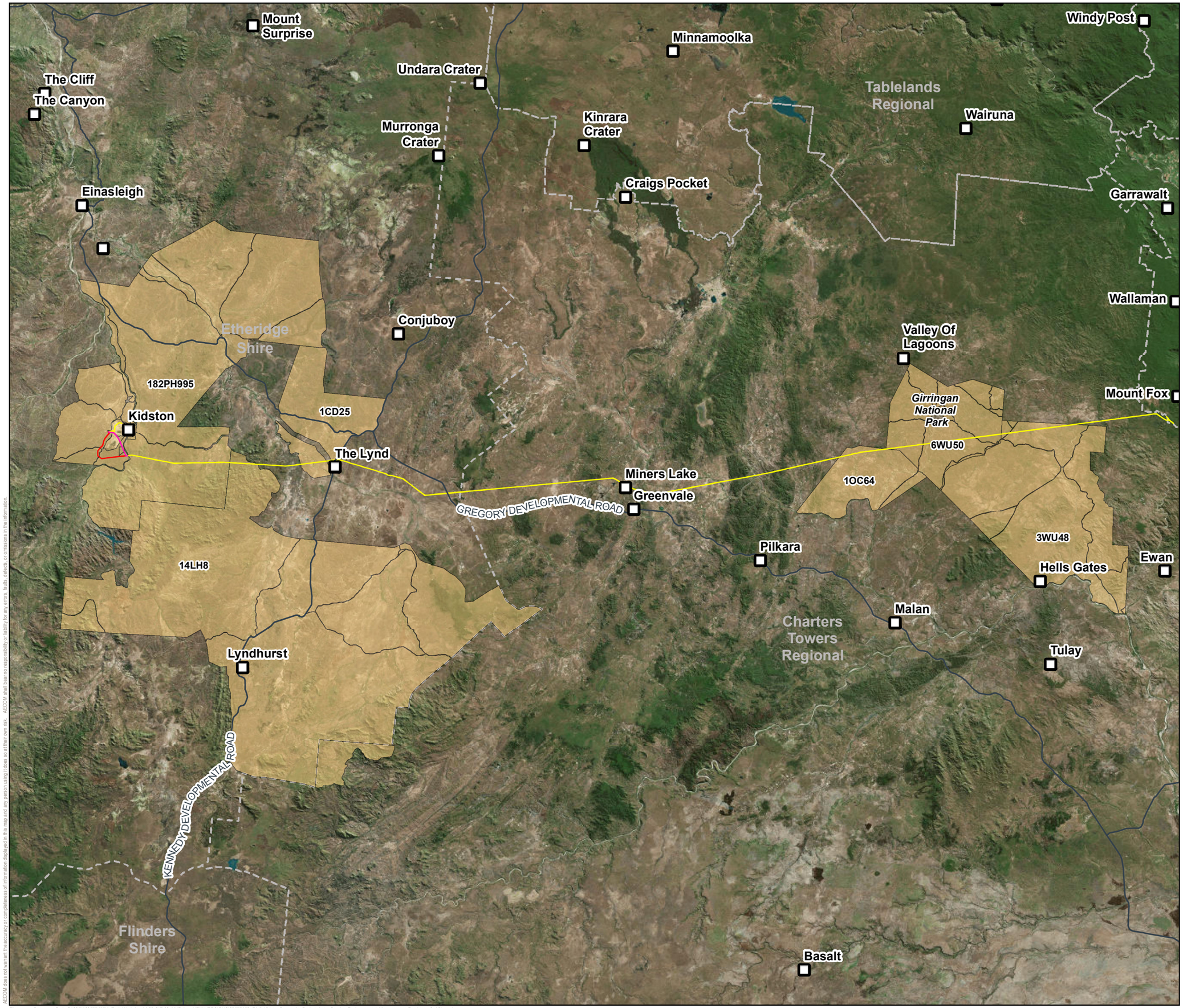
Table 4-4 Lots identified on EMR (Department of Environment and Science, 2018)

