# Graphinex – Esmeralda Graphite Project Environmental Impact Statement

## Appendix K – Surface Water Impact Assessment

GRAPHINEX

ENGENY

# QLD AUS GRAPHITE PTY LTD

## Esmeralda Graphite Project

### Surface Water Impact Assessment

BNE01208_002-REP-002

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# CONTENTS


**1. Introduction** **1**

1.1 Project Description 1

1.2 Terms of Reference Requirements 4

**2. Receiving Environment** **13**

2.1 Catchment Overview 13

2.1.1 Regional Catchment 13

2.1.2 Local Catchment/s 13

2.2 Climate 16

2.3 Existing Waterways 17

2.3.1 Warrigal Creek and Borer River 17

2.3.2 Norman River 17

2.3.3 Unnamed Waterways 17

2.3.4 Streamflow Monitoring 17

2.4 Surface Water Quality 20

2.5 Water Use 25

2.5.1 Water Sharing 25

2.5.2 Existing Surface Water Entitlements 26

2.6 Wetlands 28

2.7 Land use 31

2.7.1 Agriculture 31

2.7.2 Nearby Mines and Industry 33

**3. Environmental Values and Water Quality Objectives** **34**

3.1 Relevant Legislation 34

3.1.1 Environmental Protection Act 1994 (EP Act) 34

3.1.2 Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) 34

3.1.3 Environmental Protection Regulation (EP Regulation) 2019 34

3.1.4 Environmental Protection (Water and Wetland Biodiversity) 2019 34

3.1.5 Water Act 2000 34

3.1.6 Water Plan (Gulf) 2007 34

3.1.7 Gulf Resource Operations Plan 2010 35

3.1.8 Water Plan (Great Artesian Basin and Other Regional Aquifers) 2017 35

3.1.9 Great Artesian Basin and Other Regional Aquifers Water Management Protocol 2017 35

3.2 Environmental Values 35

3.2.1 Aquatic Ecosystem 36

3.2.2 Aquaculture and Human Consumption 36

3.2.3 Crop Irrigation 36

3.2.4 Agriculture 36

3.2.5 Recreational Uses 36

3.2.6 Drinking Water 37

3.2.7 Industrial Use 37

3.2.8 Visual Recreation 37

3.2.9 Cultural and Spiritual Values 37

3.3 Water Quality Objectives and Environmental Objectives 37
3.3.1 Draft Water Quality Objectives 37
3.3.2 Environmental Flow Objectives 42
3.3.3 Environmental Objectives and Performance Outcomes 42
**4. Contaminant Sources 43**
4.1 Potential Contaminant Sources 43
4.1.1 Surface Runoff from Disturbed Areas 43
4.1.2 Processing 43
4.1.3 Chemical and Hydrocarbon Storage 44
4.1.4 Seepage, Overtopping and Failure of Storages 44
4.1.5 Waste Rock Material Runoff and Seepage 44
4.1.6 Groundwater 45
4.2 Contaminants of Concern 45
**5. Water Management System 47**
5.1 Objectives 47
5.2 Surface Water Categories 47
5.3 Water Management System 47
5.3.1 Proposed Water Management Strategy Overview 47
5.3.2 Mine Water Storages 57
5.3.3 Sediment Storages 59
5.3.4 Raw Water System 61
5.3.5 Tailings Storage Facilities 61
5.3.6 Clean Water Management 61
5.3.7 Flood Protection Levee 62
5.3.8 Watercourse Diversions 63
5.4 Water Demands 63
5.4.1 Construction Water Demands 64
5.4.2 Process Plant Water Demand 64
5.4.3 Dust Suppression Water Demands 65
5.4.4 Potable Water Demands 66
**6. Water Balance Model 67**
6.1 Operational Water Balance Model 67
6.1.1 Climate Inputs 68
6.1.2 Catchment Runoff 68
6.1.3 Catchment Areas 70
6.1.4 Groundwater 70
6.1.5 Water Storage Seepage Losses 71
6.1.6 Starting Conditions 71
6.1.7 Simulation Details 71
6.1.8 Water Management System Performance 71
6.1.9 Site Water Inventory 73
6.1.10 Mine Water Dams Containment 74
6.1.11 Sedimentation Pond Overflows 74
6.2 Climate Change Sensitivity Assessment 75
6.2.1 Climate Change Sensitivity Results 76

**7. Regional Flood Assessment** **78**

7.1 Overview 78

7.2 Flooding History 80

7.2.1 Stream Gauging Data 80

7.2.2 Recorded Rainfall 80

7.2.3 Satellite Imagery 81

7.3 Hydrology 85

7.3.1 Overview 85

7.3.2 Catchment Delineation 85

7.3.3 Design Rainfall 85

7.4 Hydraulic Modelling 88

7.4.1 Overview 88

7.4.2 Modelling Software 88

7.4.3 Model Development 88

7.5 Validation 92

7.6 Flood Model Simulation and Results 93

7.6.1 Breakout Flow Analysis 96

7.7 Mine Developed Case Scenarios 98

7.8 Operational Phase Flood Impacts 98

7.9 Flood Risks for Project Infrastructure 101

7.9.1 Sedimentation Pond 3 Flood Interactions 101

7.9.2 Sedimentation Pond 4 Flood Interactions 101

7.9.3 Topsoil Stockpile Flood Interactions 102

7.9.4 TSF Flood Interactions 102

7.10 Closure Flood Impacts 102

7.11 Climate Change Sensitivity 108

7.12 Detailed Operational Flooding Interactions 113

**8. Surface Water Impact Assessment** **116**

8.1 Streamflow Impacts to Local and Regional Waterways 117

8.2 Mine Water Dam Overflows 118

8.2.1 Mine Affected Water Quality 118

8.3 Sediment Dam Overflows 118

8.3.1 Sediment Dam Overflow Water Quality 120

8.4 Flooding 120

8.4.1 Project Impacts on Flooding 120

8.4.2 Flood Risks to Project Infrastructure 121

8.4.3 Risk of Levee Overtopping or Failure 122

8.5 Seepage 122

8.5.1 Waste Rock Dump Seepage 122

8.5.2 Seepage from Storages 123

8.6 Cumulative Impacts 123

8.7 Climate Change Impacts 123

8.7.1 Operational Water Balance and Containment 123

8.7.2 Flooding 124

**9. Regulated Structures** **125**

9.1 Preliminary assessment of failure modes 126

9.1.1 Dam Break 126
9.1.2 Failure to Contain Overtopping 126
9.1.3 Failure to Contain Seepage 127
9.2 Preliminary Consequence Category Assessment 127
9.3 Tailings Storage Facilities 129
9.4 Flood Protection Levee 129
9.5 Preliminary Consequence Category Assessment Summary 130
**10. Mitigation and Management Measures 131**
10.1 Water Balance Model Update and Review Program 133
10.2 Water Quality Management and Monitoring 134
10.2.1 Surface Water Monitoring 134
10.3 Water Management Plan 138
10.4 Erosion and Sediment Control Plan 139
10.5 Receiving Environment Monitoring Program 139
**11. Qualifications 140**
**12. References 141**
**Appendix A: Existing Flood Results 142**
**Appendix B: Operational Phase Flood Results 161**
**Appendix C: Operational Phase Flood Impact Results 180**
**Appendix D: Existing Case and Closure Phase Climate Change Flood Results 199**
**Appendix E: Climate Change Sensitivity Flood Maps 216**

## Tables

Table 1.1: Terms of Reference Content Requirements Relating to Surface Water ..... 5
Table 2.1: Waterways in the Vicinity of the project area ..... 13
Table 2.2: Nearby Rainfall Gauging Stations ..... 16
Table 2.3 Streamflow Gauges within Norman RIVER CATCHMENT ..... 18
Table 2.4: Surface Water Quality Monitoring Results ..... 22
Table 2.5 Details of Existing Surface Water Licences ..... 26
Table 2.6: Nearby Mines ..... 33
Table 3.1: Draft Surface Water Quality Objectives ..... 39
Table 3.2: EP Regulation Environmental Objectives and Performance Outcomes ..... 42
Table 4.1: Potential Contaminants in Groundwater ..... 45
Table 4.2: Contaminants of Concern ..... 45
Table 5.1: Mine Affected Water Storages ..... 57
Table 5.2: Sediment Dam Details ..... 60
Table 5.3: Raw Water Dam Details ..... 61
Table 5.4: Project Schedule ..... 64
Table 5.5: Project Net Water Demand Calculation ..... 65
Table 6.1: Water Management System Operation of Storages ..... 67
Table 6.2: Monthly Average Climate Data ..... 68
Table 6.3: AWBM Parameters ..... 69
Table 6.4: Total Site Storage Catchment Area by Landuse and Mining Stage (hectares) ..... 70
Table 6.5: Average Annual Water Balance (ML/year) ..... 72
Table 6.6: Sediment Dam Overflow Probability ..... 75

Table 6.7: Climate change Sensitvity - model parameters ..... 76
Table 6.8: Climate change Sensitivity - Overflow risk ..... 77
Table 7.1: Stream Flow Gauging Data for the January/February Flood Event ..... 80
Table 7.2: Design Point Rainfall Depths ..... 85
Table 7.3: Climate Change Scaling Factors ..... 86
Table 7.4: PMP Estimates ..... 87
Table 7.5: TUFLOW Hydraulic Roughness Values ..... 89
Table 7.6: developed case scenarios ..... 98
Table 7.7: Sedimentation Pond 3 Flooding Interactions ..... 101
Table 7.8: Sedimentation pond 4 Flooding Interactions ..... 102
Table 8.1: Impact Pathway Diagram descriptions ..... 117
Table 9.1: Consequence Category Assessment Criteria (Table 1 of Manual) (DETSI, 2025) ..... 125
Table 9.2: Preliminary Consequence Category Assessment Outcomes and Determination ..... 128
Table 9.3: Preliminary Consequence Category Assessment Summary ..... 130
Table 10.1: Management and Mitigation Strategies ..... 131
Table 10.2: Proposed Surface Water Monitoring Locations ..... 135
Table 10.3: Proposed Surface Water Monitoring Parameters ..... 137

