p9	0.02	177.66	0.250	177.95	0.018	177.71	0.017	177.71
p10	0.07	184.36	0.080	184.42	0.021	184.34	0.016	184.34
p11	0.38	168.22	0.670	168.48	0.397	168.21	0.363	168.17
p12	0.01	179.89	0.015	179.9	0.005	179.89	0.005	179.89
p13	0.01	182.55	0.037	182.58	0.006	182.54	0.006	182.54
p14	0.01	174.81	0.010	174.81	0.006	174.81	0.007	174.81
p15	0.00	177.53	0.047	177.62	0.000	177.57	0.000	177.57
p16	0.51	173.44	0.320	173.72	0.105	173.50	0.093	173.49
p17	0.20	170.45	0.205	170.45	0.205	170.45	0.204	170.45
p18	0.002	192.86	0.002	192.90	0.000	192.89	0.001	192.39
p19	0.00	180.17	0.004	180.18	0.000	180.17	0.000	180.17
p20	0.08	182.48	0.230	182.59	0.081	182.44	0.082	182.44
p21	0.08	173.40	0.230	173.54	0.083	173.39	0.077	173.38
p22	0.01	181.04	0.041	181.10	0.004	181.06	0.004	181.06
p23	0.00	174.97	0.034	175.01	0.000	175.26	0.000	175.26
p24	0.09	166.76	0.450	167.11	0.610	166.73	0.055	166.72
p25	0.01	174.31	0.130	174.43	0.021	174.31	0.010	174.3

The flood maps show that the area includes braided creeks/flow paths that interact with each other during intense storm events. The highest flood depth is within the Woodside Rivulet flowing to the south of the site as it is the main drainage pathway in the catchment. The shallow flows at the site originate from local catchments as well as from the Woodside Rivulet where it breaks its banks upstream of the proposed site.

The existing access road (Neon TasNetwork Access Road) was overtopped by up to around 0.1 to 0.2 m at two locations as shown in Diagram 7. It should be noted that the culvert sizes and invert elevations were roughly estimated using aerial images and LiDAR data and there are uncertainties included. The accurate modelling of flow behaviour will require survey of the culverts and road level in the study area. Nevertheless, considering the uncertainties in the results, it can be concluded that the existing access road has a better flood immunity than the alternative access route which is along the Woodside Rivulet. Both sides of the alternative access route are inundated by flows from Woodside Rivulet. This inundation area is much larger than the existing access road.

Diagram 7: The existing access road was overtopped in 1% AEP design event (shown in red circle).

3.1.2. 1% AEP Climate Change (CC) Event.

The results of climate change scenario are presented from Figure 14 to Figure 19. These include the 1% AEP CC 4.5 hour (Figure 14 & Figure 17), 1% AEP CC 9 hours (Figure 15 & Figure 18), and their enveloped maps (Figure 16 & Figure 19). The flow at Woodside Rivulet peaks at around 160 m^3/s (at the outlet of sub-catchment C13) which is a significant increase compared to 1% AEP design event (which was around 30 m^3/s). The peak flood was also significantly increased around the proposed site with an average flow of 3 m^3/s. The increase in rainfall due to climate change resulted in larger flood extent and depth in the area. However, it did not drastically change the main flood behaviour around the proposed site. Flooding around the proposed site under climate change is also predominantly shallow surface flows with a depth of up to 0.25 m. There was no change in the flood hazard category and hydraulic category compared the 1% AEP design event. Nevertheless, the impact on existing access road was more significant. Increasing culvert sizes will most likely mitigate this issue as there are well-formed drainage channels.

3.1.3. 2% AEP Event.

The existing flood behaviour for the 2% AEP design event is shown in Figure 22 and Figure 25 for a 6-hour duration (TP6799), and Figure 23 and Figure 26 for a 4.5-hour duration (TP6624). Their enveloped results are shown in Figure 24 (depth) and Figure 27 (level).

In the 2% AEP event, the proposed site is generally not impacted significantly by flood water. Shallow waters entering through the north boundary have a peak flow of approximately 0.5 m^3/s.

Water depths range from 0.01 m to 0.05 m and water level from 185 mAHD to 177 mAHD.

3.1.4. 5% AEP Event.

In the 5% AEP event, much of the site remains flood free. For the 6-hr duration (TP6887), water depth (Figure 30) and levels (Figure 31) around the site range from 0.002 m to 0.040 m. Peak flow entering the north boundary at the proposed site is around 0.65 m^3/s. Peak flow in the Woodside Rivulet was around 22 m^3/s during this event. The flood hazard is estimated to be category H1 with no constrains around the site.

3.1.5. Existing Hydraulic Hazard

The existing flood hazard was defined in accordance with the Australian Disaster Resilience Handbook Collection (AIDR, 2017). A summary of this categorisation is provided in Diagram 8.

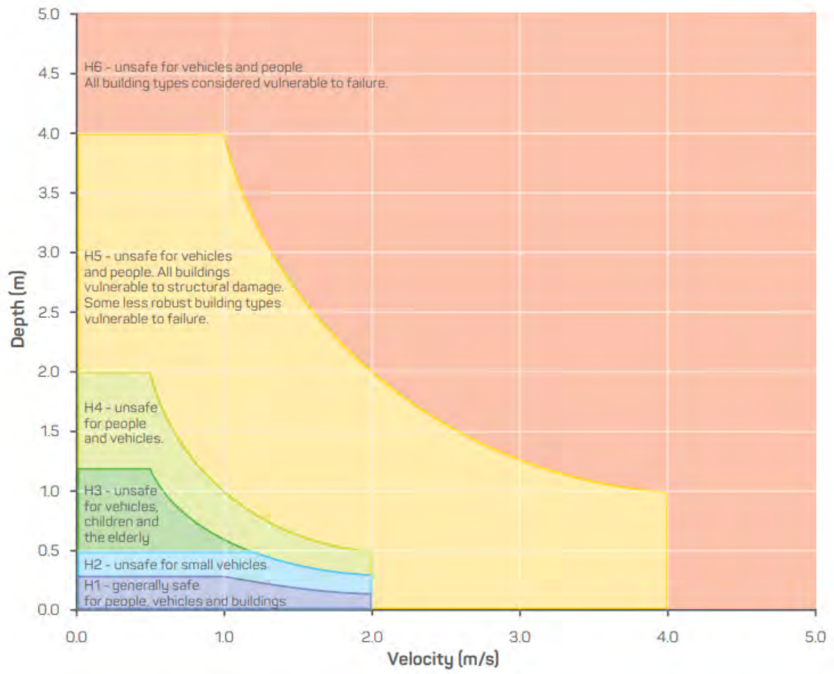

Diagram 8: General Flood Hazard Vulnerability Curves.

This classification provides a more detailed distinction and practical application of hazard categories, identifying the following 6 classes of hazard:

- H1 – Generally safe for vehicles, people, and buildings.
- H2 – Unsafe for small vehicles.
- H3 – Unsafe for vehicles, children, and the elderly.
- H4 – Unsafe for vehicles and people.
- H5 – Unsafe for all people and all vehicles. All building types vulnerable to structural damage. Some less robust building types vulnerable to failure.
- H6 – unsafe for all people and all vehicles. All building types considered vulnerable to failure.

For this assessment, the flood hazard is considered as H1 with 'no constraints' for most part of the study catchment (Figure 12). The flooding at the proposed site is also categorised as H1. There is a higher flood hazard for catchments to the south of the site with some areas showing categories of H3 and H4.

The Flood Hazard maps for the 1% AEP CC, 2% AEP and 5% AEP are shown in Figure 20, Figure 28, and Figure 32, respectively. In the 1% AEP CC, the proposed site is categorised as H1; however, a few small areas around the existing and proposed alternative access roads are classified as H2 and H3. The flooded areas around the Woodside Rivulet in the 1% AEP CC event (Figure 21) had a hazard category of H3 and H4. The alternative access route also shows nearby areas with categories of H4 and H5. The flood that extends across the site is also classified as H1 for the 2% AEP event with fewer sites as H2 and H3. A similar distribution of hazard is evident in the 5% AEP event, with less unsafe areas for the proposed site and roads.

3.1.6. Existing Hydraulic Categorisation

Floodplains can be classified into the following hydraulic categories depending on the flood function:

- Floodways
- Flood Storage and
- Flood Fringe.

There is no quantitative definition of these three categories or accepted approach to differentiate between the various classifications. The delineation of these areas is somewhat subjective based on knowledge of an area and flood behaviour, hydraulic modelling, and previous experience in categorising flood function. A few approaches are available, such as the method defined by Howells *et al (*2004).

For this study, hydraulic categories were defined by the following criteria, which has been tested and is considered a reasonable representation of the flood function of this catchment.

- Floodway is defined as areas where:
  - o the peak value of velocity multiplied by depth (V x D) > 0.25 m^2/s, **AND** peak velocity > 0.25 m/s, **OR**
  - o peak velocity > 1.0 m/s **AND** peak depth > 0.1 m.

The remainder of the floodplain is either Flood Storage or Flood Fringe:

- Flood Storage comprises areas outside the floodway where peak depth > 0.5 m, and
- Flood Fringe comprises areas outside the Floodway where peak depth ≤ 0.5 m.

For this assessment, there are areas with lower flood risk in general (H1), with majority of the floodway and flood storage area (Figure 13) contained within the natural channel.

The majority of the proposite site is classfied as Flood Fringe with small flood storage areas around the alternative road. Flood categories for the 2% AEP (Figure 29) and the 5% AEP event (Figure 33), show the same behaviour.

4. CONCLUSIONS

In this study a hydrologic and hydraulic analysis of the flood behaviour for a proposed utility scale battery was assessed using the hydrologic (WBNM) and two-dimensional hydraulic (TUFLOW) models for a range of design storms. The flood study was conducted based on the ARR2019 guidelines. The models were used to quantify and describe flood characteristics of the proposed site under existing conditions.

The entire catchment was delineated into 35 sub-catchments where hydrographs were extracted from the hydrologic model and used as inflows into the hydraulic model. An initial assessment of the flood behaviour shows interaction between flow in catchments surrounding the proposed site and flows coming from Woodside Rivulet. Due to this interconnection, two critical design storm durations were identified for rarer design events (2%, 1%, and 1% AEP with Climate Change): 4.5-hour duration for local flooding and 6 or 9-hour for the Woodside Rivulet flooding which had a much larger catchment area. Water depth and levels grids from both durations were enveloped to achieve maximum design depth and levels for the study area. For the 5% AEP flood event only the 6-hour duration was found to be critical. The locations and sizes of culverts were estimated from inspection of the LiDAR DEM, aerial imagery, and street view maps. The results represented in this study are subject to uncertainties of the input data. No validation data (such as historical flood levels) was available.

Results show that the proposed site location is generally subject to shallow overland flow of 0.1 m to 0.2 m during 1% AEP events. No other significant inundation was observed in the vicinity of the proposed site area. Most of the floodplain, including the proposed site location, was categorised as flood fringe (areas outside floodway and flood storage). Flood Hazard was assessed to be level H1 which is generally safe for vehicles, people, and buildings. Some small areas around the access road were assessed as H3 level which is Unsafe for all vehicles, children, and the elderly. The existing access road was overtopped by around 0.1 m to 0.2 m of flood water; however, culvert sizes and road levels should be surveyed for accurate assessment of flood behaviour in this area. Nevertheless, the existing access road will most likely have a better flood immunity compared to the alternative access route. The impact of climate change on the 1% AEP flood levels was not significant around the proposed site. Flood levels were increased by up to 50 mm in this area. The flood extent however was significantly increased in the remaining parts of the study area. The more frequent design storms (2% and 5% AEP) showed less significant flood impact with a shallower overland flow compared to the 1% AEP event.

The impact of the future development is the area and proposed site features (such as potential raise, fences, and blockage) was not assessed due to the lack of design inputs. Any development in the area will change the flood behaviour and their impact should be investigated using design inputs. Nevertheless, results suggest that the proposed site can be potentially protected against the shallow flows by raising the main facilities above the estimated flood levels plus a freeboard (e.g. 0.5 m). Determining the flood planning level will require surveying the culverts and access road and including site design in the TUFLOW model.

5. REFERENCES

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Figures

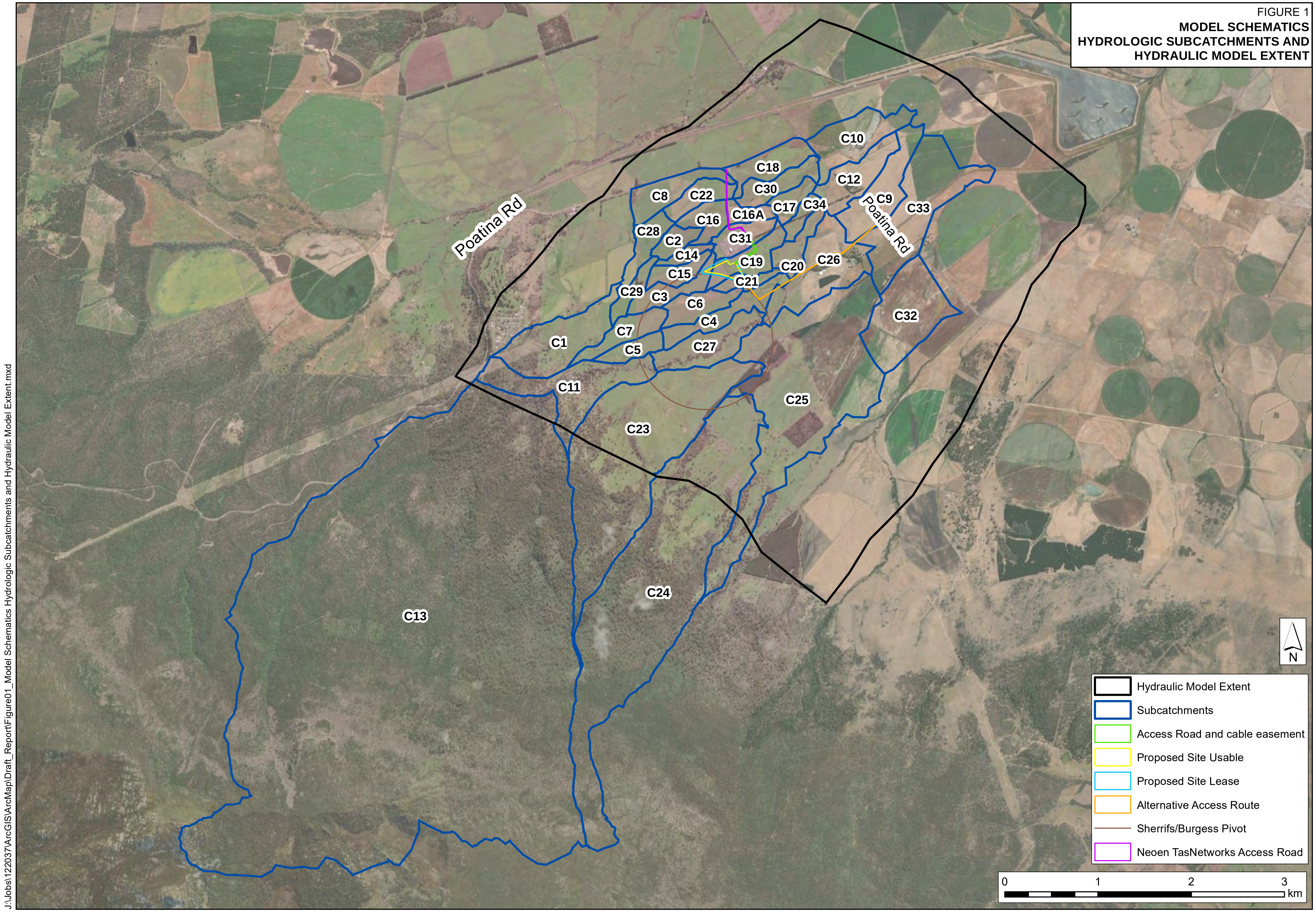
FIGURE 1
MODEL SCHEMATICS
HYDROLOGIC SUBCATCHMENTS AND
HYDRAULIC MODEL EXTENT
Poatina Rd
Poatina Rd
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
C11
C12
C13
C14
C15
C16
C16A
C17
C18
C19
C20
C21
C22
C23
C24
C25
C26
C27
C28
C29
C30
C31
C32
C33
C34
N
Hydraulic Model Extent
Subcatchments
Access Road and cable easement
Proposed Site Usable
Proposed Site Lease
Alternative Access Route
Sherrifs/Burgess Pivot
Neoen TasNetworks Access Road
0
1
2
3
km
J:\Jobs\122037\ArcGIS\ArcMap\Draft_Report\Figure01_Model Schematics Hydrologic Subcatchments and Hydraulic Model Extent.mxd

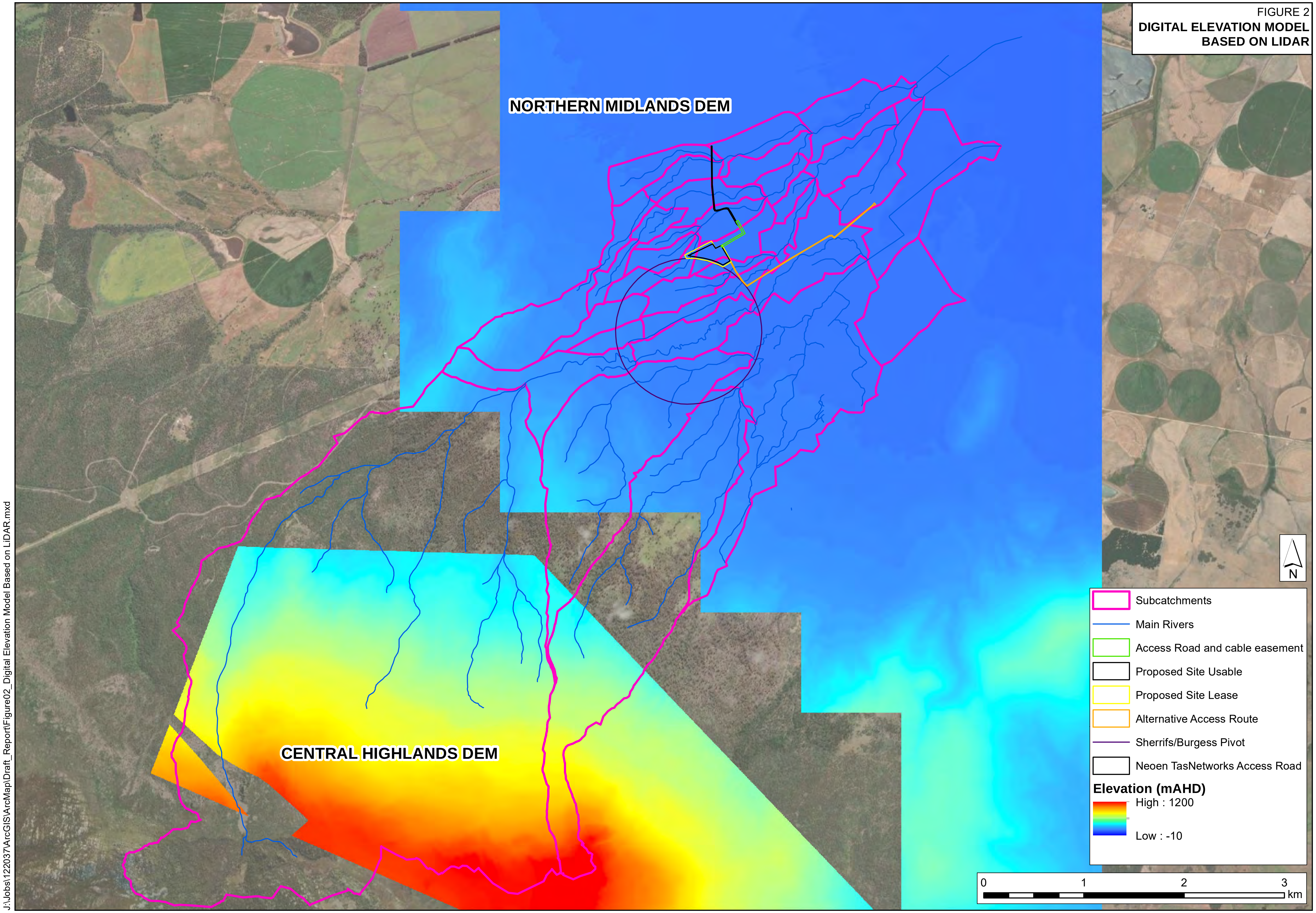
FIGURE 2
DIGITAL ELEVATION MODEL
BASED ON LIDAR
NORTHERN MIDLANDS DEM
CENTRAL HIGHLANDS DEM
Subcatchments
Main Rivers
Access Road and cable easement
Proposed Site Usable
Proposed Site Lease
Alternative Access Route
Sherrifs/Burgess Pivot
Neoen TasNetworks Access Road
Elevation (mAHD)
High : 1200
Low : -10
N
0
1
2
3
km
J:\Jobs\122037\ArcGIS\ArcMap\Draft_Report\Figure02_Digital Elevation Model Based on LiDAR.mxd