Lot on Plan	EMR Site ID	Notifiable Activity
Lot 3 WU48	14888	• Mineral processing
Lot 6 WU50	21811	• Livestock dip or spray pace • Mineral processing • Petroleum product or oil storage
Lot 1 OC64	55977	• Livestock dip or spray race • Landfill
Lot 1 CD25	56626	• Livestock dip or spray race • Petroleum product or oil storage
Lot 14 LH8	25544	• Livestock dip or spray race • Petroleum product or oil storage
Lot 182 PH995	25548	• Livestock dip or spray race
Lot 1 SP289310	166437	• Abrasive blasting • Chemical manufacturing or formulation • Chemical storage • Engine reconditioning works • Explosives production or storage • Landfill • Metal treatment or coating • Mine wastes • Petroleum production or oil storage • Smelting or refining
Lot 2 SP289310	166438	• Abrasive blasting • Chemical manufacturing or formulation • Chemical storage • Engine reconditioning works • Explosives production or storage • Landfill • Metal treatment or coating • Mine wastes

Lot on Plan	EMR Site ID	Notifiable Activity
		• Petroleum production or oil storage • Smelting or refining
Lot 66 SP287774	189246	This lot is an amalgamation of two lots which are both listed on the EMR: • Lot 6 CP857701 • Lot 2 PY12 Notifiable activities for both lots are: • Abrasive blasting • Chemical manufacturing or formulation • Chemical storage • Engine reconditioning works • Explosives production or storage • Landfill • Metal treatment or coating • Mine wastes
Lot 66 SP258871	129346	This lot is an amalgamation of two lots which are both listed on the EMR: • Lot 6 CP857701 • Lot 2 PY12 Notifiable activities for both lots are: • Abrasive blasting • Chemical manufacturing or formulation • Chemical storage • Engine reconditioning works • Explosives production or storage • Landfill • Metal treatment or coating • Mine wastes

4.1.7 Unexploded ordinance

The DSDMIP Development Assessment Mapping System identified no areas with substantial potential for unexploded ordinances as being mapped within or adjacent to the Draft Alignment (DSDMIP, 2018).



AECOM does not warrant the accuracy or completeness of information displayed in this map and any person using it does so at their own risk. AECOM shall bear no responsibility or liability for any errors, faults, defects, or omissions in the information.

Filename: Document Path: P:\605X\60577456\4. Tech Work Area\4.99 GIS\02_MXDs___NEW VERSIONS\60577456_F4-5_KidstonConnectionProject_Lots_On_the_Environmental_Management_Register_v2_A3L.mxd

AECOM
www.aecom.com

N

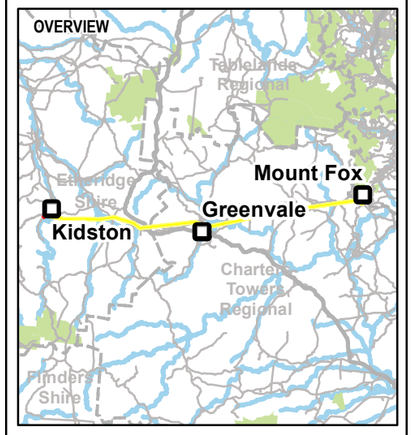
Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

0 5 10 15 20
Kilometers

1:625,000 (when printed at A3)

Legend

- Places
- Main Roads
- Draft Alignment
- Draft Alignment A
- Draft Alignment B
- Lots on the EMR
- Local Government Area



Note: no lots on the Contaminated Land Register

Data sources:
DCDB, Roads, Watercourses - DNRM 2017
Site Features and Layout - AECOM 2018
© SISP Imagery 2017

Disclaimer:
While every care is taken to ensure the accuracy of the Information Product, the State of Queensland makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and disclaims all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damage) and costs which you might incur as a result of the product being inaccurate or

Kidston Connection Project

LOTS ON THE ENVIRONMENTAL MANAGEMENT REGISTER

PROJECT ID:	60577456
CREATED BY:	JB
LAST MODIFIED:	CFS - 18-Sep-18
VERSION:	1

Figure F4-5

A3 size

4.2 Potential Impacts

Project activities that involve the disturbance of soil, such as vegetation clearing, excavation, and civil works have the potential to impact on land. Potential impacts related to topography, soil, ASS, resource interests and contaminated land are discussed below.