## Figures

Figure 1.1: Project Locality ..... 2
Figure 1.2: Proposed Project Conceptual Layout ..... 3
Figure 2.1: Regional Context ..... 14
Figure 2.2: Regional Catchments ..... 15
Figure 2.3: Monthly Rainfall and Evaporation (Range and Mean) ..... 16
Figure 2.4: Norman River Flow Duration Curve (Streamflow Gauge 916001B) ..... 18
Figure 2.5: Streamflow Gauging Stations ..... 19
Figure 2.6: Surface Water Quality Monitoring Locations ..... 21
Figure 2.7: Norman River Basin, within the greater Gulf drainage region (Water Plan (Gulf) 2007) (Queensland Government, 2007) ..... 25
Figure 2.8: Location of Existing Norman River Water Licence ..... 27
Figure 2.9: Wetlands of Ecological Significance ..... 29
Figure 2.10: Vegetation Management Wetlands ..... 30
Figure 2.11: Agricultural Land Audit Mapping ..... 32
Figure 5.1: Water Management System Schematic ..... 48
Figure 5.2: Year 2 Water Management Infrastructure ..... 49
Figure 5.3: Year 10 Water Management Infrastructure ..... 50
Figure 5.4: Year 15 Water Management Infrastructure ..... 51
Figure 5.5: Year 20 Water Management Infrastructure ..... 52
Figure 5.6: Year 30 Water Management Infrastructure ..... 53
Figure 5.7: Year 42 Water Management Infrastructure ..... 54
Figure 5.8: Year 50 Water Management Infrastructure ..... 55
Figure 5.9: Year 54 Water Management Infrastructure ..... 56
Figure 5.10: Process Water Dam Typical Section ..... 58
Figure 5.11: Sediment Dam Typical Section ..... 60
Figure 5.12: Central Clean Water Drain and Bund Typical Section ..... 62
Figure 5.13: Levee Typical Section ..... 63
Figure 5.14: Dust Suppression Water Demand ..... 66

Figure 6.1: AWBM Schematic ..... 69
Figure 6.2: Groundwater Inflows to Mining Pit ..... 71
Figure 6.3: Average Annual Inflow/Outflow – Year 15 ..... 72
Figure 6.4: Total Site Inventory Results ..... 73
Figure 6.5: Mine Water Storage Inventory Results ..... 74
Figure 6.6: Modelled Sediment Dam Annual Overflow Volumes ..... 75
Figure 6.7: Median Total Inventory – Climate Change Sensitivity ..... 76
Figure 7.1: Floodplain Topography Adjacent the Project ..... 79
Figure 7.2: Stream Gauge Data ..... 80
Figure 7.3: Time Distribution of Rainfall – January/February 2019 Rainfall Event ..... 81
Figure 7.4: Satellite Imagery (8th January 2026) ..... 82
Figure 7.5: Satellite Imagery (12th January 2026) ..... 83
Figure 7.6: Satellite Imagery (13th February 2009) ..... 84
Figure 7.7: Hydraulic Model Configuration ..... 90
Figure 7.8: Hydraulic Roughness Mapping ..... 91
Figure 7.9: Validation Result – Fog Creek (540 km²) ..... 92
Figure 7.10: Validation Result – Upstream Yappar River Catchment (680 km²) ..... 93
Figure 7.11: 0.1% AEP Flood Model Results – Existing Case ..... 94
Figure 7.12: Probable Maximum Flood Model Results – Existing Case ..... 95
Figure 7.13: Breakout Flow Hydrographs - 1% AEP ..... 96
Figure 7.14: Breakout Flow Mapping 1% AEP ..... 97
Figure 7.15: 1% AEP Flood Afflux for the Operational Phase ..... 99
Figure 7.16: Change in 1% AEP Peak Flood Velocity for the Operational Phase ..... 100
Figure 7.17: 1% AEP Flood Afflux for the Closure Phase (SSP2-4.5 2090) ..... 104
Figure 7.18: Change in 1% AEP Peak Flood Velocity for the Closure Phase (SSP2-4.5 2090) ..... 105
Figure 7.19: 1% AEP Flood Afflux for the Closure Phase (SSP5-8.5 2090) ..... 106
Figure 7.20: Change in 1% AEP Peak Flood Velocity for the Closure Phase (SSP5-8.5 2090) ..... 107
Figure 7.21: 1% AEP Flood Afflux - Climate Change Sensitivity (SSP2-4.5 2090) ..... 109
Figure 7.22: Change in 1% AEP Peak Flood Velocity - Climate Change Sensitivity (SSP2-4.5 2090) ..... 110
Figure 7.23: 1% AEP Flood Afflux - Climate Change Sensitivity (SSP5-8.5 2090) ..... 111
Figure 7.24: Change in 1% AEP Peak Flood Velocity - Climate Change Sensitivity (SSP5-8.5 2090) ..... 112
Figure 7.25: Detailed Operational Flooding Interactions – 0.1% AEP Depth ..... 114
Figure 7.26: Detailed Operational Flooding Interactions – 0.1% AEP Velocity ..... 115
Figure 8.1: Conceptualised Surface Water Impact Pathway Diagram ..... 116
Figure 8.2: Sediment Dam Overflow Pathway ..... 119
Figure 10.1: Proposed Surface Water Monitoring Locations ..... 136
Figure A.1: Existing Case 63.27% AEP Peak Flood Depth Map ..... 143
Figure A.2: Existing Case 63.27% AEP Peak Flood Velocity Map ..... 144
Figure A.3: Existing Case 50% AEP Peak Flood Depth Map ..... 145
Figure A.4: Existing Case 50% AEP Peak Flood Velocity Map ..... 146
Figure A.5: Existing Case 20% AEP Peak Flood Depth Map ..... 147
Figure A.6: Existing Case 20% AEP Peak Flood Velocity Map ..... 148
Figure A.7: Existing Case 10% AEP Peak Flood Depth Map ..... 149
Figure A.8: Existing Case 10% AEP Peak Flood Velocity Map ..... 150
Figure A.9: Existing Case 5% AEP Peak Flood Depth Map ..... 151
Figure A.10: Existing Case 5% AEP Peak Flood Velocity Map ..... 152
Figure A.11: Existing Case 2% AEP Peak Flood Depth Map ..... 153

Figure A.12: Existing Case 2% AEP Peak Flood Velocity Map ..... 154
Figure A.13: Existing Case 1% AEP Peak Flood Depth Map ..... 155
Figure A.14: Existing Case 1% AEP Peak Flood Velocity Map ..... 156
Figure A.15: Existing Case 0.1% AEP Peak Flood Depth Map ..... 157
Figure A.16: Existing Case 0.1% AEP Peak Flood Velocity Map ..... 158
Figure A.17: Existing Case PMF Peak Flood Depth Map ..... 159
Figure A.18: Existing Case PMF Peak Flood Velocity Map ..... 160
Figure B.1: Operational Phase 63.2% AEP Flood Depth Map ..... 162
Figure B.2: Operational Phase 63.2% AEP Flood Velocity Map ..... 163
Figure B.3: Operational Phase 50% AEP Flood Depth Map ..... 164
Figure B.4: Operational Phase 50% AEP Flood Velocity Map ..... 165
Figure B.5: Operational Phase 20% AEP Flood Depth Map ..... 166
Figure B.6: Operational Phase 20% AEP Flood Velocity Map ..... 167
Figure B.7: Operational Phase 10% AEP Flood Depth Map ..... 168
Figure B.8: Operational Phase 10% AEP Flood Velocity Map ..... 169
Figure B.9: Operational Phase 5% AEP Flood Depth Map ..... 170
Figure B.10: Operational Phase 5% AEP Flood Velocity Map ..... 171
Figure B.11: Operational Phase 2% AEP Flood Depth Map ..... 172
Figure B.12: Operational Phase 2% AEP Flood Velocity Map ..... 173
Figure B.13: Operational Phase 1% AEP Flood Depth Map ..... 174
Figure B.14: Operational Phase 1% AEP Flood Velocity Map ..... 175
Figure B.15: Operational Phase 0.1% AEP Flood Depth Map ..... 176
Figure B.16: Operational Phase 0.1% AEP Flood Velocity Map ..... 177
Figure B.17: Operational Phase PMP Flood Depth Map ..... 178
Figure B.18: Operational Phase PMP Flood Velocity Map ..... 179
Figure C.1: Operational Phase 63.2% AEP Depth Afflux Map ..... 181
Figure C.2: Operational Phase 63.2% AEP Change in Velocity Map ..... 182
Figure C.3: Operational Phase 50% AEP Depth Afflux Map ..... 183
Figure C.4: Operational Phase 50 % AEP Change in Velocity Map ..... 184
Figure C.5: Operational Phase 20% AEP Depth Afflux Map ..... 185
Figure C.6: Operational Phase 20 % AEP Change in Velocity Map ..... 186
Figure C.7: Operational Phase 10 % AEP Depth Afflux Map ..... 187
Figure C.8: Operational Phase 10% AEP Change in Velocity Map ..... 188
Figure C.9: Operational Phase 5% AEP Depth Afflux Map ..... 189
Figure C.10: Operational Phase 5% AEP Change in Velocity Map ..... 190
Figure C.11: Operational Phase 2% AEP Depth Afflux Map ..... 191
Figure C.12: Operational Phase 2% AEP Change in Velocity Map ..... 192
Figure C.13: Operational Phase 1% AEP Depth Afflux Map ..... 193
Figure C.14: Operational Phase 1% AEP Change in Velocity Map ..... 194
Figure C.15: Operational Phase 0.1% AEP Depth Afflux Map ..... 195
Figure C.16: Operational Phase 0.1% AEP Change in Velocity Map ..... 196
Figure C.17: Operational Phase PMP Depth Afflux Map ..... 197
Figure C.18: Operational Phase PMP Change in Velocity ..... 198
Figure D.1: Existing Case Climate Change Scenario (SSP2-4.5 year 2090) 1% AEP Depth Map ..... 200
Figure D.2: Existing Case Climate Change Scenario (SSP2-4.5 year 2090) 1% AEP Velocity Map ..... 201
Figure D.3: Existing Case Climate Change Scenario (SSP5-8.5 year 2090) 1% AEP Depth Map ..... 202
Figure D.4: Existing Case Climate Change Scenario (SSP5-8.5 year 2090) 1% AEP Velocity Map ..... 203

