

7 March 2025

Andrew Bondini
General Manager
Western Sydney Lakes

Via email: andrew.bondini@wslakes.com.au

Dear Andrew

Our ref: 25020070_L01_V04.docx

Development Modification for Penrith Lakes – Response to Agency Queries

1 BACKGROUND AND OVERVIEW

Water Technology (WT) has previously prepared a flood impact assessment which is documented in the report entitled “*Flood Impact Assessment - Western Sydney Lakes Landform*” dated 7 November 2024 (WT 2024). WT 2024 was prepared in association with a State Significant Development Modifications, DA2-Mod-12 and DA3-Mod-10 for Penrith Lakes Proposed Increased Fill application.

We understand that WT 2024 has been the subject of assessment by the Department of Planning, Housing and Infrastructure (DPHI) with concurrence agencies issuing further queries and Requests for Information that are summarised as follows:

1. DPHI Request for information, dated 18 December 2024;
2. NSW Reconstruction Authority (RA), dated 13 January 2025;
3. NSW State Emergency Service (NSW SES), dated 19 December 2024;
4. Penrith City Council (PCC) Council Response to DA 2 Modification Report - DA86/2720-Mod-12 – Penrith Lakes at 89-151 Old Castlereagh Road, Castlereagh, NSW, 2749, dated 26 November 2024; and
5. Hawkesbury City Council (HCC), Modification to Penrith Lakes Development, email dated 14 January 2025.

This letter has been prepared to provide specific responses against the various queries and requested information from each of the respective government agencies as referenced above. Specific responses are outlined separately below, noting that only responses relevant to the previously prepared WT 2024 report (report entitled “*Flood Impact Assessment - Western Sydney Lakes Landform*” dated 7 November 2024) are addressed in this letter. The contents of this letter must be read in conjunction with the full reporting documented in WT 2024 which remains equally relevant in this regard.

2 DPHI QUERIES

2.1 DPHI Query 1

1. *The submitted Flood Impact Assessment (FIA) identifies a maximum increase of 50mm in flood impacts as a result of the fill and has identified the land that was previously dry and would not be wet as a result of this modification. However, the FIA has not identified properties that were previously inundated and*



would now be subject to increased flood waters. The Department requires the identification of properties where the flood waters would increase as a result of the development and an assessment of the change of impact as a result of this modification.

2.2 Response to DPHI Query 1

As outlined in Section 5 of WT 2024 in both in the reported text in addition with the associated flood impact maps presented in Appendix D of WT 2024, the import of fill does not result in changes in water level greater than 20 mm in all events up to and including the 0.2% AEP design flood event. Table 4.1 of WT 2024 was only ever intended to show the comparison of existing flood conditions on site under the most recent model and the model previously utilised by PLDC in 2015. This was undertaken to show validity across both models and to acknowledge that the latest model shows a higher water level during larger design flood events. The water levels presented in Table 4.1 in WT 2024 DO NOT show the difference in water levels after the import of 9.7 million tonnes of fill material when compared to existing conditions. Therefore, Table 4.1 in WT 2024 should not be used to interpret the impact of this modifications on properties outside the site boundary. This table was provided in WT 2024 for background material only.

The following is also noted:

- Section 5 and Appendix D in WT 2024 includes mapping showing the extent of impacts greater than 20 mm which only occur in the 0.1% AEP (1 in 1,000), 0.05% AEP (1 in 2,000) and the 0.02% AEP (1 in 5,000) design flood events. Maps showing the extent and magnitude of flood impacts as a consequence of the proposed fill are presented in in Appendix A of this response.
- It appears that the conclusion that properties are impacted by increases in water level of 50mm is due to a misinterpretation of the map colour banding (isopleth), which shows increases in water level ranging from 20mm to 50mm. As such, it appears that there is an assumption that all the increases in areas covered by this colour banding are 50mm. For clarity, Table 2-1, below, provides greater insight into the extent and magnitude of impacts in relation to existing flooding and shows the change in water level (as impacts) adjacent to the peak flood depth under post-developed conditions. Reporting locations were determined from regions shown in the mapping as being located within an area that has water level impacts. Figure 2-1 shows the location of each reporting point.
- As presented in Table 2-1 and the impact mapping in Appendix A of this response, the import of fill does not result in impacts greater than 10 mm in flood events of a 0.2% AEP (1 in 500) magnitude or less. That is, the increases in water level are negligible in all modelled design flood events up to and including the 0.2% AEP (1 in 500) design flood event. The results outlined in Table 2-1 also show a reduction in peak water level in several locations (shown as a negative impact).
- Similarly, the information presented in Table 2-1 and the impact mapping in Appendix A of this response indicates that there are small, isolated increases in water levels which are mapped within the colour banding range of 20-50mm which do occur on some external properties in the 0.1% AEP (1 in 1,000), 0.05% AEP (1 in 2,000) and the 0.02% AEP (1 in 5,000) design flood events. This is due to the change in floodplain storage and localised decreases in flow conveyance. The largest of these increases is found to be 34 mm which occurs in an area in close proximity to the PLDC site in the 0.05% AEP (1 in 2,000) design flood event. The largest impact in the 0.1% (1 in 1,000) and 0.02% AEP (1 in 5,000) design flood events was found to be 29mm and 26 mm, respectively. Slightly less impacts occur in the 0.02% AEP (1 in 5,000) design flood event due to the increase in floodplain width and flow area across the floodplain.
- Table 2-1 shows the change in water level at each reporting point alongside the peak flood depth under the post-developed conditions for each of the modelled AEP design flood events. As is evident from Table 2-1, increases in water level greater than 20mm that occurs in the 0.1% AEP (1 in 1,000), 0.05%AEP (1 in 2,000) and the 0.02% AEP (1 in 5,000) design flood events were found to occur on properties that are already subject to significant, if not extreme, depths of existing flood inundation (greater than 3.0m). These increases in water level during these specific design flood events do not result in an increase



in the extent of inundation nor do they result in a fundamental change in flooding behaviour (i.e. increase in flood level or extent).

- Therefore, and given the above, it can be concluded that due to the large scale of the mapping, the extent of the impact may have not been clearly defined in WT 2024. As outlined above, it is confirmed that the largest impact is a maximum increase in water level of 34 mm occurs in the 0.05% (1 in 2000) AEP design flood event which occurs in a region subject to inundation depths greater than 3.0 m prior to the importation of fill.
- In summary, the import of fill only results in impacts in the 0.1% AEP (1 in 1,000), 0.05% AEP (1 in 2,000) and the 0.02% AEP (1 in 5,000) design flood events. The magnitude of these impacts, up to a maximum of 34mm in the 0.05% (1 in 2000) AEP design flood event occurs on properties subject to significant flood depths (greater than 3.0 m) prior to the import of fill.
- Although impacts have been determined to occur in these rare flood events, it is noted that the defined flood planning level is the 1% AEP (1 in 100) and in this design flood event there was found to be no impact or even a reduction in impact as shown in Table 2-1.
- The import of fill does not result in the inundation of properties that were dry under existing conditions in any of the modelled design flood events.



Figure 2-1 Reporting Point Locations



Table 2-1 Changes in Water Level and Peak Flood Depth Under Post-Developed Conditions¹

Reporting Location	1% AEP Peak Depth	1% AEP Impact	0.5% AEP Peak Depth	0.5% AEP Impact	0.2% AEP Peak Depth	0.2% AEP Impact	0.1% AEP Peak Depth	0.1% AEP Impact	0.05% AEP Peak Depth	0.05% AEP Impact	0.02% AEP Peak Depth	0.02% AEP Impact	PMF Peak Depth	PMF Peak Impact
	(m)	(mm)	(m)	(mm)	(m)	(mm)	(m)	(mm)	(m)	(mm)	(m)	(mm)	(m)	(mm)
1	N/A	N/A	0.787	8	1.646	0	2.025	3	3.303	34	4.514	21	8.049	11
2	N/A	N/A	N/A	N/A	N/A	1	0.169	11	1.859	29	3.178	25	6.784	14
3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.846	29	3.149	25	6.751	15
4	N/A	N/A	N/A	N/A	0.472	5	0.940	15	2.688	28	3.949	25	7.560	15
5	N/A	N/A	0.302	4	1.044	5	1.512	15	3.261	28	4.540	25	8.154	15
6	N/A	N/A	N/A	N/A	N/A	5	0.699	14	2.444	29	3.772	25	7.385	15
7	N/A	N/A	N/A	N/A	N/A	N/A	0.574	28	2.612	31	3.955	26	7.590	15
8	N/A	N/A	N/A	N/A	N/A	10	0.643	27	2.667	31	4.010	26	7.643	15
9	N/A	N/A	N/A	N/A	0.481	9	1.084	26	3.089	31	4.427	26	8.059	15
10	N/A	N/A	N/A	N/A	0.542	6	1.009	17	2.826	28	4.130	23	7.743	15
11	N/A	N/A	N/A	1	1.096	9	1.714	28	3.755	31	5.101	26	8.736	14
12	1.497	-12	2.237	0	3.197	10	3.820	29	5.867	31	7.212	26	10.847	14
13	1.481	-12	2.233	0	3.188	10	3.809	29	5.852	31	7.199	26	10.833	14
14	1.518	-12	2.264	0	3.220	10	3.843	29	5.890	31	7.233	26	10.868	14
15	1.566	-12	2.312	0	3.271	10	3.894	29	5.941	31	7.284	26	10.918	14
16	1.246	-12	1.992	0	2.954	10	3.577	29	5.624	31	6.965	26	10.600	14
17	0.269	-12	1.018	0	1.989	10	2.610	28	4.657	31	5.995	26	9.630	14
18	1.273	-12	2.015	0	2.996	10	3.612	27	5.659	32	6.999	26	10.635	14
19	0.459	-12	1.199	0	2.183	10	2.795	26	4.842	31	6.182	25	9.819	13
20	N/A	-105	1.034	0	2.018	10	2.629	26	4.676	31	6.015	25	9.652	13
21	N/A	N/A	N/A	N/A	N/A	7	0.449	23	2.497	29	3.833	23	7.474	11
22	N/A	N/A	N/A	N/A	0.218	7	0.573	22	2.624	28	3.960	23	7.599	11
23	N/A	N/A	N/A	N/A	0.055	N/A	0.442	8	2.494	-64	3.895	-5	7.555	-1
24	3.743	0	4.967	10	6.236	5	6.859	10	8.917	3	10.259	4	13.937	3
25	5.584	0	6.805	10	8.057	5	8.675	10	10.725	3	12.062	4	15.721	2
26	2.764	0	3.701	8	4.822	3	5.336	9	7.343	3	8.627	3	12.549	3

¹ Post-Developed Scenario includes the assessment of the import of fill

Increase in Water Level (Greater than 20mm)
No Change in Water Level (+/- 20mm)
Decrease in Water Level (Great than 20mm)
N/A = Not Inundated

3 RA QUERIES

3.1 RA Query 1

1. *Flood modelling amendments are required. Page 7 in the Flood Impact Assessment – Western Sydney Lakes Landform (Water Technology, Nov 2024) states “Medium Blockage conditions for overbank structure at Penrith – to be used for design simulations from the 5% AEP up to and including the 0.5% AEP” but a medium blockage has also been used for the 0.2% AEP flood as indicated in the report and the model results. The report should be amended, and the 0.2% AEP flood should be modelled with the High Blockage scenario.*

3.2 Response to RA Query 1

A number of blockage scenarios were included with the supplied model package, noting that blockage scenarios are used as a sensitivity assessment to simulate debris loading on drainage infrastructure. The model documented in WT 2024 has since been re-run with the high blockage scenario applied to the 0.2% AEP design flood event as requested. Please refer Table 3-1 for the updated model simulations and applied blockage. Appendix A contains impact maps based on the model configurations tabulated below.

Table 3-1 TUFLOW Events for Design Simulations

AEP	Description	Storm Duration	Event ID	Tailwater	Blockage
10%	1 in 10 AEP	4320min	BD05478	TW_MC	LBlock ²
5%	1 in 20 AEP	4320min	RD04971	TW_MC	MBlock_Penrith_Blockage ³
2%	1 in 50 AEP	4320min	RD08941	TW_MC	MBlock_Penrith_Blockage
1%	1 in 100 AEP	4320min	RD01158	TW_MC	MBlock_Penrith_Blockage
0.5%	1 in 200 AEP	4320min	RD09247	TW_MC	MBlock_Penrith_Blockage
0.2%	1 in 500 AEP	4320min	RD03880	TW_MC	HBlock_Penrith_Blockage
0.1%	1 in 1000 AEP	4320min	RD08891	TW_MC	HBlock_Penrith_Blockage ⁴
0.05%	1 in 2000 AEP	4320min	RD00937	TW_MC	HBlock_Penrith_Blockage
0.02%	1 in 5000 AEP	4320min	RD01374	TW_MC	HBlock_Penrith_Blockage
PMF	Probable Maximum Flood	4320min	PenrithPMF72h	TW_PMF	HBlock_Penrith_Blockage

² Low Blockage conditions to be used for design simulations smaller than the 5%AEP. Blockage is based on ARR guidelines and it applies to major structures only

³ Medium Blockage conditions for overbank structure at Penrith – to be used for design simulations from the 5%AEP up to and including the 0.5%AEP

⁴ High Blockage conditions for overbank structure at Penrith – to be used for design simulations larger than the 0.5%AEP



3.3 RA Query 2

2. *2021 (SEPP WPC) requires the consent authority to be satisfied that the proposal does “not significantly adversely affect flood behaviour in a way that results in detrimental increases in the potential flood affectation of other development or properties” for events up to the PMF. This appears to have not been achieved. The Flood Impact Assessment identifies an increase of 50mm in flood waters on surrounding properties in flood events greater than the 1 in 500 chance per year flood level. Modelling also identifies additional impacts in the smaller events such as the 1 in 200 chance per year flood. As a result, it does not comply with the requirements of Section 5.38 of SEPP WPC. In addition, the already approved fill and resulting landform will displace flood waters onto surrounding properties and should not be further exacerbated.*

3.4 Response to RA Query 2

As outlined in Section 5 of WT 2024 in both in the reported text and with the associated flood impact maps presented in Appendix D, that the import of fill does not result in changes in water level. This is due to the extent of floodplain storage provided in the study area and that the site is not located in an active flow area that is subject to high velocities. It appears that the conclusion that properties are impacted by increases in water level of 50mm is due to a misinterpretation of the map colour banding (isopleth) which shows increases in water level ranging from 20mm to 50mm. As such, it appears that there is an assumption that all the increases in areas covered by this colour banding are 50mm. For clarity, Table 2-1, above, provides greater insight into the extent and magnitude of impacts in relation to existing flooding. This has been explained above in the DPHI response and will be addressed again here. Reporting locations were determined from regions shown in the mapping as being located within an area that has water level impacts. Figure 2-1 shows the location of each reporting point. The following is also of note:

- Table 4.1 in WT 2024 shows the differences in water levels in the 0.5% AEP event in the Main Lake A. It should also be noted that Table 4.1 shows the comparison of water levels under the existing conditions and directly compares levels between the latest Hawkesbury – Nepean River TUFLOW model (adopted for this assessment) and the TUFLOW model developed for the PLDC site in 2014/15. The levels presented in Table 4.1 in WT 2024, as stated in the report, are NOT associated with the proposed filling works. Therefore, Table 4.1 in WT 2024 should not be used to interpret the impact of this modifications on properties outside the site boundary. This table was provided in WT 2024 for background material only. Please refer to Section 2.1 in WT 2024.
- Maps showing the extent and magnitude of flood impacts as a consequence of the proposed fill are presented in Appendix A.
- As presented in Table 2-1 and the impact mapping in Appendix A of this response, the import of fill does not result in impacts greater than 10 mm in flood events of a 0.2% AEP (1 in 500) magnitude or less. That is, the increases in water level are negligible in all modelled design flood events up to and including the 0.2% AEP (1 in 500) design flood event.
- Similarly, the information presented in Table 2-1 and the impact mapping in Appendix A of this response indicates that there are small, isolated increases in water levels which are mapped within the colour banding range of 20-50mm which do occur on some external properties in the 0.1% AEP (1 in 1,000), 0.05% AEP (1 in 2,000) and the 0.02% AEP (1 in 5,000) design flood events. The largest of these increases is found to be 34 mm which occurs in an area in in one isolated location close to the PLDC site in the 0.05% AEP (1 in 2,000) design flood event. The largest impact in the 0.1% (1 in 1,000) and 0.02% AEP (1 in 5,000) design flood events was found to be 29mm and 26 mm, respectively. This is due to the increase in floodplain width and flow area across the floodplain in larger magnitude flood events.
- Table 2-1 shows the change in water level at each reporting point, the locations of which are shown in Figure 2-1, alongside the peak flood flood depth once 9.7 million tonnes of materials has been imported to site for each of the modelled AEP design flood events. As is evident from Table 2-1, increases in water



level greater than 20mm that occur the 0.1% AEP (1 in 1,000), 0.05% AEP (1 in 2,000) and the 0.02% AEP (1 in 5,000) design flood events were found to occur on properties that are already subject to significant, if not extreme, depths of existing flood inundation (greater than 3.0m). These increases in water level during these specific design flood events do not result in an increase in the spatial extent of inundation nor do they materially contribute to any change in flood depths and flow patterns within the floodplain.

- The maximum increase in water level of 34 mm occurs in one isolated area in the 0.05% (1 in 2000) AEP design flood event which occurs in a region subject to inundation depths greater than 3.0 m.
- The import of fill does not result in the inundation of properties that were dry under existing conditions in any of the modelled design flood events. That is, the import of fill does not change the extent of flooding within the study area.
- Although impacts have been determined to occur in these rare flood events, it is noted that the defined flood planning level is the 1% AEP (1 in 100) and in this design flood event there was found to be no impact or even a reduction in impact as shown in Table 2-1.

An additional assessment of flood hazard has also been undertaken using the model outputs for each of the existing and developed case site conditions and is presented in the plans included in Appendix B. This task was undertaken to provide context with regards to the existing flood hazard within the study area and to confirm that the the import of 9.7 million tonnes of fill does not alter this flood hazard. The hydraulic hazard was categorised based on the flood hazard categories as outlined by Australian Emergency Management Institute (AEMI). The category values range from one (H1) representing for low hazard to six (H6) for the most severe flood hazard as shown in Figure 3-1. A summary of the various hazard categories is included below:

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

As shown in the maps presented in Appendix B, the impacts shown in Table 2-1 are located in sections of the floodplain that are already subject to hazard categories H5 and H6 under the existing flood conditions (i.e. before the importation of fill on the site). That is, the maximum impact of up to 34 mm is shown to occur on properties that contain buildings that are already significantly vulnerable to failure under existing conditions and without the import of fill. These properties are already severely compromised in the existing situation and without considering any development proposal. Plans showing the change in flood hazard are presented in Appendix C.

In conclusion, and in regard to flood hazard, the maximum increase in water level of 34mm, which only occurs in the 0.05% AEP (1 in 2,000) design flood event does not result in a material change in flood hazard across the study area and does not alter the flood hazard categorisation of properties or the vulnerability of properties in the floodplain.

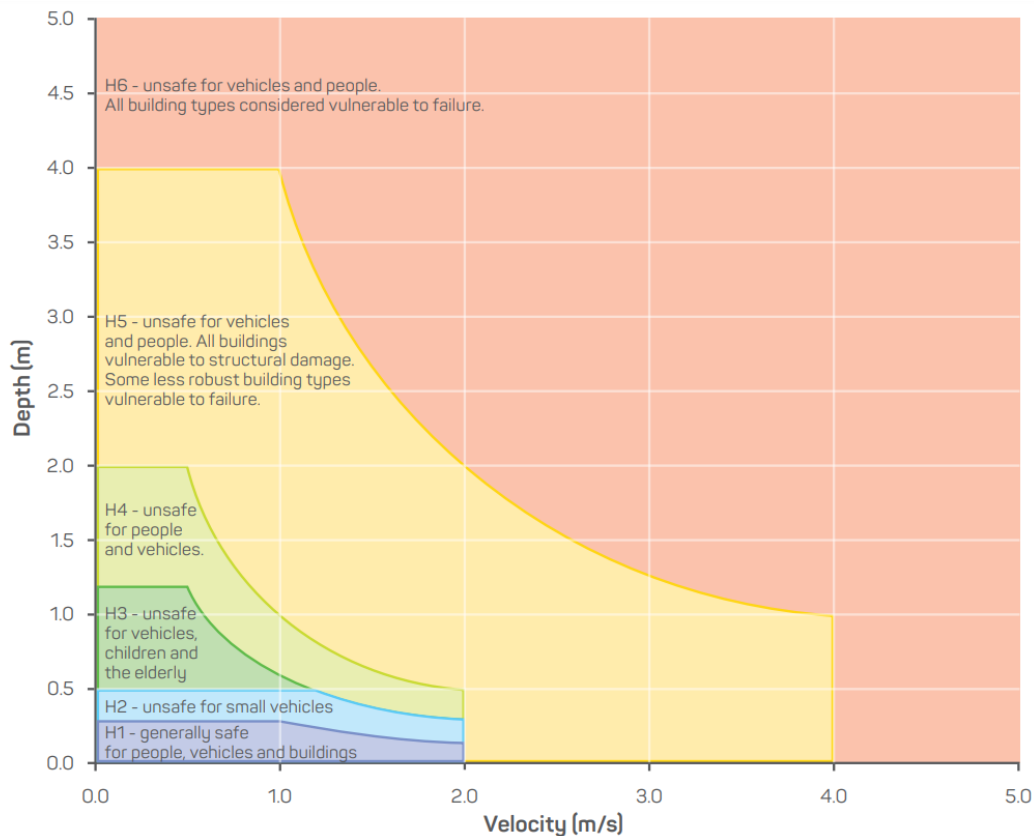


Figure 3-1 Flood Hazard as defined by the Australian Emergency Management Institute (AIDR, 2017)

With regards to Section 5.38 of the State Environmental Planning Policy (SEPP) Western Parkland City (WPC), Table 3-2 summarises the main objectives and the level of compliance achieved by the proposed development. As presented below, the proposed development complies with the relevant objectives outlined in Section 5.38 of SEPP WPC.

Table 3-2 Compliance with Section 5.38 of SEPP WPC

Objective	Development Compliance
To minimise the flood risk to life and property associated with the use of land.	The import of fill contends to place fill to a level above the 0.2% AEP (1 in 500) and does not result in an outcome that increases flood risk to life and property. The assessment of flooding behaviour and impacts associated with the importation of fill on the site have been found to only result in small increases in water level in extreme flood events (greater than the 0.2% AEP (1 in 500)). These impacts do not alter the material flood hazard on properties and do not result in a changed risk to life and property within the study area as shown in the Response to RA Query 2, above.