4.2.1 Topography

Construction of the Project may involve cut and fill earthworks for the establishment of access tracks in undulating terrain, and for transmission line structures and substation platforms.

Access tracks will be required to service each transmission line structure site and for access to substations. Access will be established to accommodate a range of construction equipment including delivery trucks, concrete trucks and cranes.

Cut and fill earthworks are likely to be required at some transmission line structure locations where topography is steep or undulating to establish safe work areas for assembly and erection of structures. It is anticipated that earthworks associated with pad and footing construction for support structures will generally be restricted to an area of approximately 40 m by 40 m.

Construction of the substation sites will require cut and fill earthworks to provide a flat pad. Detailed earthwork profiles will be developed during substation detailed design, involving the balance of cut and fill quantities to minimise disturbance to the surrounding existing topographic profile whilst meeting flood modelling heights.

The earthworks described above will occur at a number of relatively small, discrete locations and no other changes to the geomorphic landscape are anticipated. Therefore, construction impact on the existing topography is anticipated to be negligible. No operational impacts to topography are anticipated.

4.2.2 Soils

4.2.2.1 Erosion

Any activity which exposes the ground surface, such as vegetation clearing or earthworks, may potentially result in soil erosion or other soil management issues if not appropriately managed.

Where the Draft Alignment traverses through areas of vertosol and sodosol soils, the areas are considered to be susceptible to erosion due to the dispersive nature of these soils. The soil orders chromosols, tenosols and kandasols are considered to generally not be dispersive and present a lower erosion risk to the Project during construction and operation.

Alluvial soils on the banks and approaches to watercourses are generally of a loamy sand nature, and are considered to be prone to erosion when disturbed.

The erosion of topsoil, considered to be the most productive part of the soil profile, has the potential to impact on the surrounding land use if not appropriately managed, which is predominately grazing. Where topsoil is lost, this may lead to a reduced ability of the soil to store water and nutrients, result in higher runoff rates, and the exposure of subsoil. The deposition of eroded soil also has the potential to impact on local waterways through siltation and a potential reduction in water quality, as eroded soils may contain nutrients, fertilisers, herbicides or pesticides.

4.2.2.2 Compaction

Soil compaction may occur during construction of the Project through increased frequency of light vehicles on access tracks, the introduction of heavy machinery during construction and the storage of materials.

Potential impacts associated with soil compaction include a decline in soil structural stability, a decrease in water entering the soil either as rain or irrigation, and subsequent issues with poor root growth, soil cultivation and seedbed preparation.

4.2.3 Acid sulfate soils

When ASS are disturbed, they can generate large amounts of sulfuric acid, iron, aluminium and sometimes heavy metals, which has the potential to impact on the environment and infrastructure. Low

levels of acidity may weaken aquatic plants and animals, with high levels of acidity potentially causing death. Sulfuric acid may also impact on infrastructure containing concrete and steel, slowly destroying pipes, roads, and building foundations. In areas where acid sulfate soils are not treated properly before construction, repairs may be required, or infrastructure may need to be replaced before the end of its intended lifespan.

The Project area is mapped as having a “high probability” of containing ASS where the Draft Alignment crosses the Copperfield River and East Creek near Kidston and the Burdekin River near Greenvale. These high probability areas are mapped as between 100 m and 250 m in width where they intersect the Draft Alignment. Structures will be located a minimum of 50 m from watercourses, where possible, and it is anticipated that the majority of areas mapped as high probability ASS will be avoided during construction.

4.2.4 Resource interests

Where infrastructure is proposed to cross or traverse a resource interest, consent from the respective authority holders may be required for construction of the transmission line, as well as any heavy vehicle and plant movements which have the potential to impact any existing infrastructure.