Figure D.5: Existing Case Climate Change Scenario (SSP2-4.5 year 2090) 0.1% AEP Depth Map ..... 204
Figure D.6: Existing Case Climate Change Scenario (SSP2-4.5 year 2090) 0.1% AEP Velocity Map ..... 205
Figure D.7: Existing Case Climate Change Scenario (SSP5-8.5 year 2090) 0.1% AEP Depth Map ..... 206
Figure D.8: Existing Case Climate Change Scenario (SSP5-8.5 Year 2090) 0.1% AEP Velocity Map ..... 207
Figure D.9: Closure Phase with Climate Change (SSP2-4.5 year 2090) 1% AEP Depth Map ..... 208
Figure D.10: Closure Phase with Climate Change (SSP2-4.5 year 2090) 1% AEP Velocity Map ..... 209
Figure D.11: Closure Phase with Climate Change (SSP5-8.5 year 2090) 1% AEP Depth Map ..... 210
Figure D.12: Closure Phase with Climate Change (SSP5-8.5 year 2090) 1% AEP Velocity Map ..... 211
Figure D.13: Closure Phase with Climate Change (SSP2-4.5 year 2090) 0.1% AEP Depth Map ..... 212
Figure D.14: Closure Phase with Climate Change (SSP2-4.5 year 2090) 0.1% AEP Velocity Map ..... 213
Figure D.15: Closure Phase with Climate Change (SSP5-8.5 year 2090) 0.1% AEP Depth Map ..... 214
Figure D.16: Closure Phase with Climate Change (SSP5-8.5 year 2090) 0.1% AEP Velocity Map ..... 215
Figure E.1: Closure Phase with climate change (SSP2-4.5 Year 2090) 1% AEP Depth Afflux Map ..... 217
Figure E.2: Closure Phase with climate change (SSP2-4.5 Year 2090) 1% AEP Change in Velocity Map ..... 218
Figure E.3: Closure Phase with climate change (SSP5-8.5 Year 2090) 1% AEP Depth Afflux Map ..... 219
Figure E.4: Closure Phase with climate change (SSP5-8.5 Year 2090) 1% AEP Change in Velocity Map ..... 220
Figure E.5: Closure Phase with climate change (SSP2-4.5 Year 2090) 0.1% AEP Depth Afflux Map ..... 221
Figure E.6: Closure Phase with climate change (SSP2-4.5 Year 2090) 0.1% AEP Change in Velocity Map ..... 222
Figure E.7: Closure Phase with climate change (SSP5-8.5 Year 2090) 0.1% AEP Depth Afflux Map ..... 223
Figure E.8: Closure Phase with climate change (SSP5-8.5 Year 2090) 0.1% AEP Change in Velocity Map ..... 224

# 1. INTRODUCTION

This document has been prepared for Qld Aus Graphite Pty Ltd (Graphinex), to support the environmental impact statement (EIS) for the Esmeralda Graphite Project (the Project). This report provides an assessment of surface water interactions and potential impacts associated with the Project in accordance with the terms of reference (TOR) for the EIS (DSDIP, 2025) issued by the Department of State Development, Infrastructure and Planning (DSDIP).

## 1.1 Project Description

The Project is located approximately 70 km south of Croydon, Queensland, Australia as shown in Figure 1.1. The Project proposes mining of the Esmeralda Granite Unit and on-site concentration of graphite ore. Key activities within the scope of the Project include:

- construction, operation and rehabilitation of an open cut graphite mine within Mining Lease Application (MLA) 100431 and MLA 100430;
- mineral processing of ore to produce a graphite concentrate, within MLA 100431;
- haul road construction and transport of concentrate along a private road within MLA 100431, to an intersection with the public road network at Esmeralda Prospect Road; and
- transport of graphite concentrate using road trains on the public road network to the Port of Townsville for export.

The proposed open cut mining operation will mine up to 3.5 million tonnes per annum (Mtpa) of Run-of-Mine (ROM) ore. A total of approximately 170 Mt graphite ore will be mined over the operational life of the Project.

The proposed life-of-mine (LOM) is approximately 65 years, including construction (2 years), operation (53 years), and final rehabilitation (10 years). The resource base consists of a granite hosted ore body of approximately 150 meters thickness, located beneath approximately 70 to 100 metres of weathered sedimentary overburden. Ore will be mined to an approximate maximum depth of 250 m below ground level. Extracted ROM ore will be hauled to the mineral processing plant for stockpiling and processing via conventional floatation methods.

Excavated waste rock will be deposited in out-of-pit waste dumps located adjacent to the mining void. The majority of waste rock excavation will occur within the first 18 years of the mine life, with a total of 188.05 Mt estimated to be extracted over the operational life of the Project.

Low-grade ore will be stockpiled separately for processing later in the mine life, as ore reserves begin to deplete in the pit. Processing of low-grade stockpiles will continue post-mining, economically supporting the backfilling and rehabilitation of the mining void.

Graphite concentrate from the processing plant will be trucked via road train on a dedicated haul road within MLA 100431. The 23 km haul road will connect to Esmeralda Prospect Road, south-east of the mine. B-double trucks will then continue from the Project, south to Richmond and then east on the Flinders Highway to Townsville for distribution to market via the Port of Townsville.