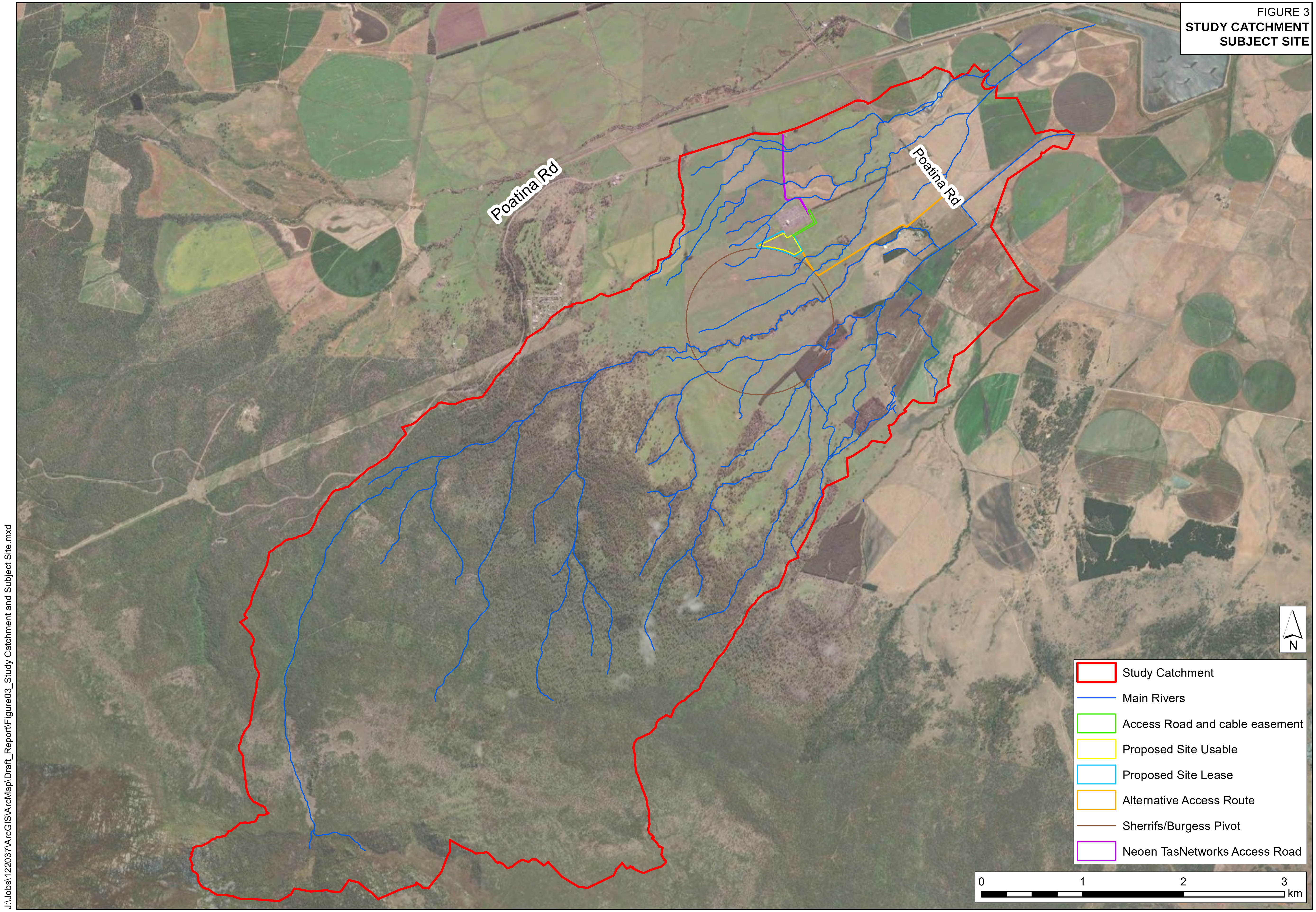
FIGURE 3
STUDY CATCHMENT
SUBJECT SITE
Poatina Rd
Poatina Rd
N
Study Catchment
Main Rivers
Access Road and cable easement
Proposed Site Usable
Proposed Site Lease
Alternative Access Route
Sherrifs/Burgess Pivot
Neoen TasNetworks Access Road
0
1
2
3
km
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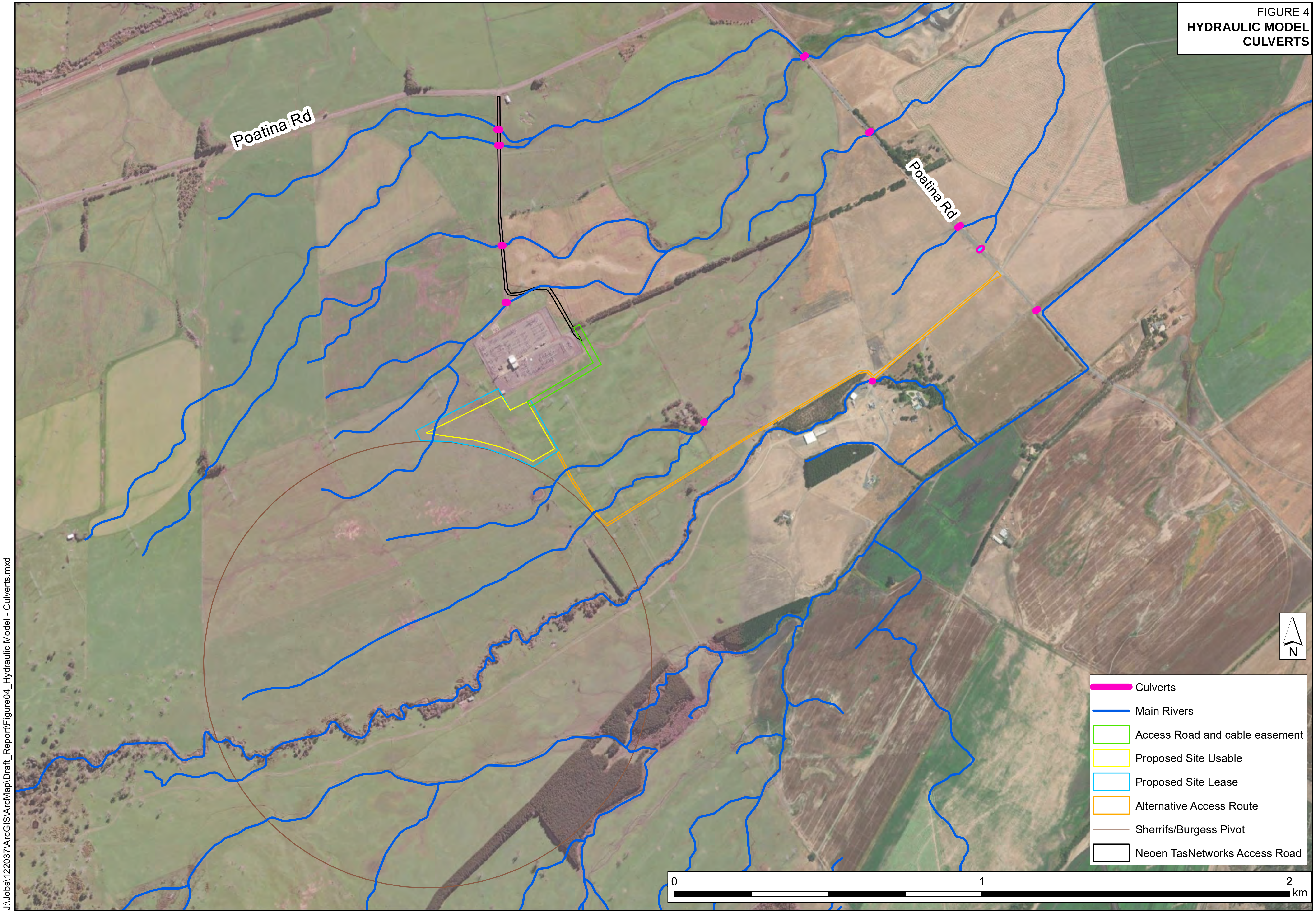
FIGURE 4
HYDRAULIC MODEL
CULVERTS
Poatina Rd
Poatina Rd
Culverts
Main Rivers
Access Road and cable easement
Proposed Site Usable
Proposed Site Lease
Alternative Access Route
Sherrifs/Burgess Pivot
Neoen TasNetworks Access Road
N
0
1
2
km
J:\Jobs\122037\ArcGIS\ArcMap\Draft_Report\Figure04_Hydraulic Model - Culverts.mxd

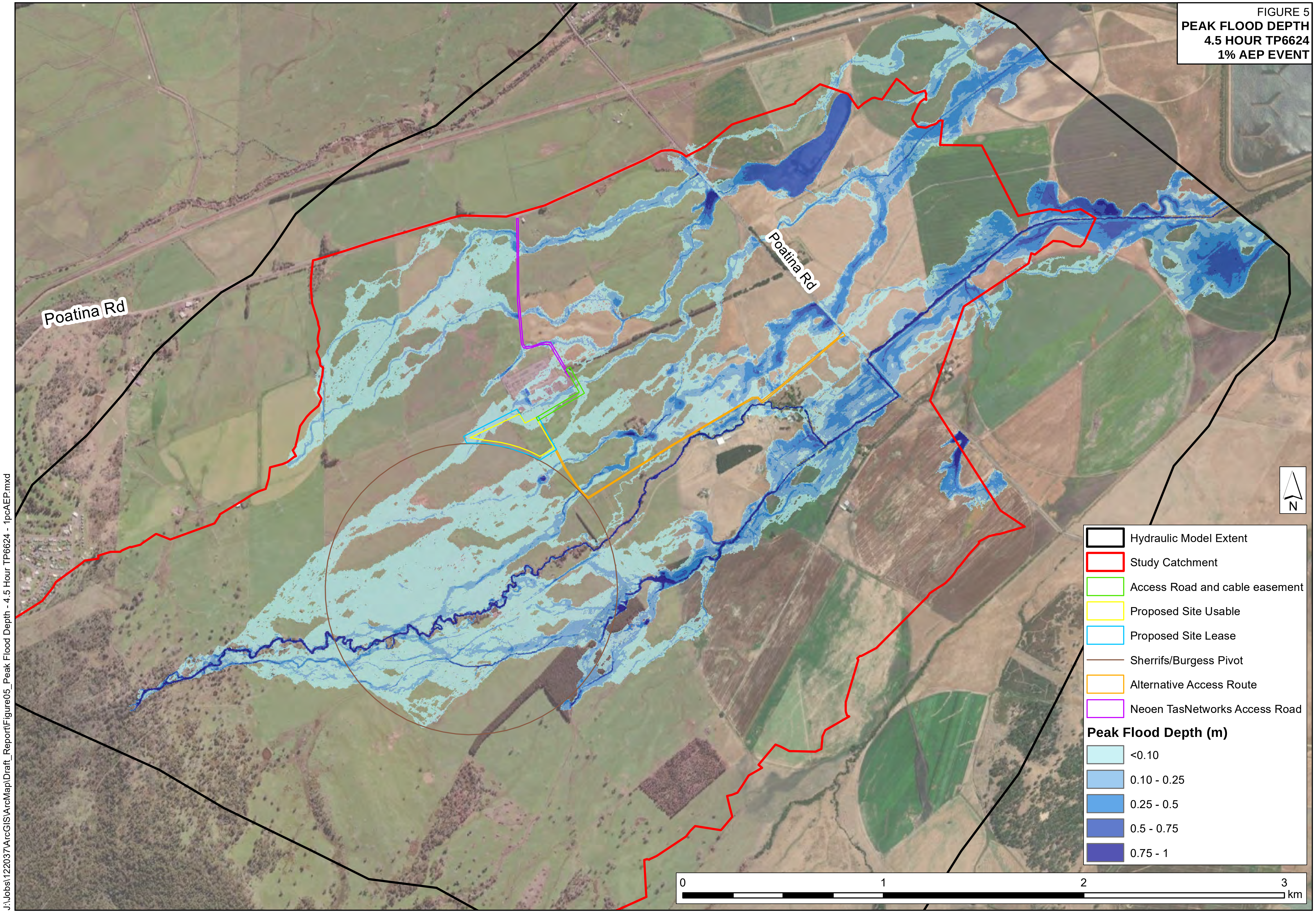
FIGURE 5
PEAK FLOOD DEPTH
4.5 HOUR TP6624
1% AEP EVENT
Poatina Rd
Poatina Rd
Hydraulic Model Extent
Study Catchment
Access Road and cable easement
Proposed Site Usable
Proposed Site Lease
Sherrifs/Burgess Pivot
Alternative Access Route
Neoen TasNetworks Access Road
Peak Flood Depth (m)
<0.10
0.10 - 0.25
0.25 - 0.5
0.5 - 0.75
0.75 - 1
0
1
2
3
km
N
J:\Jobs\122037\ArcGIS\ArcMap\Draft_Report\Figure05_Peak Flood Depth - 4.5 Hour TP6624 - 1pcAEP.mxd

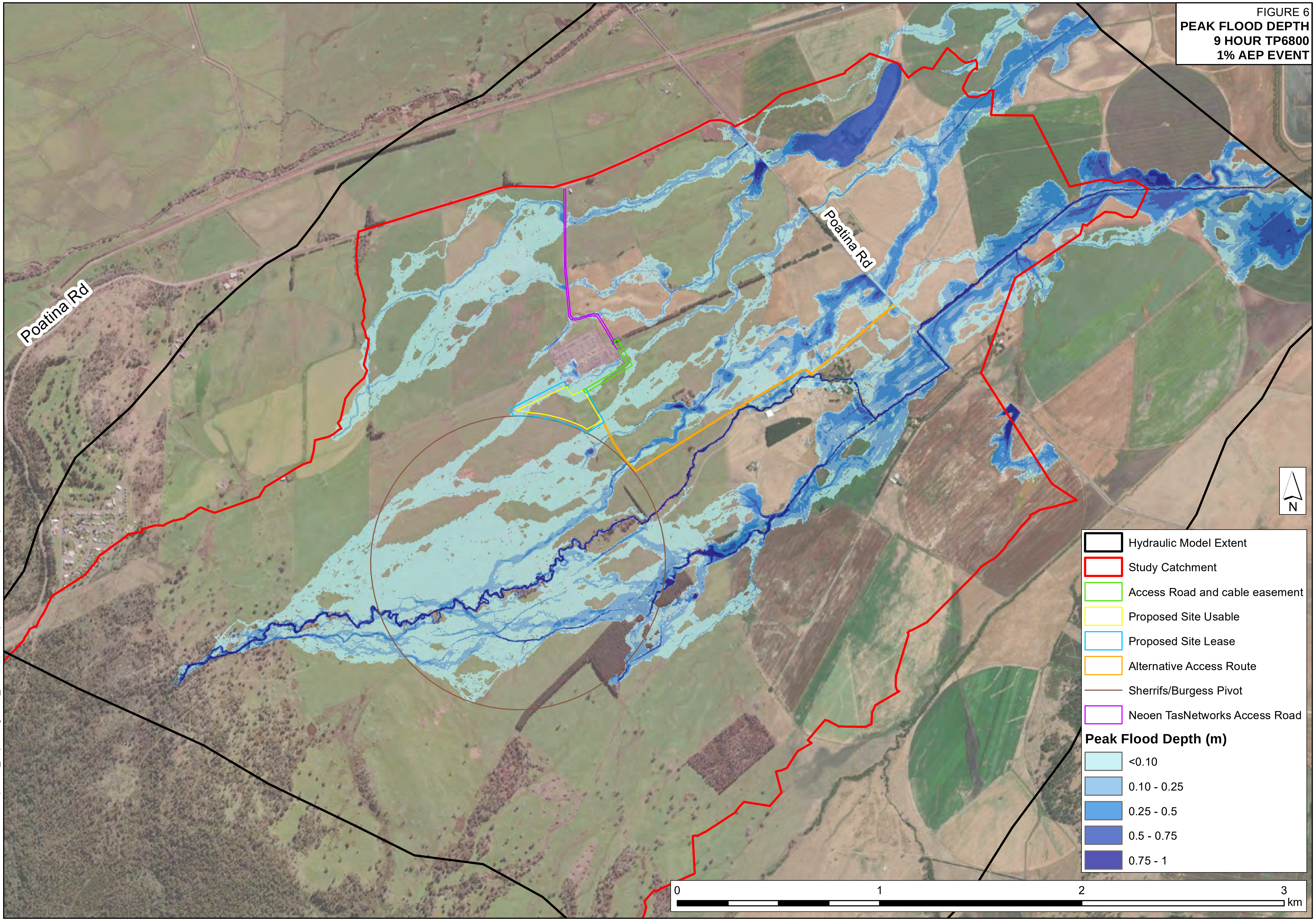

FIGURE 6
PEAK FLOOD DEPTH
9 HOUR TP6800
1% AEP EVENT
Poatina Rd
Poatina Rd
N
Hydraulic Model Extent
Study Catchment
Access Road and cable easement
Proposed Site Usable
Proposed Site Lease
Alternative Access Route
Sherrifs/Burgess Pivot
Neoen TasNetworks Access Road
Peak Flood Depth (m)
<0.10
0.10 - 0.25
0.25 - 0.5
0.5 - 0.75
0.75 - 1
0
1
2
3
km
J:\Jobs\122037\ArcGIS\ArcMap\Draft_Report\Figure06_Peak Flood Depth - 9 Hour TP6800 - 1pcAEP.mxd

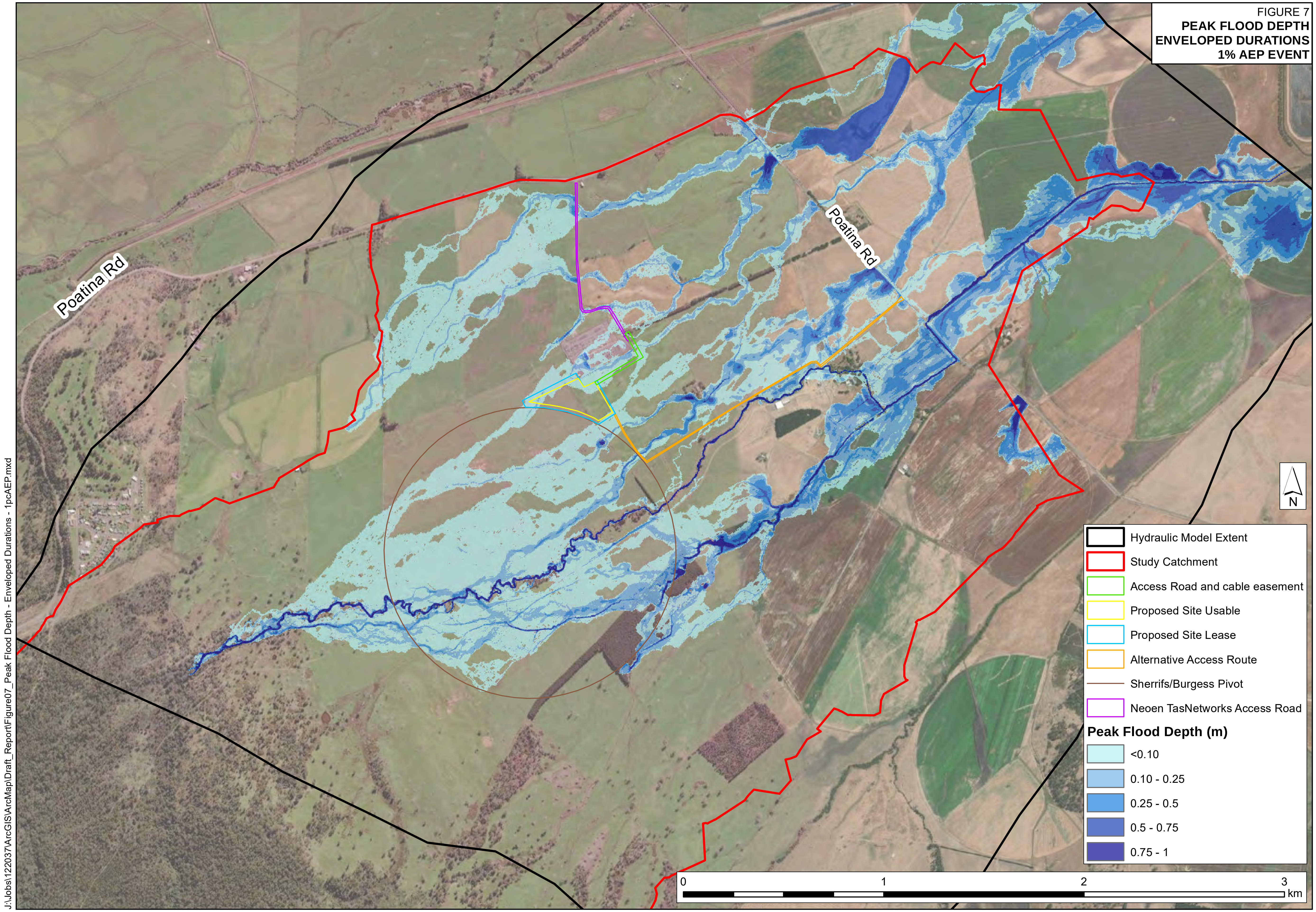
FIGURE 7
PEAK FLOOD DEPTH
ENVELOPED DURATIONS
1% AEP EVENT
Poatina Rd
Poatina Rd
N
Hydraulic Model Extent
Study Catchment
Access Road and cable easement
Proposed Site Usable
Proposed Site Lease
Alternative Access Route
Sherrifs/Burgess Pivot
Neoen TasNetworks Access Road
Peak Flood Depth (m)
<0.10
0.10 - 0.25
0.25 - 0.5
0.5 - 0.75
0.75 - 1
0
1
2
3
km
J:\Jobs\122037\ArcGIS\ArcMap\Draft_Report\Figure07_Peak Flood Depth - Enveloped Durations - 1pcAEP.mxd