Objective	Development Compliance
To allow development on land that is compatible with the land's flood hazard, taking into account projected changes as a result of climate change	The import of fill seeks to provide land that has a significantly higher level of flood immunity than it currently has. The model developed by RA and supplied to WT does not include an assessment of climate change however the assessment includes the analysis of all design events up to and including the PMF which includes large, low-likelihood flood events. The PMF is also well beyond the flood design level of the 1% AEP, which therefore inherently captures any future climate change impacts.
To avoid adverse or cumulative impacts on flood behaviour and the environment	The import of fill on the proposed site does not result in adverse impacts on flood behaviour and the environment as shown in Sections 2.2 and 3.4 of this response on pages 2 and 7, respectively.
To enable the safe occupation and efficient evacuation of people in the event of a flood	The proposed development does not include an intensification of people at risk of flooding and does not impact the efficiency of current flood evacuation procedures. As noted above, the marginal impact of up to 34 mm under the most extreme scenario, does not affect Australian Emergency Management Institute flood category value in any location.
Is compatible with the flood function and behaviour on the land	The proposed development, which is located in the Nepean River floodplain, includes the placement of fill to a level above the 0.2% AEP (1 in 500) and is compatible with the current flood function and behaviour. The inclusion of this fill does not alter flooding behaviour in the wider floodplain as shown in Sections 2.2 and 3.4 of this response on pages 2 and 7, respectively.
Will not significantly adversely affect flood behaviour in a way that results in detrimental increases in the potential flood affectation of other development or properties	The proposed development does not result in adverse impacts on other developments or properties. Increases in water level only occur in rare flood events (greater than a 0.2% AEP (1 in 500) flood event and occur on land subject to significant depths under existing conditions as shown in Sections 2.2 and 3.4 of this response on pages 2 and 7, respectively. As there is no impact on flood behaviour for the reasons described above, this means there would be no increase in the potential flood affectation of buildings or properties.
Will not significantly adversely affect the safe occupation and efficient evacuation of people or exceed the capacity of evacuation routes for the Hawkesbury-Nepean Valley floodplain in the event of a flood	The proposed development does not include an intensification of people at risk of flooding and does not impact the efficiency of current flood evacuation procedures for the reasons discussed below in Section 4.2.
Incorporates appropriate measures to manage risk to life in the event of a flood	The proposed development does not include an intensification of people at risk of flooding for the reasons discussed below in Section 4.2. As such, appropriate mitigation measures are not required .



Objective	Development Compliance
Will not significantly adversely affect the environment or cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of river banks or watercourses	The import of fill on the proposed site does not result in adverse impacts on flooding behaviour as shown in Sections 2.1 and 3.2 of this response and in Appendix A. This means there is no feasible mechanism to increase the extent or potential for unavoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of river banks or watercourses beyond the impacts that would occur from the extreme flooding that already occurs under such an event.
Is not likely to result in unsustainable social and economic costs to the community as a consequence of flooding	As shown in Sections 2.1 and 3.2, the import of fill on the proposed site does not result in adverse impacts that would result in unsustainable social and economic costs to the community as there is no material flooding impact resulting from this.
Whether the building will be affected by projected changes to flood behaviour resulting from climate change	The proposed development does not include the provision of buildings.
Whether the design of the building incorporates measures to minimise the risk to life and ensure the safe evacuation of people in the event of a flood	The proposed development does not include the provision of buildings.
The potential to modify, relocate or remove the building if the Hawkesbury-Nepean Valley floodplain is impacted by flooding	The proposed development does not include the provision of buildings.

3.5 RA Query 3

3. *The modifications to the fill are likely to result in an increased developable area. While RA acknowledges this application is only for fill, it is likely the aspiration achieved by this fill and increased developable area may be additional development resulting in additional vehicles accessing the site. SEPP WPC requires the consent authority to be satisfied the proposal will “not significantly adversely affect the safe occupation and efficient evacuation of people or exceed the capacity of evacuation routes for the Hawkesbury-Nepean Valley floodplain in the event of a flood” for flood events up to the PMF. This requirement in the SEPP will most likely not be achieved if additional vehicles are required to evacuate from the site as they will further impact the already constrained evacuation capacity of the surrounding roads impacting the ability for these vehicles and others to evacuate safely and efficiently. An approval at this stage would give a false sense of development potential.*

3.6 Response to RA Query 3

The application includes the importation of fill and does not include the rezoning of the land that would result in any change or subsequent increase in the population at risk in the floodplain. The development consists of the placement of fill in line with previous applications, just to a higher level. The RA acknowledge that the application is for fill only and accordingly it ought to simply be assessed on this basis. Any future change in land use will be subject to a separate approval process and it is therefore beyond the scope of assessment.

4 SES QUERIES



4.1 SES Query 1

1. *Recommend undertaking further modelling to demonstrate the proposed fill does not impact on regional evacuation routes across all flood extents, up to and including the Probable Maximum Flood (PMF) in accordance with the SEPP which states that development should not “adversely affect the safe occupation and efficient evacuation of people or exceed the capacity of evacuation routes for the Hawkesbury-Nepean Valley floodplain”*

4.2 Response to SES Query 1

The modelling undertaken shows that, with a maximum increase in water level of up to 34 mm in the 0.05% AEP (1 in 2,000), the import of fill on the PLDC site does not compromise evacuation routes given that the flood level increases are limited to occur only to areas that are already subject to extreme depths of existing inundation. In such instances, there is no value or benefit in undertaking any further modelling as it is clearly shown there to be no change in flood evacuation routes as a consequence of the proposal as there is no material cumulative impact on what are already compromised flood evacuation routes. The impacts have been found to be minor in nature (maximum increase of 34 mm in the 0.05% AEP (1 in 2,000) design flood event) noting again that evacuation routes are inundated to depths of greater than 3.0m. Additionally, given that there is no proposed change in the current land use, there is no change in vehicle loading on evacuation routes.

4.3 SES Query 2

2. *Recommend demonstrating any flood impacts as a result of the modification do not impact on the ability of site users to safely evacuate the site.*

4.4 Response to SES Query 2

This aspect has been addressed in Section 4.2, above.

4.5 SES Query 3

3. *Recommend further modelling is undertaken showing the flood hazard for the site in post development conditions to help better understand the risks to life and property posed by this modification.*

4.6 Response to SES Query 3

Flood hazard mapping has been undertaken and is provided in response to the RA queries in Section 3.4 previously. This is replicated below for clarity.

As outlined in Section 5 of WT 2024 in both in the reported text and with the associated flood impact maps presented in Appendix D, that the import of fill does not result in changes in water level. This is due to the extent of floodplain storage provided in the study area and that the site is not located in an active flow area that is subject to high velocities. It appears that the conclusion that properties are impacted by increases in water level of 50mm is due to a misinterpretation of the map colour banding (isopleth) which shows increases in water level ranging from 20mm to 50mm. As such, it appears that there is an assumption that all the increases in areas covered by this colour banding are 50mm. For clarity, Table 2-1, above, provides greater insight into the extent and magnitude of impacts in relation to existing flooding. This has been explained above in the DPHI response and will be addressed again here. Reporting locations were determined from regions shown in the mapping as being located within an area that has water level impacts. Figure 2-1 shows the location of each reporting point. The following is also of note:

- Table 4.1 in WT 2024 shows the differences in water levels in the 0.5% AEP event in the Main Lake A. It should also be noted that Table 4.1 shows the comparison of water levels under the existing conditions and directly compares levels between the latest Hawkesbury – Nepean River TUFLOW model (adopted for this assessment) and the TUFLOW model developed for the PLDC site in 2014/15. The levels



presented in Table 4.1 in WT 2024, as stated in the report, are NOT associated with the proposed filling works. Therefore, Table 4.1 in WT 2024 should not be used to interpret the impact of this modifications on properties outside the site boundary. This table was provided in WT 2024 for background material only. Please refer to Section 2.1 in WT 2024.

- Maps showing the extent and magnitude of flood impacts as a consequence of the proposed fill are presented in Appendix A.
- As presented in Table 2-1 and the impact mapping in Appendix A of this response, the import of fill does not result in impacts greater than 10 mm in flood events of a 0.2% AEP (1 in 500) magnitude or less. That is, the increases in water level are negligible in all modelled design flood events up to and including the 0.2% AEP (1 in 500) design flood event.
- Similarly, the information presented in Table 2-1 and the impact mapping in Appendix A of this response indicates that there are small, isolated increases in water levels which are mapped within the colour banding range of 20-50mm which do occur on some external properties in the 0.1% AEP (1 in 1,000), 0.05% AEP (1 in 2,000) and the 0.02% AEP (1 in 5,000) design flood events. The largest of these increases is found to be 34 mm which occurs in an area in one isolated location close to the PLDC site in the 0.05% AEP (1 in 2,000) design flood event. The largest impact in the 0.1% (1 in 1,000) and 0.02% AEP (1 in 5,000) design flood events was found to be 29mm and 26 mm, respectively. This is due to the increase in floodplain width and flow area across the floodplain in larger magnitude flood events.
- Table 2-1 shows the change in water level at each reporting point, the locations of which are shown in Figure 2-1, alongside the peak flood depth once 9.7 million tonnes of materials has been imported to site for each of the modelled AEP design flood events. As is evident from Table 2-1, increases in water level greater than 20mm that occur the 0.1% AEP (1 in 1,000), 0.05% AEP (1 in 2,000) and the 0.02% AEP (1 in 5,000) design flood events were found to occur on properties that are already subject to significant, if not extreme, depths of existing flood inundation (greater than 3.0m). These increases in water level during these specific design flood events do not result in an increase in the spatial extent of inundation nor do they materially contribute to any change in flood depths and flow patterns within the floodplain.
- The maximum increase in water level of 34 mm occurs in one isolated area in the 0.05% (1 in 2000) AEP design flood event which occurs in a region subject to inundation depths greater than 3.0 m.
- The import of fill does not result in the inundation of properties that were dry under existing conditions in any of the modelled design flood events. That is, the import of fill does not change the extent of flooding within the study area.
- Although impacts have been determined to occur in these rare flood events, it is noted that the defined flood planning level is the 1% AEP (1 in 100) and in this design flood event there was found to be no impact or even a reduction in impact as shown in Table 2-1.

An additional assessment of flood hazard has also been undertaken using the model outputs for each of the existing and developed case site conditions and is presented in the plans included in Appendix B. This task was undertaken to provide context with regards to the existing flood hazard within the study area and to confirm that the import of 9.7 million tonnes of fill does not alter this flood hazard. The hydraulic hazard was categorised based on the flood hazard categories as outlined by Australian Emergency Management Institute (AEMI). The category values range from one (H1) representing for low hazard to six (H6) for the most severe flood hazard as shown in Figure 3-1. A summary of the various hazard categories is included below:

- **H1** – Generally safe for people, vehicles and buildings.
- **H2** – Unsafe for small vehicles.
- **H3** – Unsafe for vehicles, children and the elderly.
- **H4** - Unsafe for people and vehicles



- **H5** - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust building types vulnerable to failure
- **H6** – Unsafe for vehicles and people. All building types considered vulnerable to failure.

As shown in the maps presented in Appendix B, the impacts shown in Table 2-1 are located in sections of the floodplain that are already subject to hazard categories H5 and H6 under the existing flood conditions (i.e. before the importation of fill on the site). That is, the maximum impact of up to 34 mm is shown to occur on properties that contain buildings that are already significantly vulnerable to failure under existing conditions and without the import of fill. These properties are already severely compromised in the existing situation and without considering any development proposal. Plans showing the change in flood hazard are presented in Appendix C.

In conclusion, and in regard to flood hazard, the maximum increase in water level of 34mm, which only occurs in the 0.05% AEP (1 in 2,000) design flood event does not result in a material change in flood hazard across the study area and does not alter the flood hazard categorisation of properties or the vulnerability of properties in the floodplain.

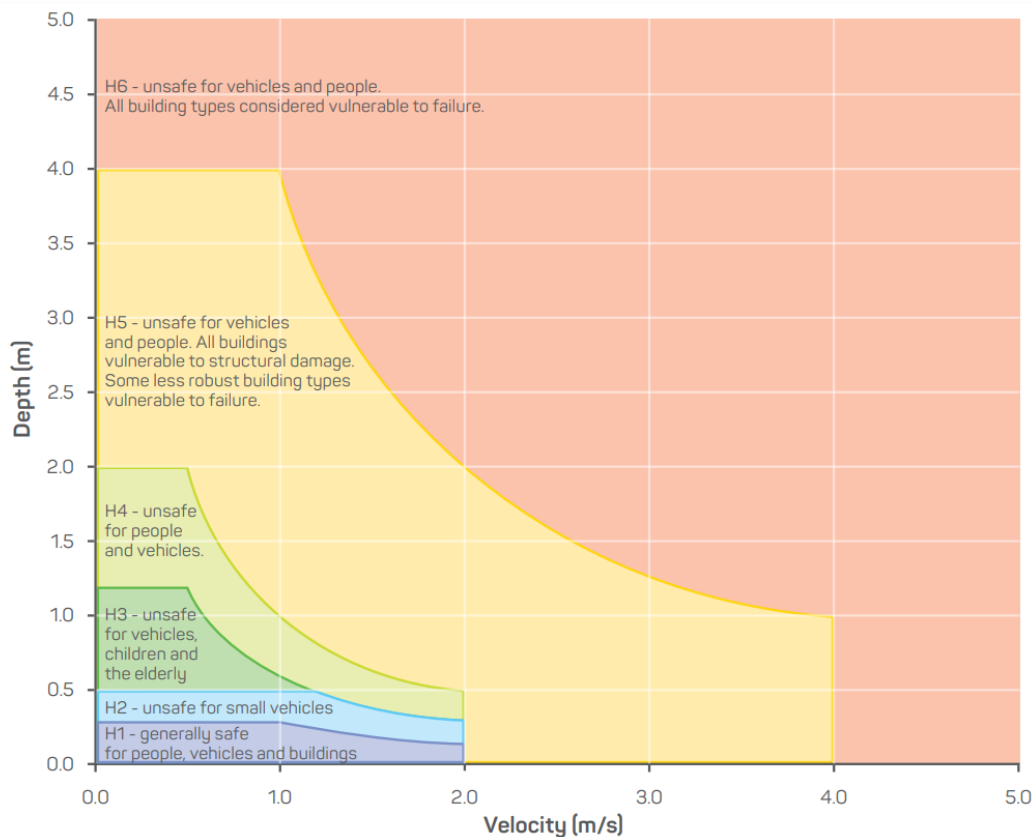


Figure 4-1 Flood Hazard as defined by the Australian Emergency Management Institute (AIDR, 2017)

The flood hazard mapping presented in Appendix C shows that there is no change in hazard category under post-developed conditions and, as such, there is no change to the risks to life and property caused by the modification. As such, there is no requirement for further modelling, noting that an assessment of every design flood event up to and including the PMF has been undertaken. Additionally, further modelling is not required as this application does not seek to change any activity on the land as a result of the approval of the modification. This advice is following previous advice from DPHI to ensure the site is more flood resilient.



5 HCC QUERIES

5.1 HCC Query 1

1. *Figure 4-1: 0.2% AEP Peak Flood Depth – Existing Conditions and Figure 4-2: 0.2% AEP Peak Flood Depth – Post Development Conditions of the submitted Flood Impact Assessment demonstrates that whilst additional land within the site will be above the 0.2% AEP, access and hence evacuation routes are still affected by flood waters.*

5.2 Response to HCC Query 1

The proposed application does not seek to increase the population at risk in the floodplain. The import of fill on the PLDC site does not compromise evacuation routes given that the flood level increases are limited to occur only to areas that are already subject to extreme depths of existing inundation. That is, evacuation routes in the floodplain are already compromised based on the existing flooding and the proposal does not have any implication on existing compromised evacuation routes as confirmed in Section 4.2, above.

5.3 HCC Query 2

2. *The Flood Impact Assessment states that there is no fundamental change to flooding behaviour in the wider Nepean River Floodplain, however the impacts further downstream into the Hawkesbury Local Government Area have not been demonstrated. The impacts on flood levels, velocities or evacuation capability (including consideration of the outcomes of the NSW State Governments Flood Evacuation Modelling) within the Hawkesbury have not been quantified.*

5.4 Response to HCC Query 2

It was outlined in Section 5 of the submitted WT 2024 report that the flood impacts were fully contained to an isolated region of the floodplain located immediately adjacent to where fill is proposed to be placed. The mapping produced in Appendix D of WT 2024 and Appendix A of this response confirm this. However, for the purposes of clarity in this response and to otherwise better illustrate the results specifically to HCC, Figure 5-1 shows the change in water level in the critical design flood event for the 0.05% AEP (1 in 2,000) event in the downstream HCC Local Government Area (LGA). The 0.05% AEP (1 in 2,000) is represented in this figure as the largest increases in water level occur during this design flood event.

It is evident from Figure 5-1 that the import of fill does not result in impacts within the HCC LGA greater than 20mm, nor does it impact existing evacuation capability with the HCC LGA, noting that any minor increase in water level of possibly, particularly in extreme flood events, is not likely to result in a change in road flood immunity or hazard. The flood impacts that are estimated to occur, which have already been prescriptively documented in Section 5 of the submitted WT 2024 report and further clarified in Section 2.2 of this letter, are located in close proximity to the immediate PLDC site, occur only in very rare flood events and additionally only occur in areas that are already subject to significant flood depths and flood hazard. Increases were found to occur in events smaller than the 0.1% AEP (1 in 1,000) but these are less than 20mm.

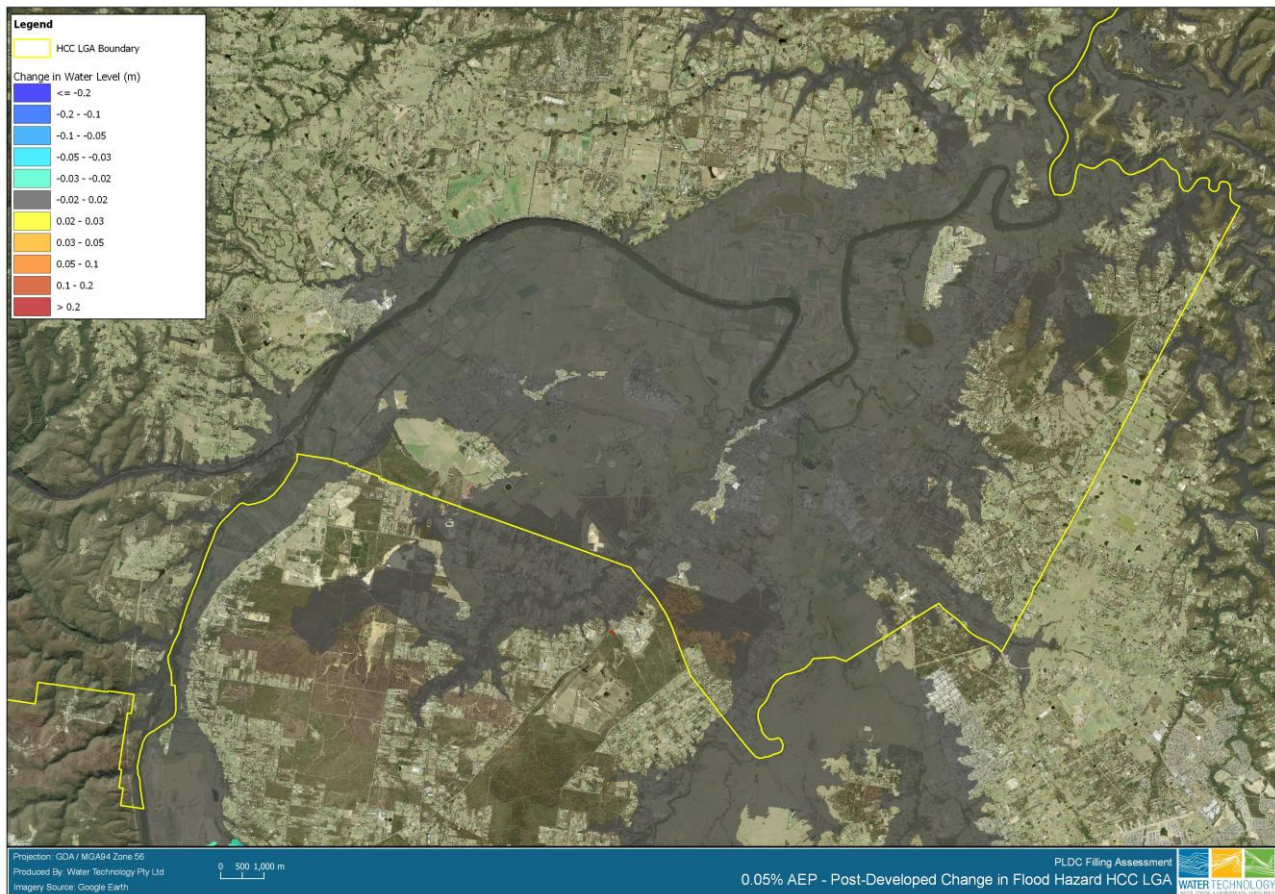


Figure 5-1 Change in Water Level in HCC LGA – 0.05% AEP (1 in 2,000) Design Flood Event

5.5 HCC Query 3

3. *The Flood Impact Assessment has not demonstrated that the proposed land filling and subsequent future development is compatible with the flood function and behaviour as required by Section 5.38(2) of State Environmental Planning Policy (Precincts - Western Parkland City) 2021.*

5.6 Response to HCC Query 3

As previously outlined in Section 2.2 and 3.4, the inclusion of the fill in small increases in water level on external properties in the 0.1% AEP (1 in 1,000), 0.05% AEP (1 in 2,000) and the 0.02% AEP (1 in 5,000) design flood events. The largest of these increases is 34 mm which occurs in an isolated area in close proximity to the PLDC site in the 0.05% AEP (1 in 2,000) design flood event. The largest increase in water level in the 0.1% (1 in 1,000) and 0.02% AEP (1 in 5,000) design flood events was found to be 29mm and 26 mm, respectively. These increases occur on properties that are already subject to both extreme existing flood depths (greater than 3.0m) as well as high existing flood hazards. Tabulated results are presented in Table 2-1. This table shows the peak increase in water level alongside the peak flood depth under developed conditions. As shown in this table, the increases in water level occur on properties that are inundated to significant depths (greater than 3.0m). As outlined in Section 3.4, the wider study area is subject to extreme flood hazard under existing conditions and the import of fill does not alter the flood hazard or risk on external properties.

The application includes the importation of fill and does not include the rezoning of the land that would result in any change or subsequent increase in the population at risk in the floodplain. The development consists of the placement of fill in line with previous applications, just to a higher level. The application is for fill only and



accordingly it ought to simply be assessed on this basis. Any future change in land use will be subject to a separate approval process and it is therefore beyond the scope of assessment

A response to this query, with regard to Section 5.38(2) of State Environmental Planning Policy (Precincts - Western Parkland City) 2021 is presented in Table 3-2.

6 PCC RESPONSE

Council's Development Engineering Team reviewed the proposal and raises no objections as the submitted Flood Impact Assessment has been assessed in consideration to Council's DCP 2014 Section C3.5 Control 14. There is no impact to flood behaviour up to the 0.2% AEP flood event (including the 1% AEP flood planning event). Flooding impacts in storm events greater than this are minor (less than 50mm flood level impact) and meet DCP requirements.