The Draft Alignment traverses ML3347 in order to connect to the Kidston Renewable Energy Hub. This ML pertains to the Kidston gold mine operation, which is effectively in “care and maintenance”. There is an active Environmental Authority over the site which controls the maintenance activities for the site. The ML and Environmental Authority holder for the site is Kidston Gold Mines Limited, which is wholly owned by Genex. All siting of infrastructure within the ML boundaries will be undertaken in consultation with Genex and will not contravene the requirements of the Environmental Authority.

The Draft Alignment traverses ML6750, is known as One Mile and is based on exploratory drilling that contains low-grade copper, gold, zinc and silver values. Powerlink Queensland provided written project information to the proponent of One Mile about its study corridor investigations in early 2017 and invited them to participate in further discussions. Any required consents from the proponent of One Mile are not linked to this EAR approvals process, and will be sought once detailed design is completed and prior to construction activities commencing.

The Project intersects with 15 EPMs. Exploration activities associated with these EPMs are not sufficiently advanced for possible mining footprints to be considered for potential impacts within this EAR.

4.2.5 Contaminated land

Ten lots affected by the Draft Alignment were identified on the EMR for a ‘notifiable activity’ (activities that have the potential to cause land contamination).

Landholders and occupiers of land which is listed on the EMR or CLR, or suspected of being contaminated, must ensure that they meet their general environmental duty under the *Environmental Protection Act 1994* when using the land to ensure that any risks to human health and the environment are known and managed.

Geotechnical investigations will be undertaken prior to construction which may include testing for the presence of contamination prior to excavation or other earthworks based upon a risk assessment for sites listed on the EMR and where known or suspected contamination exists. Should contamination be confirmed, on-site remediation of contaminated soil is considered best practice, with removal of contaminated soil for treatment or disposal off-site only to be carried out when that option is not practicable. A disposal permit is required to remove contaminated soil for treatment or disposal from land listed on EMR or CLR if it is found to contain the contaminant for which it is listed on the EMR or CLR. If further contaminants are confirmed through testing, notification to DES of additional contamination may be required.

The chemicals used during the construction, operation and decommissioning phases of the Project will include fuel (predominantly diesel), unleaded petrol, electrical equipment transformer oil, lubricants, oils, minor quantities of solvents and acids, degreasers and domestic cleaning agents. The accidental release of these materials during storage, use or transport has the potential to result in land contamination. The management of these materials is discussed in Chapter 20 Hazards and Risks.

Waste management, including potential impacts to land, is discussed in Chapter 23 Waste.

4.3 Mitigation and Management Measures

Potential impacts to land will be managed in accordance with Powerlink's Standard Environmental Controls (Appendix I Environmental Management Plans). In addition to these controls, the following measures will be implemented.

- Where practicable, existing access tracks will be used for the Project in preference to creating new tracks, with upgrading or extension conducted for the requirements of this Project. Where possible, these existing access tracks will include established and maintained erosion and control measures (culverts, whoa boys and spoon drains), minimising vegetation clearing and disturbance to soil structures.
- Structures will be located a minimum of 50 m from watercourses, where possible, to avoid areas mapped as high probability ASS during construction.
- Geotechnical assessments will be undertaken prior to construction to determine the appropriate foundation type for each structure and the substations. The choice of foundation type is dependent on the specific nature of the soil and rock and takes into account soil/concrete friction strength, water levels, soil bearing capacity, construction constraints, rock levels, and soil properties.
- Testing for the presence of contamination prior to excavation or other earthworks will be undertaken based upon a risk assessment for sites listed on the EMR and where known or suspected contamination exists. Excavated soil material will be reused where possible and any contaminated material unable to be remediated must be disposed of by an appropriately licensed waste contractor to a license waste facility.
- Reinstatement will be undertaken progressively during construction, where practicable, and Powerlink Queensland will ensure that all disturbed areas impacted from construction are reinstated at the end of the Project. The short-term goal of reinstatement is the stabilisation of soils to provide a suitable matrix for vegetation establishment, to aid in preventing erosion. Reinstatement also includes the replacement of topography, topsoil, and fences.