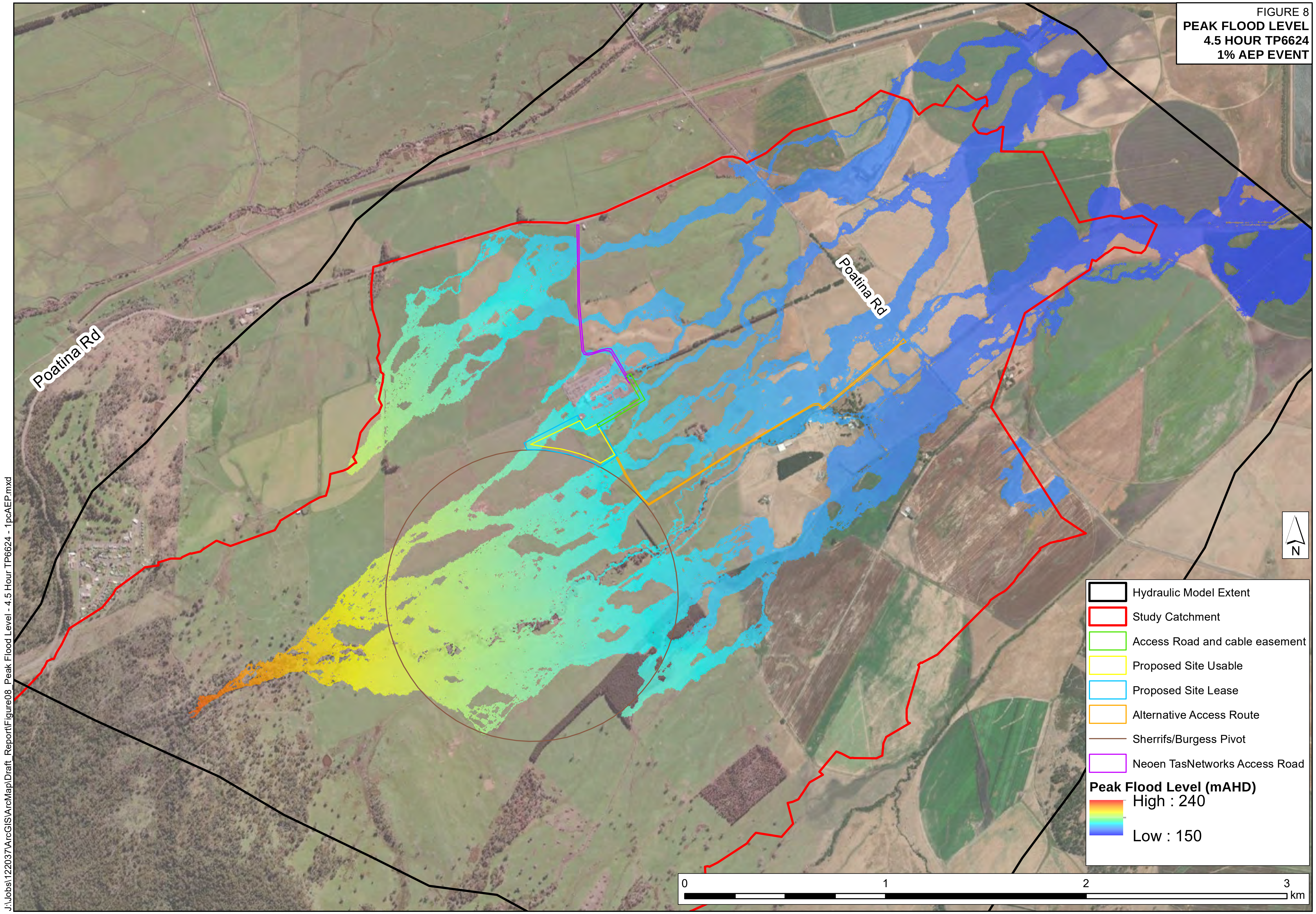
FIGURE 8
PEAK FLOOD LEVEL
4.5 HOUR TP6624
1% AEP EVENT
Poatina Rd
Poatina Rd
N
Hydraulic Model Extent
Study Catchment
Access Road and cable easement
Proposed Site Usable
Proposed Site Lease
Alternative Access Route
Sherrifs/Burgess Pivot
Neoen TasNetworks Access Road
Peak Flood Level (mAHD)
High : 240
Low : 150
0
1
2
3
km
J:\Jobs\122037\ArcGIS\ArcMap\Draft_Report\Figure08_Peak Flood Level - 4.5 Hour TP6624 - 1pcAEP.mxd

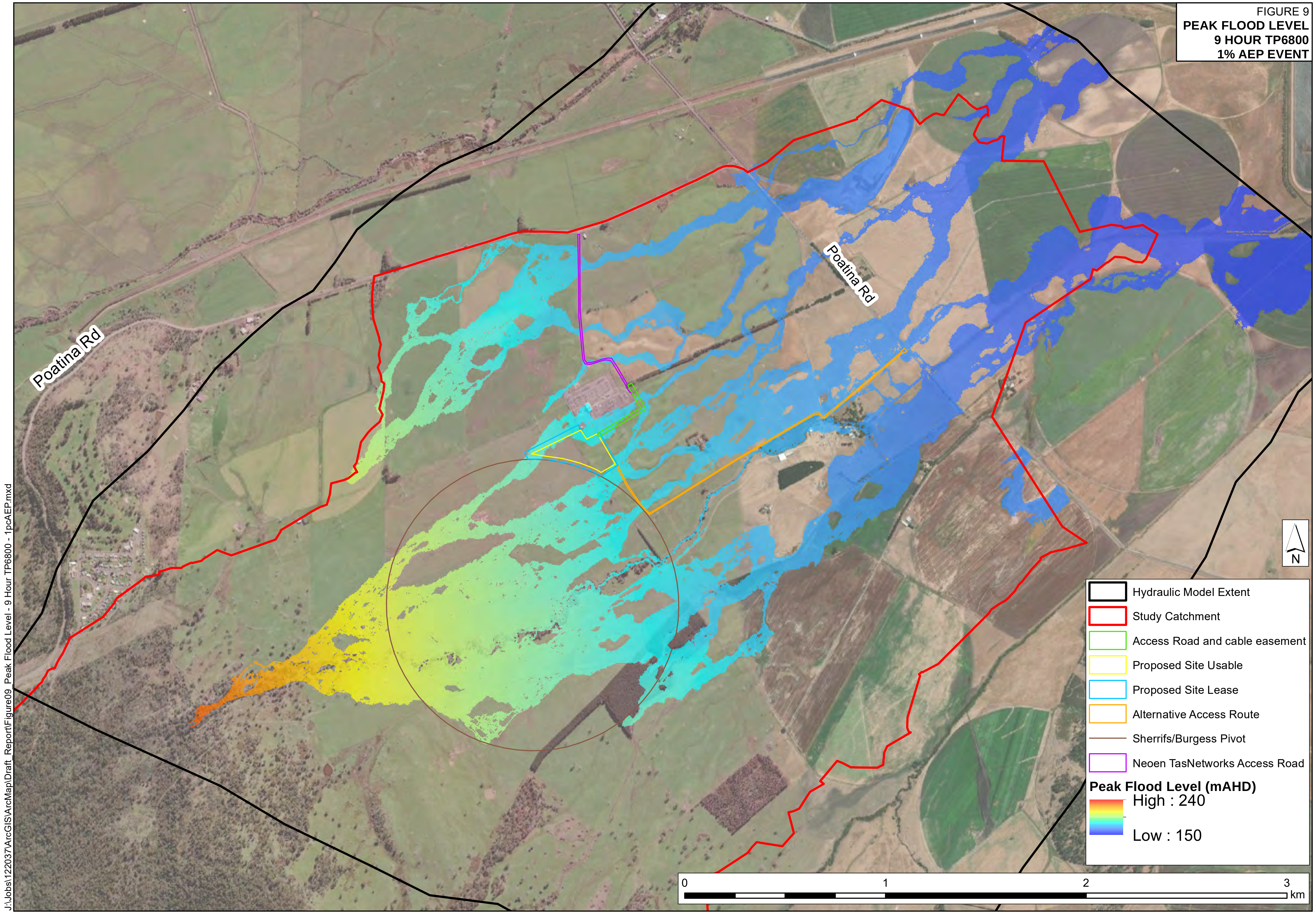
FIGURE 9
PEAK FLOOD LEVEL
9 HOUR TP6800
1% AEP EVENT
Poatina Rd
Poatina Rd
N
Hydraulic Model Extent
Study Catchment
Access Road and cable easement
Proposed Site Usable
Proposed Site Lease
Alternative Access Route
Sherrifs/Burgess Pivot
Neoen TasNetworks Access Road
Peak Flood Level (mAHD)
High : 240
Low : 150
0
1
2
3
km
J:\Jobs\122037\ArcGIS\ArcMap\Draft_Report\Figure09_Peak Flood Level - 9 Hour TP6800 - 1pcAEP.mxd

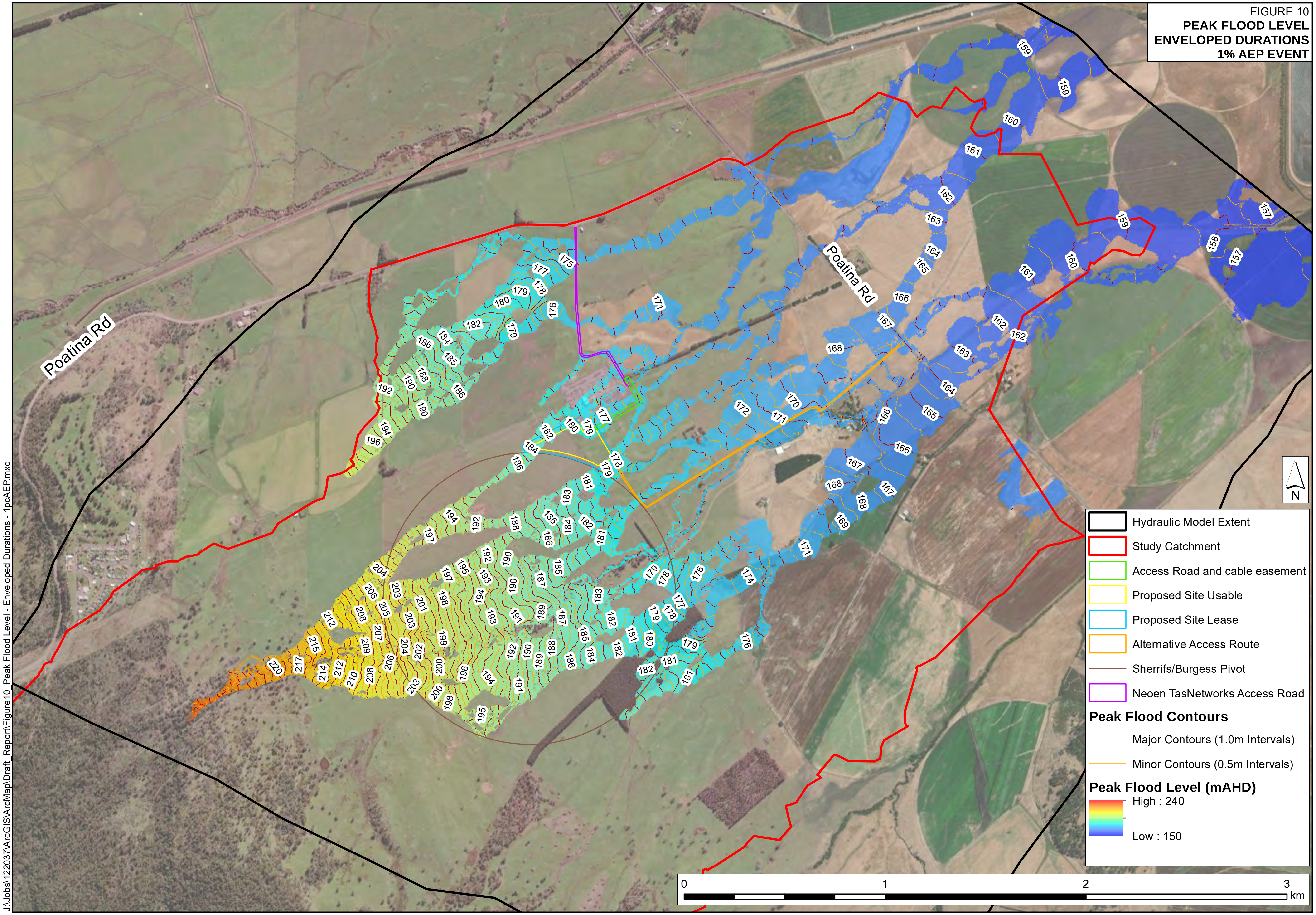
FIGURE 10
PEAK FLOOD LEVEL
ENVELOPED DURATIONS
1% AEP EVENT
Poatina Rd
Poatina Rd
N
Hydraulic Model Extent
Study Catchment
Access Road and cable easement
Proposed Site Usable
Proposed Site Lease
Alternative Access Route
Sherrifs/Burgess Pivot
Neoen TasNetworks Access Road
Peak Flood Contours
Major Contours (1.0m Intervals)
Minor Contours (0.5m Intervals)
Peak Flood Level (mAHD)
High : 240
Low : 150
0
1
2
3
km
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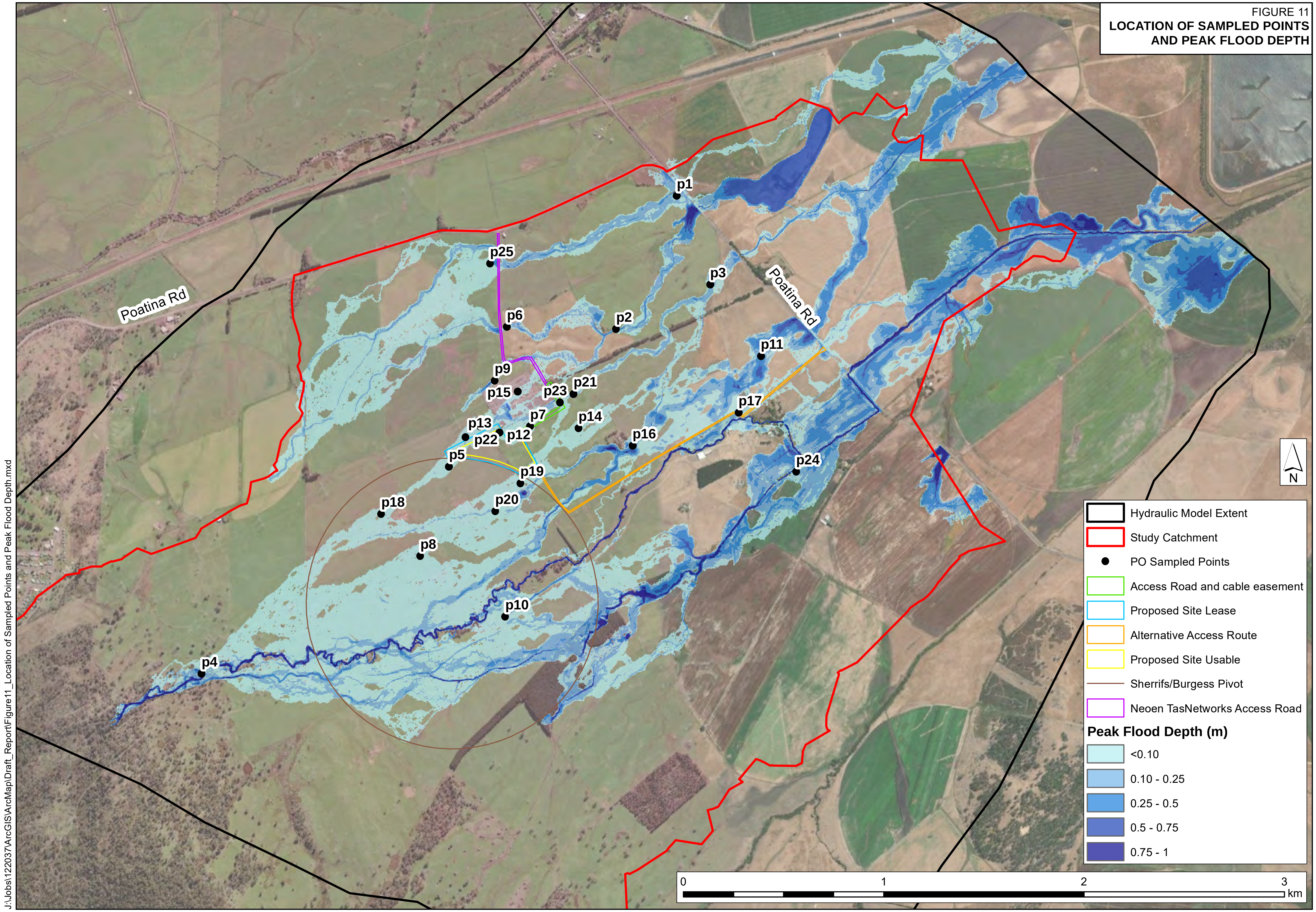
FIGURE 11
LOCATION OF SAMPLED POINTS
AND PEAK FLOOD DEPTH
Poatina Rd
Poatina Rd
p1
p2
p3
p4
p5
p6
p7
p8
p9
p10
p11
p12
p13
p14
p15
p16
p17
p18
p19
p20
p21
p22
p23
p24
p25
N
Hydraulic Model Extent
Study Catchment
PO Sampled Points
Access Road and cable easement
Proposed Site Lease
Alternative Access Route
Proposed Site Usable
Sherrifs/Burgess Pivot
Neoen TasNetworks Access Road
Peak Flood Depth (m)
<0.10
0.10 - 0.25
0.25 - 0.5
0.5 - 0.75
0.75 - 1
0
1
2
3
km
J:\Jobs\122037\ArcGIS\ArcMap\Draft_Report\Figure11_Location of Sampled Points and Peak Flood Depth.mxd

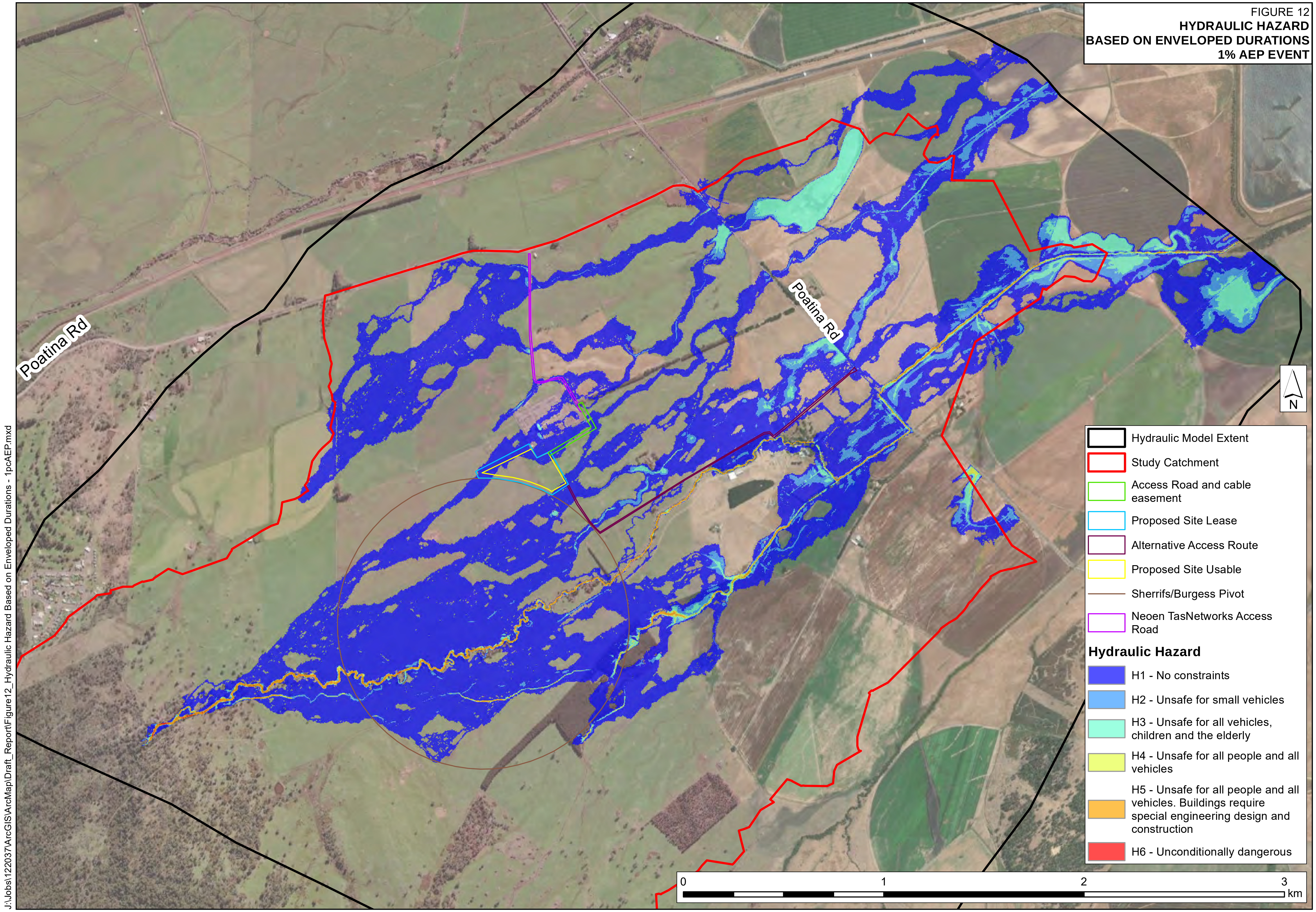
FIGURE 12
HYDRAULIC HAZARD
BASED ON ENVELOPED DURATIONS
1% AEP EVENT
Poatina Rd
Poatina Rd
N
Hydraulic Model Extent
Study Catchment
Access Road and cable easement
Proposed Site Lease
Alternative Access Route
Proposed Site Usable
Sherrifs/Burgess Pivot
Neoen TasNetworks Access Road
Hydraulic Hazard
H1 - No constraints
H2 - Unsafe for small vehicles
H3 - Unsafe for all vehicles, children and the elderly
H4 - Unsafe for all people and all vehicles
H5 - Unsafe for all people and all vehicles. Buildings require special engineering design and construction
H6 - Unconditionally dangerous
0
1
2
3
km
J:\Jobs\122037\ArcGIS\ArcMap\Draft_Report\Figure12_Hydraulic Hazard Based on Enveloped Durations - 1pcAEP.mxd