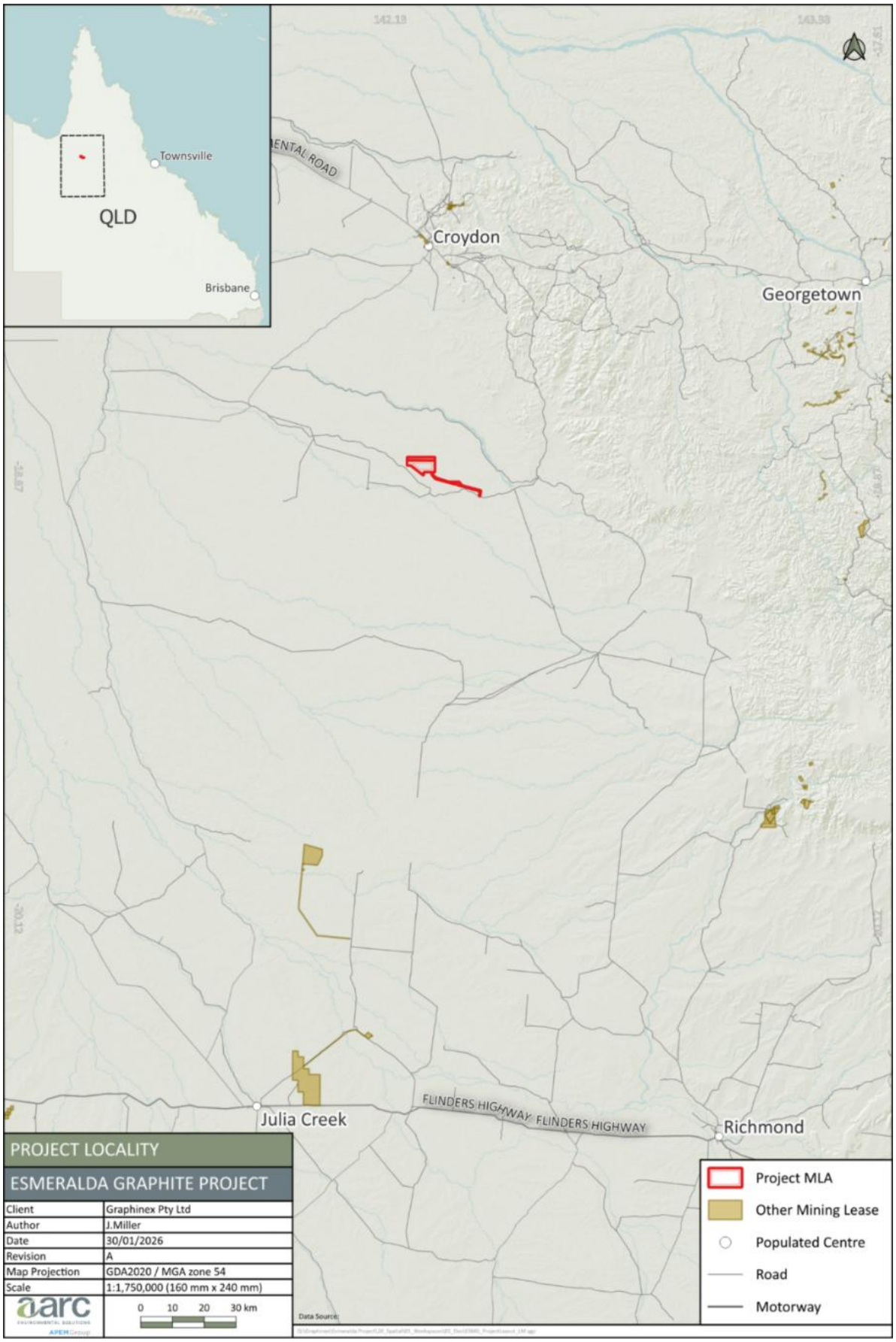



**Figure 1.1: Project Locality**

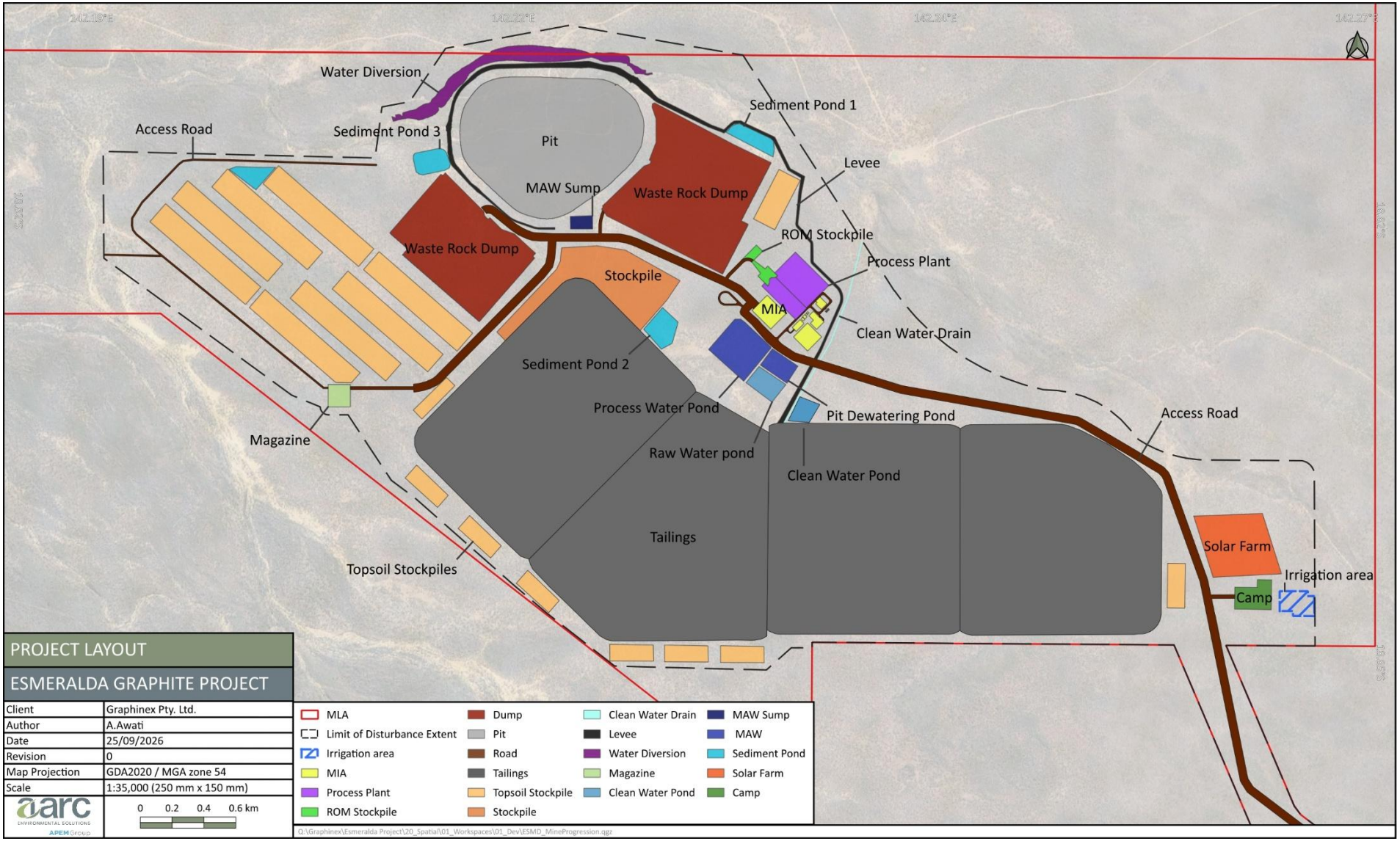



**Figure 1.2: Proposed Project Conceptual Layout**

## 1.2 Terms of Reference Requirements

The TOR sets the scope of critical matters that should be given detailed treatment in the EIS. Fifteen (15) specific matters have been identified for the Project, four (4) of which have content requirements relating to surface water, including

- Water Resources.
- Water Quality.
- Hazards, health and safety - Flooding and Regulated Dams.
- Cumulative Impacts.

Table 1.1 lists the content requirements from the TOR relating to surface water and references where the requirements have been met in this report or other technical assessment reports for the EIS.

**TABLE 1.1: TERMS OF REFERENCE CONTENT REQUIREMENTS RELATING TO SURFACE WATER**

| Specific Matter | Content Requirement | Reference |
|---|---|---|
| Water Resources | **Existing Environment** | |
| | 14.2. Describe the legislative context for water resources in the project footprint and surrounding area, including the Water Act 2000, provisions (e.g. outcomes, strategies and objectives) of the relevant water plan(s), water management protocols and other relevant water planning instruments relevant to the project. | Section 3.1 |
| | 14.3. Describe, map and illustrate water features within the existing surface water environment in the project footprint, surrounding area and potential impact area including:<br>a) natural, modified, ephemeral and perennial waterways, watercourses,35 drainage features, lakes (including waterholes, lagoons, wetlands and swamps) and springs<br>b) drainage patterns, catchments, stream order, sediment processes and geomorphology<br>c) hydrology and streamflow characteristics, including the frequency, duration and magnitude of flow events, and seasonal variations (supported by site-specific hydrological modelling)<br>d) flooding and overland flow patterns, including flood-prone or low-lying land within the project footprint<br>e) waterways providing for fish passage, and natural or artificial waterway barriers<br>f) alterations or interferences with the flow regime, including impoundments (dams, weirs, etc.) diversions, levees and stormwater management systems<br>g) groundwater-surface water interactions, including identification of waterways as gaining or losing streams, and potential for groundwater baseflow to other water features (e.g. wetlands)<br>h) current and potential surface water uses and users, including supported environmental values (e.g. aquatic ecosystem health), licenced and unlicenced abstraction (including location, purpose and volumes where relevant) their existing condition and the streamflow required to support uses and users<br>i) the significance of water features within the local and regional surface water environment<br>j) the sensitivity of the surface water environment to change, particularly within the context of project-related changes. | Section 2 |
| | 14.4. Describe, map and illustrate the existing groundwater environment within the project footprint, surrounding area and potential impact area, including for each relevant groundwater formation:<br>a) its nature, type, geology/lithology, stratigraphy, thickness and depth<br>b) its hydraulic properties, vertical and horizontal connectivity (including inter-aquifer connectivity, groundwater-surface water interaction and barriers to flow) and the effects of geological structures (e.g. faults and dykes)<br>c) hydrostratigraphical characteristics including groundwater flow, recharge and discharge, current and historical groundwater levels (supported by hydrographs), seasonal variations and other trends, contours and flow directions<br>d) current and potential groundwater uses and users, including supported environmental values (e.g. GDEs, water supply bores, etc.), authorised (licenced and unlicenced) abstraction (including purpose and volumes where relevant), location and source of existing groundwater supply facilities (e.g. bores or wells) and the groundwater levels required to support uses and users<br>e) its significance within the local and regional environment<br>f) its sensitivity to change, particularly within the context of project-related impacts. | Groundwater Assessment (Hydrogeologist.com.au, 2026) |
| | 14.5. Develop an ecohydrological conceptual model using illustrations, maps and cross-sections that represents the groundwater and surface water components and how they interact with ecological and human uses and users within the project footprint, surrounding area and potential impact area in consideration of the Information Guidelines Explanatory Note – Using impact pathway diagrams based on ecohydrological conceptualisation in environmental impact assessment. | Section 1137.12 and the Groundwater Assessment |

| Specific Matter | Content Requirement | Reference |
|---|---|---|
| | | (Hydrogeologist.com.au, 2026) |
| | 14.6. Describe investigation and monitoring programs to support characterisation of the existing water environment (including sediment), and demonstrate that it is supported by sufficiently robust site-specific data, and is in accordance with relevant guidelines and best practice by:<br>a) justifying the number and spatial extent of monitoring locations (including reference locations), relevant to the existing environment and proposed project activities or infrastructure<br>b) justifying the frequency and duration of monitoring periods<br>c) providing monitoring bore stratigraphy and drilling logs<br>d) describing monitoring and sampling methods and equipment<br>e) describing any limitations of the monitoring network or dataset (e.g. reliance on third party access) and how and when these limitations will be addressed<br>f) justifying the representativeness and suitability of the monitoring network to characterise the existing environment, establish baseline conditions (including natural variations) and monitor project-related impacts. | Sections 2.4, 10.2 and the Groundwater Assessment (Hydrogeologist.com.au, 2026) |
| | **Impact Assessment and Mitigation Measures** | |
| | 14.7. Identify the location of all project activities, disturbance footprint and infrastructure in relation to the existing water environment. | Section 5.3 |
| | 14.8. Describe and map project water management infrastructure including water storages, regulated structures, inundation areas, drains, diversions, levees, water treatment plant, water pipelines, irrigation areas, discharge points and monitoring points. Provide the flow rate and dimensions of water flow diversions and the dimensions and volumes of impoundments. | Section 5.3 and the functional design report for the watercourse diversion (Engeny, 2026). |
| | 14.9. Describe the project's water supply requirements for each stage of the project. Identify and evaluate all water supply options for the project, including any options available under the relevant water plan. Detail the source(s)/location(s), type(s) (e.g. potable, raw), volumes required, storage locations, security, availability and quality of supply, expected rates of usage and water treatment requirements. | Section 5.4 and 6.1.8 |
| | 14.10. Describe any temporary or permanent watercourse diversion and include scaled plans and cross-sections of the proposed diversion. Demonstrate how the proposed functional design of any diversion would address the key principles and achieve each of the outcomes of Works that interfere with water in a watercourse for a resource activity—watercourse diversions authorised under the Water Act 2000 in sufficient detail to facilitate assessment.38 | Section 5.3.8 and the functional design report for the watercourse diversion (Engeny, 2026) |
| | 14.11. Describe the project's direct and indirect water take/interference, including groundwater dewatering, and alteration of drainage characteristics (e.g. diversion or interception of waterways or overland flow) to facilitate project water management. | Section 5.3 and the Groundwater Assessment (Hydrogeologist.com.au, 2026) |
| | 14.12. Provide a detailed water balance for the project across all project stages. Include groundwater collected during dewatering, and management of incident rainfall on disturbed areas such as spoil piles. Quantify the water balance analysis including evaporative and seepage losses from relevant infrastructure. Identify | Section 6.1.8 |