7 CONCLUSION

This letter provides detailed responses to queries submitted by various regulatory and concurrence agencies that have been raised in connection with the previously submitted flood impact assessment documented in the report entitled *"Flood Impact Assessment - Western Sydney Lakes Landform"* prepared by Water Technology Pty Ltd dated 7 November 2024 (WT 2024). WT 2024 was prepared in association with a State Significant Development Modifications, DA2-Mod-12 and DA3-Mod-10 for Penrith Lakes Proposed Increased Fill application. The response to the queries have been provided in this letter reiterates the findings of the WT 2024 flood impact assessment, being that the proposed development results in no discernible changes in water level on external properties in all modelled design flood events up to and including the PMF. As demonstrated above and outlined in WT 2024, a maximum increase in water level of 34 mm occurs in the 0.05% (1 in 2000) AEP design flood event which occurs in an isolated region subject to inundation depths greater than 3.0 m prior to the importation of fill and on properties that are already subject to significant to extreme flood hazards.

In summary, the proposed development has found that there is no increase in risk to life from flooding or change in the flood risk profile of the site as a result of this modification.

Yours sincerely

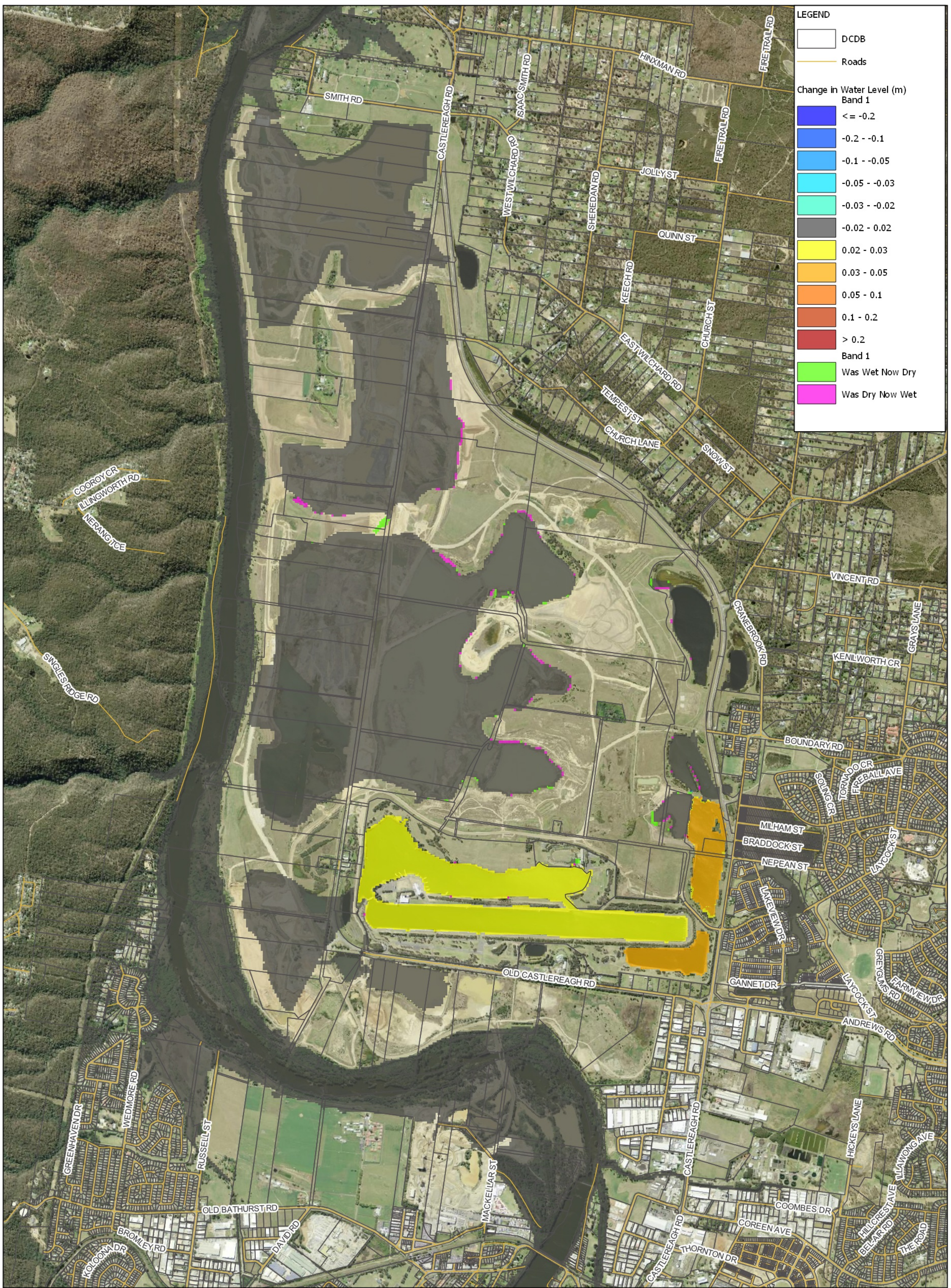
Andrew Thompson
Senior Engineer | Team Lead - Flooding
andrew.thompson@watertech.com.au
WATER TECHNOLOGY PTY LTD

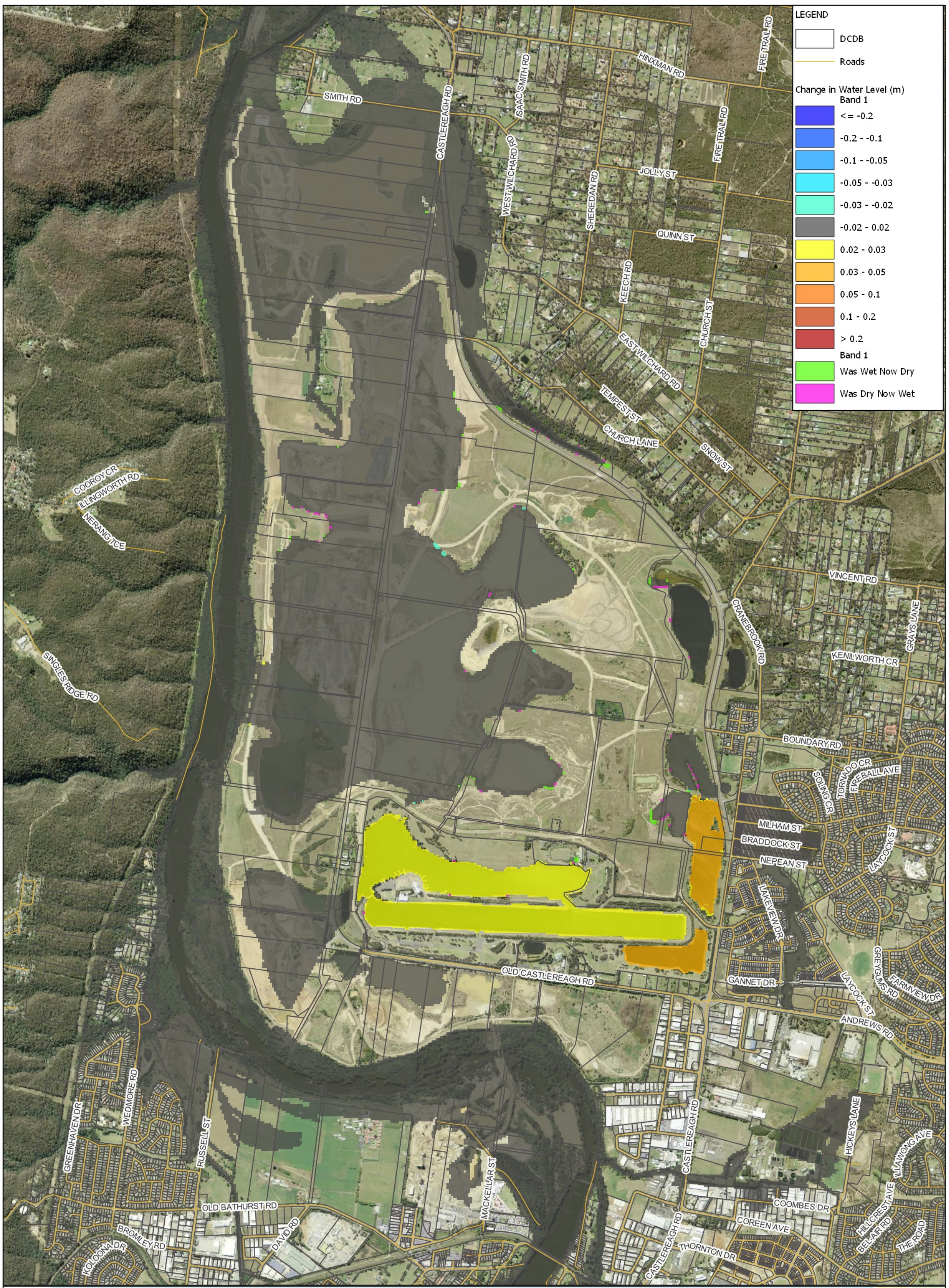
Water Technology pays respect to all First Nations peoples, their cultures and to their Elders, past and present.



APPENDIX A FLOOD IMPACT MAPPING







LEGEND

DCDB

Roads

Change in Water Level (m)
Band 1

<= -0.2

-0.2 - -0.1

-0.1 - -0.05

-0.05 - -0.03

-0.03 - -0.02

-0.02 - 0.02

0.02 - 0.03

0.03 - 0.05

0.05 - 0.1

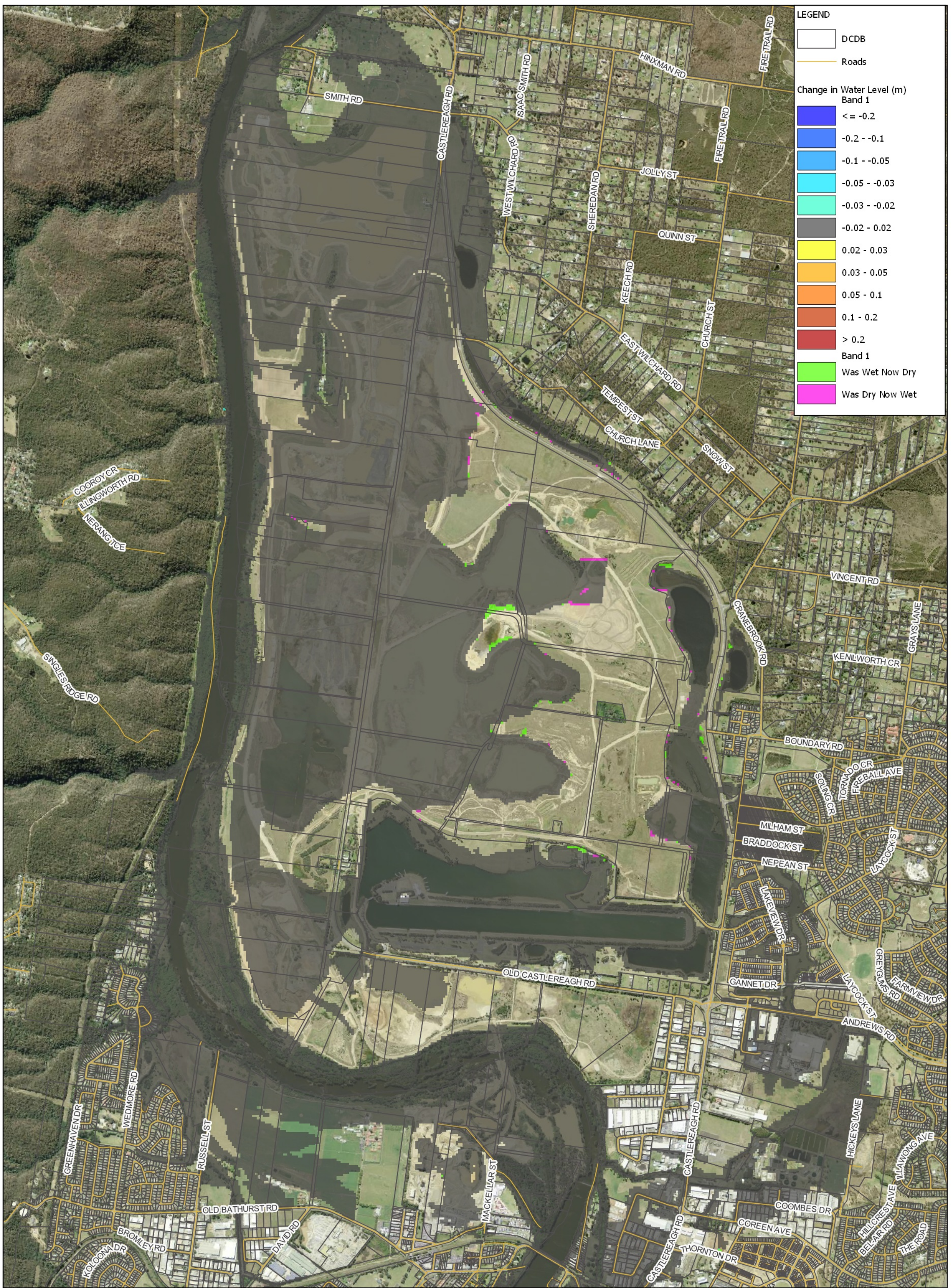
0.1 - 0.2

> 0.2

Band 1

Was Wet Now Dry

Was Dry Now Wet



LEGEND

DCDB

Roads

Change in Water Level (m)
Band 1

<= -0.2

-0.2 - -0.1

-0.1 - -0.05

-0.05 - -0.03

-0.03 - -0.02

-0.02 - 0.02

0.02 - 0.03

0.03 - 0.05

0.05 - 0.1

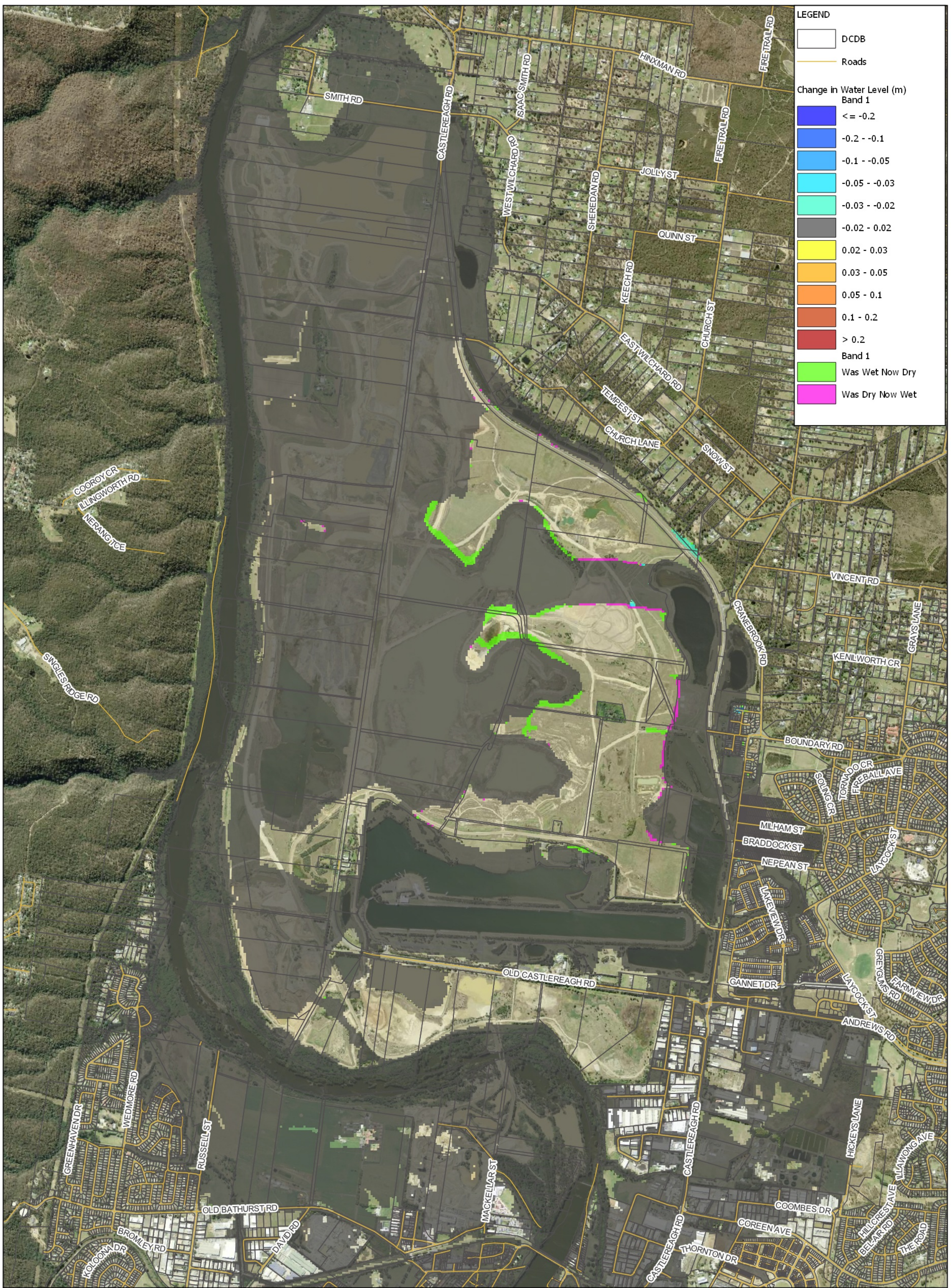
0.1 - 0.2

> 0.2

Band 1

Was Wet Now Dry

Was Dry Now Wet



LEGEND

DCDB

Roads

Change in Water Level (m)
Band 1

<= -0.2

-0.2 - -0.1

-0.1 - -0.05

-0.05 - -0.03

-0.03 - -0.02

-0.02 - 0.02

0.02 - 0.03

0.03 - 0.05

0.05 - 0.1

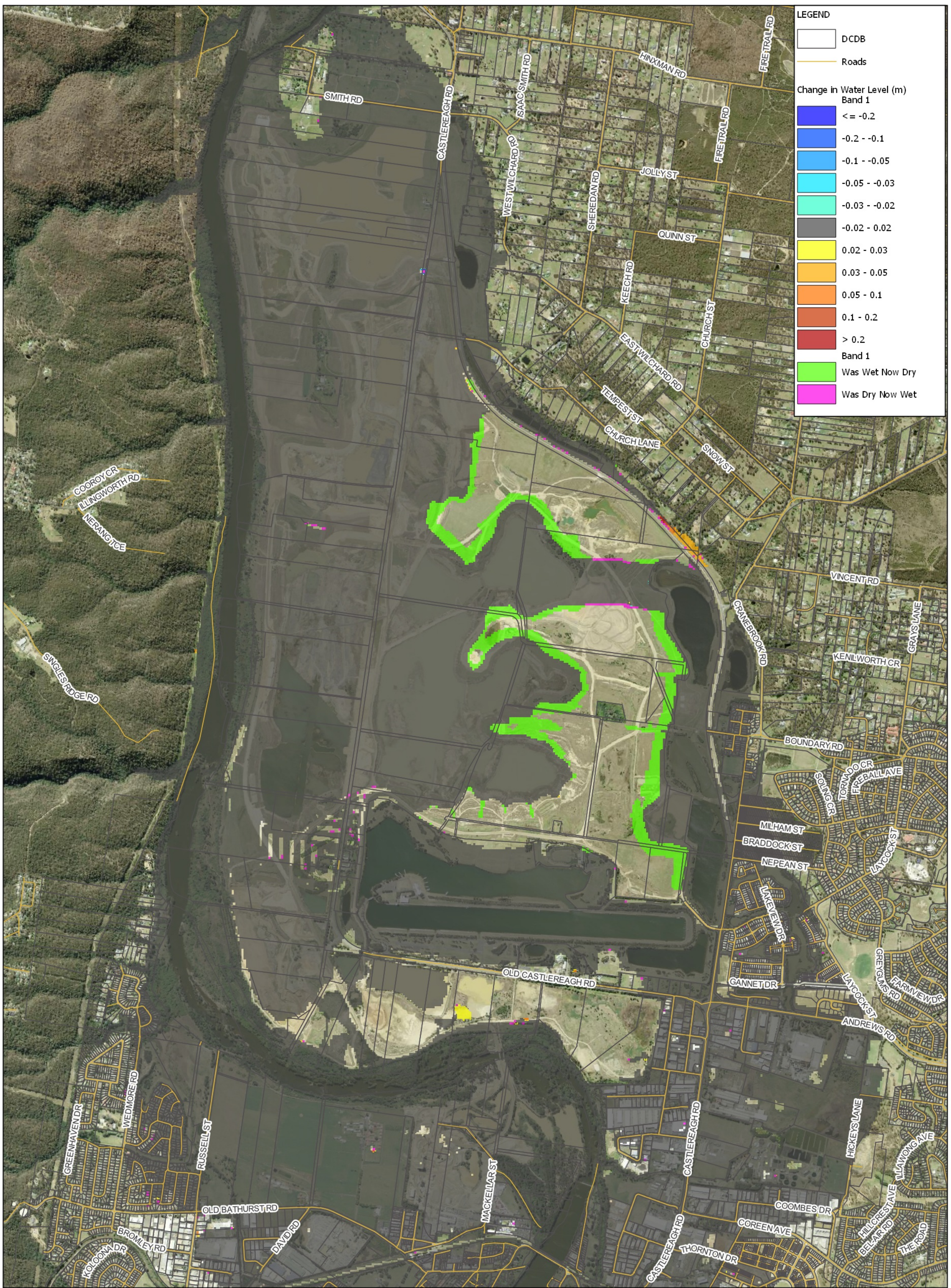
0.1 - 0.2

> 0.2

Band 1

Was Wet Now Dry

Was Dry Now Wet



LEGEND

DCDB

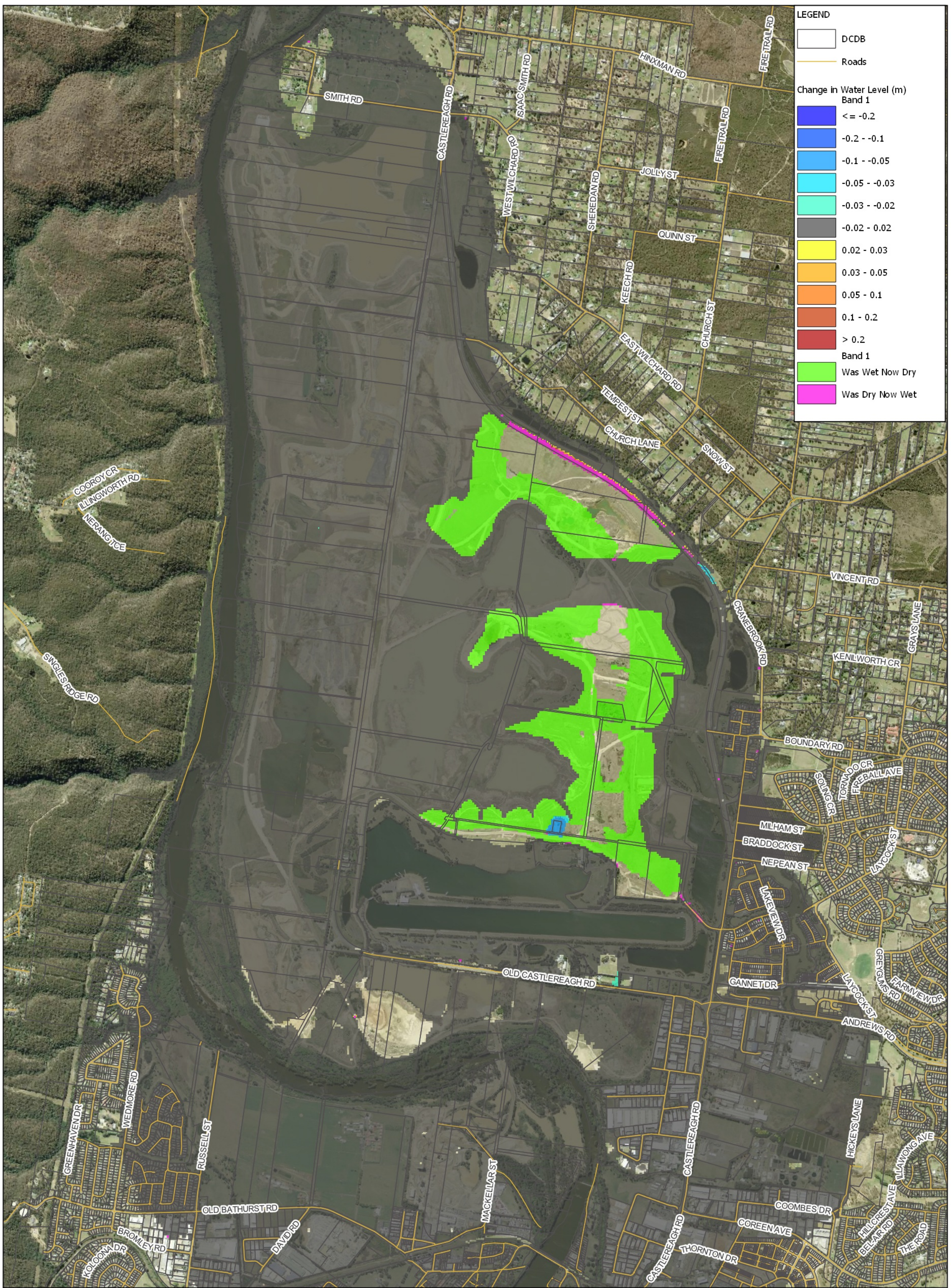
Roads

Change in Water Level (m)
Band 1

<= -0.2
-0.2 - -0.1
-0.1 - -0.05
-0.05 - -0.03
-0.03 - -0.02
-0.02 - 0.02
0.02 - 0.03
0.03 - 0.05
0.05 - 0.1
0.1 - 0.2
> 0.2