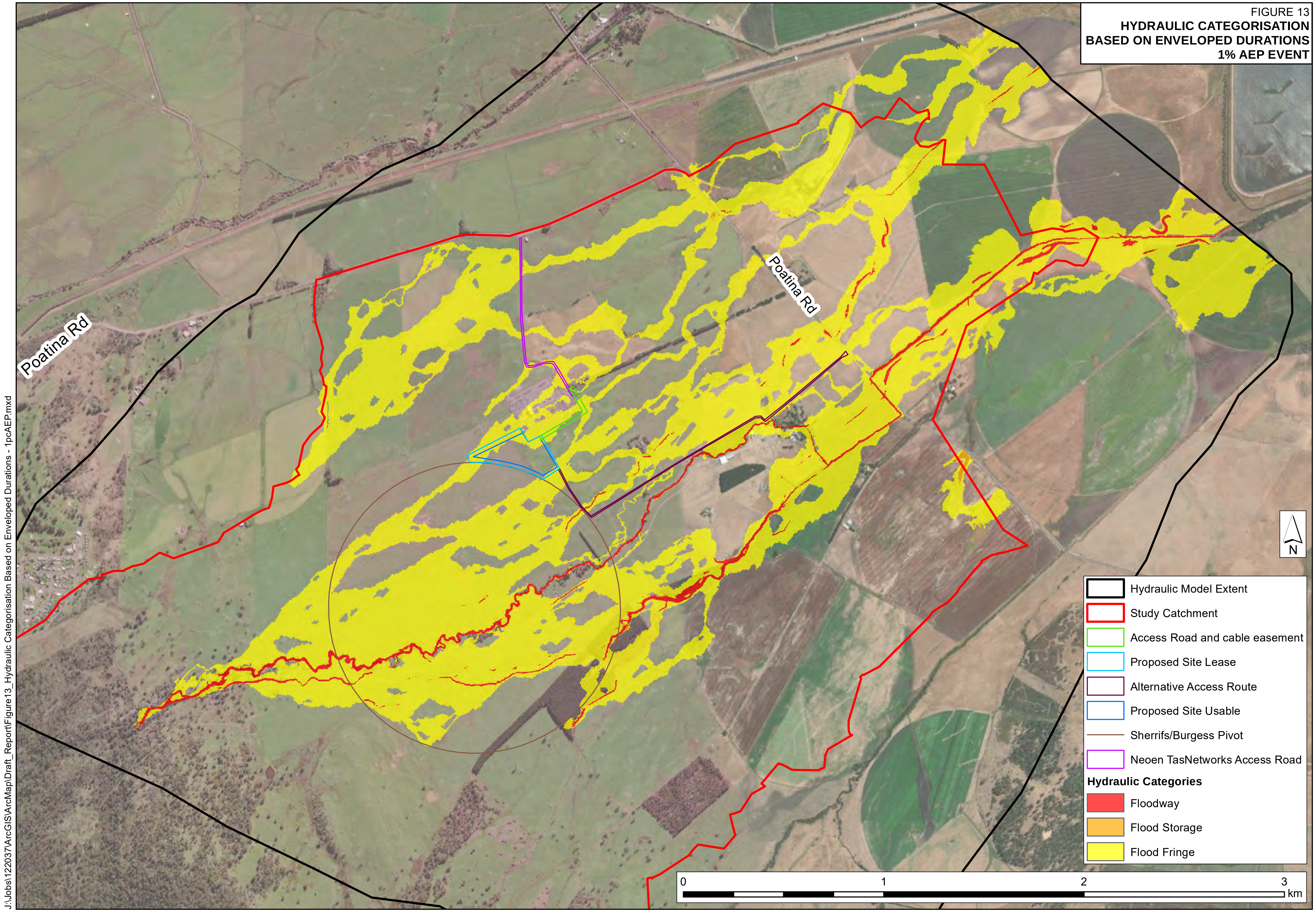
FIGURE 13
HYDRAULIC CATEGORISATION
BASED ON ENVELOPED DURATIONS
1% AEP EVENT
Poatina Rd
Poatina Rd
N
Hydraulic Model Extent
Study Catchment
Access Road and cable easement
Proposed Site Lease
Alternative Access Route
Proposed Site Usable
Sherrifs/Burgess Pivot
Neoen TasNetworks Access Road
Hydraulic Categories
Floodway
Flood Storage
Flood Fringe
0
1
2
3
km
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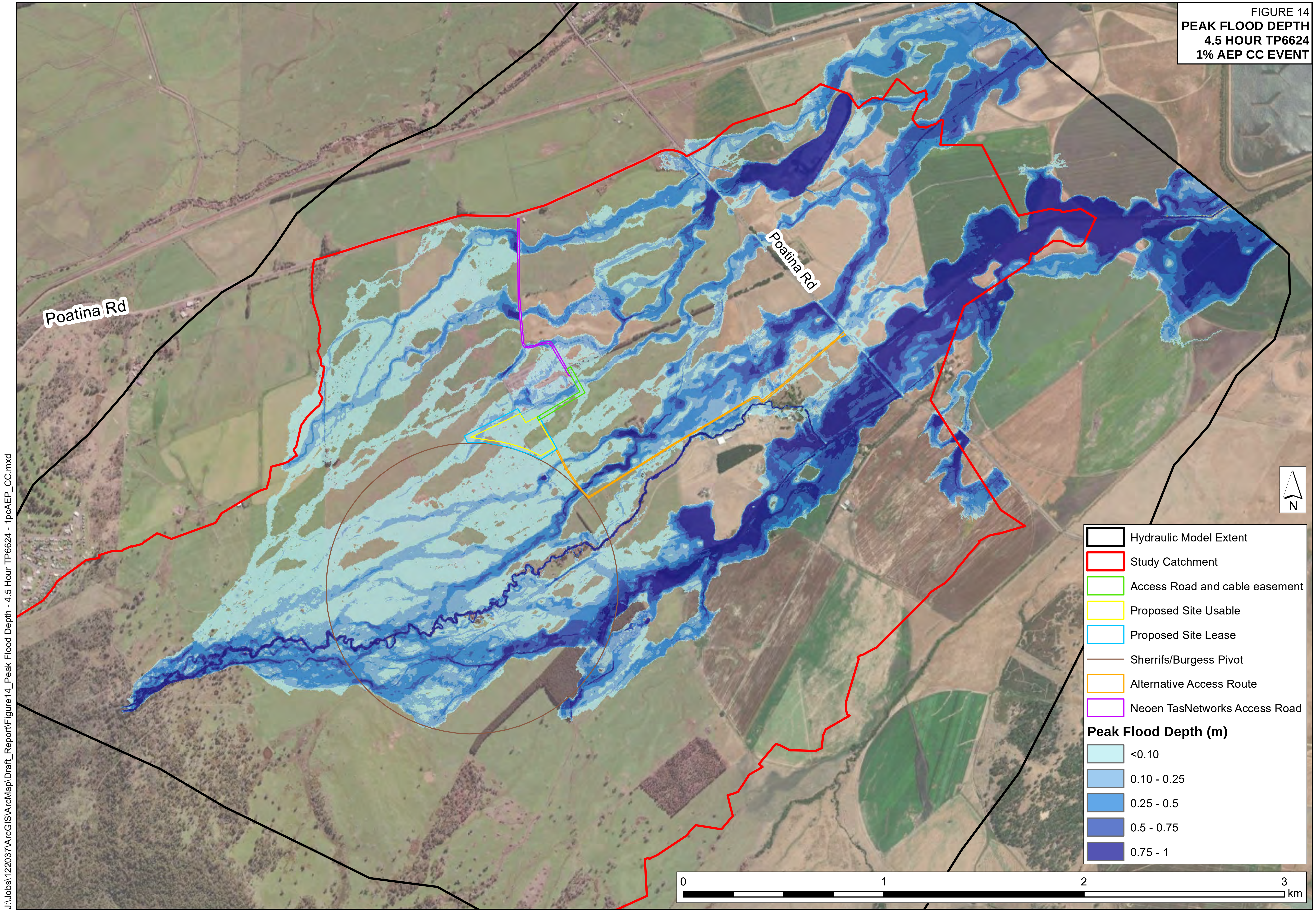
FIGURE 14
PEAK FLOOD DEPTH
4.5 HOUR TP6624
1% AEP CC EVENT
Poatina Rd
Poatina Rd
Hydraulic Model Extent
Study Catchment
Access Road and cable easement
Proposed Site Usable
Proposed Site Lease
Sherrifs/Burgess Pivot
Alternative Access Route
Neoen TasNetworks Access Road
Peak Flood Depth (m)
<0.10
0.10 - 0.25
0.25 - 0.5
0.5 - 0.75
0.75 - 1
0
1
2
3
km
N
J:\Jobs\122037\ArcGIS\ArcMap\Draft_Report\Figure14_Peak Flood Depth - 4.5 Hour TP6624 - 1pcAEP_CC.mxd