| Specific Matter | Content Requirement | Reference |
|---|---|---|
| | quantities of water the project will require to release and any proposed measures to reduce the volume of water to be released (suitability and quantities used for dust suppression, irrigation, evaporation, etc.). | |
| | 14.13. Describe and map any waterway barrier works that may interfere with fish passage. Include any upstream inundation areas caused by project infrastructure; and impacts to downstream flow regimes that may impact fisheries resources that are reliant on environmental flows. Measure and document the main channel and bankfull widths of each impacted waterway at representative points throughout the impacted area. | Section 5.3.8 and Watercourse Diversion Functional Design Report (Engeny, 2026) |
| | 14.14. Describe and map any activities or disturbance in, or within 40 metres of, the bed and banks of a watercourse, lake or spring as defined by the Water Act. Describe, map and justify the extraction of materials obtained from the bed and banks of the watercourse, lake or spring. Describe any exemptions or approvals that may be required for these activities and provide the relevant information.39 | Main EIS Document |
| | 14.15. Describe the proposed water supply and direct and indirect water usage/interference, including the details and timing of relevant authorisations and approvals (e.g. allocations, licences, agreements, exemptions, unallocated water). Identify the water that is regulated under the relevant legislative instruments, and how it applies/does not apply to the project. Describe how the project, including proposed authorisations and approvals for all project stages (including post-closure), would address and satisfy the relevant criteria in the Water Act 2000 and the relevant water plan(s). | Main EIS Document |
| | 14.16. If seeking unallocated water as a water supply for the project, as either surface water under the Water Plan (Gulf) 2007 and/or groundwater under the Water Plan (Great Artesian Basin and Other Regional Aquifers) 2017, describe how the project meets the requirements for releasing strategic or state reserve unallocated water under the respective water plan, including:<br>a) eligibility requirements for accessing strategic or state reserve unallocated water<br>b) the availability of water in the plan area for the proposed purpose<br>c) the efficiency of existing and proposed water use practices<br>d) the impact of the proposed taking of water may have on existing authorisations in the plan area, as well as other known potential projects in the immediate and surrounding area<br>e) the availability of an alternative water supply for the purpose of which the water is required, including why alternatives are not suitable for the project<br>f) the impact the proposed taking and use of water may have on natural ecosystems and the environmental outcomes of the water plan<br>g) impact the proposed taking and use of water may have on cultural and spiritual values under the cultural outcomes of the plan. | Not Relevant, the Project is not seeking water supply under the Water Plan (Gulf). |
| | 14.17. Supported by hydrological modelling, prepare a detailed water balance for the project including for each stage of the project, considering temporary and long-term water requirements. Identify and assess the impacts of project activities, disturbance and infrastructure on surface water resources, existing or potential water users and uses, and relevant environmental values. Analyse and describe the significance of direct, indirect and cumulative impacts on water features, hydrology and flow characteristics, drainage patterns, sediment processes, geomorphology, groundwater-surface water interactions, and the environmental values supported by these features and characteristics (e.g. dry season refugia, recreation facilities). Analyse and describe the significance of impacts in the context of local and regional water resources, and with reference to provisions of the relevant water plan(s), water management protocols and other water planning instruments relevant to the project. | Section 6 |
| | 14.18. Develop a numerical groundwater model in accordance with the relevant guidelines that:<br>a) is consistent with the ecohydrological conceptual model<br>b) predicts project-only and cumulative groundwater changes to: | Groundwater Assessment (Hydrogeologist.com.au, 2026) |

| Specific Matter | Content Requirement | Reference |
|---|---|---|
| | I. groundwater drawdown or pressure changes in affected formations<br>II. groundwater flows, inter-aquifer connectivity, recharge and discharge<br>III. groundwater-surface water connectivity<br>IV. groundwater uses and users<br>c) simulates groundwater impacts for the life of project and post closure, with sufficient timeframe to assess long term impacts, evaporation losses from a residual void and potential plume behaviour and aquifers recovery<br>d) connects model outputs to groundwater monitoring design and defines adaptive management strategies (e.g. drawdown thresholds or contaminant concentrations)<br>e) is peer reviewed by an independent third-party specialist, and accompanied by a peer review report | |
| | 14.19. Supported by numerical groundwater modelling, identify and assess the impacts of project activities, disturbance and infrastructure on groundwater resources and environmental values. Analyse and describe the significance of direct and indirect impacts on aquifers and other relevant groundwater units, including groundwater levels and pressure, groundwater flows, inter-aquifer connectivity, recharge and discharge, groundwater-surface water connectivity, and the environmental values supported by these features and characteristics (e.g. GDEs, water supply bores, etc.). Analyse and describe the significance of impacts in the context of local and regional water resources, and with reference to provisions of the relevant water plan(s) and other relevant water planning instruments relevant to the project. | Groundwater Assessment (Hydrogeologist.com.au, 2026) |
| | 14.20. Provide an assessment against the relevant prescribed solution(s) for any area of regional interest impacted by the project, if relevant. | Groundwater Assessment (Hydrogeologist.com.au, 2026) |
| | **Mitigation Measures** | |
| | 14.21. Provide a project water management strategy (including site layout and conceptual plans) that details stormwater and wastewater management systems and structures including any significant diversion or interception of overland flow, capacity of onsite detention systems, details of water sensitive urban design measures, sediment basins, discharge locations, and measures to treat, reuse or dispose of water. Demonstrate that project water management systems have been designed to minimise the likelihood of uncontrolled discharges and avoid or minimise impacts to the receiving environment. | Section 6 and 10 |
| | 14.22. Describe proposed measures to avoid, minimise, mitigate or offset the predicted impacts to surface water and groundwater resources, existing or potential water users and uses, and relevant environmental values. Demonstrate how proposed measures are consistent with best practice environmental management. | Section 10 |
| | 14.23. Demonstrate how the proposed project will meet the environmental objectives and performance outcomes in Schedule 8 of the EP Regulation. | Section 3.3.3 and 7.12 |
| | 14.24. Describe how the achievement of water resources objectives in relevant water plan(s) would be monitored, audited, reported, and how corrective/preventative actions and continual improvement would be managed. Provide measurable criteria, standards and/or indicators that will be used to assess the condition of environmental values and the receiving water environment. | Section 10.2 |
| | 14.25. Provide an assessment against SDAP State code 10: Taking or interfering with water for any assessable operational works that take or interfere with water required for the project, including construction activities, if relevant. | Not applicable |

| Specific Matter | Content Requirement | Reference |
|---|---|---|
| | 14.26. Provide an assessment against SDAP State code 15: Removal of quarry material from a watercourse or lake for any assessable operational works required for the project, including construction activities, if relevant. | N/A – no removal of quarry materials from a watercourse or lake |
| | 14.27. Provide an assessment against SDAP State code 20: Referable dams for any assessable operational works requiring the development of a referable dam required for the project, if relevant. | N/A – Project has no referrable dams |
| Water Quality | **Existing Environment** | |
| | 15.2. With reference to the Environmental Protection (Water and Wetland Biodiversity) Policy 2019 and section 9 of the EP Act, identify, map and describe the environmental values of surface water and groundwater in the project footprint, surrounding area and potential impact area. | Section 2.3, 2.5, 2.6, 2.7 and 3.2 |
| | 15.3. Identify and describe the relevant water and sediment quality objectives and guidelines applicable to the environmental values. Where there are no scheduled EPP water or sediment quality objectives for the project site, these are required to be locally derived in accordance with relevant guidelines,42 supported by complying water quality monitoring data submitted as part of the EIS. | Section 3.3 |
| | 15.4. Describe current and historical surface water, groundwater and sediment quality in terms of physical, chemical and biological characteristics in the project footprint, surrounding area and potential impact area. Characterise the nature and extent of any existing surface and groundwater contamination sources, including licenced releases from other developments, that may interact with project activities. | Section 2.4 |
| | 15.5. Analyse water quality variability to identify and describe trends, including those associated with seasonal or climatic factors, variability of freshwater flows and responses to natural and anthropogenic events/changes. This analysis should be supported by raw and quality assured data (including removal of statistical outliers where relevant), clearly presented statistical summaries, time-series graphs and comparisons against relevant water quality objectives and/or water quality guideline values. Use suitable reference locations and statistically robust site-specific data to adequately establish baseline condition and define natural variation, including seasonal variation. All surface water quality data should be presented alongside corresponding flow conditions at the time of sampling. | Section 2.4 |
| | 15.6. Within the project footprint, surrounding area and potential impact area, describe:<br>a) the relationship of water quality to location, rainfall, stream flow and groundwater movement supported by site-specific and local catchment data<br>b) existing water quality issues (e.g. stratification, eutrophication and deoxygenation) and/or exceedance of existing water quality objectives and/or water quality guideline values<br>c) the confirmed or likely causes of existing water quality issues, including how they are managed (if known)<br>d) correlations between groundwater quality data and surface water quality data to inform groundwater-surface water interactions. | Section 2.4 |
| | 15.7. Surface water samples must as a minimum be analysed for electrical conductivity, temperature, pH, sulfate, fluoride, dissolved oxygen, turbidity, total suspended solids, nutrients, dissolved and total metals and metalloids, total recoverable hydrocarbons and major anions and cations, plus any other potential contaminants relevant to the project. Groundwater samples must be analysed for the same parameters (except turbidity and total suspended solids) as a minimum. Sediments should be analysed for relevant metals (e.g. those elevated above normal crustal abundance and relevant potential contaminants) and relevant influential factors (e.g. sediment particle size for metals). Sample analysis should be appropriate for relevant water quality objectives to be assessed (e.g. laboratory reporting limits appropriate for the relevant objectives). | Sections 2.4 and 10.2 |
| | 15.8. Discuss how the environmental values relating to water quality informed the project design (i.e. constraints, impact mitigation). | Section 10 |

| Specific Matter | Content Requirement | Reference |
|---|---|---|
| | **Impact Assessment** | |
| | 15.9. Describe and map all potential and/or proposed controlled and uncontrolled discharges of water and contaminants by the project, including the predicted quantity, quality, location, source (point or diffuse) timing and duration. Discharges may include controlled water releases to surface waters, uncontrolled discharges when the design capacity of storages is exceeded, management of spills of products during loading or transportation, stormwater discharge, and contaminated run-off or seepage from operational areas of the site. Address the following matters for each potential discharge:<br>a) Describe the circumstances in which controlled and uncontrolled discharges might occur<br>b) describe chemical and physical discharge properties, including predicted concentrations of contaminants, at the point of entering natural surface waters along with toxicity of discharge contaminants to relevant environmental values (e.g. aquatic ecosystems, irrigation water etc.)<br>c) provide receiving environment stream flow data, discharge rates and other relevant information to estimate the potential for in-stream dilution, mixing and resultant water quality<br>d) provide an assessment of the available assimilative capacity of the receiving waters given existing water quality and other potential point source discharges in the catchment. Investigate options for controlled discharge at times of natural stream flow to ensure that adequate flushing of wastewater is achieved<br>e) provide draft contaminant release limits and receiving water conditions, with detailed scientific justification to ensure the protection of aquatic ecosystem | Sections 8.2, 8.3, 8.5. |
| | 15.10. Identify and assess the impacts of project activities (including point source and diffuse discharges), disturbance and infrastructure on groundwater and surface water and sediment quality and relevant environmental values. Analyse and describe the significance of direct, indirect and cumulative impacts on physical, chemical and biological characteristics in the receiving environment in the context of the assimilative capacity, supported environmental values and relevant water and sediment quality objectives and/or guideline values. This should include potential impacts from air deposition of contaminants from stack point source emissions. | Section 7.12 |
| | **Mitigation Measures** | |
| | 15.11. Describe proposed measures to avoid, minimise, mitigate or offset predicted impacts to surface water and groundwater quality, and relevant environmental values. | Section 10 |
| | 15.12. Describe the management framework for controlled discharges, including:<br>a) treatment options and requirements prior to discharge<br>b) receiving environment flows<br>c) discharge water quality limits and receiving environment conditions designed to comply with water quality objectives and/or water quality guideline values and protect environmental values within the receiving environment. | Not applicable as controlled release not assessed. |
| | 15.13. Describe how unplanned or indirect impacts (including uncontrolled discharges) to water quality will be managed, including measures to:<br>a) avoid, identify, remediate and manage water that is contaminated or may become contaminated<br>b) limit the impacts of flooding and extreme weather events. | Section 10 |
| | 15.14. Demonstrate how the project will meet the environmental objectives for water and performance outcomes in Schedule 8 of the EP Regulation. | Section 3.3.3 and 7.12. |