Band 1

Was Wet Now Dry
Was Dry Now Wet



LEGEND

DCDB

Roads

Change in Water Level (m)
Band 1

<= -0.2

-0.2 - -0.1

-0.1 - -0.05

-0.05 - -0.03

-0.03 - -0.02

-0.02 - 0.02

0.02 - 0.03

0.03 - 0.05

0.05 - 0.1

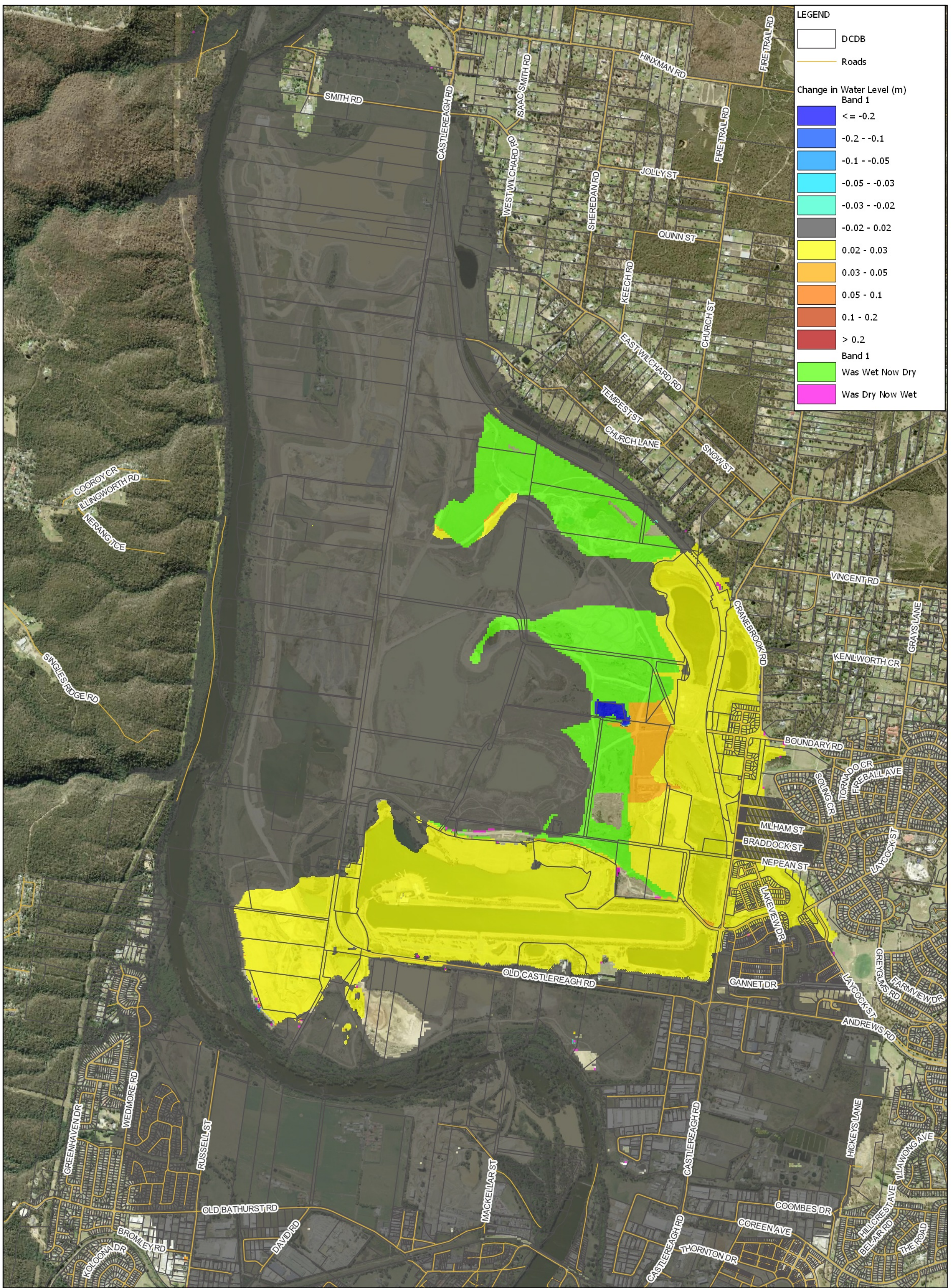
0.1 - 0.2

> 0.2

Band 1

Was Wet Now Dry

Was Dry Now Wet



LEGEND

DCDB
Roads

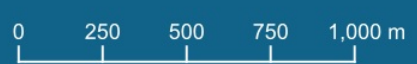
Change in Water Level (m)
Band 1

- ≤ -0.2
- $-0.2 - -0.1$
- $-0.1 - -0.05$
- $-0.05 - -0.03$
- $-0.03 - -0.02$
- $-0.02 - 0.02$
- $0.02 - 0.03$
- $0.03 - 0.05$
- $0.05 - 0.1$
- $0.1 - 0.2$
- > 0.2

Band 1
Was Wet Now Dry
Was Dry Now Wet

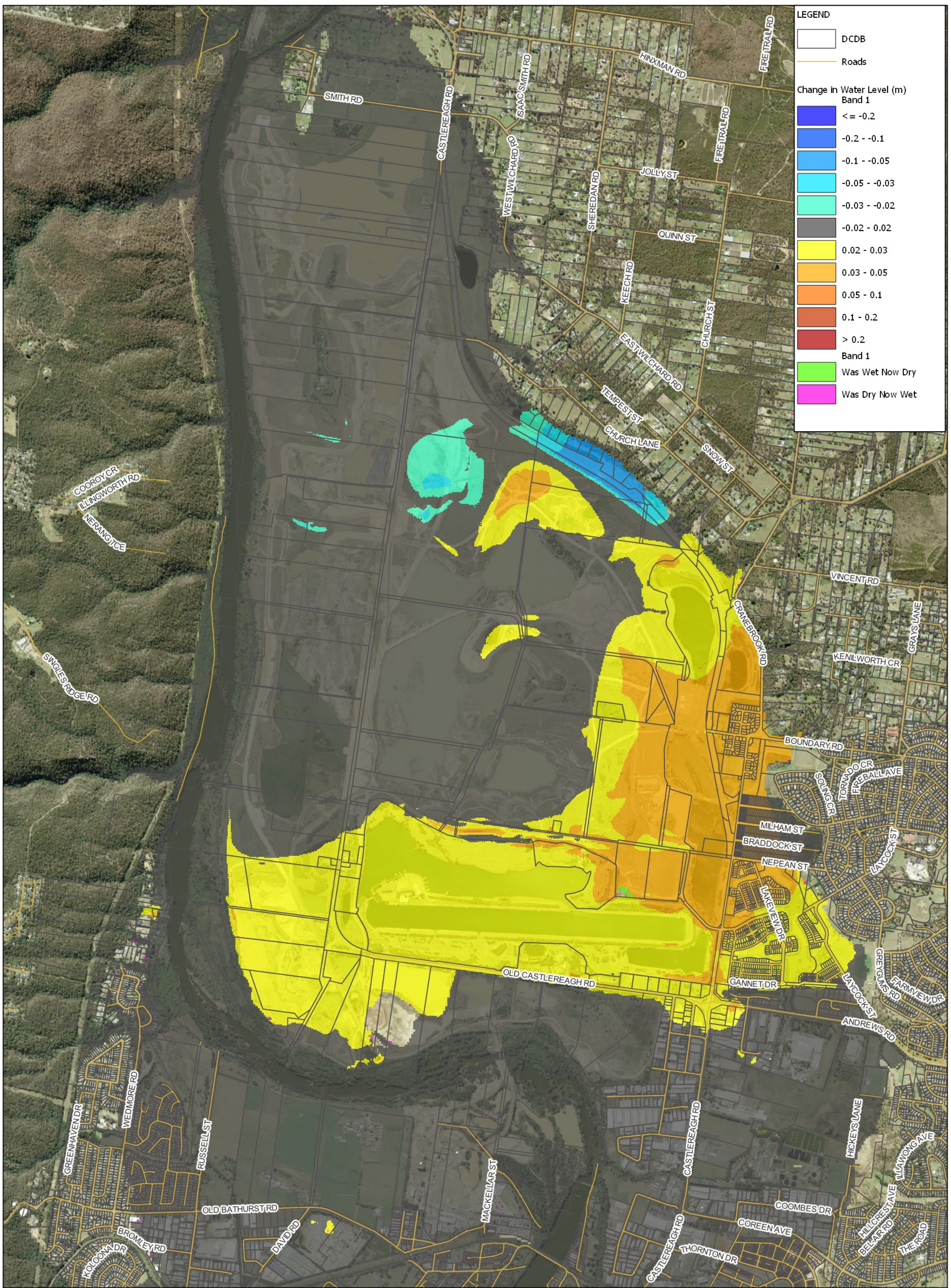


Projection: GDA2020 / MGA Zone 56
Produced By: Water Technology Pty Ltd



PLDC Filling Assessment
0.1% AEP - Post-Developed Change in Water Level





LEGEND

DCDB

Roads

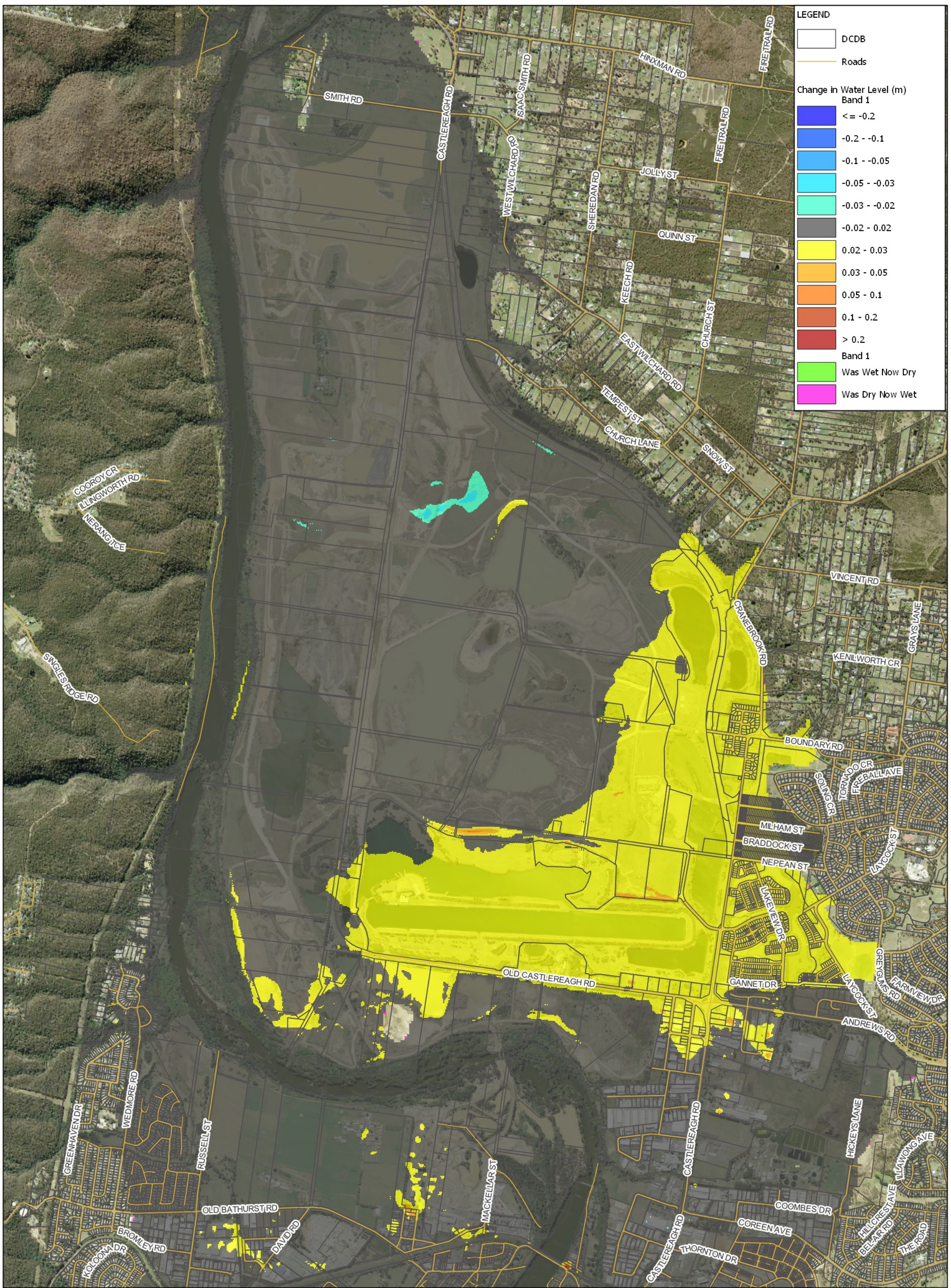
Change in Water Level (m)
Band 1

<= -0.2
-0.2 - -0.1
-0.1 - -0.05
-0.05 - -0.03
-0.03 - -0.02
-0.02 - 0.02
0.02 - 0.03
0.03 - 0.05
0.05 - 0.1
0.1 - 0.2
> 0.2