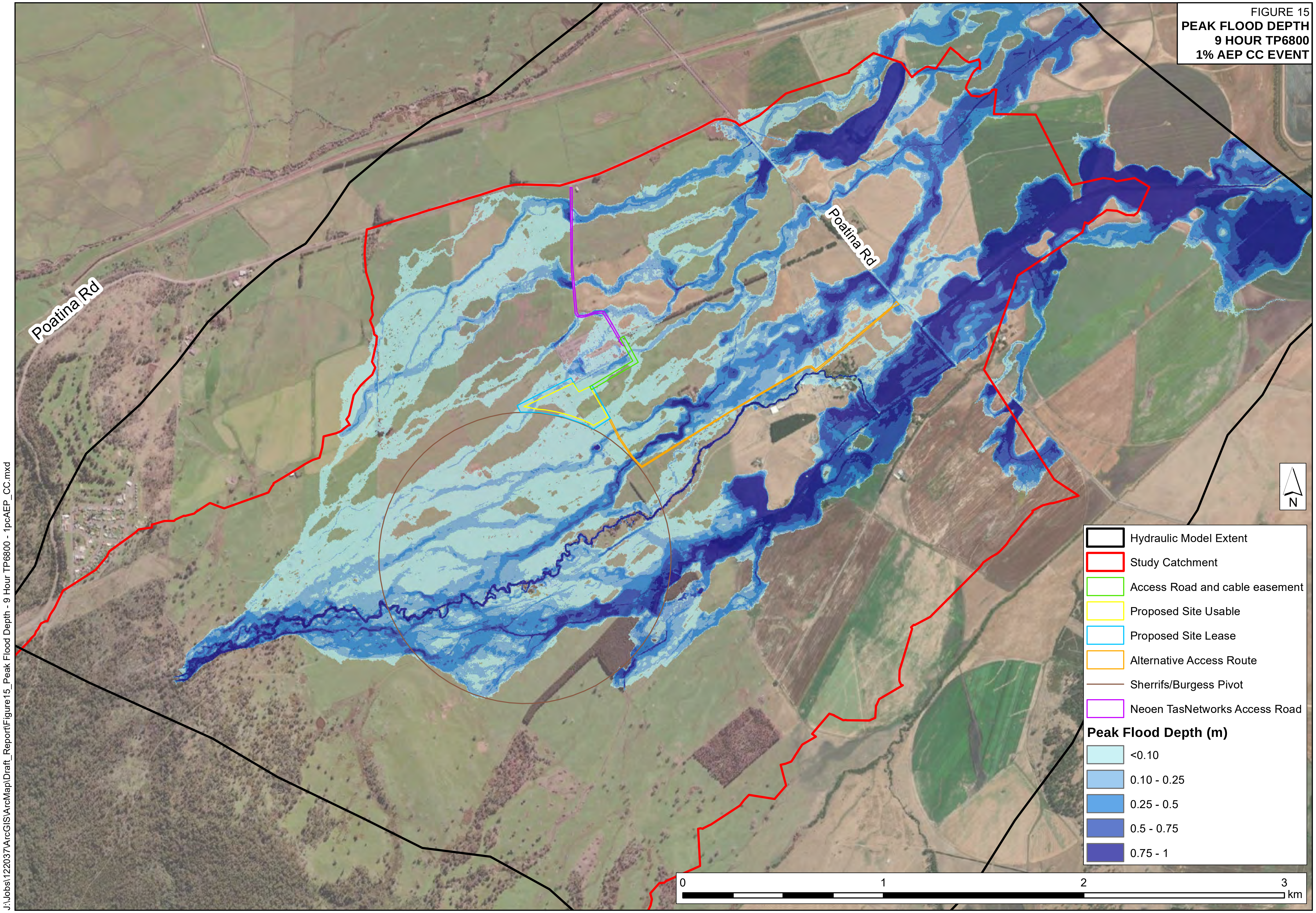
FIGURE 15
PEAK FLOOD DEPTH
9 HOUR TP6800
1% AEP CC EVENT
Poatina Rd
Poatina Rd
N
Hydraulic Model Extent
Study Catchment
Access Road and cable easement
Proposed Site Usable
Proposed Site Lease
Alternative Access Route
Sherrifs/Burgess Pivot
Neoen TasNetworks Access Road
Peak Flood Depth (m)
<0.10
0.10 - 0.25
0.25 - 0.5
0.5 - 0.75
0.75 - 1
0
1
2
3
km
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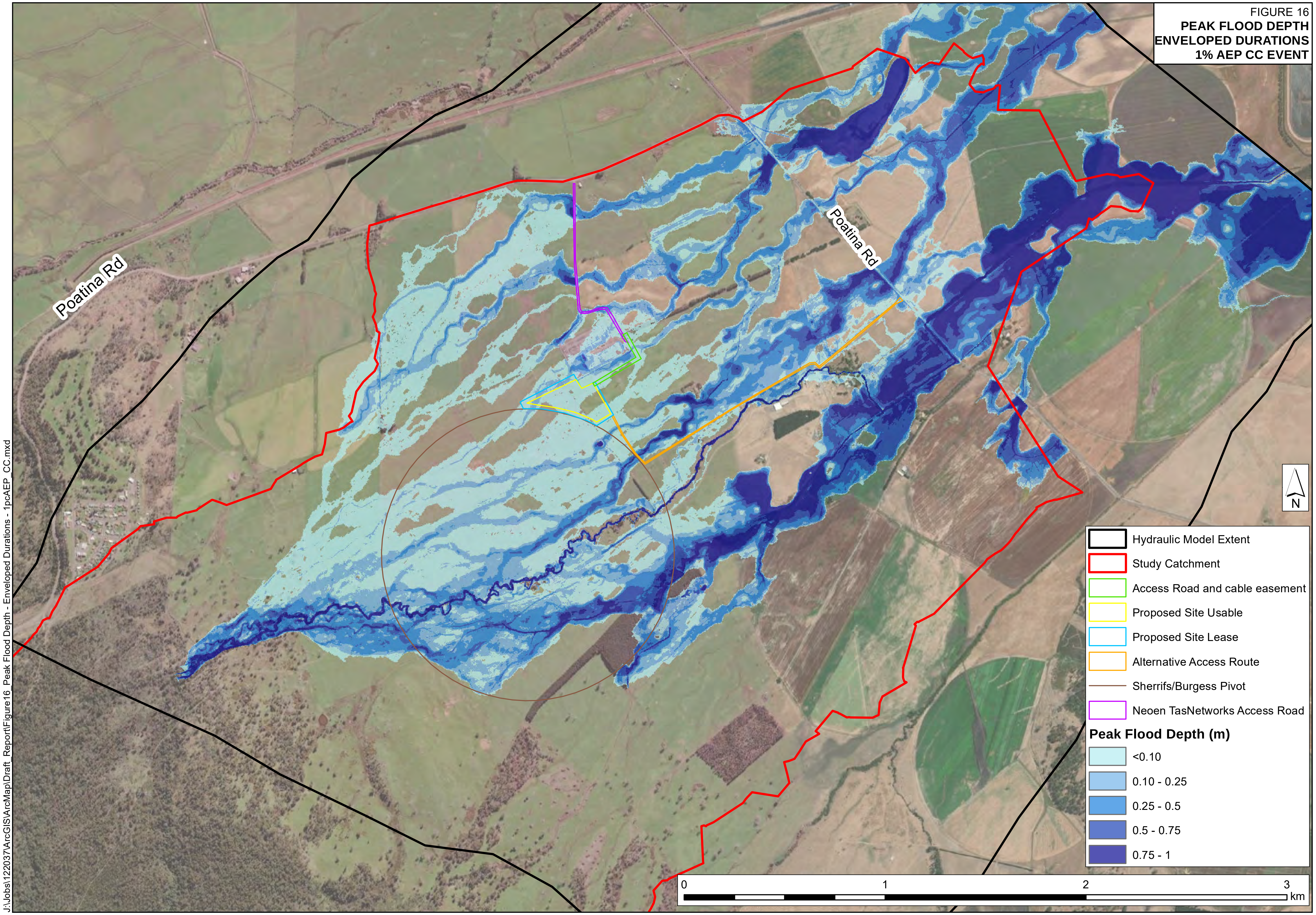
FIGURE 16
PEAK FLOOD DEPTH
ENVELOPED DURATIONS
1% AEP CC EVENT
Poatina Rd
Poatina Rd
N
Hydraulic Model Extent
Study Catchment
Access Road and cable easement
Proposed Site Usable
Proposed Site Lease
Alternative Access Route
Sherrifs/Burgess Pivot
Neoen TasNetworks Access Road
Peak Flood Depth (m)
<0.10
0.10 - 0.25
0.25 - 0.5
0.5 - 0.75
0.75 - 1
0
1
2
3
km
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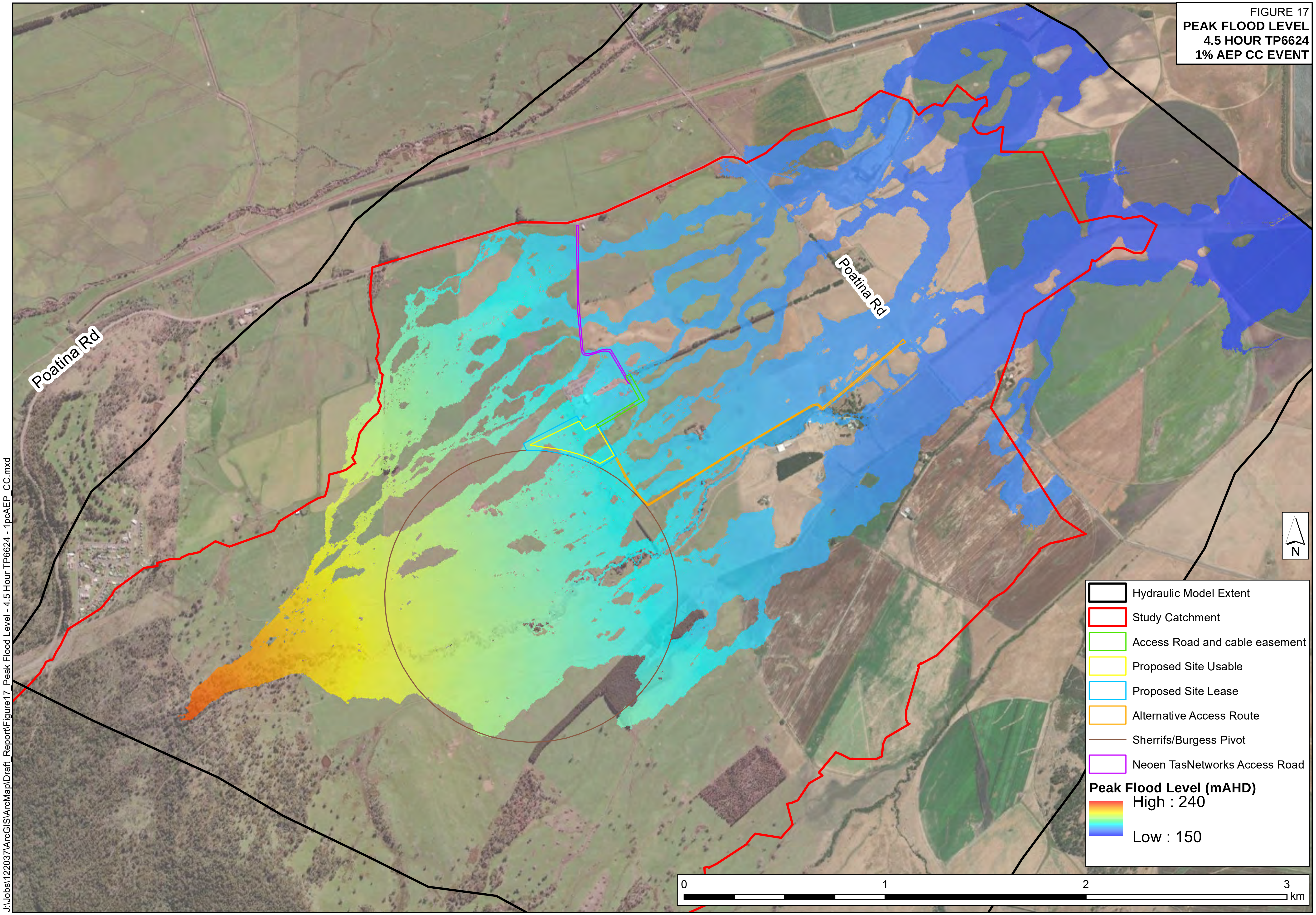
FIGURE 17
PEAK FLOOD LEVEL
4.5 HOUR TP6624
1% AEP CC EVENT
Poatina Rd
Poatina Rd
N
Hydraulic Model Extent
Study Catchment
Access Road and cable easement
Proposed Site Usable
Proposed Site Lease
Alternative Access Route
Sherrifs/Burgess Pivot
Neoen TasNetworks Access Road
Peak Flood Level (mAHD)
High : 240
Low : 150
0
1
2
3
km
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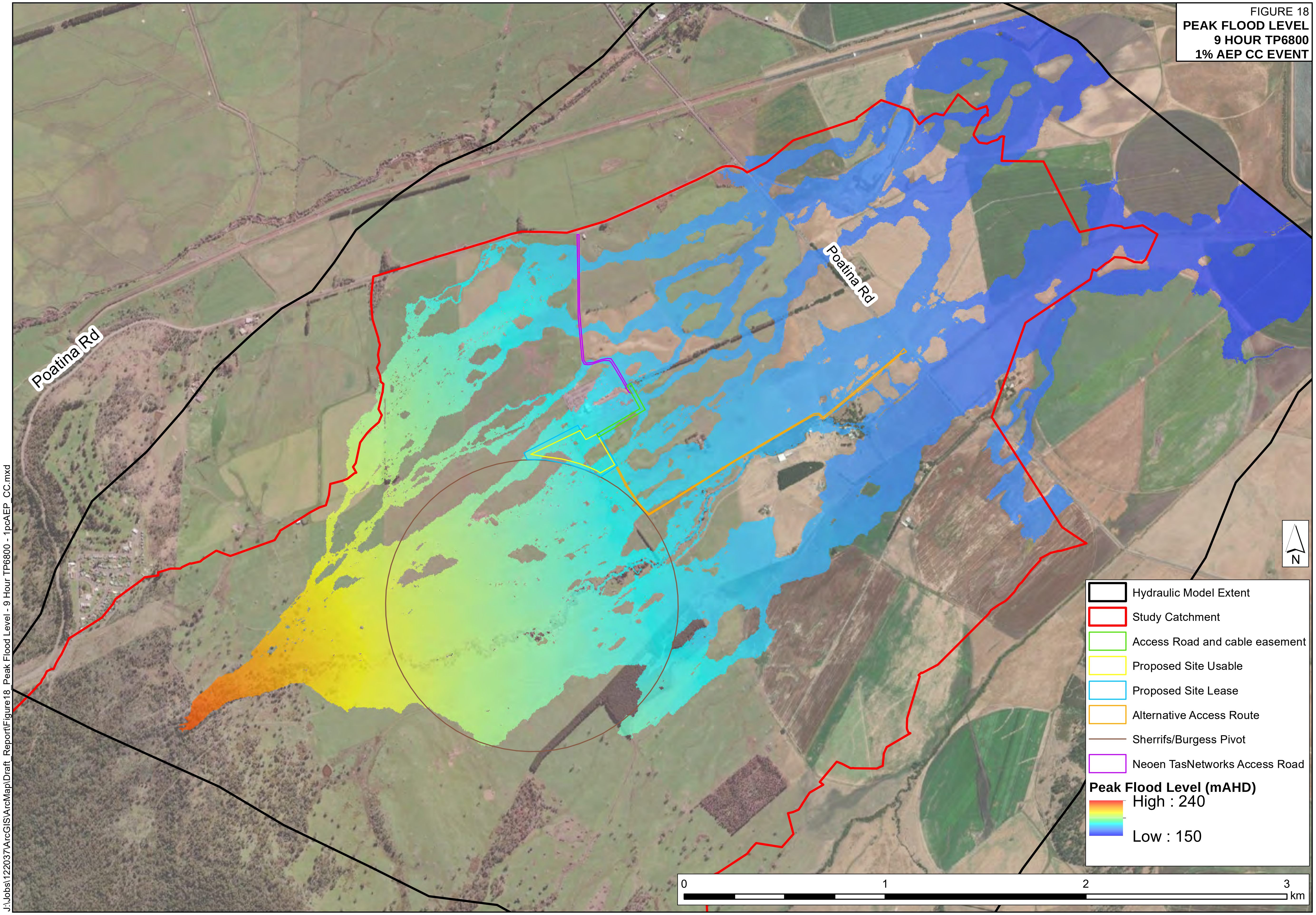
FIGURE 18
PEAK FLOOD LEVEL
9 HOUR TP6800
1% AEP CC EVENT
Poatina Rd
Poatina Rd
N
Hydraulic Model Extent
Study Catchment
Access Road and cable easement
Proposed Site Usable
Proposed Site Lease
Alternative Access Route
Sherrifs/Burgess Pivot
Neoen TasNetworks Access Road
Peak Flood Level (mAHD)
High : 240
Low : 150
0
1
2
3
km
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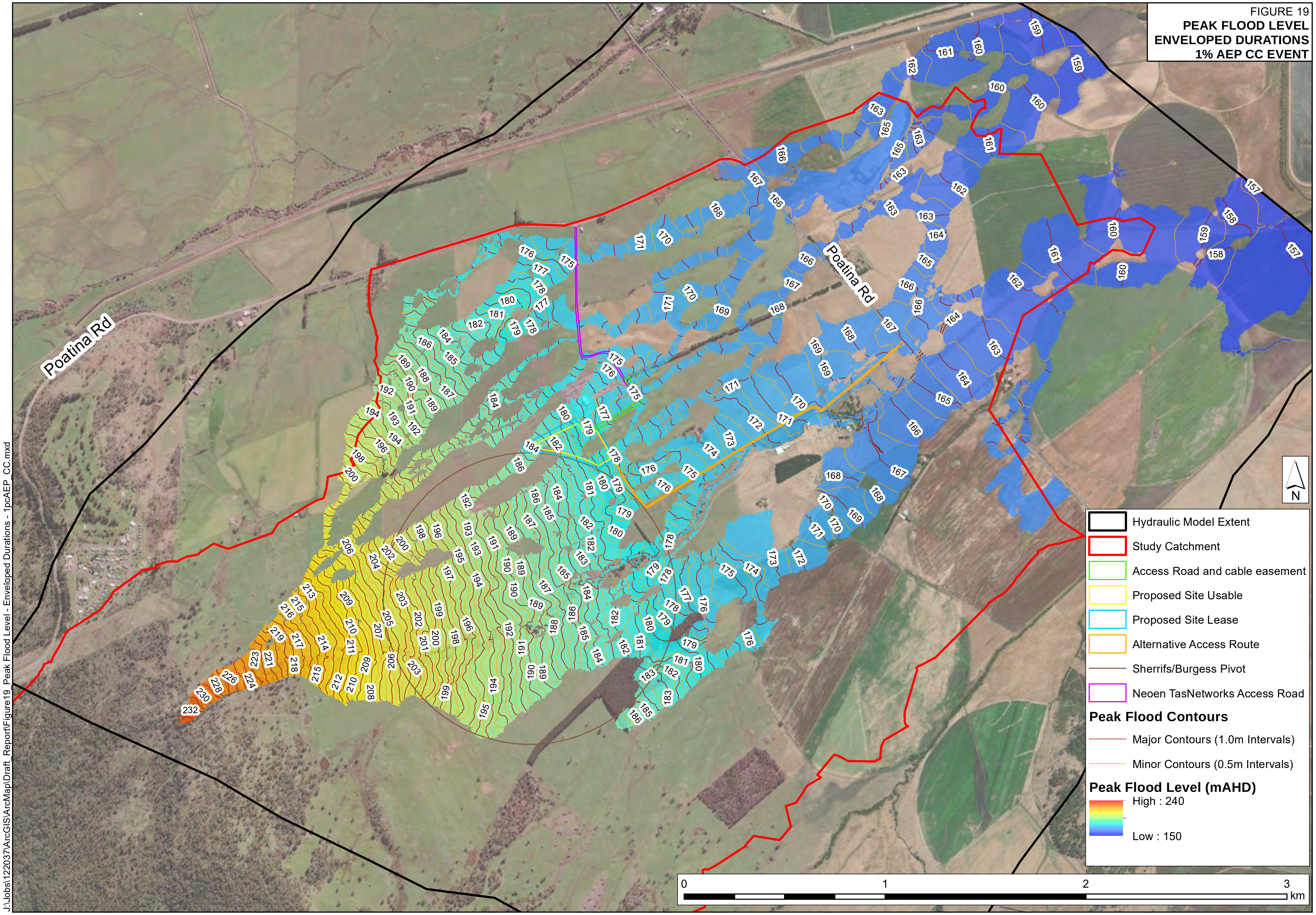
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ENVELOPED DURATIONS
1% AEP CC EVENT
Poatina Rd
Poatina Rd
Hydraulic Model Extent
Study Catchment
Access Road and cable easement
Proposed Site Usable
Proposed Site Lease
Alternative Access Route
Sherrifs/Burgess Pivot
Neoen TasNetworks Access Road
Peak Flood Contours
Major Contours (1.0m Intervals)
Minor Contours (0.5m Intervals)
Peak Flood Level (mAHD)
High : 240
Low : 150
N
0
1
2
3
km
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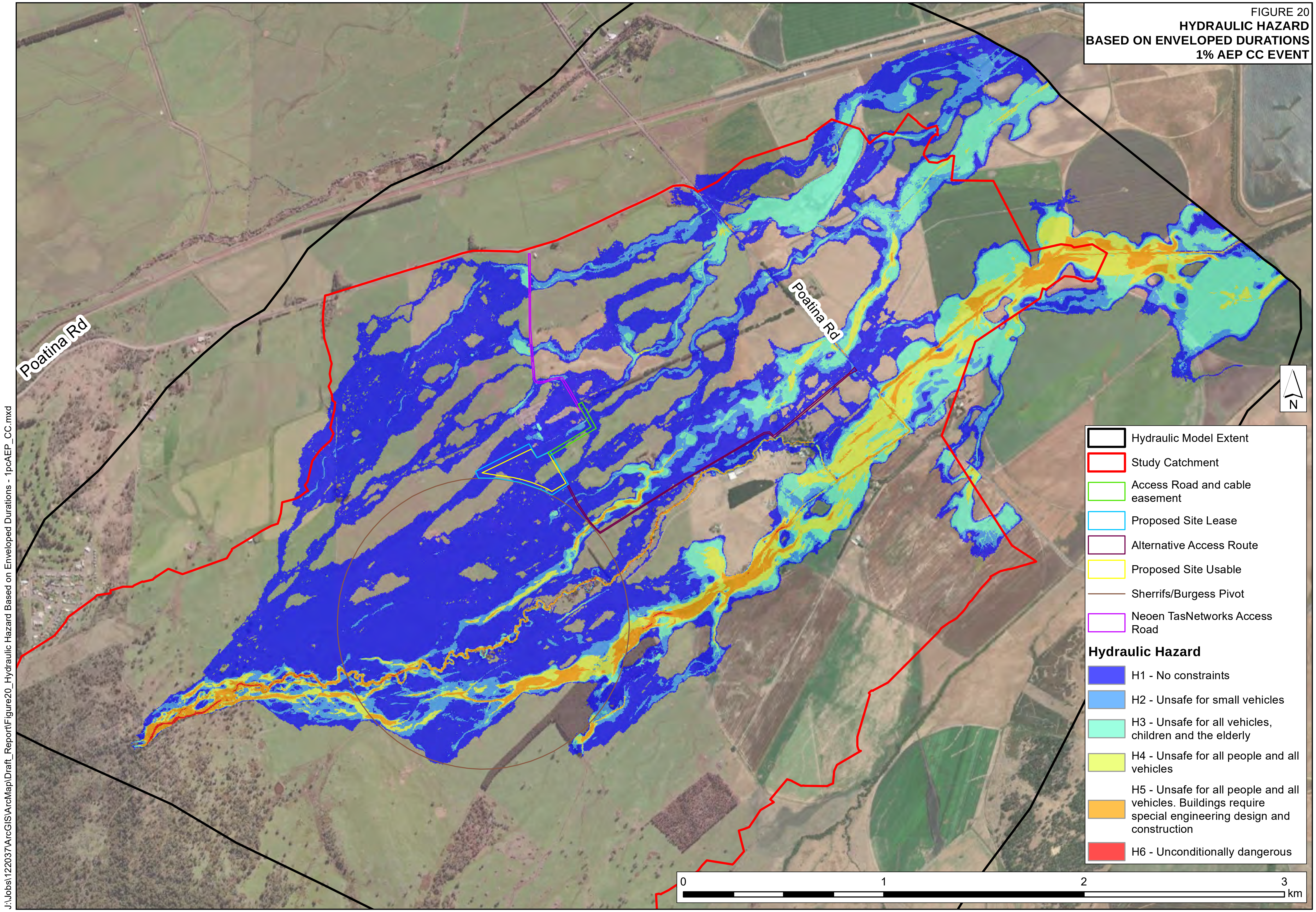
FIGURE 20
HYDRAULIC HAZARD
BASED ON ENVELOPED DURATIONS
1% AEP CC EVENT
Poatina Rd
Poatina Rd
N
Hydraulic Model Extent
Study Catchment
Access Road and cable easement
Proposed Site Lease
Alternative Access Route
Proposed Site Usable
Sherrifs/Burgess Pivot
Neoen TasNetworks Access Road
Hydraulic Hazard
H1 - No constraints
H2 - Unsafe for small vehicles
H3 - Unsafe for all vehicles, children and the elderly
H4 - Unsafe for all people and all vehicles
H5 - Unsafe for all people and all vehicles. Buildings require special engineering design and construction
H6 - Unconditionally dangerous
0
1
2
3
km
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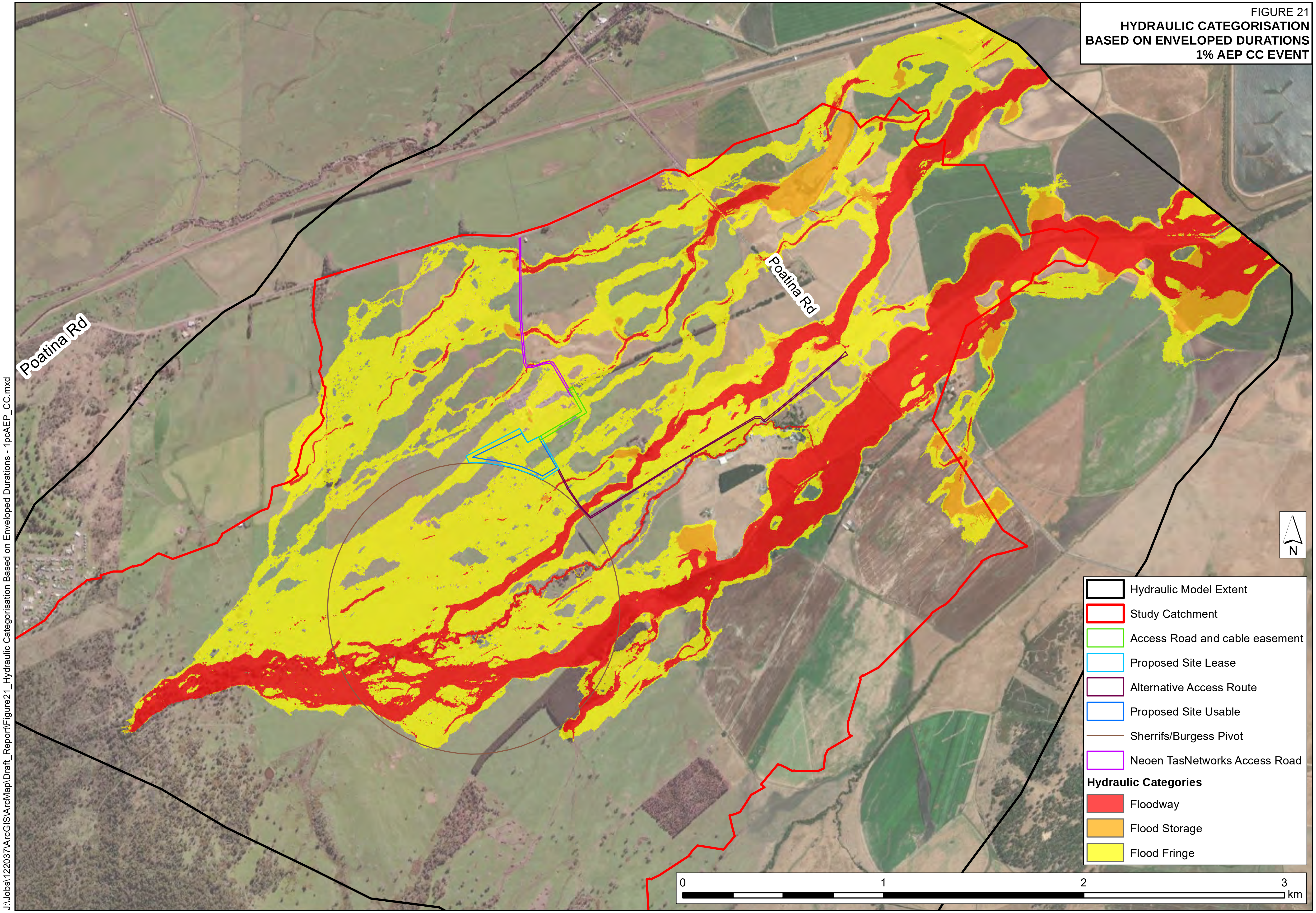
FIGURE 21
HYDRAULIC CATEGORISATION
BASED ON ENVELOPED DURATIONS
1% AEP CC EVENT
Poatina Rd
Poatina Rd
N
Hydraulic Model Extent
Study Catchment
Access Road and cable easement
Proposed Site Lease
Alternative Access Route
Proposed Site Usable
Sherrifs/Burgess Pivot
Neoen TasNetworks Access Road
Hydraulic Categories
Floodway
Flood Storage
Flood Fringe
0
1
2
3
km
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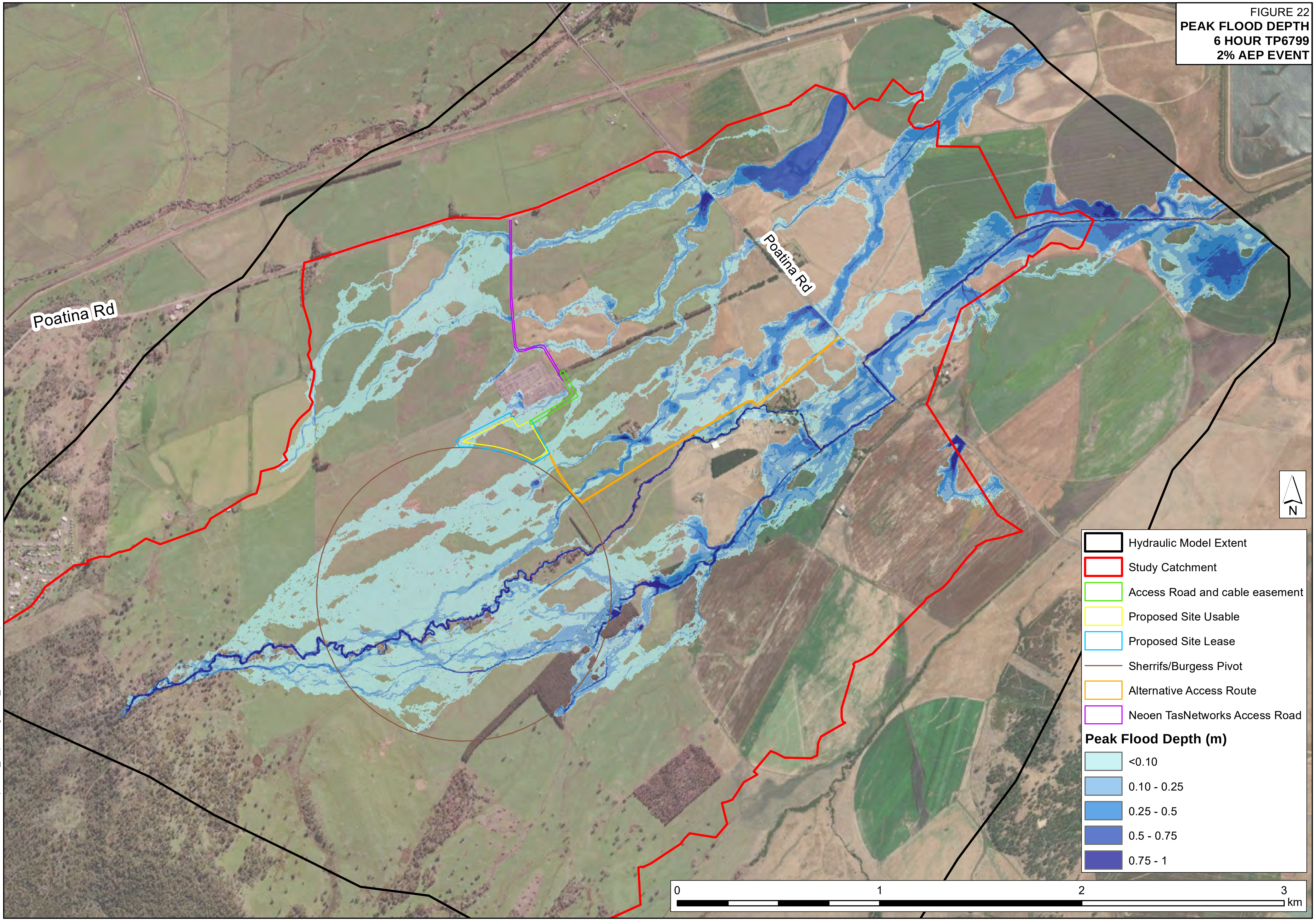