| Specific Matter | Content Requirement | Reference |
|---|---|---|
| | 15.15. Describe how water quality will be monitored, audited, reported, and how corrective/preventative actions and continual improvement would be managed. Provide measurable criteria, standards and/or indicators that will be used to assess the condition of environmental values and the receiving water environment. | Section 10.2. |
| | 15.16. Develop proposed conditions for any proposed release to waters and receiving environment monitoring that meet the requirements of relevant guidelines and are designed to protect environmental values, prevent environmental harm and allow for responsive management and reporting actions. | Section 10. |
| Flooding and Regulated Structures | **Existing Environment** | |
| | 16.2. Provide a hydraulic and hydrological flood model demonstrating the design flood peak discharges for the project footprint and surrounding area which exist in the pre- and post-development scenarios for all flood and stormwater events. This should include at least the following flood and stormwater events: 86.5%, 63.2%, 50%, 20%, 10%, 5%, 2%, 1% and 0.1% Annual Exceedance Probability (AEP), and Probable Maximum Flood. | Section 7. |
| | 16.3. Describe the likelihood and history of flooding (from all sources) within the project footprint and surrounding areas that may be modified by the project or have the potential to impact on the project. Evaluate flood-related constraints and considerations in the existing environment relevant for the impact assessment. | Section 7 and 7.2. |
| | **Impact assessment** | |
| | 16.4. Describe and map where project infrastructure would lie in relation to the existing and predicted flood risk from all sources for the following flood and stormwater events: 86.5%, 63.2%, 50%, 20%, 10%, 5%, 2%, 1% and 0.1% AEP, and Probable Maximum Flood. The maps and modelling are to detail the location of infrastructure prior to disturbance, during operations (including progressive development and rehabilitation of infrastructure such as waste rock dumps, tailings storage facilities, dams and voids) and at the end of operations. | Sections 7.7, 7.8, 7.9. |
| | 16.5. Use flood modelling (and any additional data) to assess how the project may potentially change flooding and run-off characteristics within the project footprint, and both upstream and downstream of the project footprint. The assessment must consider all project infrastructure and all design measures to avoid or minimise impacts. Mapping (afflux, water level/depth and velocity) should be provided to clearly illustrate the pre-development scenario, and the post development impacts for all relevant design events. The flood modelling assessment should consider impacts and risks to people, property (including damage to other properties), community and environmental values during flooding events. | Sections 7.7, 7.8, 7.9. |
| | 16.6. Assess the project's vulnerabilities to climate change (e.g. changing patterns, frequencies and severities of rainfall, hydrology, temperature and extreme weather events) and demonstrate that flood storage capacity is maintained. | Sections 7.9 and 7.11. |
| | 16.7. Identify, map and describe (including their purpose) existing or proposed dams, levees and regulated structures in the project footprint. | Sections 5 and 9. |
| | 16.8. Undertake a consequence category assessment to determine the consequence category (low, significant or high) for each dam, levee, or potential regulated structure according to criteria outlined in the relevant guidelines. The assessment must be undertaken for the 3 different failure event scenarios, i.e. seepage, overtopping and dam break. Provide copies of the consequence category determination for each structure assessed. | Section 9. |
| | 16.9. Develop environmental objectives and performance outcomes for dams, levees and regulated structures with reference to guidelines published by the Australian National Committee on Large Dams as well as other relevant guidelines. | Section 5.3 and 9. |
| | 16.10. Assess the potential impact on regulated structures in accordance with relevant guidelines. | Section 9. |
| | **Mitigation Measures** | |

| Specific Matter | Content Requirement | Reference |
|---|---|---|
| | 16.11. Describe how the project has been designed to avoid or minimise flood risks. | Section 10 |
| | 16.12. Describe management actions to minimise impacts of flooding to mine infrastructure and manage mine pit water post-flooding, if required. | Section 10 |
| | 16.13. Describe how risks associated with dam failure, seepage, and overtopping will be avoided or minimised to protect people, property and environmental values. | Section 10 |
| | 16.14. Describe how dams, levees and regulated structures would be monitored and managed during periods of high incidental rainfall and/or flooding to minimise potential impacts. | Section 10.2 |
| | 16.15. Demonstrate how the project will meet the environmental objectives and performance outcomes in Schedule 8 of the EP Regulation. | Section 3.3.3 and 7.12. |
| Cumulative Impacts | 29.1. Provide a cumulative impact assessment that considers the combined effect of potential impacts of different components/aspects of the project on the same environmental value (i.e. intra-project cumulative impacts) and the impacts of other relevant projects acting in combination on the same environmental value (i.e. inter-project cumulative impacts). The cumulative impact assessment must identify potential cumulative environmental, social, economic and cultural impacts for each phase of the project on identified environmental values, including consideration of the likelihood, intensity, duration, magnitude and extent of impacts. | Section 8.6 |
| | 29.2. Describe how identified cumulative impacts may be affected by climate change, including the frequency and intensity of extreme weather events. | Section 8.6 |
| | 29.3. Describe how the cumulative impact assessment and management measures could be progressed further on an inter-project basis. | Section 8.6 |
| | 29.4. Discuss the impact of the project on overall state and national GHG inventories and targets. | Section 8.6 |
| | 29.5. Describe measures that would be used to avoid, minimise, or mitigate any identified cumulative impacts. | Section 8.6 |

# 2. RECEIVING ENVIRONMENT

## 2.1 Catchment Overview

### 2.1.1 Regional Catchment

The Project is located in Northern Queensland within the Norman River Catchment area, which drains north to the Gulf of Carpentaria (see Figure 2.1). The Norman River Basin has a total catchment of 49,000 km$^2$ with the main rivers being the Norman River, Clara River and Yappar River. The Norman River Basin catchment and its sub-catchments are presented in Figure 2.2.

### 2.1.2 Local Catchment/s

The Project is located immediately north of Warrigal Creek and the Borer River and has an unnamed waterway (stream order 3) flowing through the northern extent of the proposed MLA. The Borer River/ Warrigal Creek is a major tributary of the Clara River, which is a stream order 6 watercourse with a sub catchment area of 2,275 km$^2$. The Yappar River is located 20 km east of the site. The Yappar River had several breakout flow paths which flow in a westerly direction towards Warrigal Creek and the MLA. Topography surrounding the Project area is very flat which facilitates widespread flooding with interactions between the major waterways during significant flood events.

**TABLE 2.1: WATERWAYS IN THE VICINITY OF THE PROJECT AREA**

| Waterway | Stream Order | Catchment Area Near the Project Location (km2) | Proximity to Project |
|---|---|---|---|
| Unnamed Waterway (reports to Warrigal Creek/Borer River) | 3 | 115 | Flows through the Project area |
| Warrigal Creek | 5 | 1,127 | Flows through the SW corner of EPM 28274 |
| Borer River | 5 | 178 (plus Warrigal Creek) | Flows through the SW corner of EPM 28274 |
| Clara River | 6 | 2,275 | 5 km south |
| Yappar River | 6 | 2,498 | 18 km east and north |