Band 1

Was Wet Now Dry

Was Dry Now Wet



LEGEND

DCDB

Roads

Change in Water Level (m)
Band 1

<= -0.2

-0.2 - -0.1

-0.1 - -0.05

-0.05 - -0.03

-0.03 - -0.02

-0.02 - 0.02

0.02 - 0.03

0.03 - 0.05

0.05 - 0.1

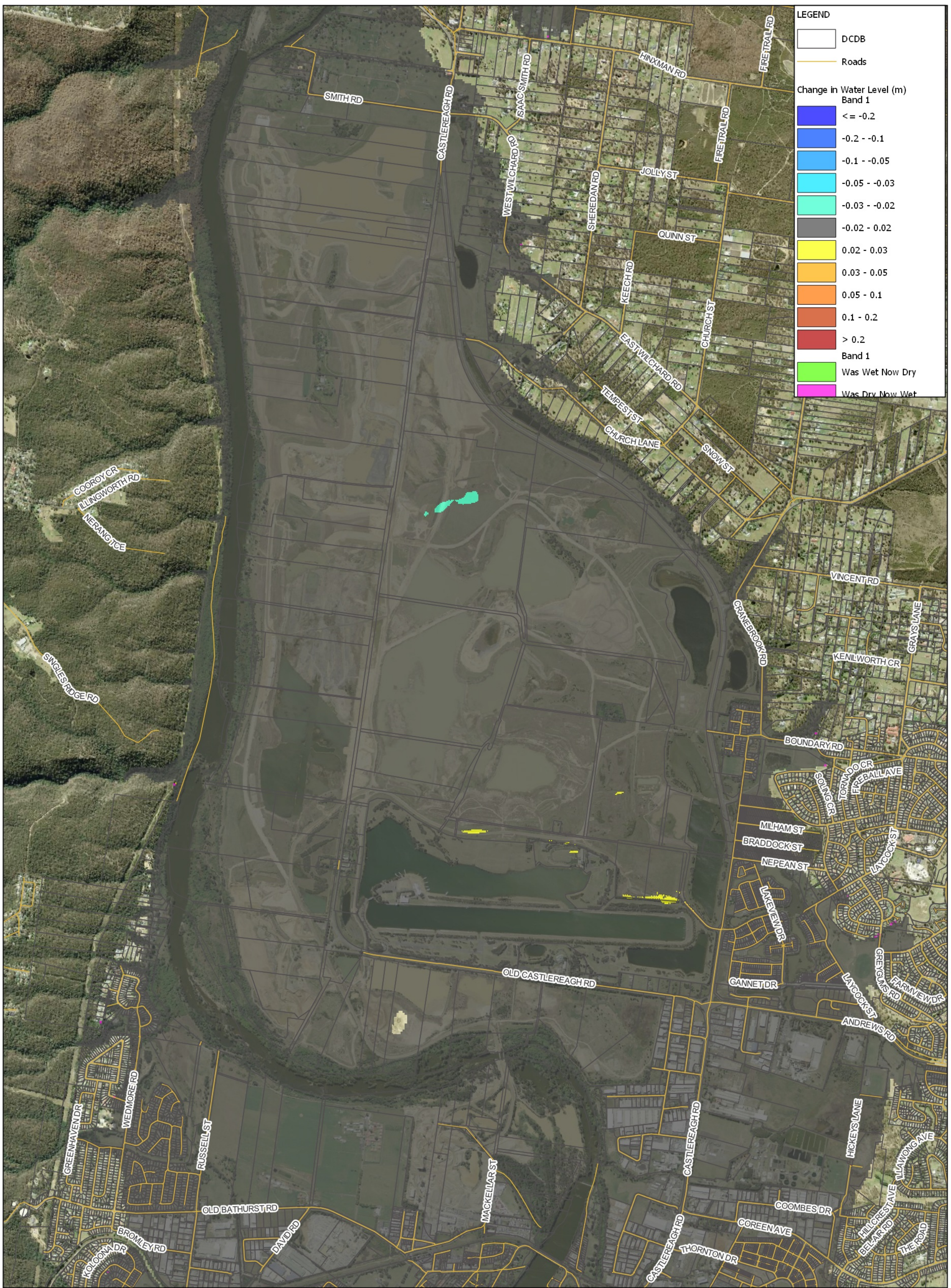
0.1 - 0.2

> 0.2

Band 1

Was Wet Now Dry

Was Dry Now Wet



LEGEND

DCDB

Roads

Change in Water Level (m)
Band 1

<= -0.2

-0.2 - -0.1

-0.1 - -0.05

-0.05 - -0.03

-0.03 - -0.02

-0.02 - 0.02

0.02 - 0.03

0.03 - 0.05

0.05 - 0.1

0.1 - 0.2

> 0.2

Band 1

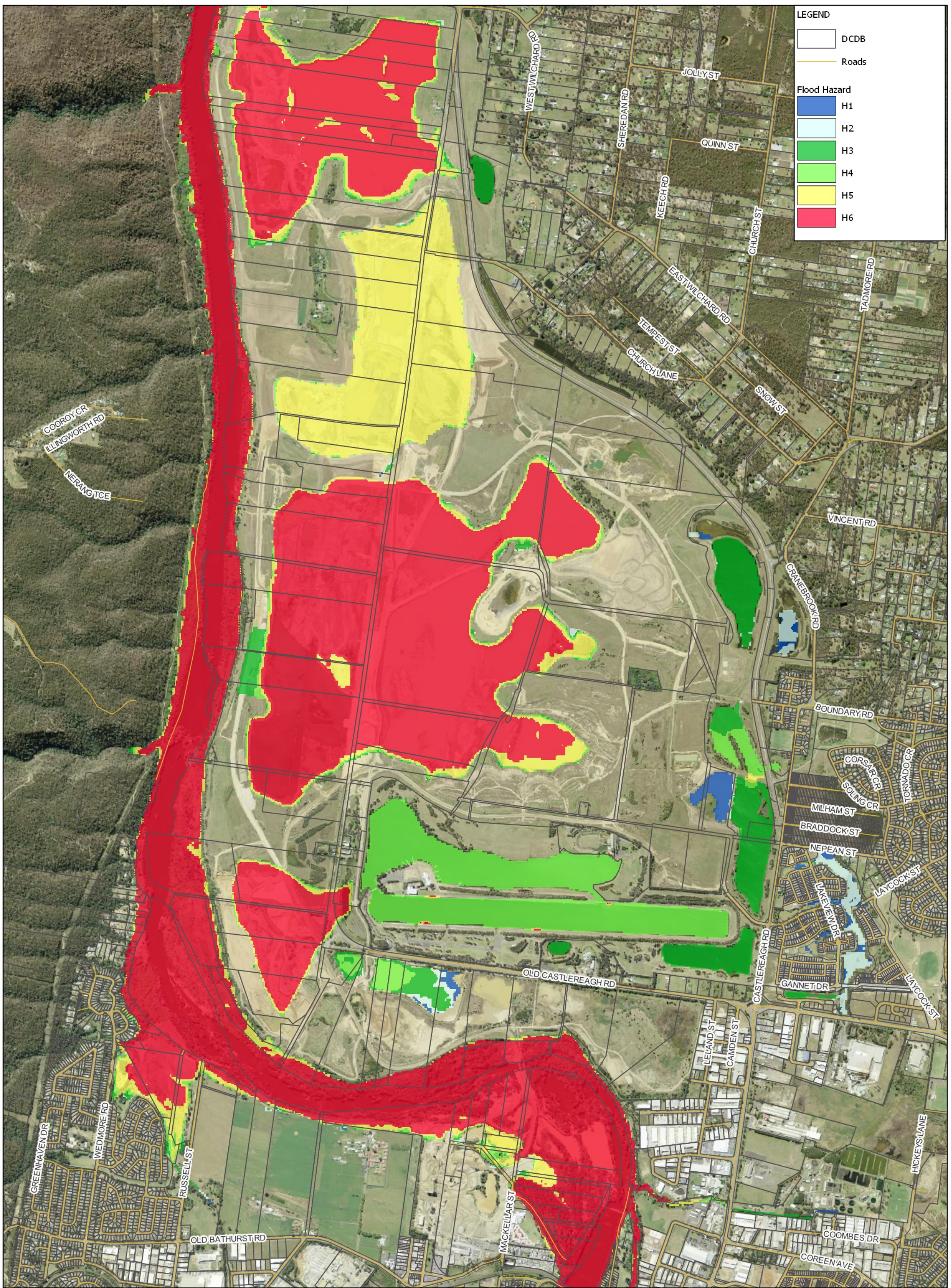
Was Wet Now Dry

Was Dry Now Wet



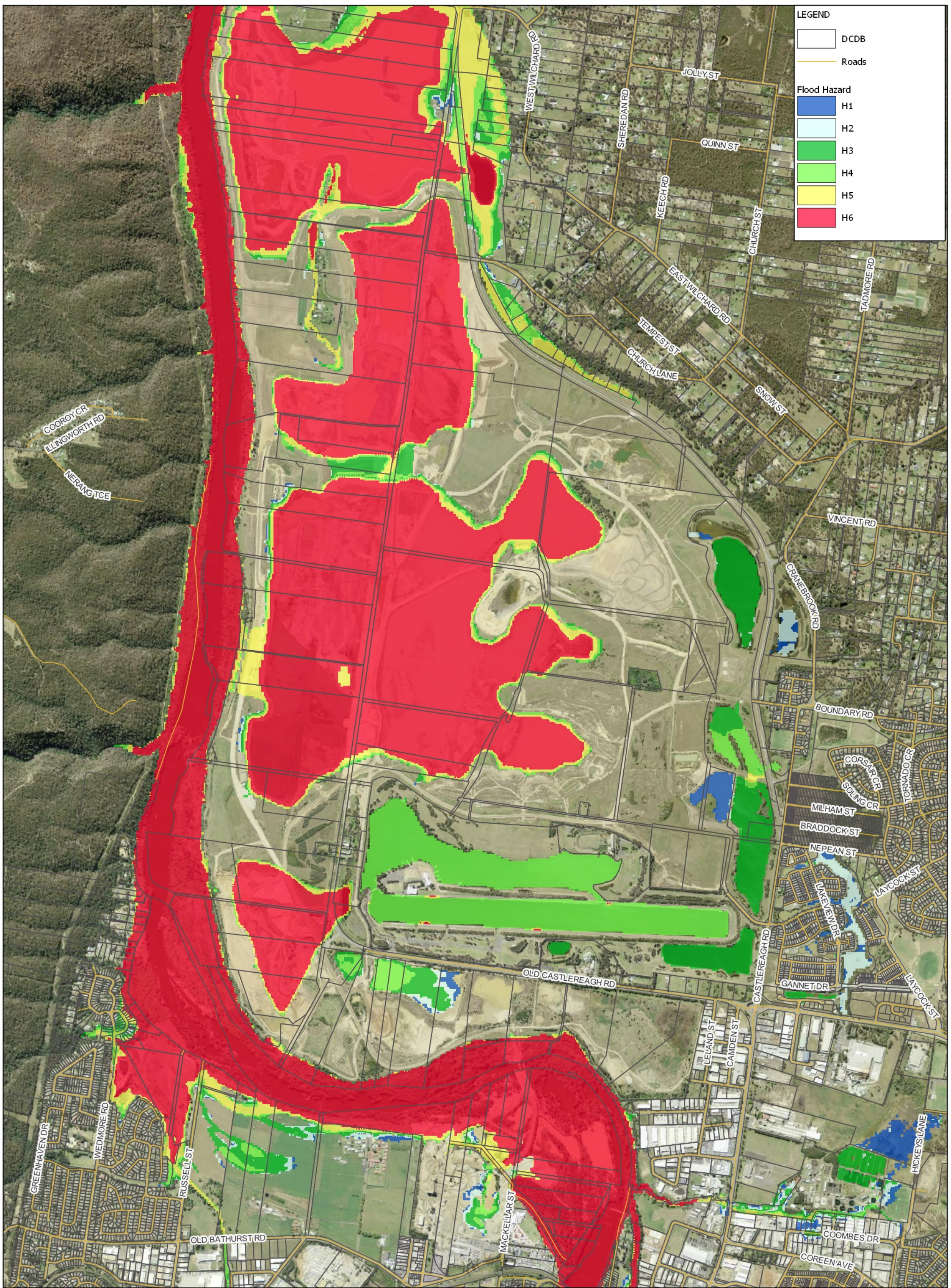
APPENDIX B FLOOD HAZARD MAPPING





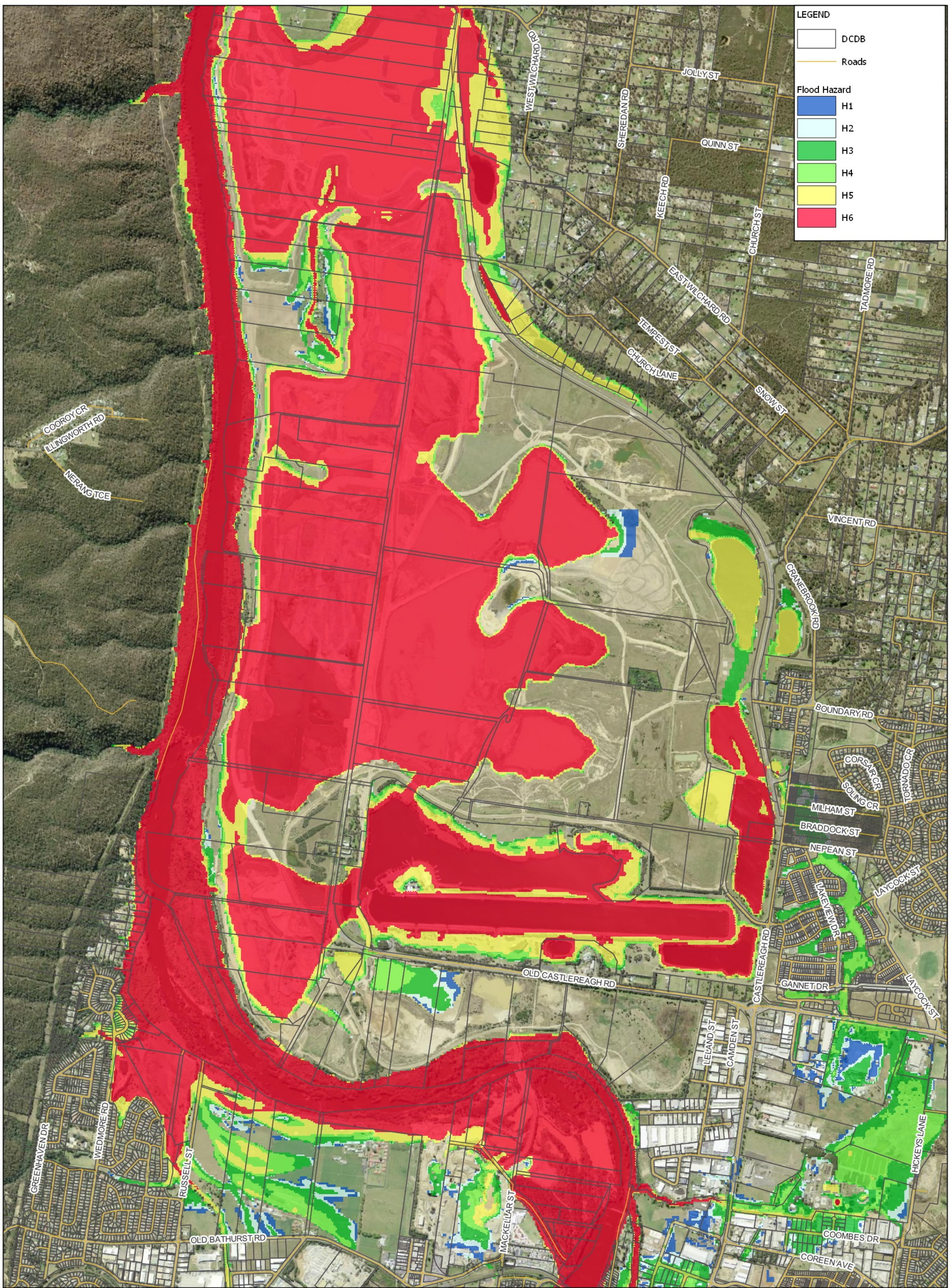
LEGEND

- DCDB
- Roads
- Flood Hazard
 - H1
 - H2
 - H3
 - H4
 - H5
 - H6



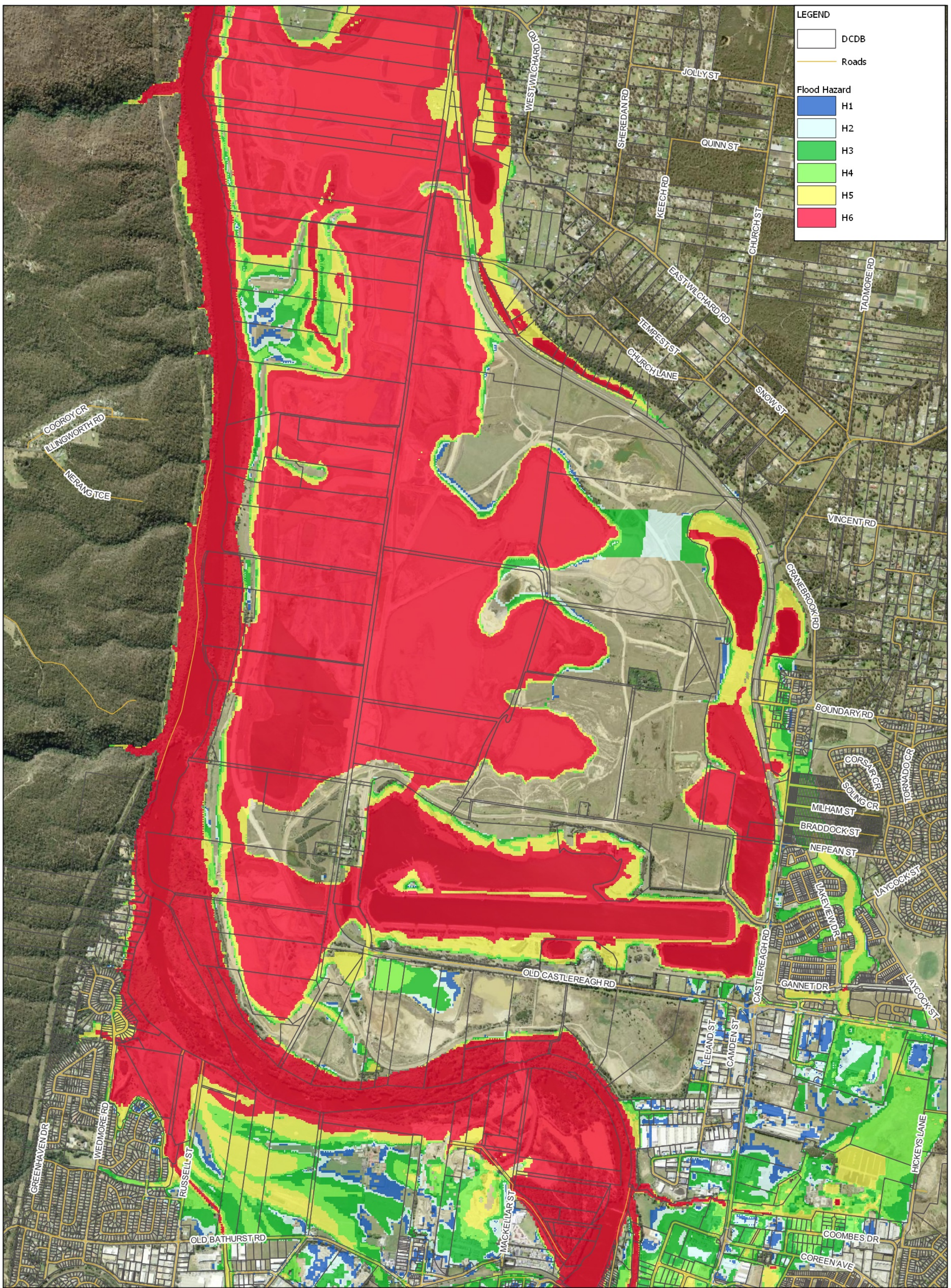
LEGEND

- DCDB
- Roads
- Flood Hazard
 - H1
 - H2
 - H3
 - H4
 - H5
 - H6



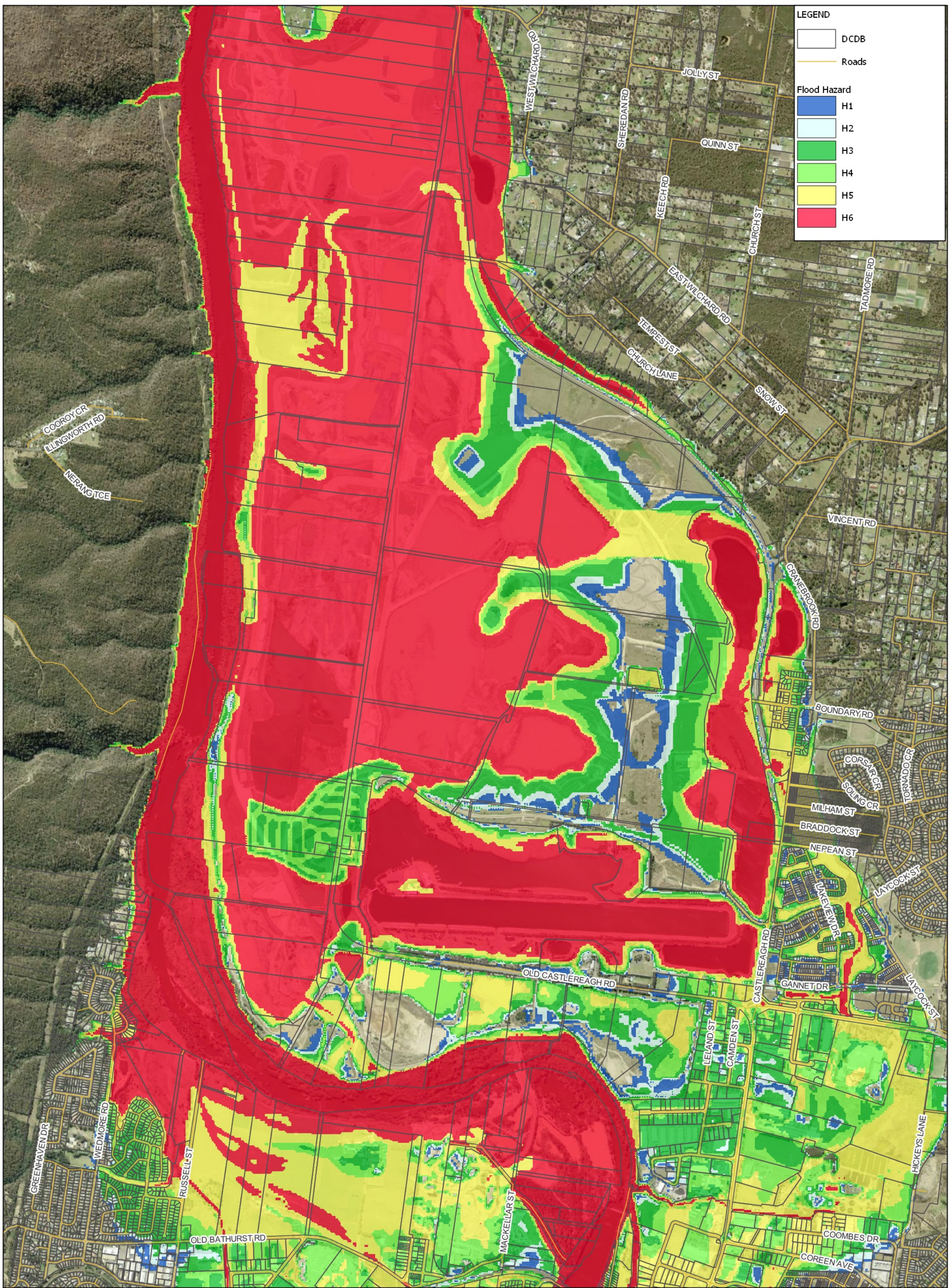
LEGEND

- DCDB
- Roads
- Flood Hazard