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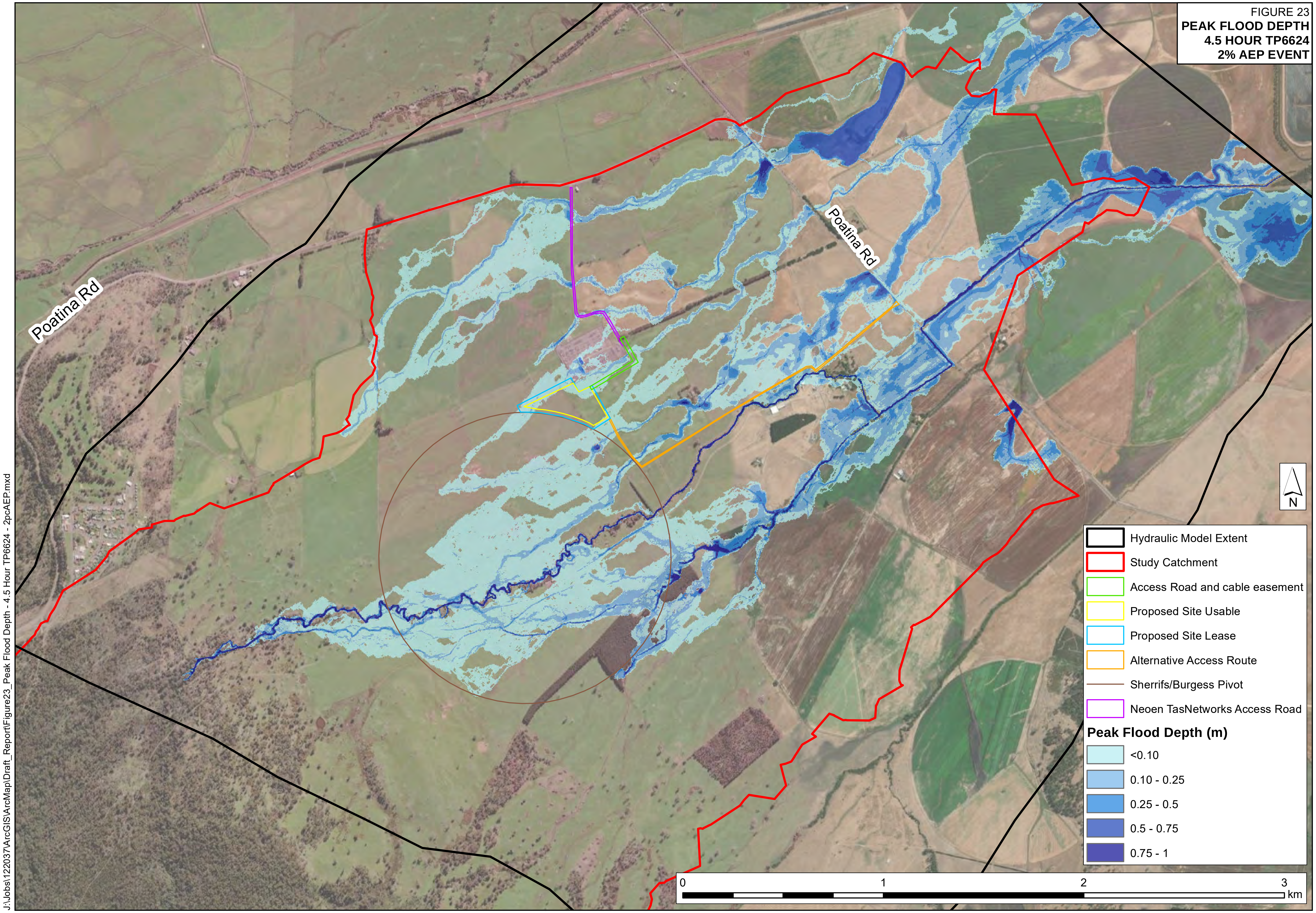
FIGURE 23
PEAK FLOOD DEPTH
4.5 HOUR TP6624
2% AEP EVENT
Poatina Rd
Poatina Rd
N
Hydraulic Model Extent
Study Catchment
Access Road and cable easement
Proposed Site Usable
Proposed Site Lease
Alternative Access Route
Sherrifs/Burgess Pivot
Neoen TasNetworks Access Road
Peak Flood Depth (m)
<0.10
0.10 - 0.25
0.25 - 0.5
0.5 - 0.75
0.75 - 1
0
1
2
3
km
J:\Jobs\122037\ArcGIS\ArcMap\Draft_Report\Figure23_Peak Flood Depth - 4.5 Hour TP6624 - 2pcAEP.mxd

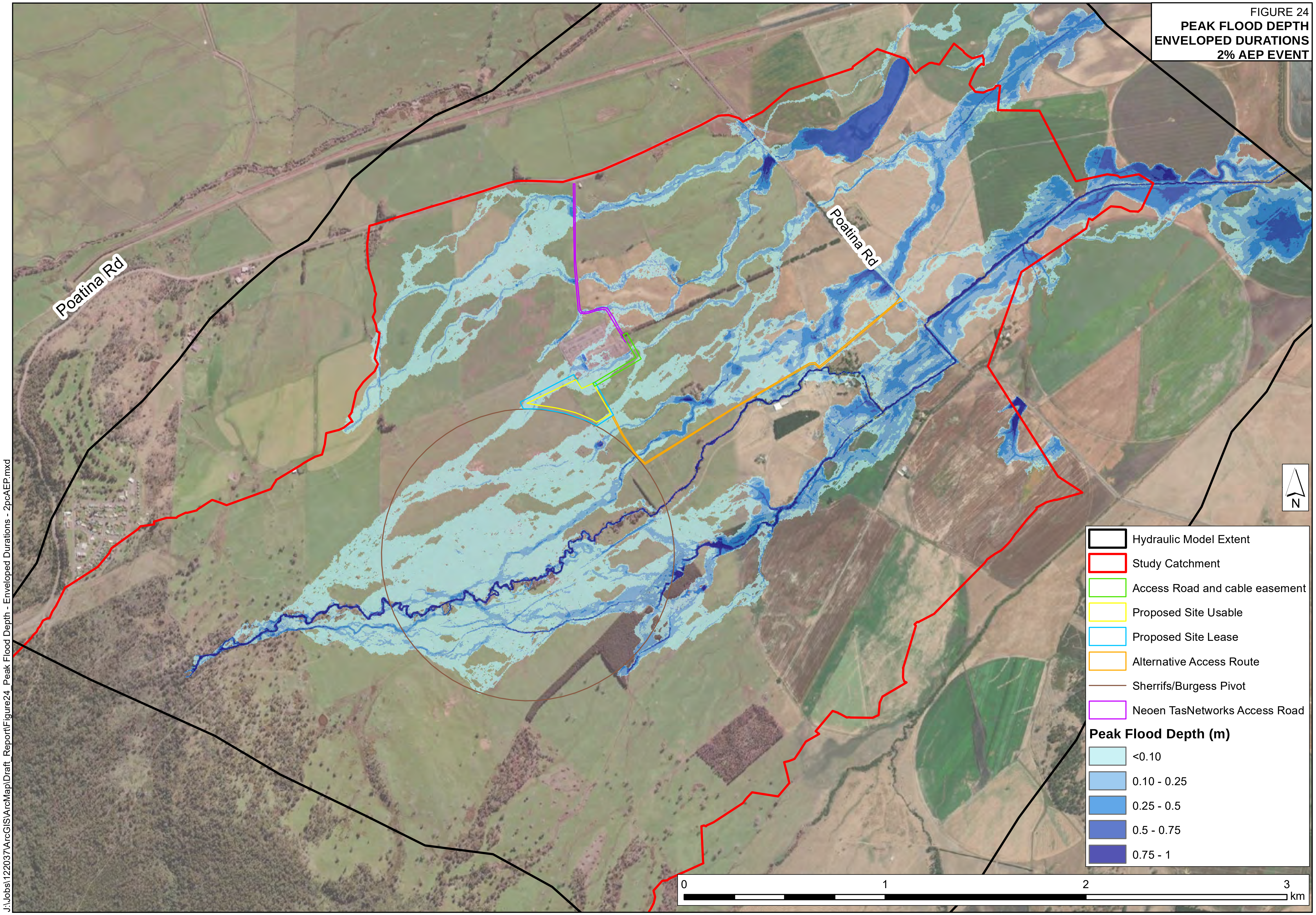
FIGURE 24
PEAK FLOOD DEPTH
ENVELOPED DURATIONS
2% AEP EVENT
Poatina Rd
Poatina Rd
N
Hydraulic Model Extent
Study Catchment
Access Road and cable easement
Proposed Site Usable
Proposed Site Lease
Alternative Access Route
Sherrifs/Burgess Pivot
Neoen TasNetworks Access Road
Peak Flood Depth (m)
<0.10
0.10 - 0.25
0.25 - 0.5
0.5 - 0.75
0.75 - 1
0
1
2
3
km
J:\Jobs\122037\ArcGIS\ArcMap\Draft_Report\Figure24_Peak Flood Depth - Enveloped Durations - 2pcAEP.mxd

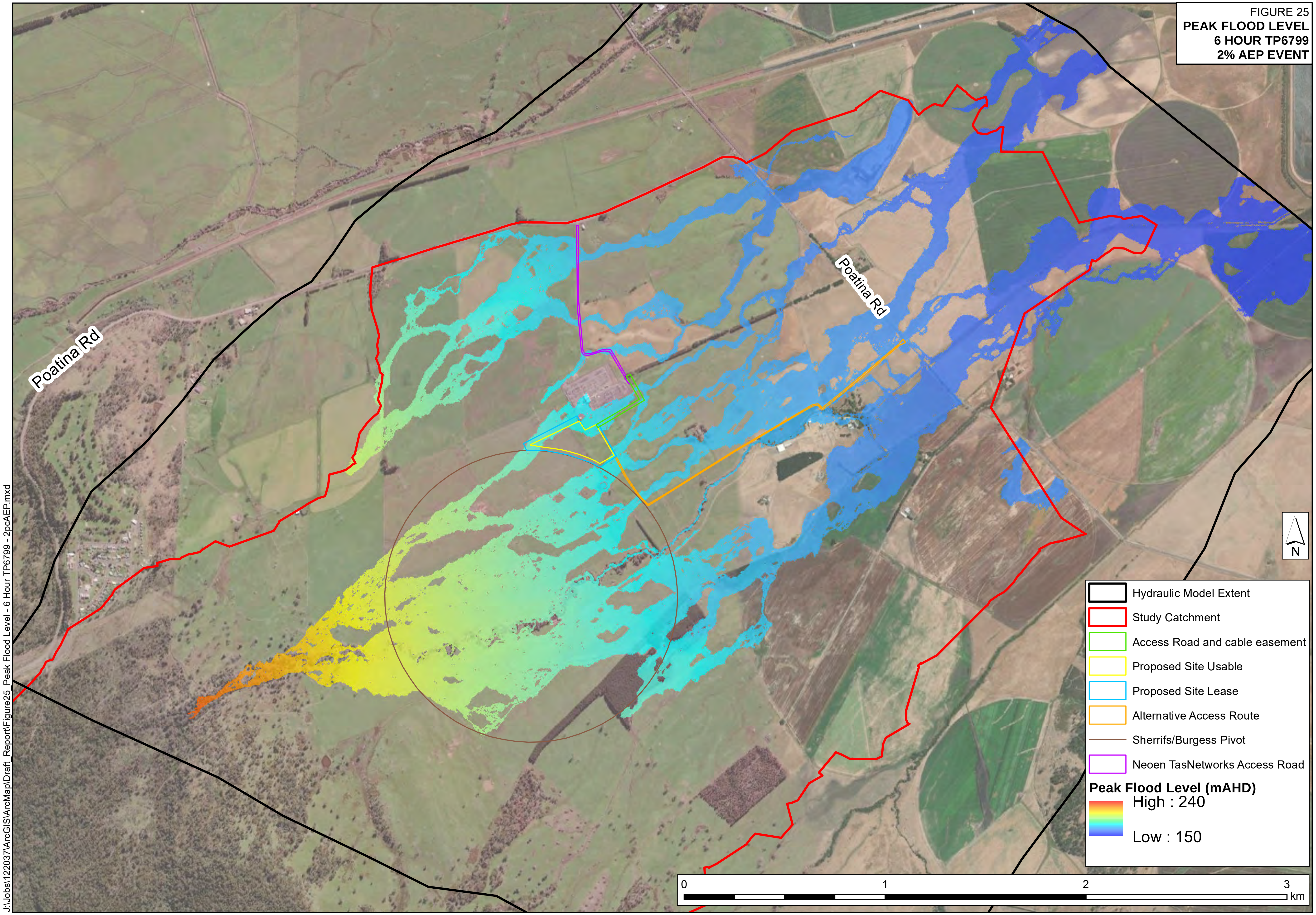

FIGURE 25
PEAK FLOOD LEVEL
6 HOUR TP6799
2% AEP EVENT
Poatina Rd
Poatina Rd
N
Hydraulic Model Extent
Study Catchment
Access Road and cable easement
Proposed Site Usable
Proposed Site Lease
Alternative Access Route
Sherrifs/Burgess Pivot
Neoen TasNetworks Access Road
Peak Flood Level (mAHD)
High : 240
Low : 150
0
1
2
3
km
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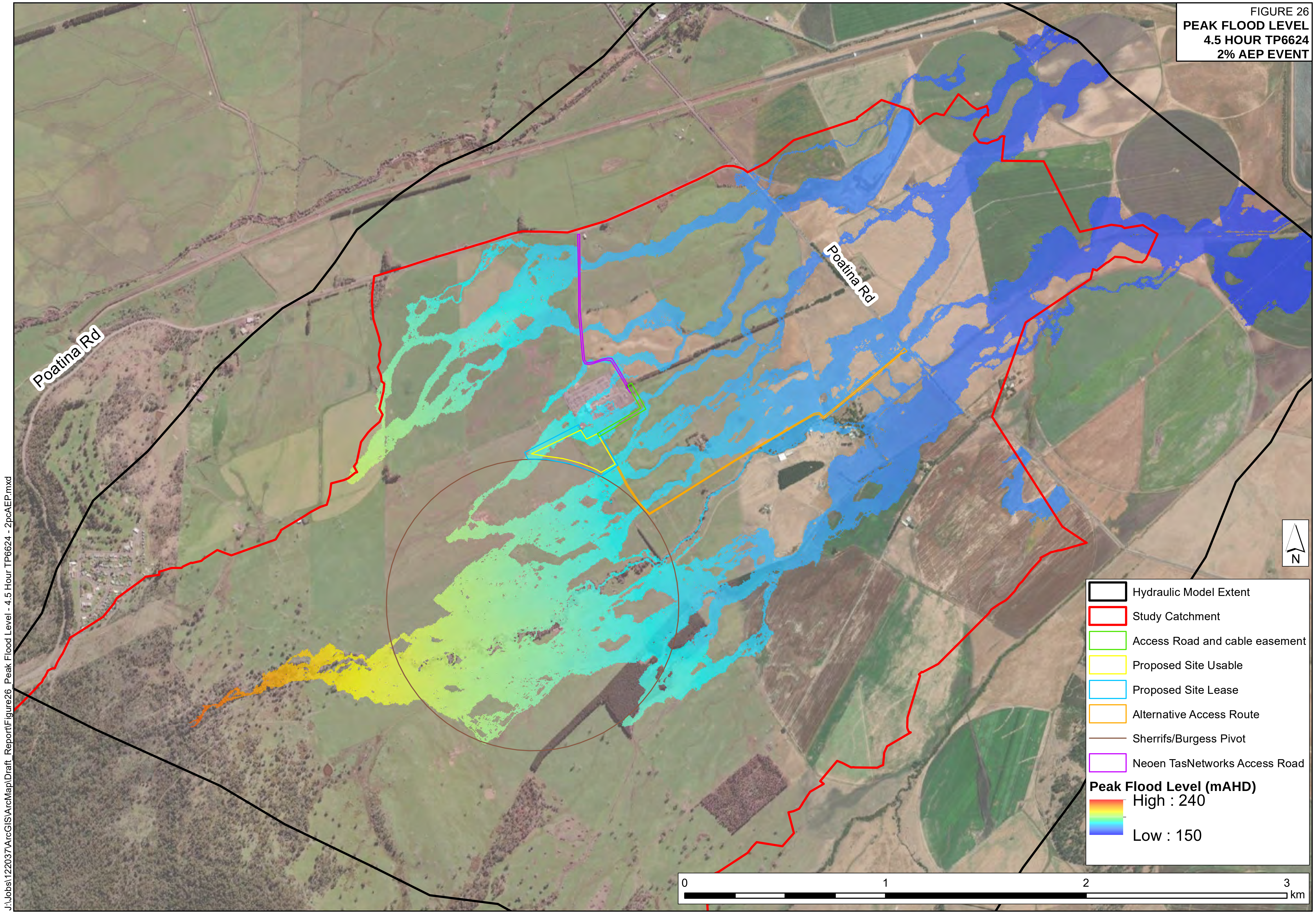
FIGURE 26
PEAK FLOOD LEVEL
4.5 HOUR TP6624
2% AEP EVENT
Poatina Rd
Poatina Rd
N
Hydraulic Model Extent
Study Catchment
Access Road and cable easement
Proposed Site Usable
Proposed Site Lease
Alternative Access Route
Sherrifs/Burgess Pivot
Neoen TasNetworks Access Road
Peak Flood Level (mAHD)
High : 240
Low : 150
0
1
2
3
km
J:\Jobs\122037\ArcGIS\ArcMap\Draft_Report\Figure26_Peak Flood Level - 4.5 Hour TP6624 - 2pcAEP.mxd