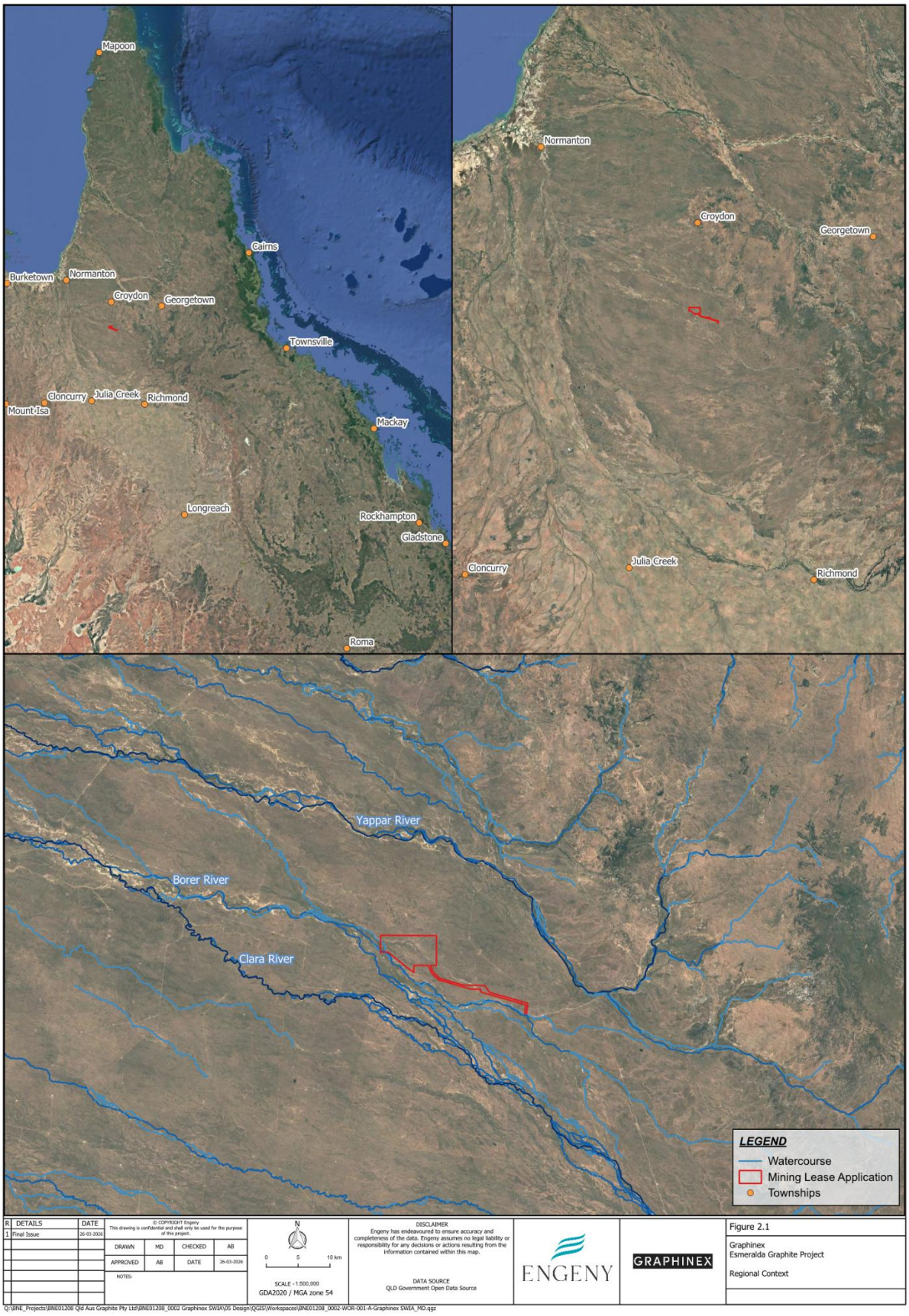



**Figure 2.1: Regional Context**

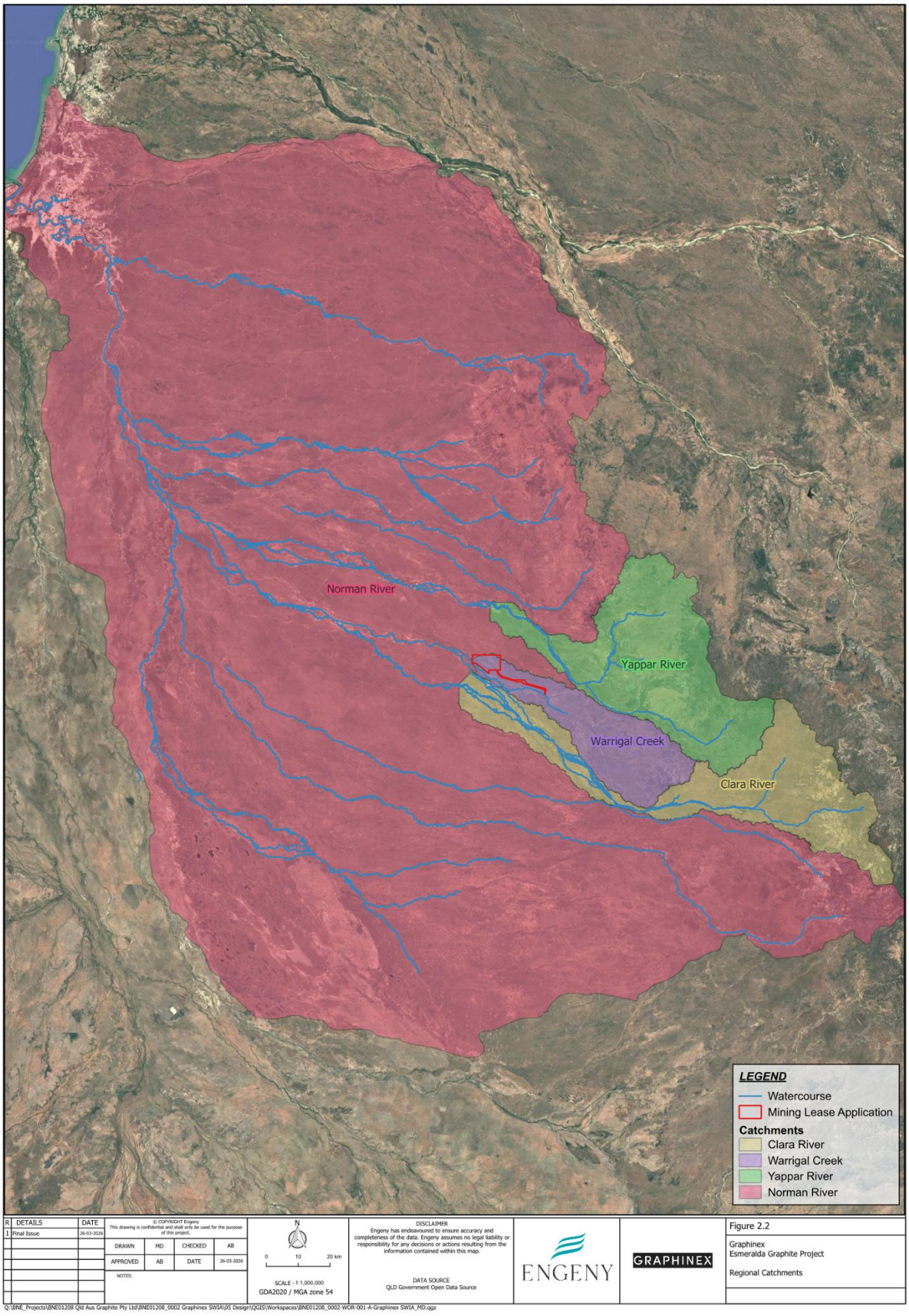



**Figure 2.2: Regional Catchments**

## 2.2 Climate

The regional climate of the area can be described as dry tropical, with most rainfall received between December and March and an extended dry season with little rain throughout the remainder of the year.

A long-term representative historical rainfall data set for the surface water assessment was developed from nearby recorded data from Bureau of Meteorology (the Bureau) rainfall gauging stations and infilled with SILO Data Drill when gauged data was unavailable. Monthly pan evaporation data was adopted from the SILO data drill at the location of the Project (DES, 2026). The SILO data drill is a derived data set from a combination of interpolated recorded data between weather stations and derived long-term average values.

A summary of rainfall gauges operated by the Bureau near the Project with significant rainfall records is provided in Table 2.2. Monthly rainfall and evaporation rates for the Project location are presented in Figure 2.3.

Due to poor distribution of evaporation monitoring stations near the Project, the interpolated evaporation data at the location of the Project may be inaccurate. Therefore, the long-term pan evaporation derived from the SILO data drill has been compared against the average monthly recorded data from the station at Croydon Township (nearest station available) to validate the SILO data. The long-term average data from the SILO data drill matches well with the data recorded at Croydon Township from the period 1970 to 2022.

**TABLE 2.2: NEARBY RAINFALL GAUGING STATIONS**

| Source | Proximity to the Project | Data Range |
|---|---|---|
| Prospect Station (029044) | 9 km | 1920-1964 |
| Esmeralda Station (029016) | 35 km | 1914-2025 |
| Mittagong Station (029082) | 49 km | 1969-2002 |
| Alehvale Station (029096) | 59 km | 1972-2010 |
| Mundjuro Station (29156) | 72 km | 1993 - 2003 |
| Yappar River (29154) | 108 km | 1992-2025 |
| Iffley Station (029023) | 108 km | 1895-2025 |

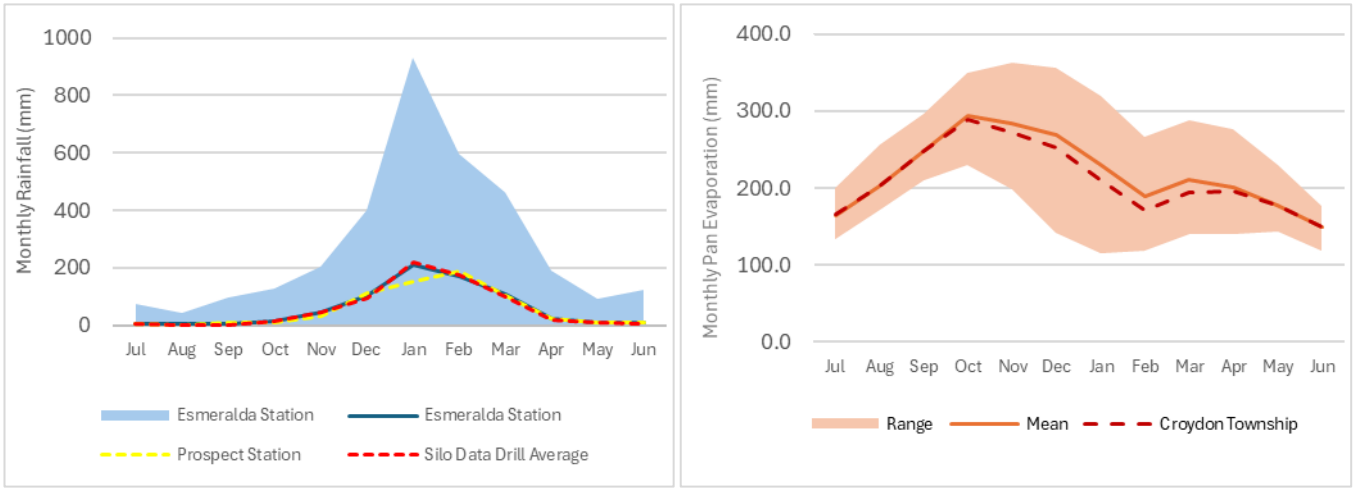



**Figure 2.3: Monthly Rainfall and Evaporation (Range and Mean)**

## 2.3 Existing Waterways

The Project is located within the Warrigal Creek floodplain. Warrigal Creek is a tributary of the Borer River which has a confluence with the Clara River 50 km downstream of the Project, before flowing into the Norman River main branch, approximately 100 km downstream of the Project  An unnamed waterway also traverses the MLA flowing in a northwestern direction. The existing waterway locations relative to the Project is shown in Figure 2.6.

### 2.3.1 Warrigal Creek and Borer River

Warrigal Creek, traverses through the eastern edge of the MLA, joining the Borer River 9km downstream of the site and has a catchment area of 1,127 km$^2$. Multiple braided channels make up Warrigal Creek, covering a total width of 120 m. Typically 2 m in depth, the creek is shallow and not defined by high banks. The Borer River is formed from an anabranch of the Clara River which flows towards Warrigal Creek. Borer River joins with the Clara River 50 km downstream of the Project before discharging into the Norman River.

Warrigal Creek and Borer River are defined as a watercourse under the Water Act 2000. No streamflow gauges are available on these watercourses. However, it is understood to be an ephemeral watercourse typically subject to limited flows during the dry season (April – October) and high flow/flooding events during the wet season (November – March) in response to large rainfall events. The topography of the surrounding area is very flat which results in widespread flooding with interactions between waterways during wet season flood events.

The proximity of the Borer River to the MLAs is shown in Figure 2.1.