 - H1
 - H2
 - H3
 - H4
 - H5
 - H6



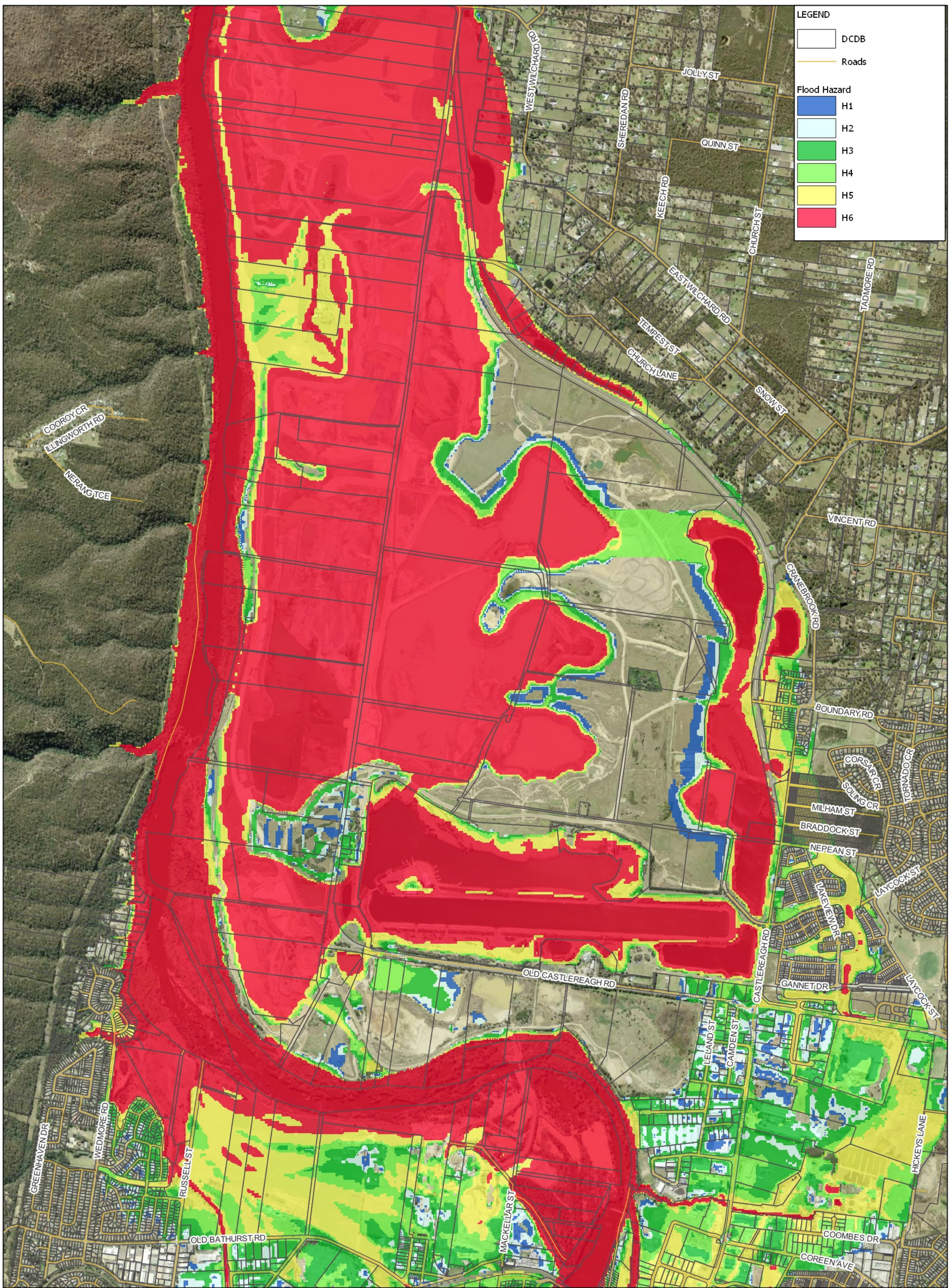
LEGEND

- DCDB
- Roads
- Flood Hazard
 - H1
 - H2
 - H3
 - H4
 - H5
 - H6



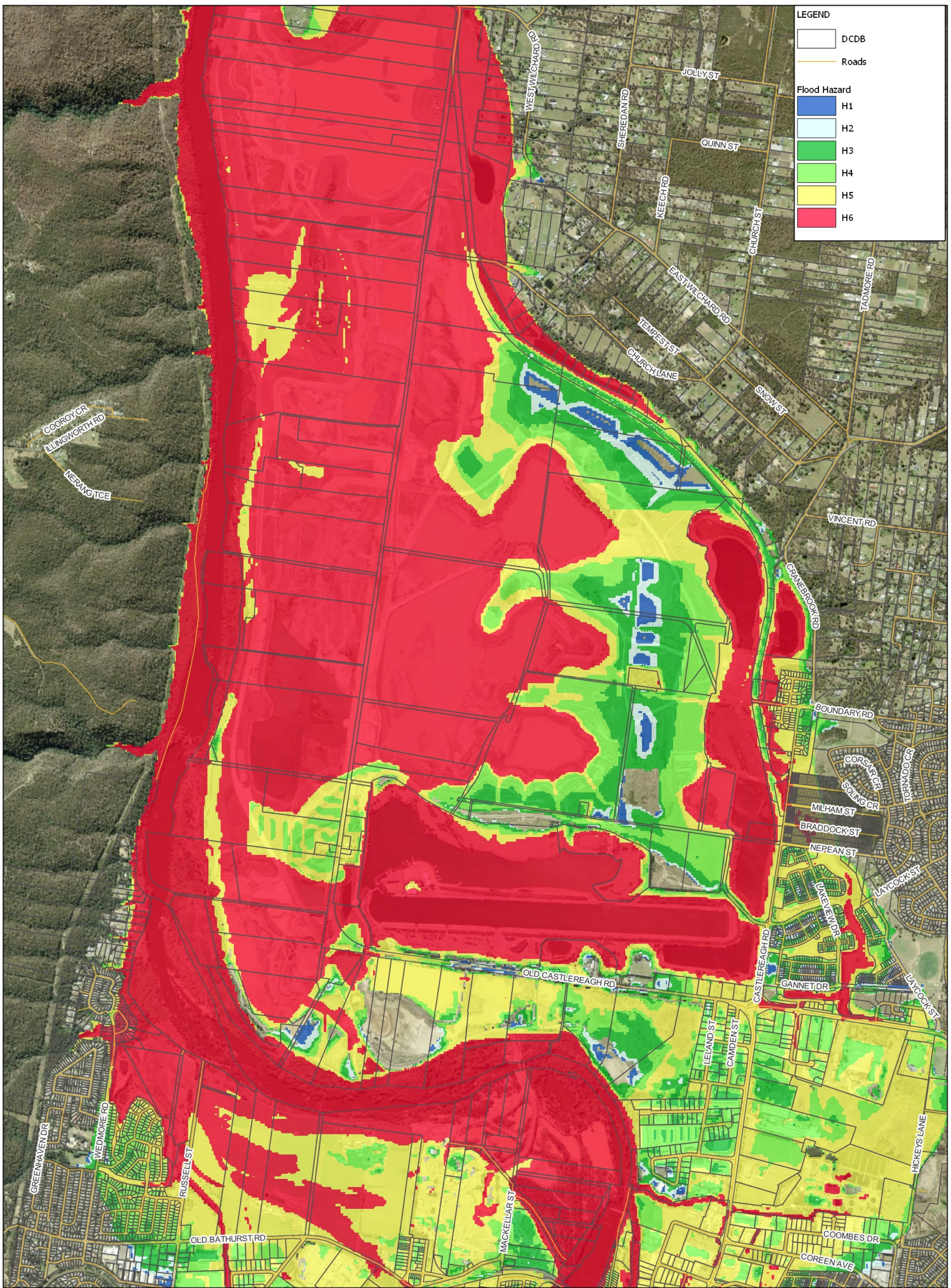
LEGEND

- DCDB
- Roads
- Flood Hazard
 - H1
 - H2
 - H3
 - H4
 - H5
 - H6



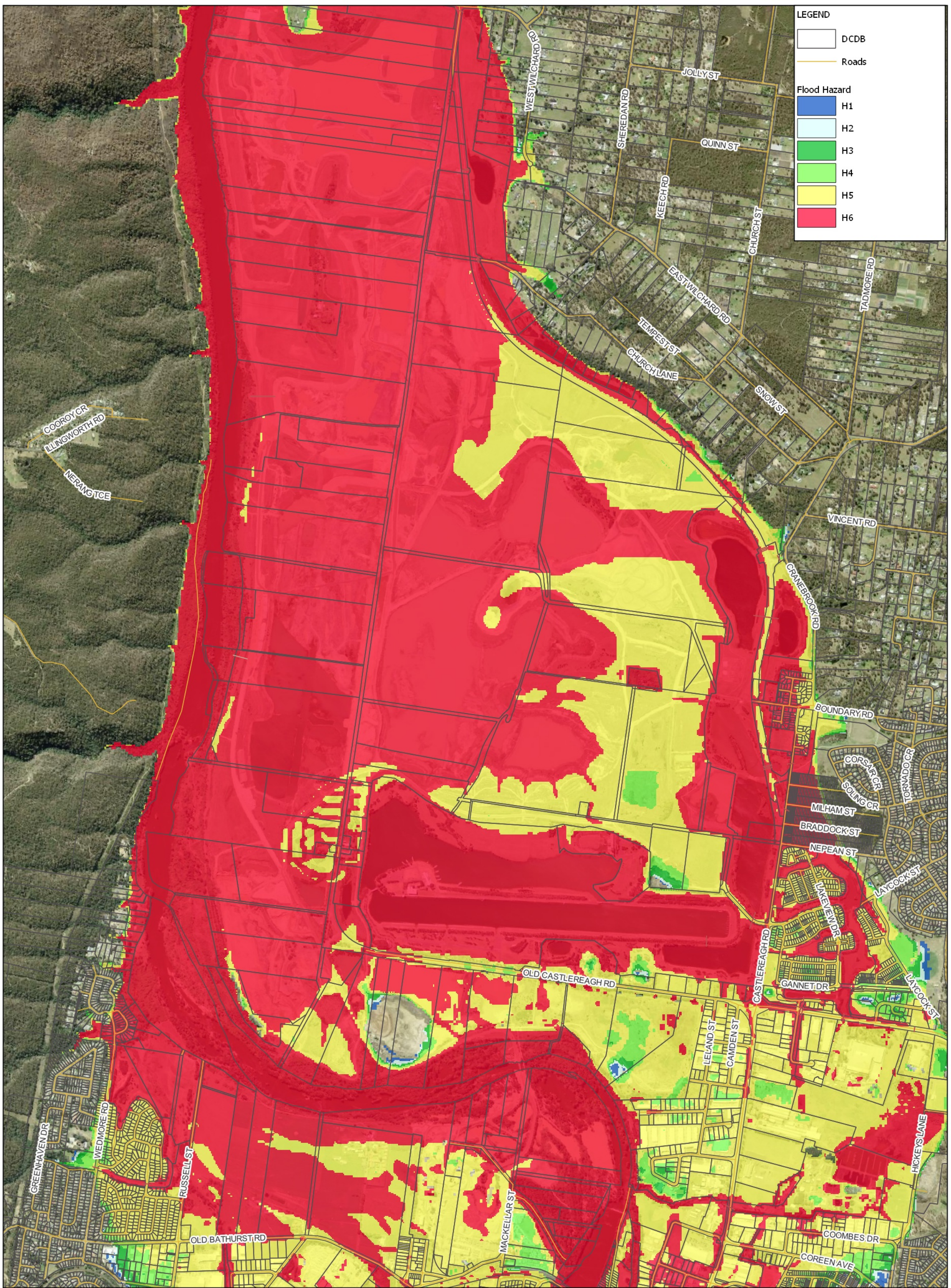
LEGEND

- DCDB
- Roads
- Flood Hazard
 - H1
 - H2
 - H3
 - H4
 - H5
 - H6



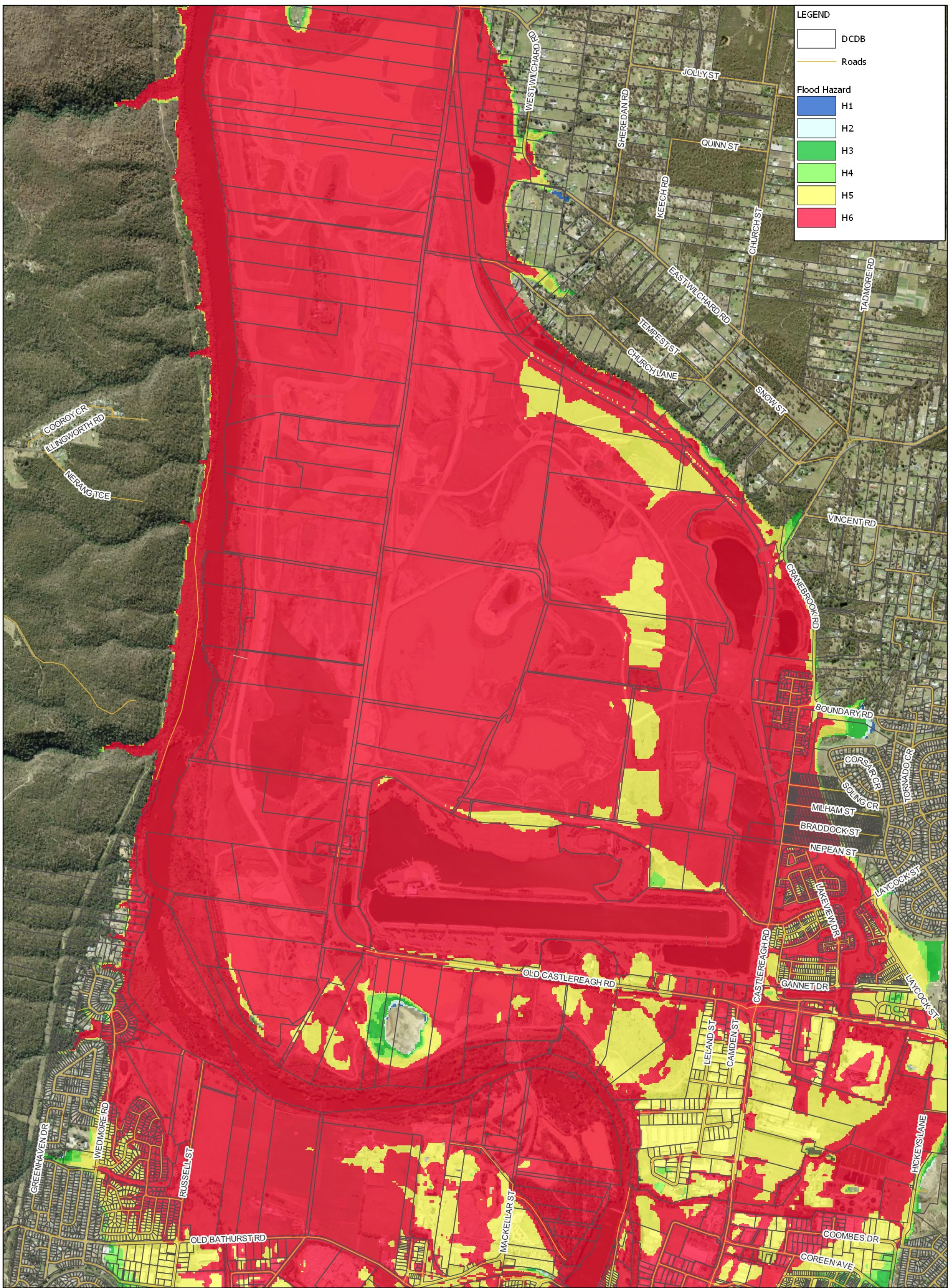
LEGEND

- DCDB
- Roads
- Flood Hazard
 - H1
 - H2
 - H3
 - H4
 - H5
 - H6



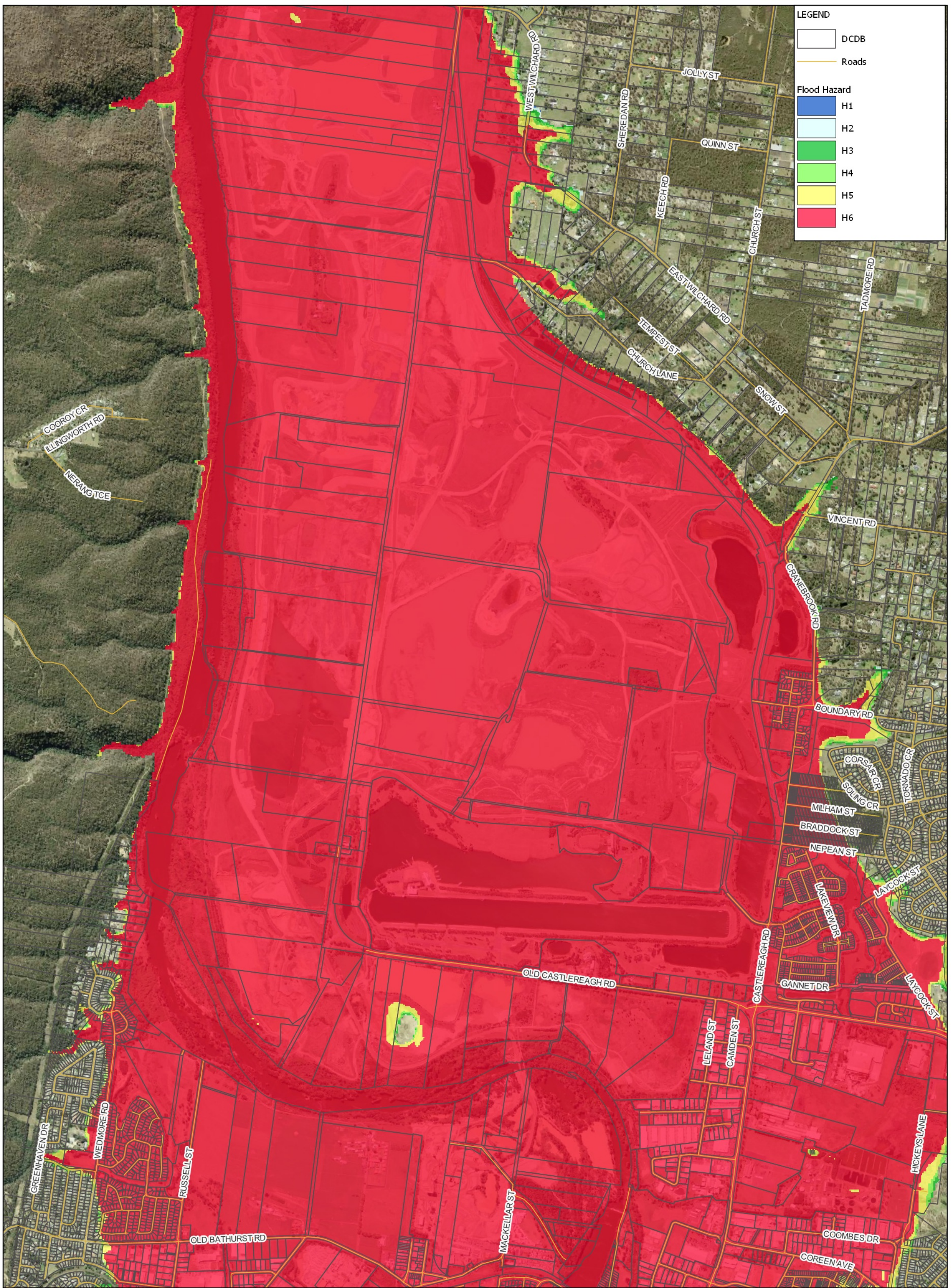
LEGEND

- DCDB
- Roads
- Flood Hazard
 - H1
 - H2
 - H3
 - H4
 - H5
 - H6



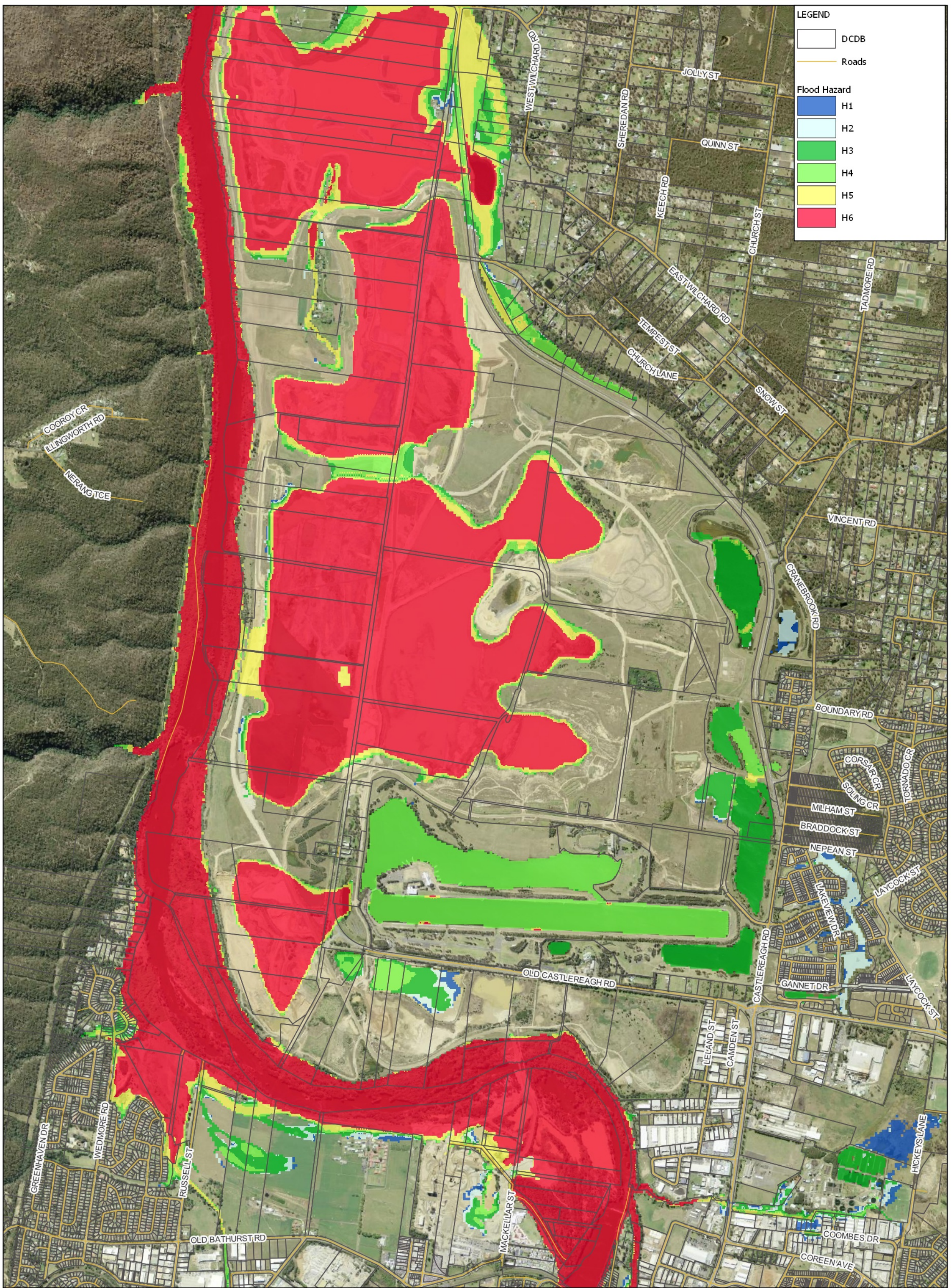
LEGEND

- DCDB
- Roads
- Flood Hazard
 - H1
 - H2
 - H3
 - H4
 - H5
 - H6



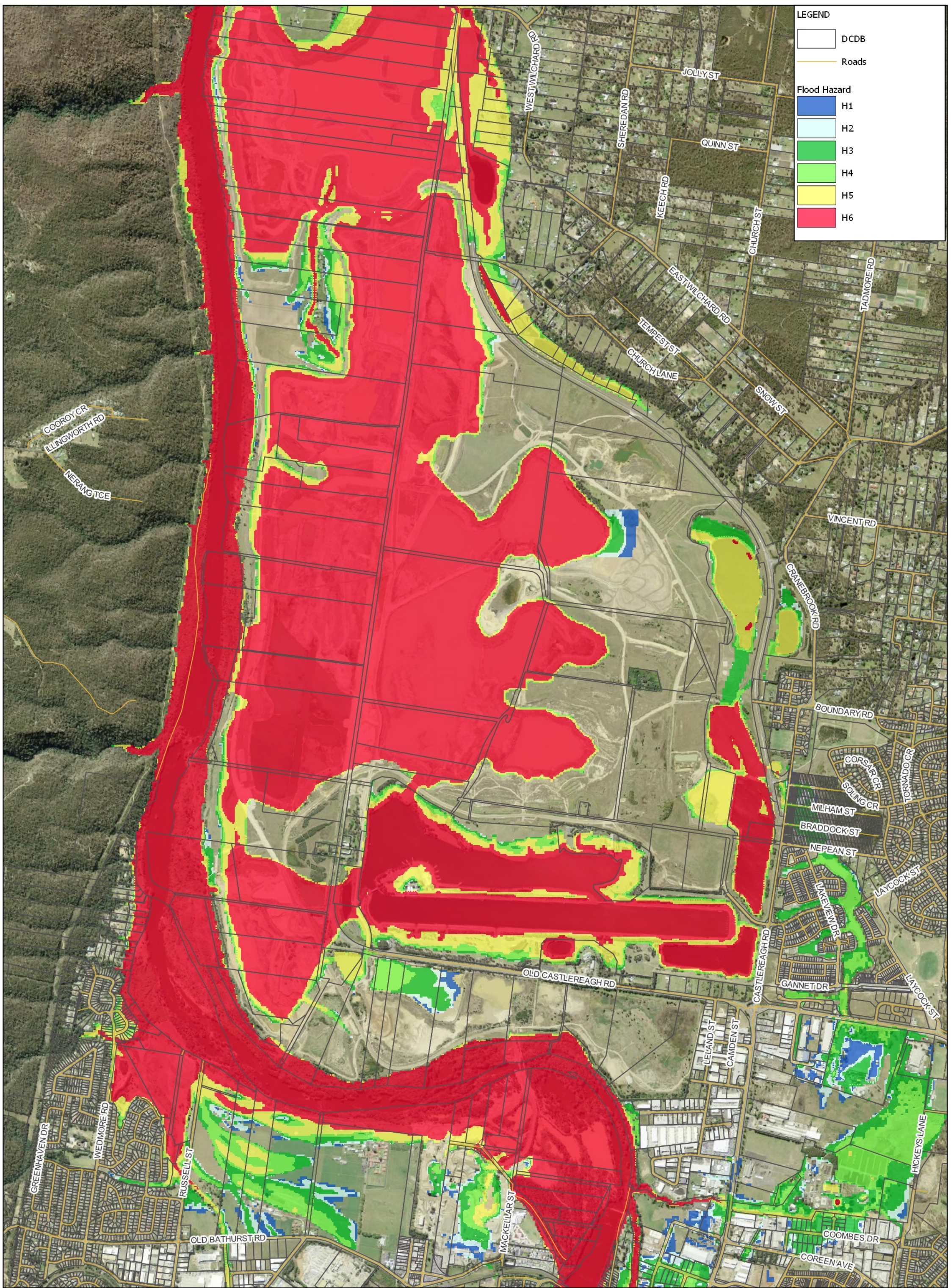
LEGEND

- DCDB
- Roads
- Flood Hazard
 - H1
 - H2
 - H3
 - H4
 - H5
 - H6



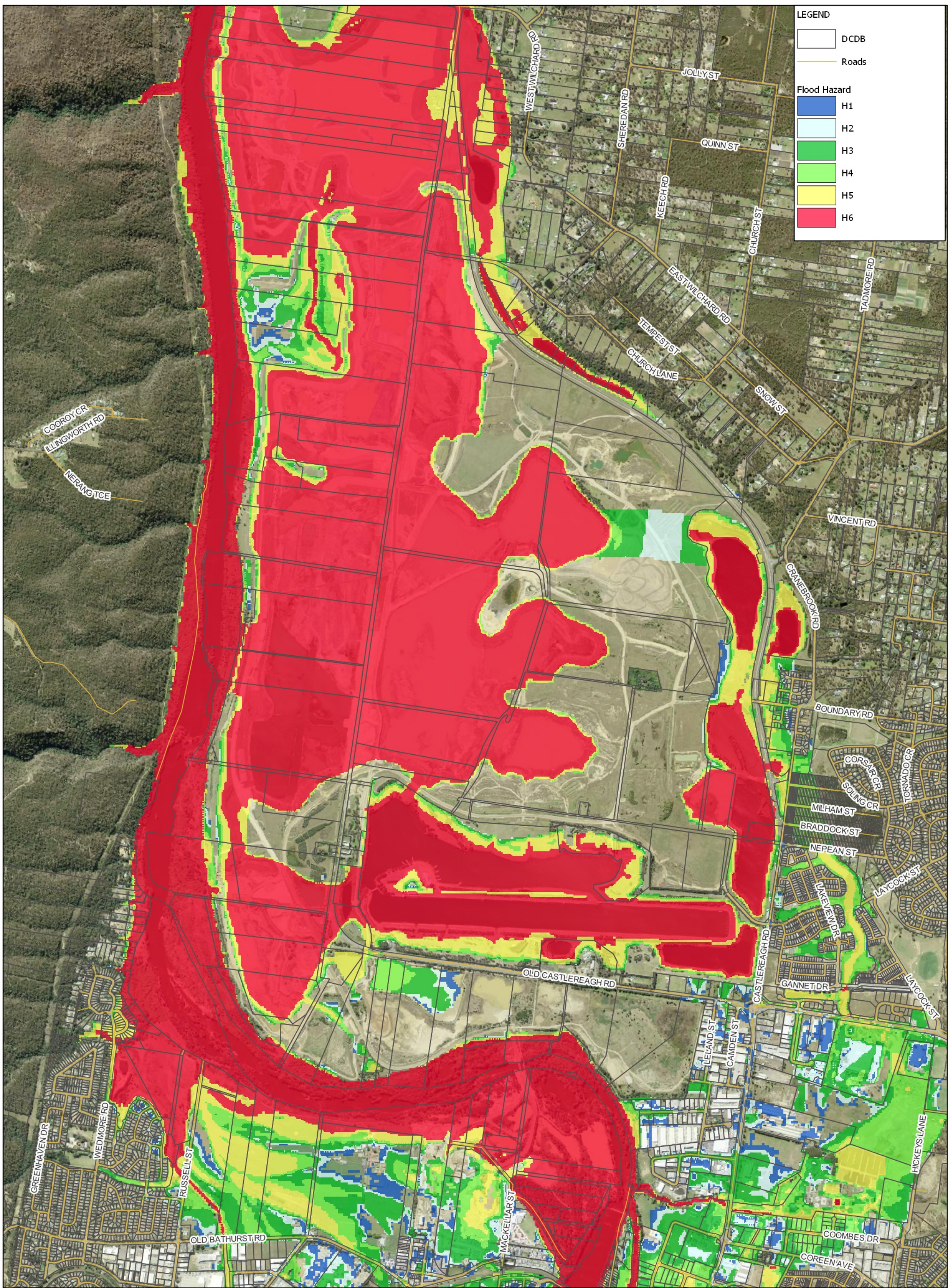
LEGEND

- DCDB
- Roads
- Flood Hazard
 - H1
 - H2
 - H3
 - H4
 - H5
 - H6