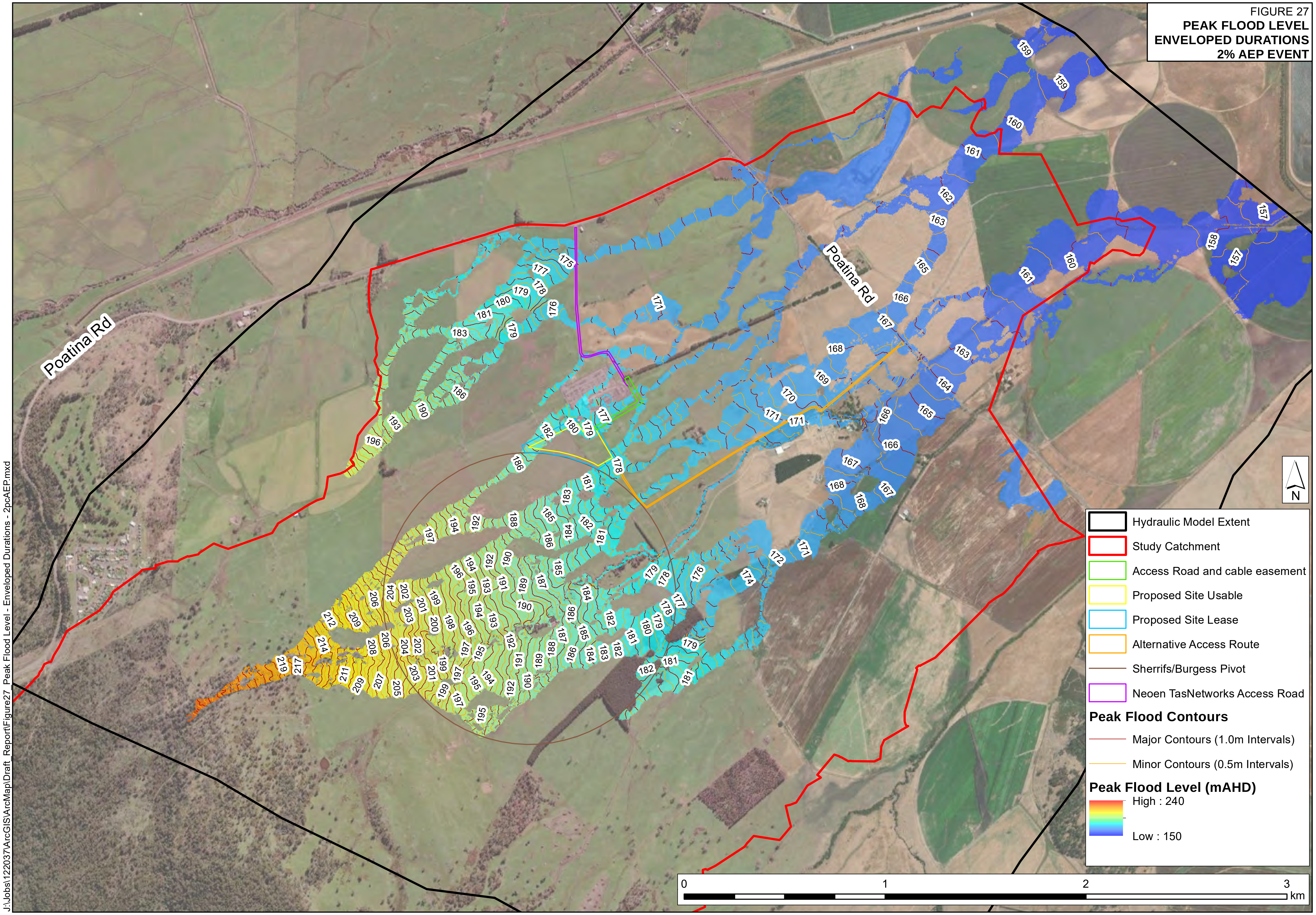
FIGURE 27
PEAK FLOOD LEVEL
ENVELOPED DURATIONS
2% AEP EVENT
Poatina Rd
Poatina Rd
Hydraulic Model Extent
Study Catchment
Access Road and cable easement
Proposed Site Usable
Proposed Site Lease
Alternative Access Route
Sherrifs/Burgess Pivot
Neoen TasNetworks Access Road
Peak Flood Contours
Major Contours (1.0m Intervals)
Minor Contours (0.5m Intervals)
Peak Flood Level (mAHD)
High : 240
Low : 150
0
1
2
3
km
N
J:\Jobs\122037\ArcGIS\ArcMap\Draft_Report\Figure27_Peak Flood Level - Enveloped Durations - 2pcAEP.mxd

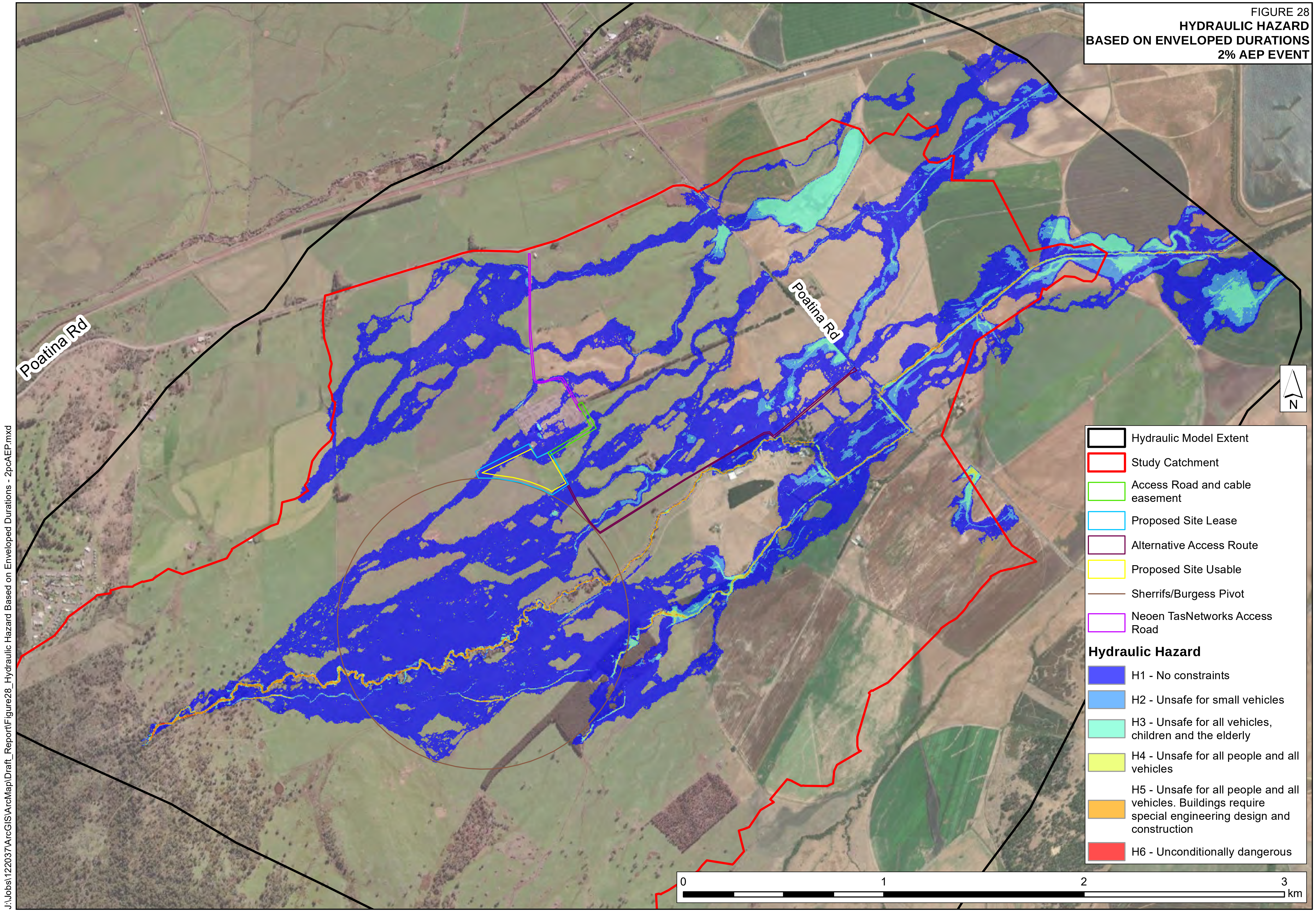
FIGURE 28
HYDRAULIC HAZARD
BASED ON ENVELOPED DURATIONS
2% AEP EVENT
Poatina Rd
Poatina Rd
N
Hydraulic Model Extent
Study Catchment
Access Road and cable easement
Proposed Site Lease
Alternative Access Route
Proposed Site Usable
Sherrifs/Burgess Pivot
Neoen TasNetworks Access Road
Hydraulic Hazard
H1 - No constraints
H2 - Unsafe for small vehicles
H3 - Unsafe for all vehicles, children and the elderly
H4 - Unsafe for all people and all vehicles
H5 - Unsafe for all people and all vehicles. Buildings require special engineering design and construction
H6 - Unconditionally dangerous
0
1
2
3
km
J:\Jobs\122037\ArcGIS\ArcMap\Draft_Report\Figure28_Hydraulic Hazard Based on Enveloped Durations - 2pcAEP.mxd

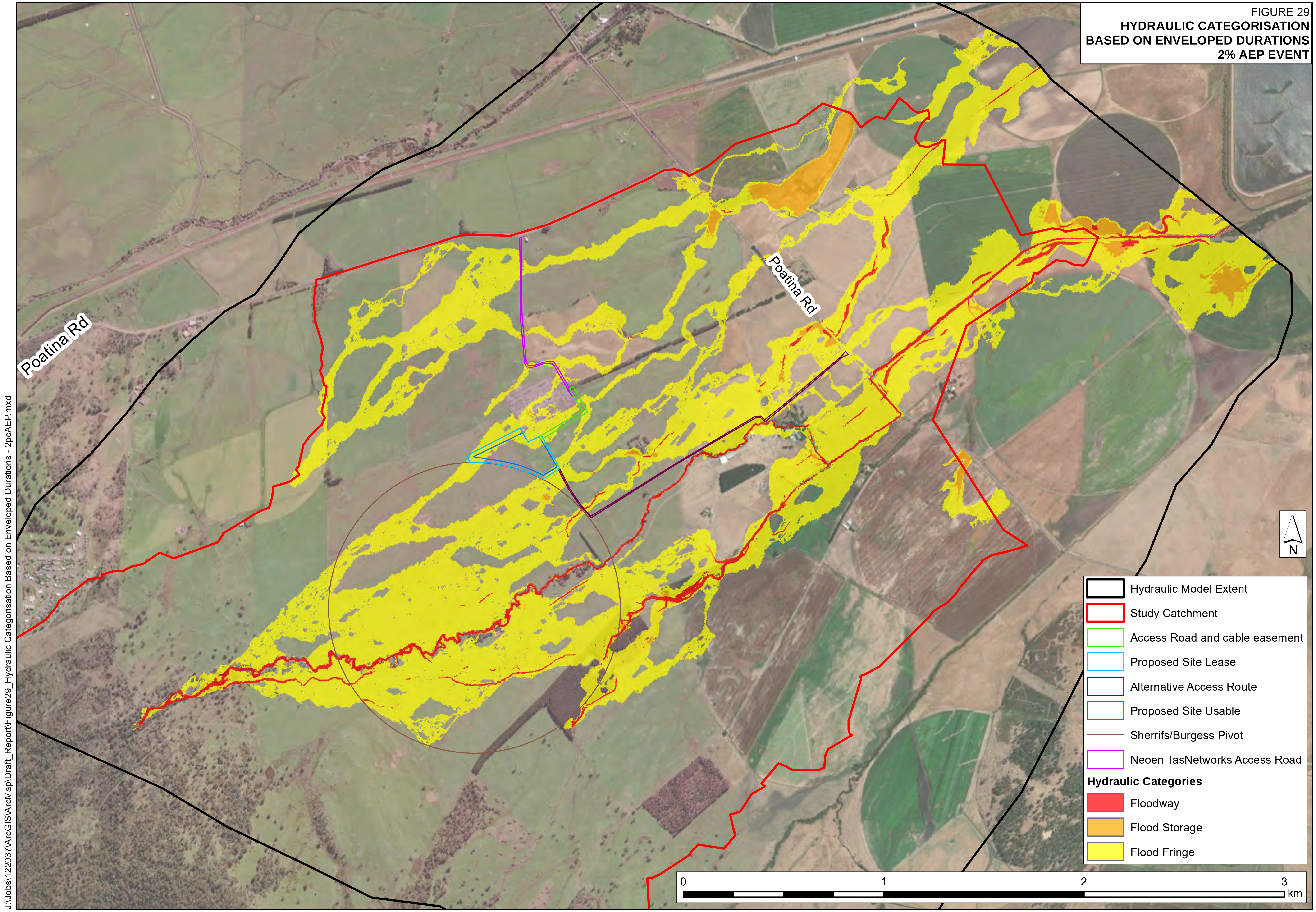
FIGURE 29
HYDRAULIC CATEGORISATION
BASED ON ENVELOPED DURATIONS
2% AEP EVENT
Poatina Rd
Poatina Rd
N
Hydraulic Model Extent
Study Catchment
Access Road and cable easement
Proposed Site Lease
Alternative Access Route
Proposed Site Usable
Sherrifs/Burgess Pivot
Neoen TasNetworks Access Road
Hydraulic Categories
Floodway
Flood Storage
Flood Fringe
0
1
2
3
km
J:\Jobs\122037\ArcGIS\ArcMap\Draft_Report\Figure29_Hydraulic Categorisation Based on Enveloped Durations - 2pcAEP.mxd

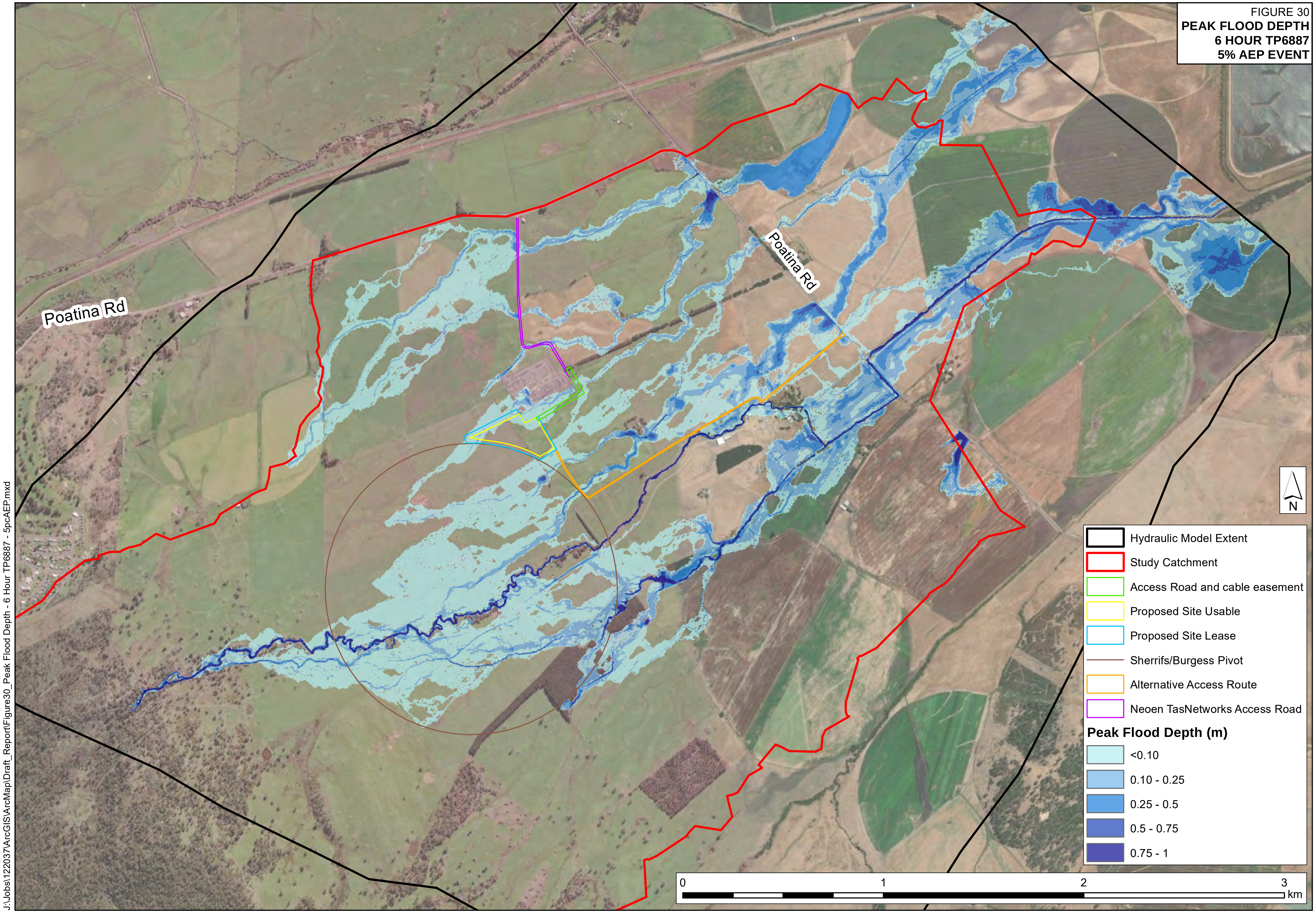
FIGURE 30
PEAK FLOOD DEPTH
6 HOUR TP6887
5% AEP EVENT
Poatina Rd
Poatina Rd
Hydraulic Model Extent
Study Catchment
Access Road and cable easement
Proposed Site Usable
Proposed Site Lease
Sherrifs/Burgess Pivot
Alternative Access Route
Neoen TasNetworks Access Road
Peak Flood Depth (m)
<0.10
0.10 - 0.25
0.25 - 0.5
0.5 - 0.75
0.75 - 1
0
1
2
3
km
N
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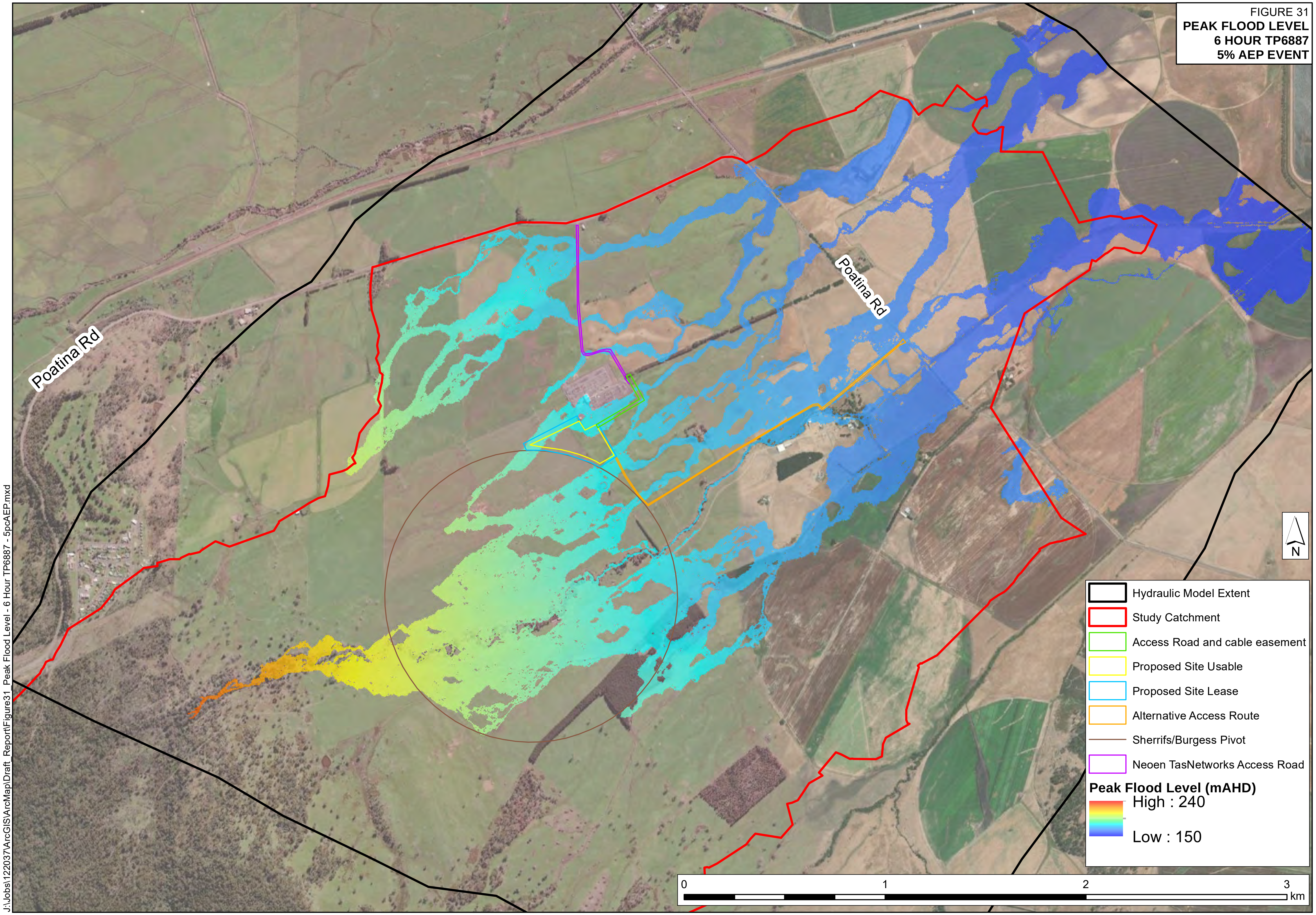
FIGURE 31
PEAK FLOOD LEVEL
6 HOUR TP6887
5% AEP EVENT
Poatina Rd
Poatina Rd
N
Hydraulic Model Extent
Study Catchment
Access Road and cable easement
Proposed Site Usable
Proposed Site Lease
Alternative Access Route
Sherrifs/Burgess Pivot
Neoen TasNetworks Access Road
Peak Flood Level (mAHD)
High : 240
Low : 150
0
1
2
3
km
J:\Jobs\122037\ArcGIS\ArcMap\Draft_Report\Figure31_Peak Flood Level - 6 Hour TP6887 - 5pcAEP.mxd