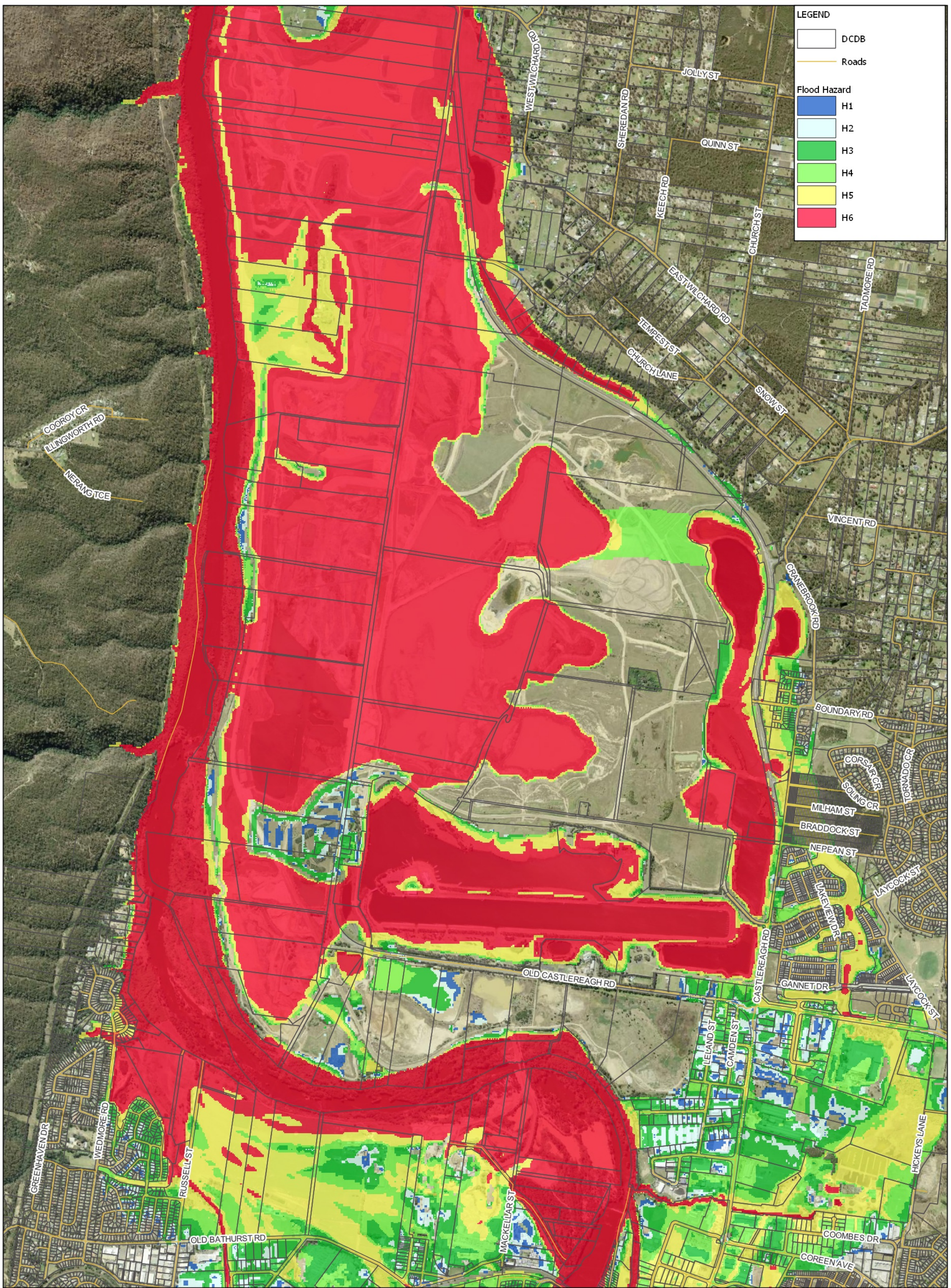
LEGEND

- DCDB
- Roads
- Flood Hazard
 - H1
 - H2
 - H3
 - H4
 - H5
 - H6



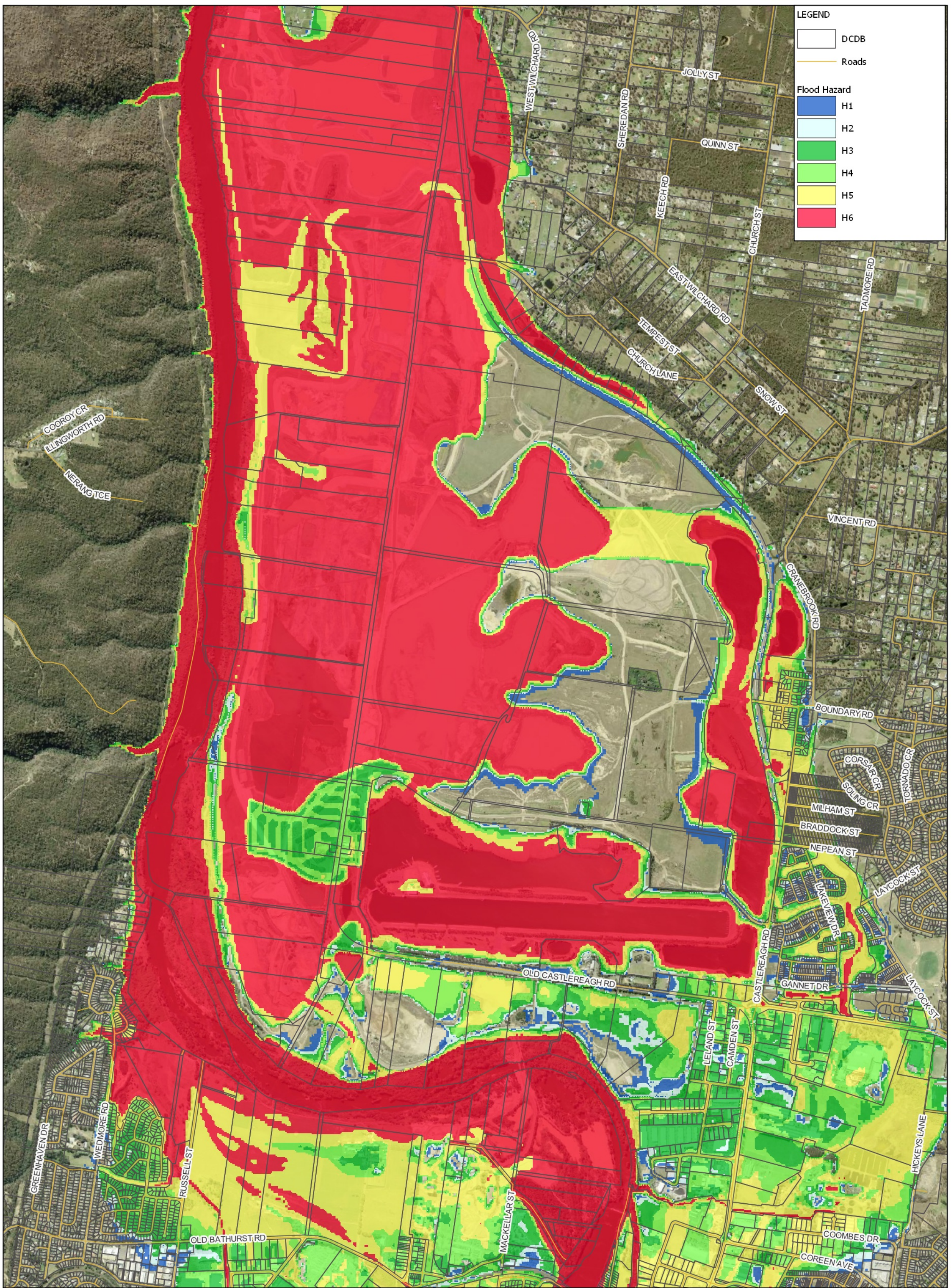
LEGEND

- DCDB
- Roads
- Flood Hazard
 - H1
 - H2
 - H3
 - H4
 - H5
 - H6



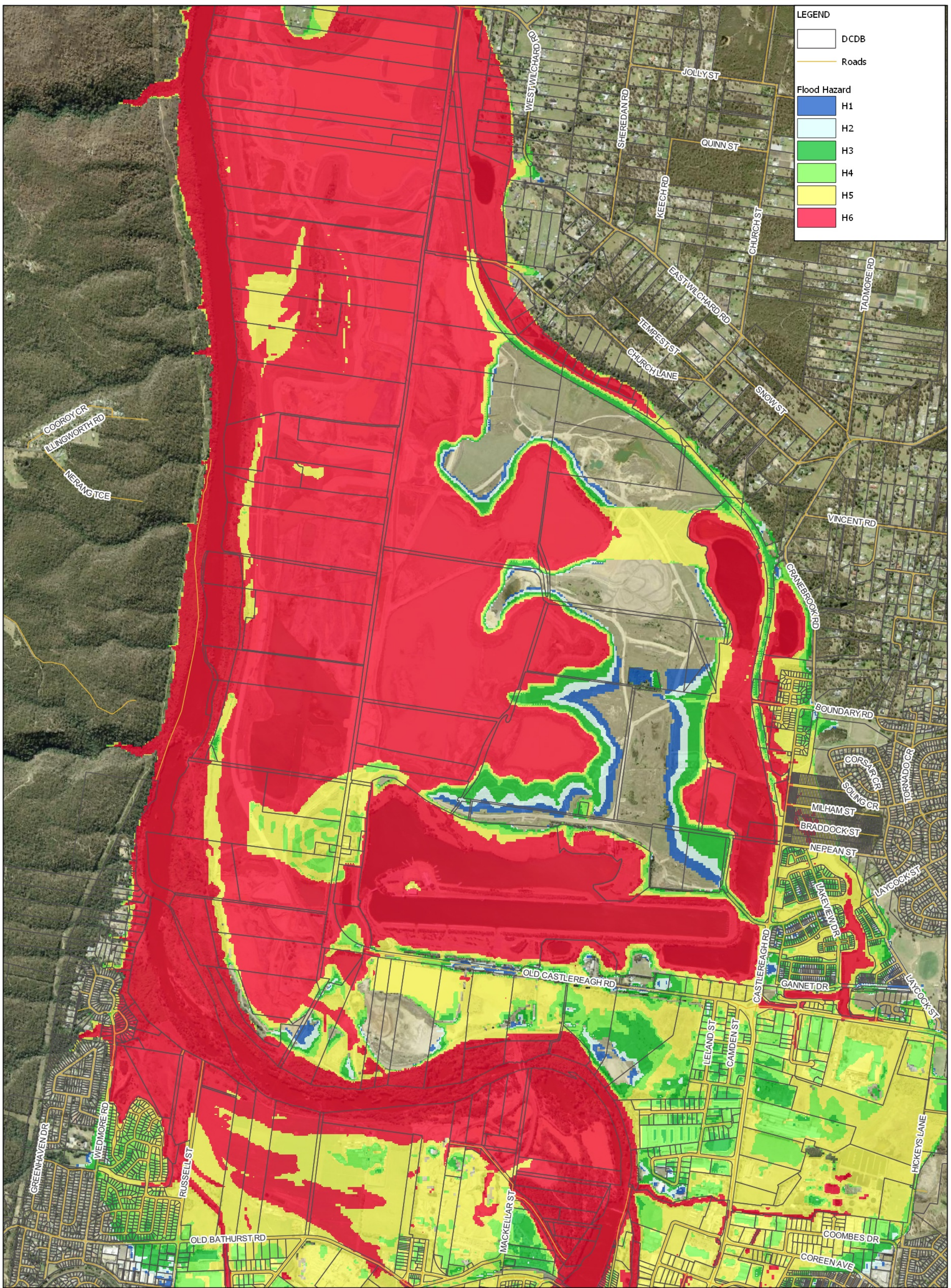
LEGEND

- DCDB
- Roads
- Flood Hazard
 - H1
 - H2
 - H3
 - H4
 - H5
 - H6



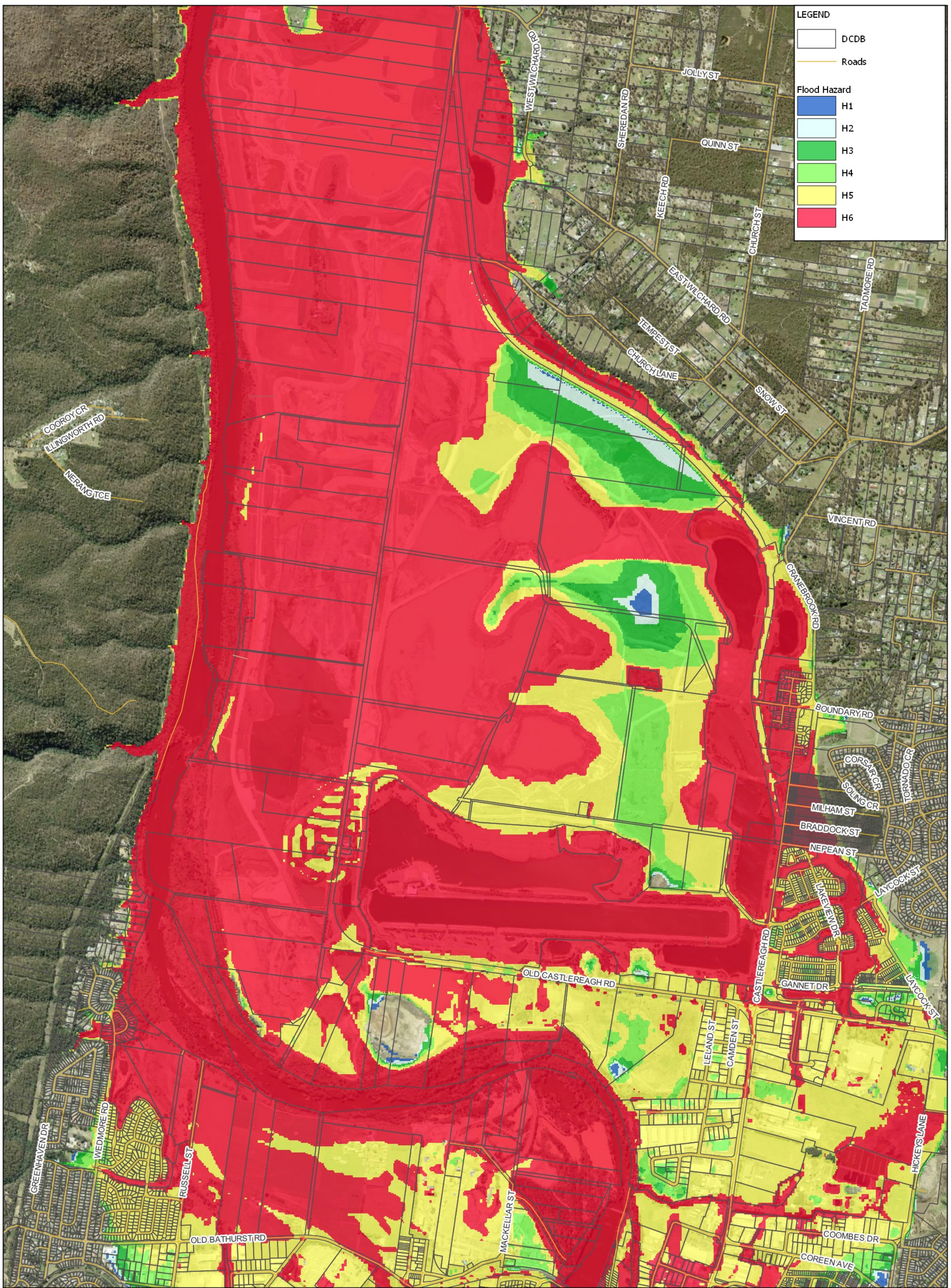
LEGEND

- DCDB
- Roads
- Flood Hazard
 - H1
 - H2
 - H3
 - H4
 - H5
 - H6



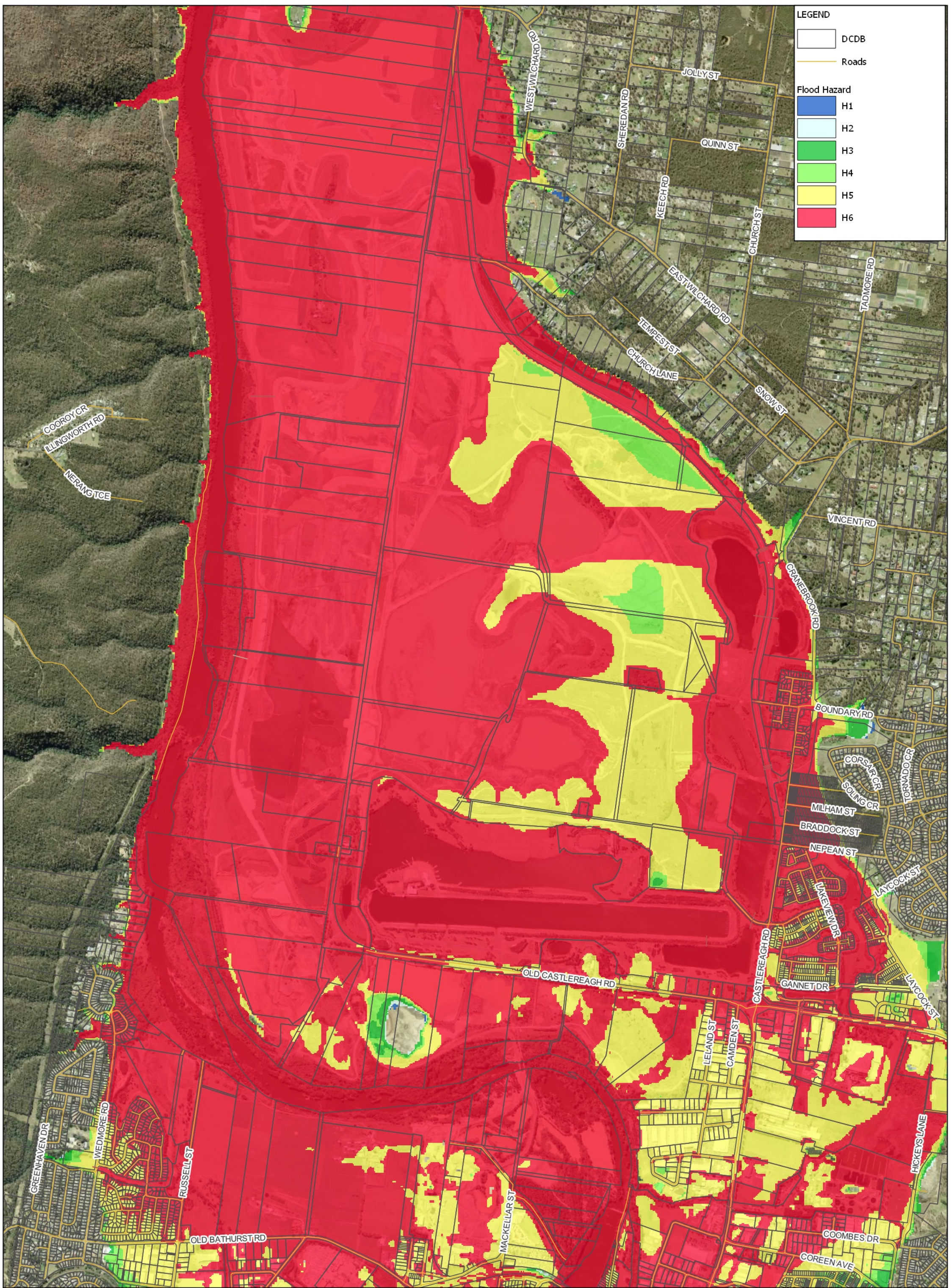
LEGEND

- DCDB
- Roads
- Flood Hazard
 - H1
 - H2
 - H3
 - H4
 - H5
 - H6



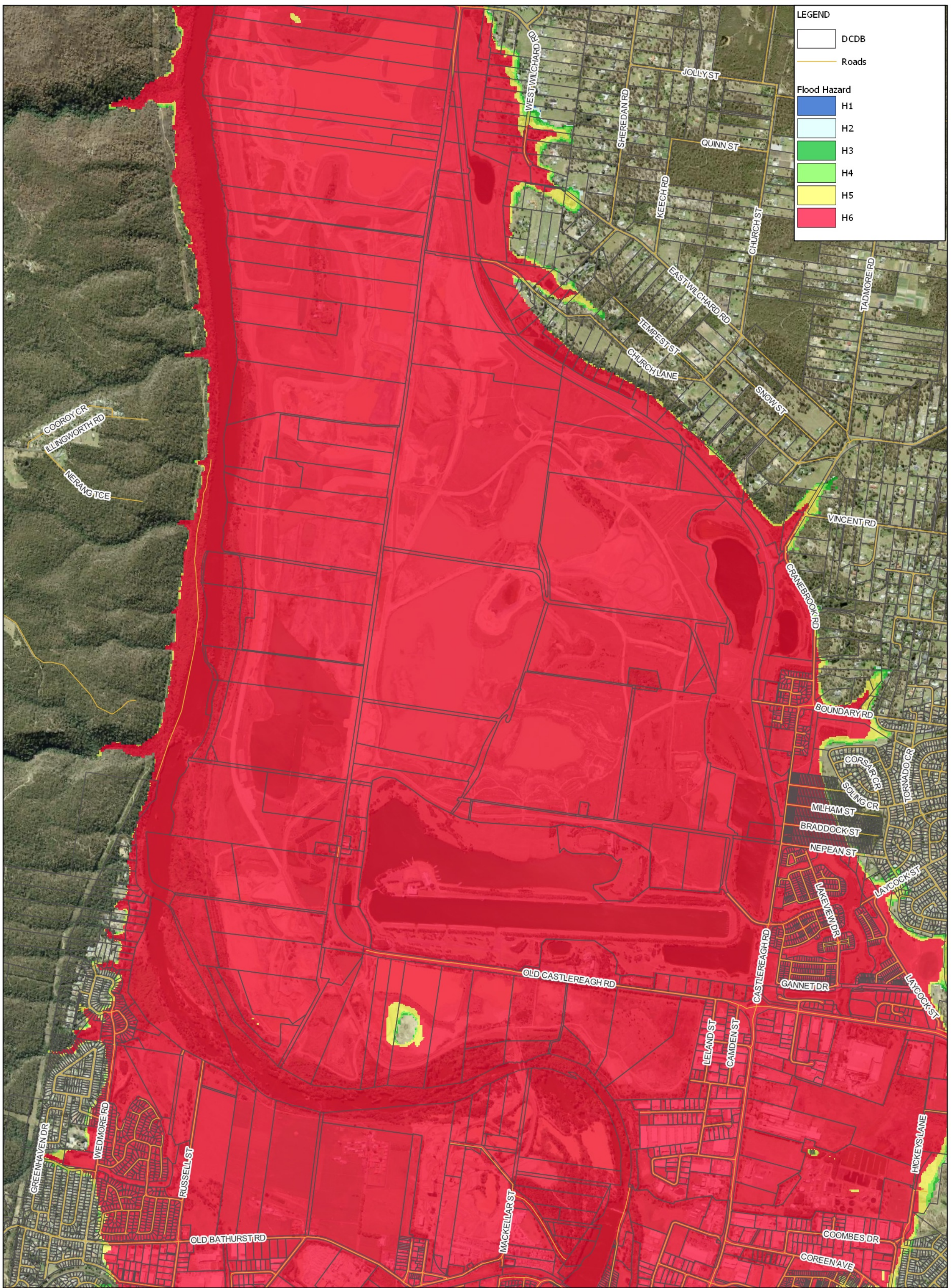
LEGEND

- DCDB
- Roads
- Flood Hazard
 - H1
 - H2
 - H3
 - H4
 - H5
 - H6



LEGEND

- DCDB
- Roads
- Flood Hazard
 - H1
 - H2
 - H3
 - H4
 - H5
 - H6



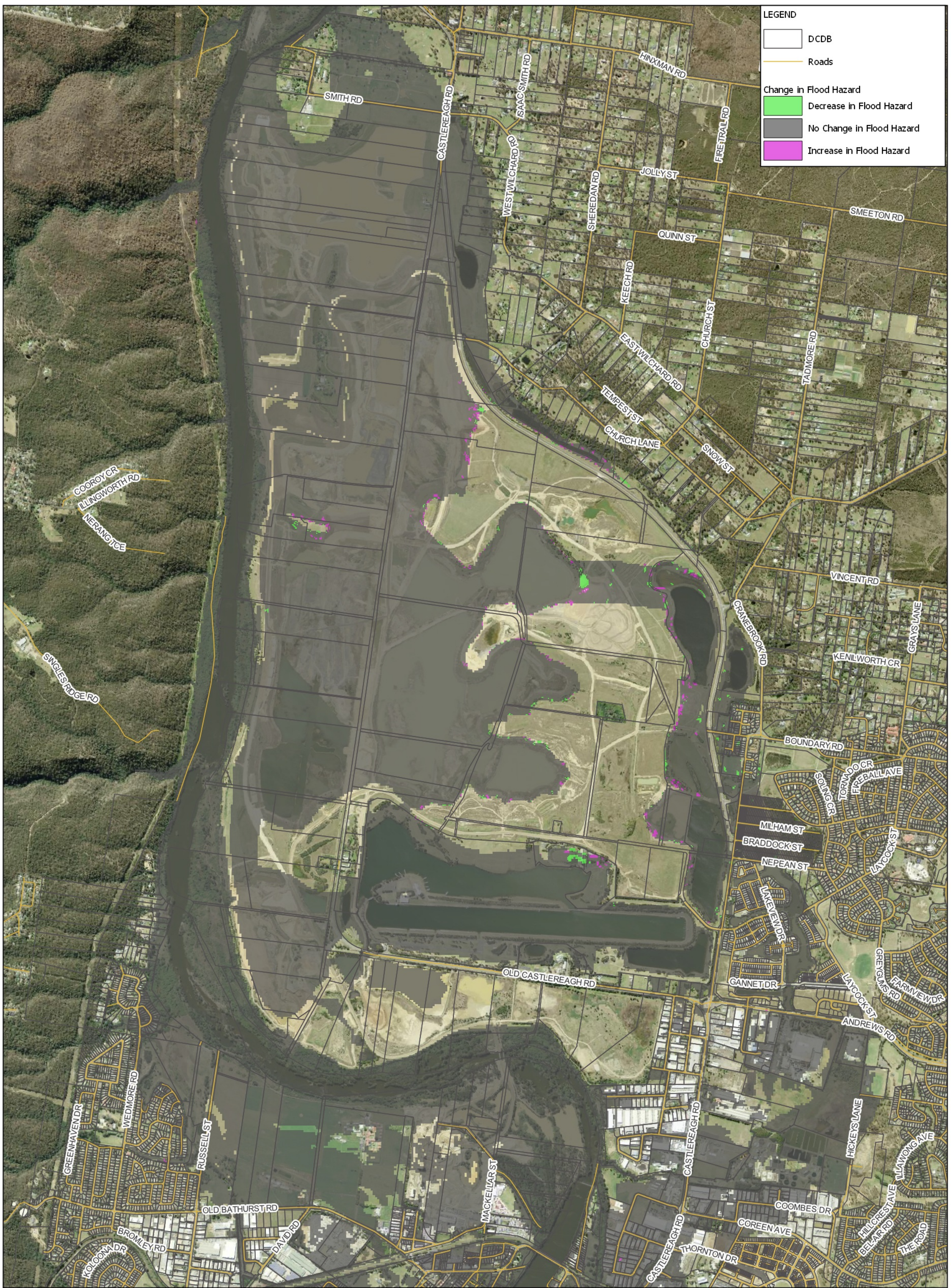
LEGEND

- DCDB
- Roads
- Flood Hazard
 - H1
 - H2
 - H3
 - H4
 - H5
 - H6



APPENDIX C CHANGE IN FLOOD HAZARD





LEGEND

DCDB

Roads

Change in Flood Hazard

Decrease in Flood Hazard

No Change in Flood Hazard

Increase in Flood Hazard



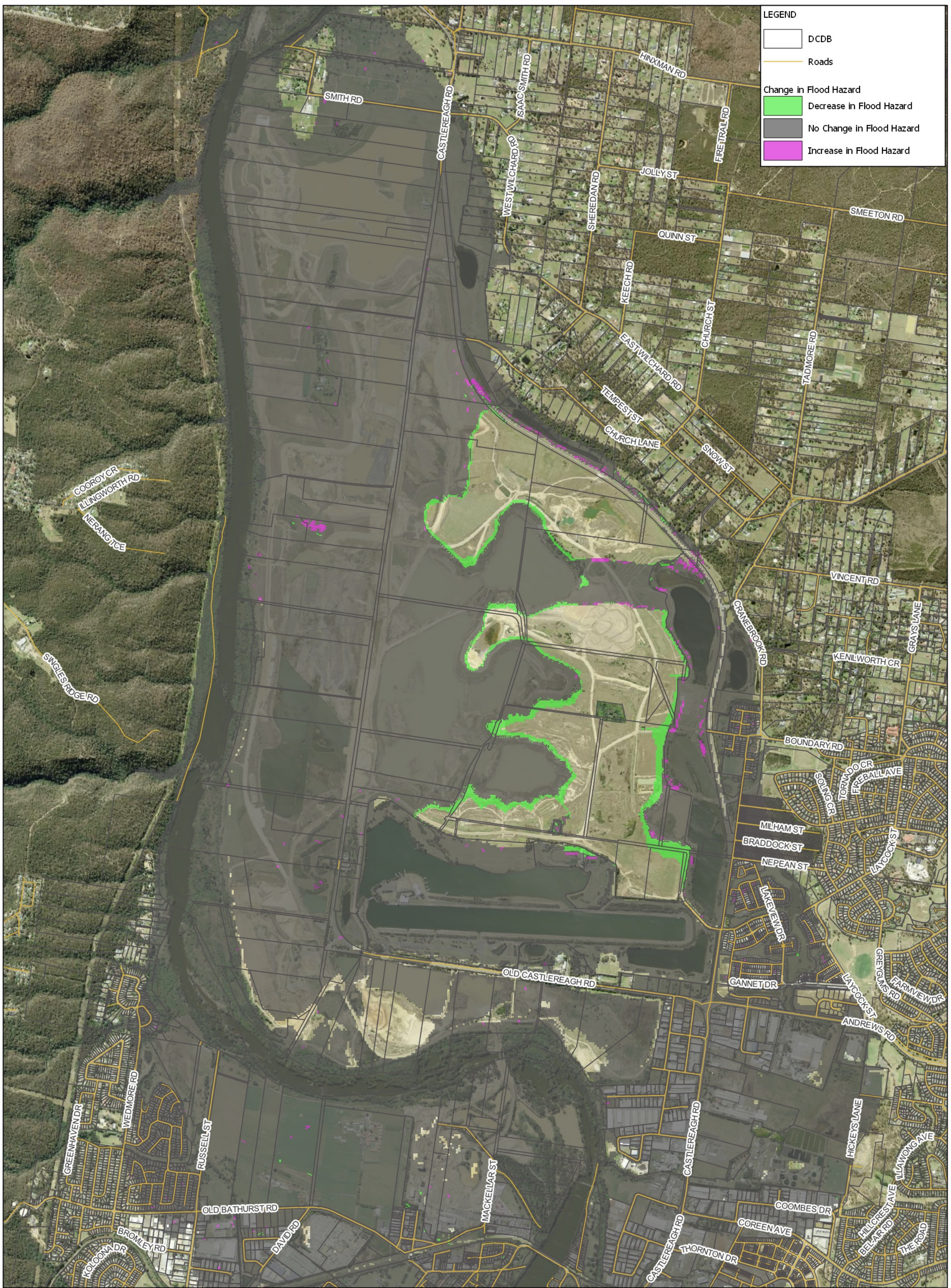
LEGEND

DCDB

Roads

Change in Flood Hazard

- Decrease in Flood Hazard
- No Change in Flood Hazard
- Increase in Flood Hazard



LEGEND

DCDB

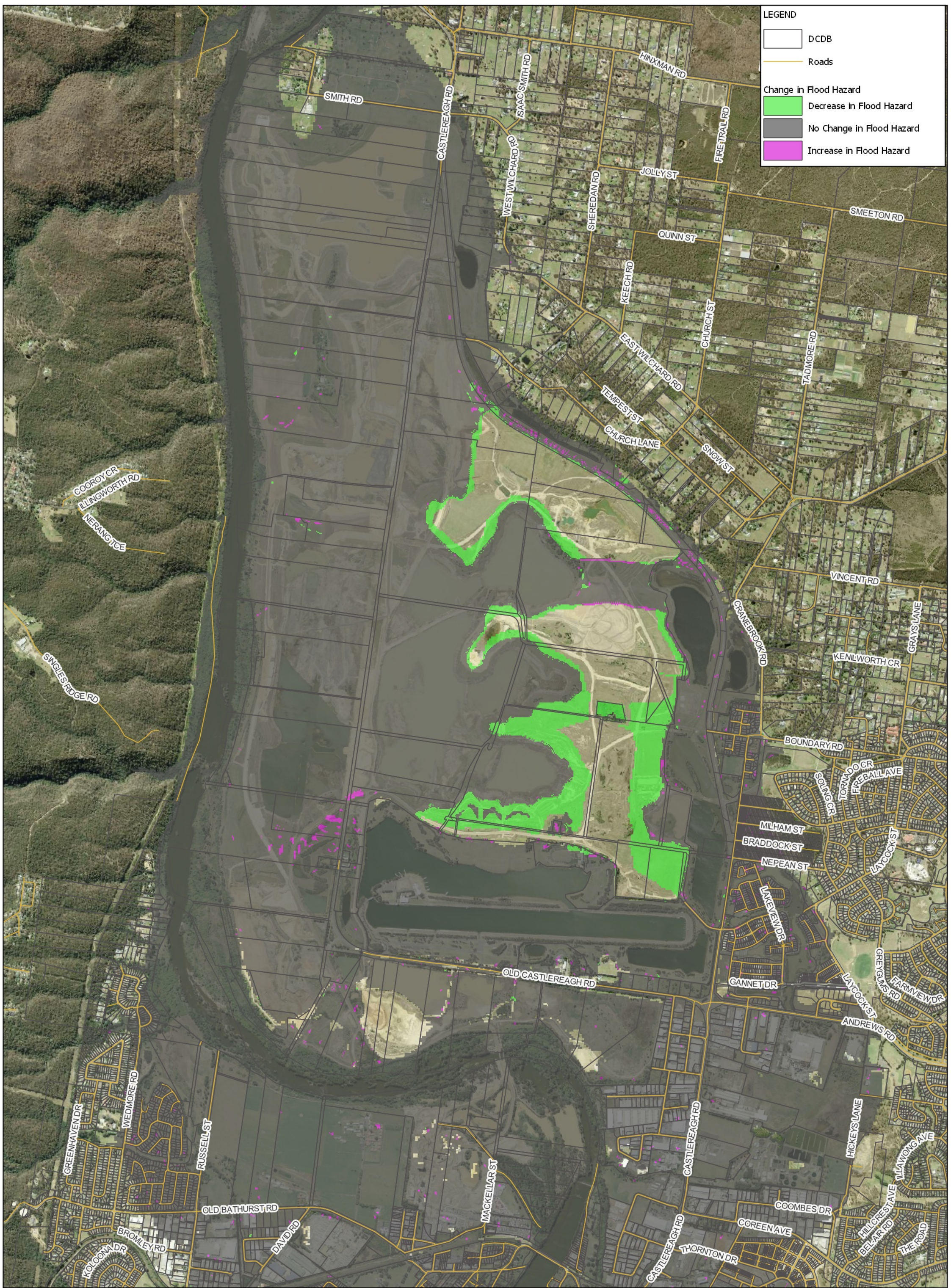
Roads

Change in Flood Hazard

Decrease in Flood Hazard

No Change in Flood Hazard

Increase in Flood Hazard



LEGEND

DCDB

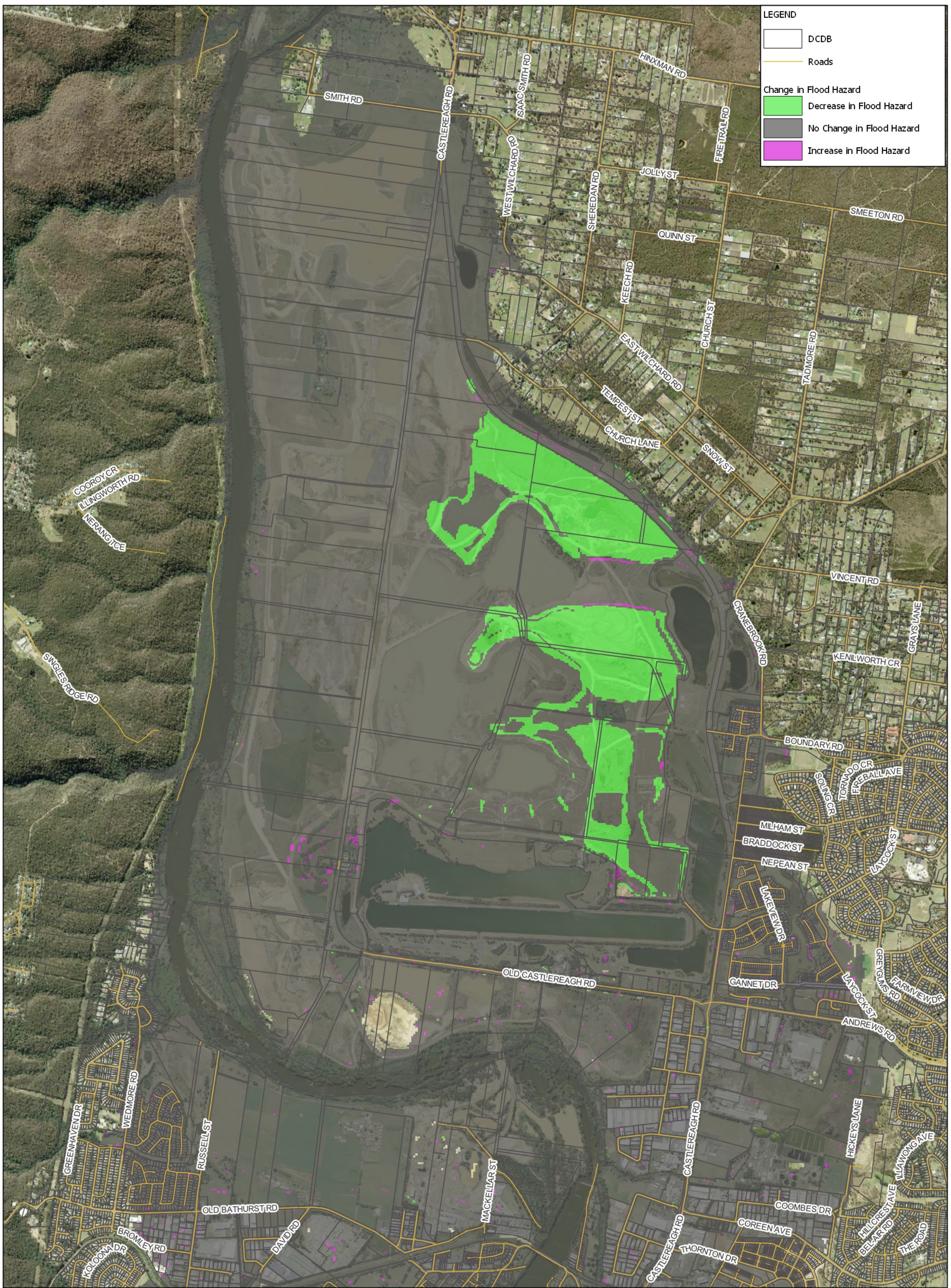
Roads

Change in Flood Hazard

Decrease in Flood Hazard

No Change in Flood Hazard

Increase in Flood Hazard



LEGEND

DCDB

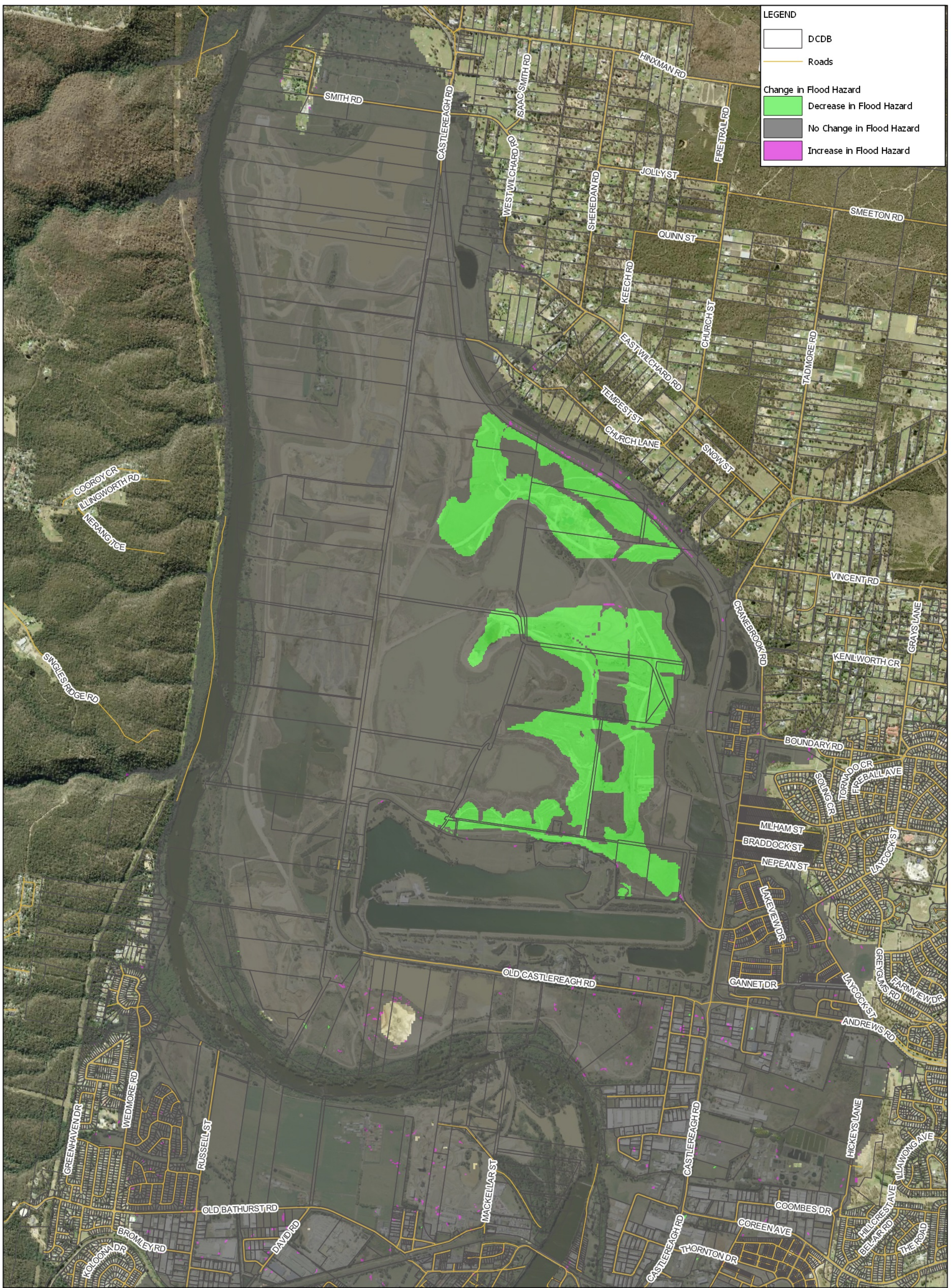
Roads

Change in Flood Hazard

Decrease in Flood Hazard

No Change in Flood Hazard

Increase in Flood Hazard



LEGEND

DCDB

Roads

Change in Flood Hazard

Decrease in Flood Hazard

No Change in Flood Hazard

Increase in Flood Hazard



LEGEND

DCDB

Roads

Change in Flood Hazard

Decrease in Flood Hazard

No Change in Flood Hazard

Increase in Flood Hazard