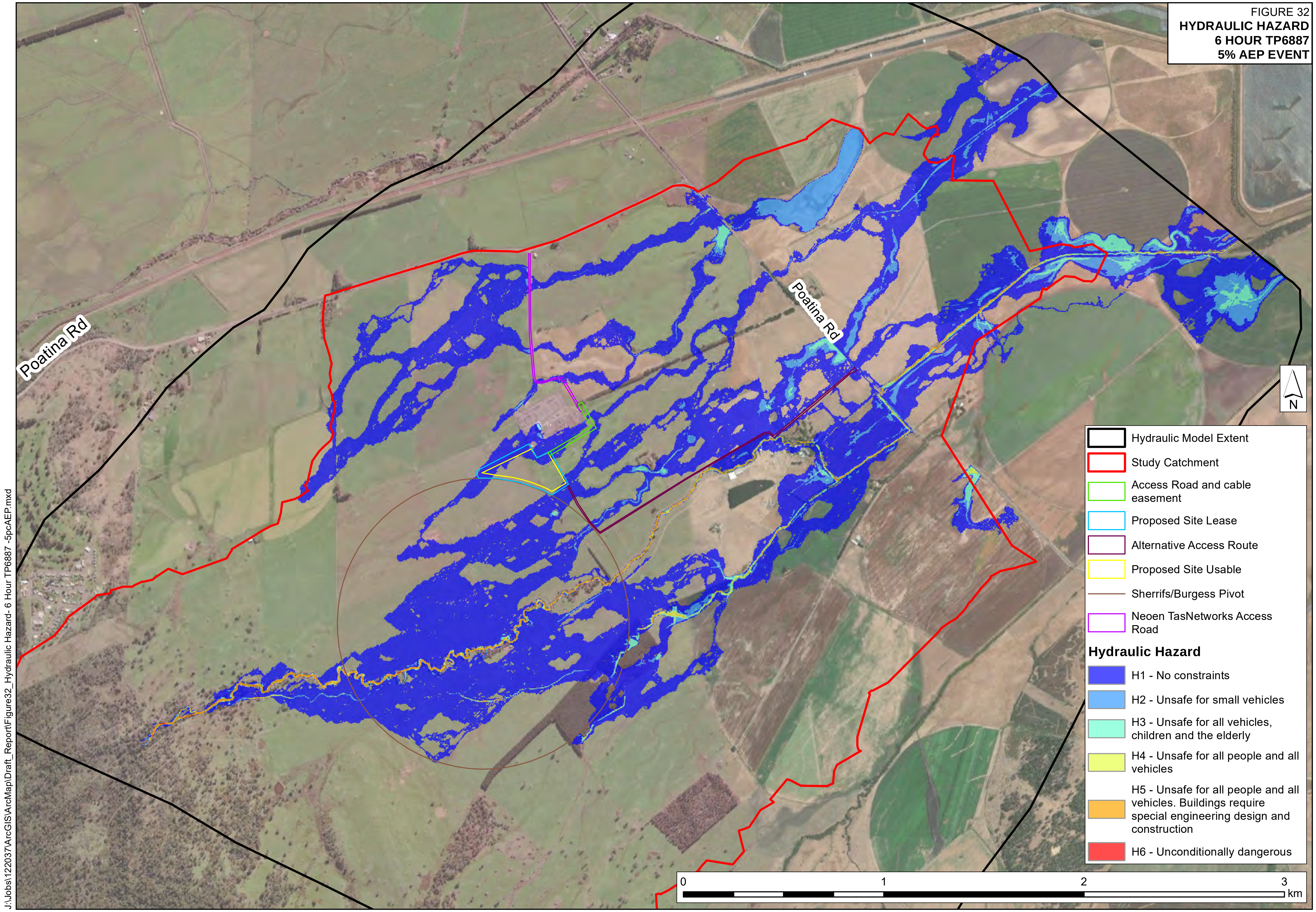
FIGURE 32
HYDRAULIC HAZARD
6 HOUR TP6887
5% AEP EVENT
Poatina Rd
Poatina Rd
N
Hydraulic Model Extent
Study Catchment
Access Road and cable easement
Proposed Site Lease
Alternative Access Route
Proposed Site Usable
Sherrifs/Burgess Pivot
Neoen TasNetworks Access Road
Hydraulic Hazard
H1 - No constraints
H2 - Unsafe for small vehicles
H3 - Unsafe for all vehicles, children and the elderly
H4 - Unsafe for all people and all vehicles
H5 - Unsafe for all people and all vehicles. Buildings require special engineering design and construction
H6 - Unconditionally dangerous
0
1
2
3
km
J:\Jobs\122037\ArcGIS\ArcMap\Draft_Report\Figure32_Hydraulic Hazard- 6 Hour TP6887 -5pcAEP.mxd

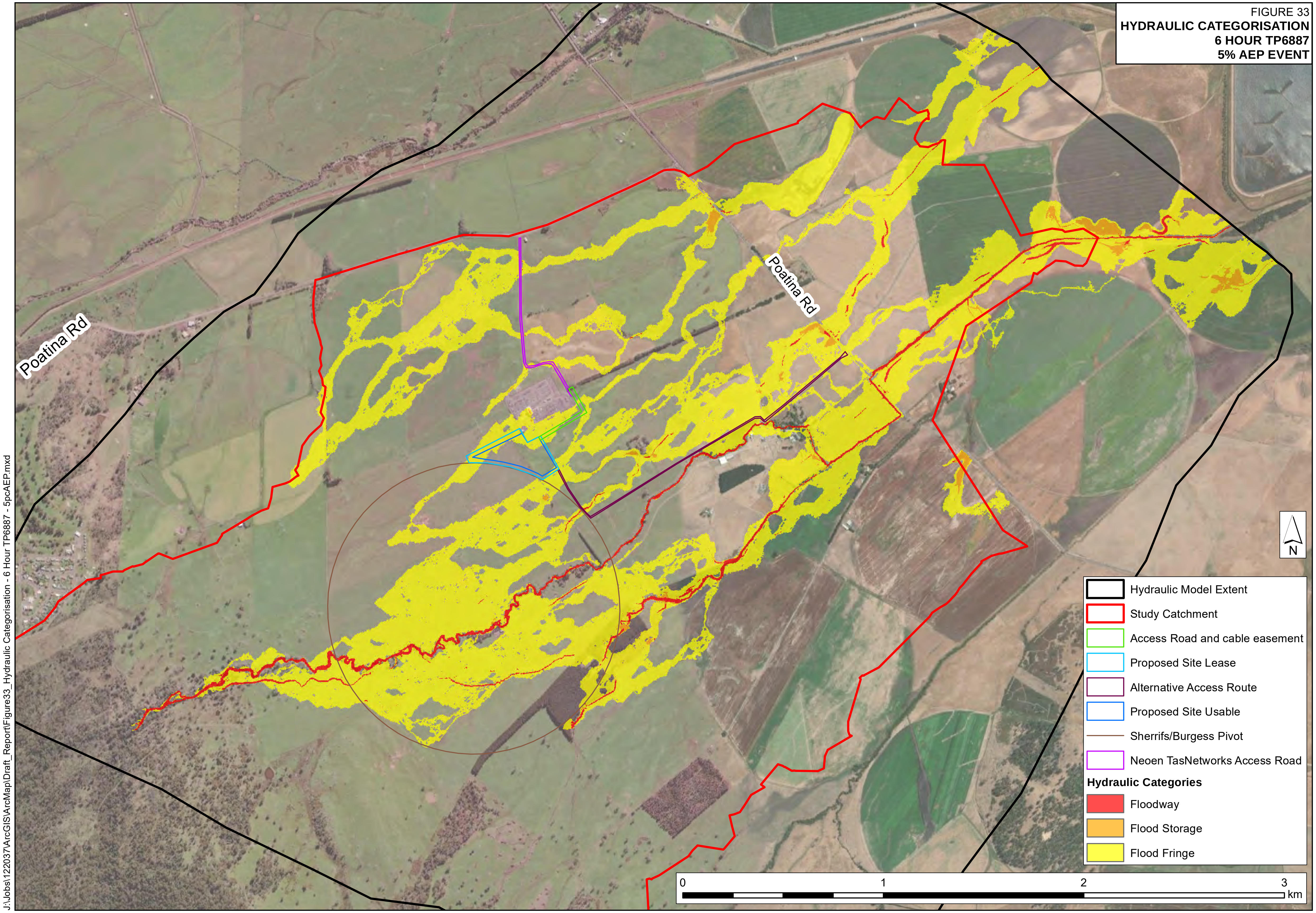

FIGURE 33
HYDRAULIC CATEGORISATION
6 HOUR TP6887
5% AEP EVENT
Poatina Rd
Poatina Rd
N
Hydraulic Model Extent
Study Catchment
Access Road and cable easement
Proposed Site Lease
Alternative Access Route
Proposed Site Usable
Sherrifs/Burgess Pivot
Neoen TasNetworks Access Road
Hydraulic Categories
Floodway
Flood Storage
Flood Fringe
0
1
2
3
km
J:\Jobs\122037\ArcGIS\ArcMap\Draft_Report\Figure33_Hydraulic Categorisation - 6 Hour TP6887 - 5pcAEP.mxd

Joule Logic

Renewable Energy and Environment Specialists

Preliminary Soil and Water Management Plan

Great Lakes Battery

Prepared for Neoen Australia

Date	Revision	Prepared	Reviewed	Approved
27 June 2023	Final	Sue Marsh	Rick Perrin Lachy McLeod (Neoen)	Sue Marsh

Table of Contents

Tables

Figures

Key Definitions Used in this Document:

Acronym	Definition
Preliminary SWMP	Preliminary Soil and Water Management Plan
CEMP	Construction Environmental Management Plan
OEMP	Operational Environmental Management Plan
DRP	Decommissioning and Rehabilitation Plan
EWP	Environmental Works Plan

1. This Document

This Preliminary Soil and Water Management Plan (Preliminary SWMP) has been prepared as supporting documentation for Neoen Australia's Development Application to the Northern Midlands Council for the Great Lakes Battery. Further details on the Great Lakes Battery Project are provided in the Development Application Supporting Document.

The Project involves the construction and operation of a 280 MW/560 MWh utility scale battery on private land near Palmerston Substation, the upgrading of a portion of TasNetworks' existing access road to the substation, and the construction of a section of new access road across TasNetworks' land and private land to the battery site.

The Project is to be constructed in two stages. Stage 1 involves:

- upgrading 680 m of the existing TasNetworks' access road from Poatina Road to the Palmerston Substation;
- constructing 700 m of new access road running from the existing TasNetworks road to the Project site, crossing titles owned by TasNetworks and one private landholder; and
- constructing and operating a 140 MW/280 MWh utility scale battery.

Stage 2 involves the construction and operation of an additional 140 MW/280 MWh utility scale battery within the Project compound. The development of Stage 2 is dependent on future market requirements.

This Preliminary SWMP outlines how soil and water issues will be addressed throughout the construction and operation stages of the Project, as well as providing details of standard management measures that may be adopted at the site. Note that this is a preliminary document, and that more specific management measures will be detailed in the Construction Environmental Management Plan (CEMP) and the Operational Environmental Management Plan (OEMP) which will be prepared for the Project when geotechnical investigations, detailed engineering design and construction planning is undertaken post-approvals.

A CEMP and OEMP will be prepared for each stage. In terms of soil and water management, any 'learnings' from the construction of Stage 1 will be used in the environmental management of the construction of Stage 2.

2. Soil and Water Management Performance Criteria

The Project is being assessed by the Northern Midlands Council under the Tasmanian Planning Scheme - Northern Midlands.

The main requirements for soil and water management stem from the Development Standard *C7.6.1 Buildings and works within a waterway and coastal protection area or a future coastal refugia area* of the Natural Assets Code of the Planning Scheme.

Given that TasNetworks' Palmerston Substation access road will be used by the Project, and that the battery site is close to the substation, the potential for soil and water issues from the Project works to impact TasNetworks' assets are also considered.

As shown on Figure 1 below, the battery site and the access road intersect the Waterway and Coastal Protection Area overlay. The waterways shown on Figure 1 are Class 4 watercourses *"which carry running water for part or all of the year for most years and are up to 10 m wide"*[1].

[1] As defined in Table C7.3 Spatial Extent of Waterway and Coastal Protection Areas of the Tasmanian Planning Scheme – State Planning Provisions

Figure 1:The Waterway and Coastal Protection Area overlay

Within the Natural Assets Code, the requirements listed below relating to 'waterways' in Performance Criteria P1.1 and P3 are relevant.

Performance Criteria P1.1

Buildings and works within a waterway and coastal protection area must avoid or minimise adverse impacts on natural assets, having regard to:

- impacts caused by erosion, siltation, sedimentation and runoff;
- impacts on riparian or littoral vegetation;
- maintaining natural streambank and streambed condition, where it exists;
- impacts on in-stream natural habitat, such as fallen logs, bank overhangs, rocks and trailing vegetation;
- the need to avoid significantly impeding natural flow and drainage;
- the need to group new facilities with existing facilities, where reasonably practical;
- minimising cut and fill;
- building design that responds to the particular size, shape, contours or slope of the land;
- minimising the need for future works for the protection of natural assets, infrastructure and property; and
- the environmental best practice guidelines in the *Wetlands and Waterways Works Manual.*

Performance Criteria P3

Performance Criteria P3 states:

Development within a waterway and coastal protection area or a future coastal refugia area involving a new stormwater point discharge into a watercourse, wetland or lake must avoid or minimise adverse impacts on natural assets, having regard to:

(a) the need to minimise impacts on water quality; and
(b) the need to mitigate and manage any impacts likely to arise from erosion, sedimentation or runoff.

3. The Site

The Project area is approximately 2.5 ha and the new access road covers approximately 0.75 ha. The site is predominantly cleared agricultural land (pasture), used for dryland grazing and occasional cropping. The use of pivot irrigation is common throughout the local area, and the Project site landowner operates a pivot irrigator in the paddocks to the immediate south-west of the battery site. Placement of the facility has ensured that spray from this irrigator will not reach the boundary of the battery facility.

The land is classed as Class 4 Land Capability with the main limitation being drainage. There is no Prime Agricultural Land associated with the site, access, or surrounding land[2]. The average annual rainfall total for Poatina (about 2.5 km away) is 795 mm (www.bom.gov.au).

Hydrology

Watercourses in the vicinity of the Palmerston Substation and the Project site are shown on Figure 2. Most of these are intermittent drainage lines that flow after prolonged rain. The most significant watercourse in the immediate area is Woodside Rivulet which is approximately 700 m to the south of the battery. Woodside Rivulet originates in the mountains to the west of the site and flows east for around 14 km to discharge into Dairy Creek.

There is an irrigation dam and reservoir approximately 1.8 km to the northeast of the site. This dam is privately owned and was constructed in 1995.

[2] Agricultural Report, Woodside – 4740 Poatina Road, Cressy. Prepared by RMCG, 3 November 2022.

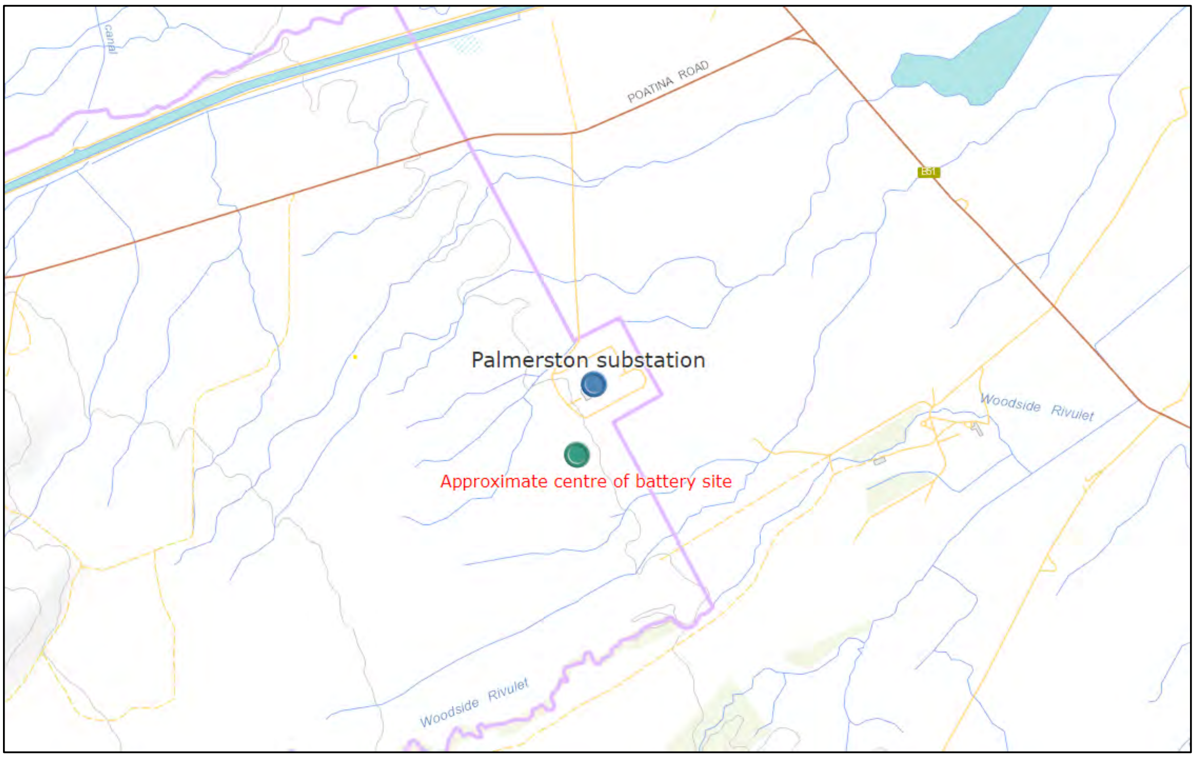

Figure 2:Watercourses in the vicinity of the battery site

A flood risk assessment was carried out for the Project by WMA Water.[3] WMA Water noted that the contributing catchment area for the small watercourses in the Project area is approximately 1.5 km2.

Results of the flood risk assessment show that the proposed Project site is generally subject to shallow overland flow of 0.1 to 0.2 m during 1% AEP (annual exceedance probability[4]) events. No other significant inundation was observed in the vicinity of the study area. Most of the study area, including the proposed Project site location, was categorised as flood fringe (i.e. areas outside floodway and flood storage).

Figure 3 shows the areas mapped by WMA Water that are subject to shallow overland flow during a 1% AEP event. The red circled areas are the locations on the TasNetworks' substation access road that were overtopped in the 1% AEP event.

[3] Flood Risk Assessment Palmerston Battery Development, WMA Water, October 2022

[4] A 1% AEP flood is a flood that has a 1% chance of occurring, or being exceeded, in any one year.

Figure 3:Areas that are subject to shallow overland flow (0.1 to 0.2m) during a 1% AEP event

The areas of overland flow shown on Figure 3 correspond with information from TasNetworks' staff, who note that the substation access road, the area to the east of the substation, and the southwest corner of the substation and the adjacent area of paddock, are occasionally prone to inundation.

WMA water suggests that the proposed battery site can be potentially protected against the shallow flows by raising the main facilities above the estimated flood levels of 0.1.to 0.2 m plus a freeboard (e.g. 0.5m). Construction methods required to address shallow flows will be finalised in the detailed civil design for the facility.

A topographical survey of the site carried out in early 2023 shows that across the battery site there is a consistent 1-2° downward slope from the southwest to the northeast (i.e. heading towards the Palmerston Substation).

Civil design of the battery site and the access road will be completed post-approvals and will make specific recommendations for managing site drainage which will be adopted by the Project. Additionally, should diversion drains be required to divert water around the battery site towards the south, away from the Palmerston Substation, the Project will ensure these are installed.

Geology and soils

Geology and soils at the site were described by RMCG [5]as part of an agricultural assessment of the battery area and access. Geology for the development site and access is Quaternary deposits which is described as sand, gravel and mud of alluvial, lacustrine and littoral origin. This extends to the north and west. To the southeast are Tertiary sediments which are described as dominantly non-marine sequences of gravel, sand, silt, clay and regolith (a layer of unconsolidated deposits covering solid rock).

There is no local-scale soil mapping for the area. However, RMCG note that soil mapping to the east can be correlated with Project site area. The soils assessed at the site are consistent with those described as 'Brumby soils'. Brumby soils are described as poorly drained soils on alluvium above Tertiary clays on flat to gently undulating (0-3%) river terraces. The subsurface clay component of Brumby soils (greater than 40 cm deep) is probably dispersive (or 'sodic', i.e. they have a high sodium content). Dispersive soils tend to collapse or disperse to form a dissolved slurry when in contact with fresh water[6]. Brumby soils tend to waterlog.

Brumby soils have recently been used in a dam wall 1.9 km to the south on the same geology and gypsum was applied to the embankment soil at a rate of 2% by mass to mitigate soil dispersion (RMCG, via email).

Geotechnical investigations will be carried out by Neoen Australia at the battery site and along the new access road post-approvals. This information will inform the civil engineering design of the battery area and the new access road and will detail the appropriate management of soils to minimise erosion and water issues.

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[5] Agricultural Report, Woodside – 4740 Poatina Road, Cressy. Prepared by RMCG, 3 November 2022.
[6] https://epa.tas.gov.au/Documents/Soil_and_Water_Management_Fact_Sheet_4.pdf