### 2.3.2 Norman River

The Norman River, a significant QLD river, is defined as a watercourse under the Water Act 2000 and has a catchment area of approximately 49,000 km$^2$. There is currently one operational streamflow gauge on the Norman River, located 170 km downstream of the Project at the Glenore Weir.

The Norman River flows through the townships of Normanton and Karumba before its' outlet to the Gulf of Carpentaria. The river flows in a generally north-westerly direction with the headwaters originating on the western slopes of the Great Dividing Range around Bellfield. As stated above, the Norman River joins with the Clara River around 100 km downstream of the Project. Other major tributaries of the Norman River Include Yapper River (16 km north of the site), Belmore Creek (originating in the Croydon township) and Spear Creek.

### 2.3.3 Unnamed Waterways

There is one unnamed waterway within the Project's MLA boundary. The stream order 3 waterway tracks north westerly through the center of the MLA. The waterway is defined as a watercourse under the Water Act 2000 and has a total catchment area of 115 km$^2$. The waterway is ephemeral with flow occurring immediately following rainfall events.

### 2.3.4 Streamflow Monitoring

There is one open streamflow gauging station operated by the Department of Regional Development, Manufacturing and Water (DRDMW) located within the Norman River Catchment. This station is summarised in Table 2.3 and shown in Figure 2.5.

The Norman River at Glenore Weir gauge is located 170 km downstream of the Project and started operation in 1974, then inactive between 1999 – 2021 before reopening in 2022. Flow duration curves for gauging station 916001B is shown in Figure 2.4. There are several closed gauges within the Norman River catchment that have historical water level and flow records. The closest gauge is on Moonlight Creek which is a tributary of the Norman River near the Township of Croydon. The other gauges are located at the headwaters of the Norman River catchment and near the Gulf. The gauges were all closed prior to the 1990s.

**TABLE 2.3 STREAMFLOW GAUGES WITHIN NORMAN RIVER CATCHMENT**

| Station | Proximity to Site | Catchment Area | Data Range |
|---|---|---|---|
| **Operational Gauges** | | | |
| 916001B Norman River at Glenore Weir | 170 km downstream | 39,360 km$^2$ | 1974 – 1998, 2022 - Present |
| **Closed Gauges** | | | |
| 916003A Moonlight Creek at Alehvale | 62 km north | 127 km$^2$ | 1969-1989 |
| 916004A Walker Creek at Maggieville | 186 km northwest | 3,080 km$^2$ | 1973-1989 |
| 916001A Norman River at Rocky Waterhole | 155 km downstream | 35,550 km$^2$ | 1969-1974 |
| 916002A Norman River at Strathpark | 135 km east | 285 km$^2$ | 1969-1988 |

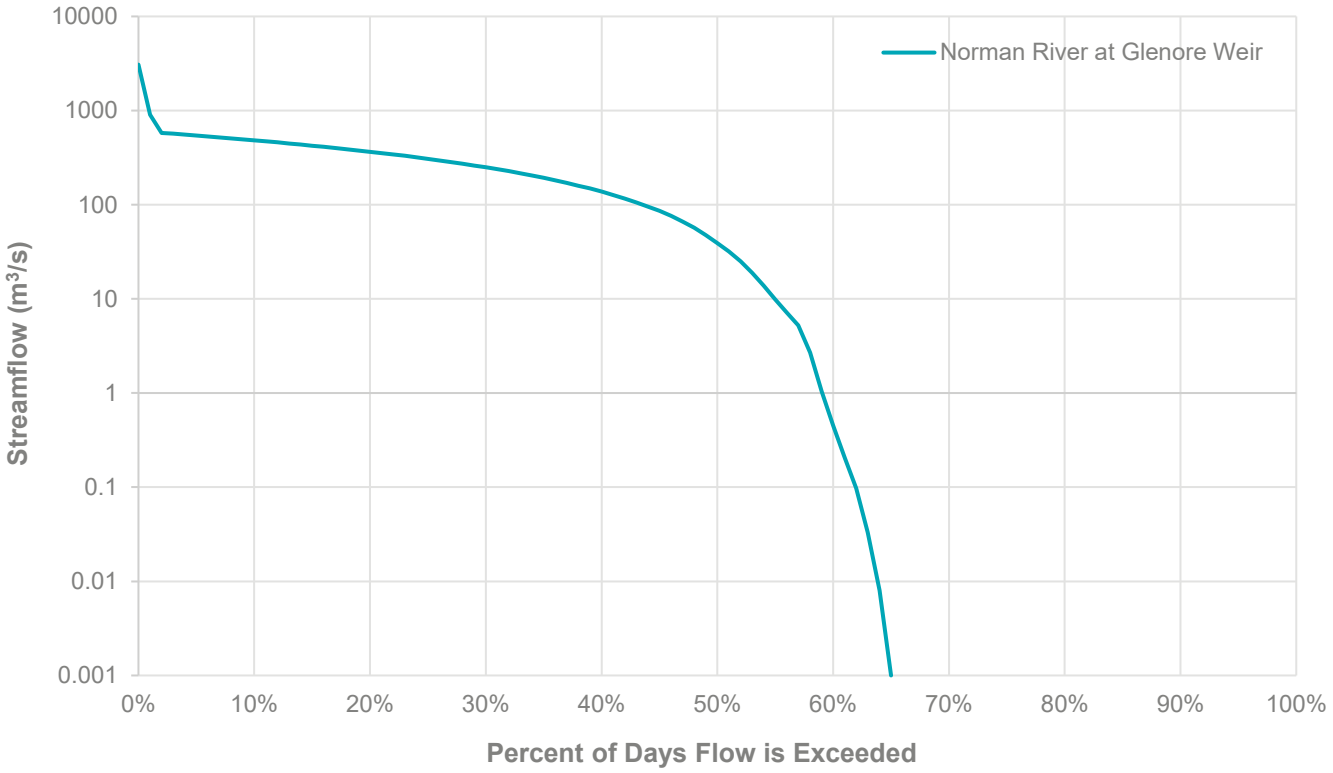



**Figure 2.4: Norman River Flow Duration Curve (Streamflow Gauge 916001B)**

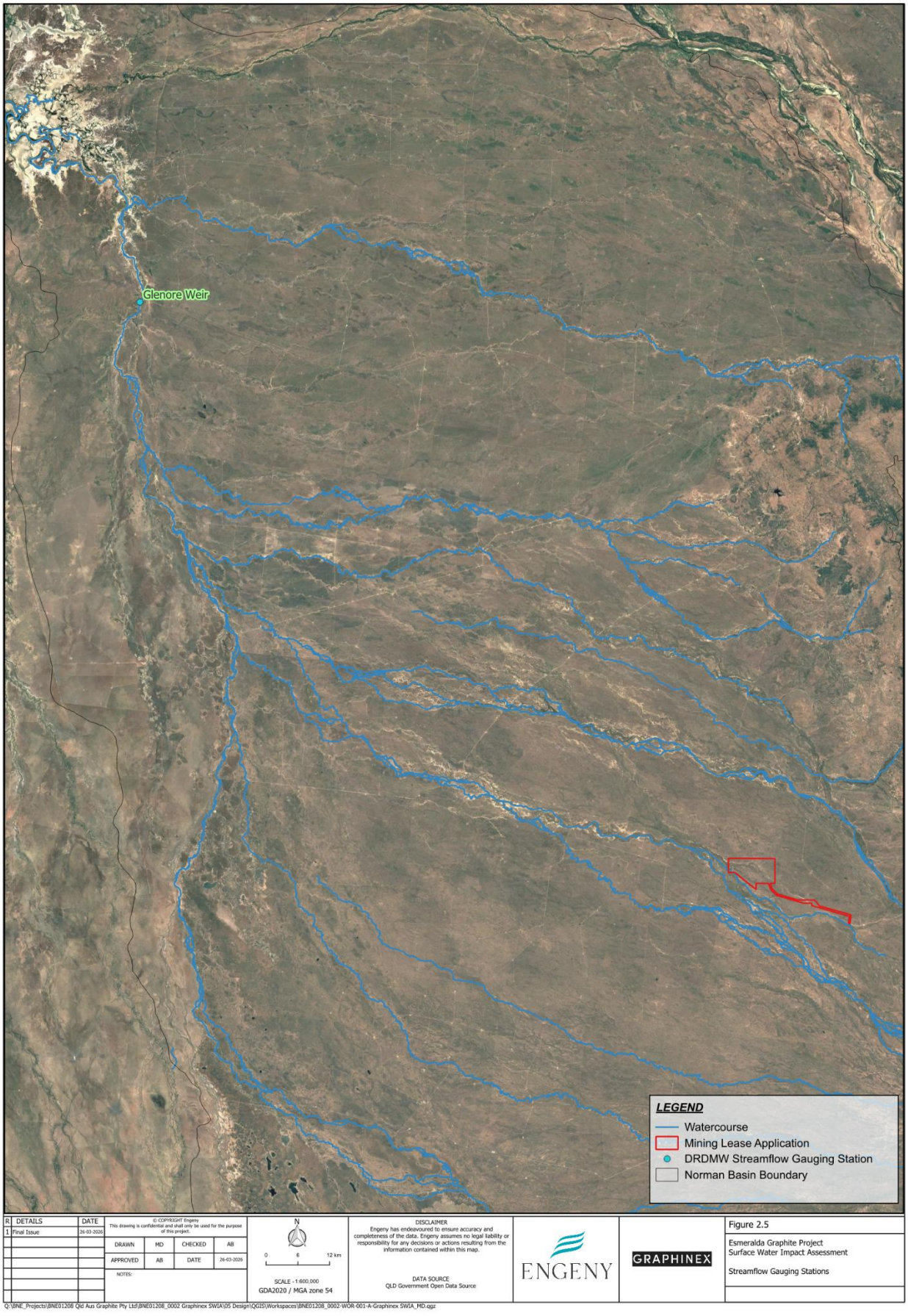



**Figure 2.5: Streamflow Gauging Stations**

## 2.4 Surface Water Quality

Water quality data for the project area is limited with no historical monitoring data available for the Clara River or Warrigal Creek. A baseline water monitoring program for site-specific data was established in 2025 and currently two rounds of sampling have been collected and analysed with 19 samples in total collected and analysed.

The data collected is summarised in Table 2.5 and the sampling locations are shown in Figure 2.6. Sampling was done for the local stream order 3 tributary at various locations through the proposed MLA as well as Warrigal Creel/Borer River at various locations near the proposed MLA.

The water quality data is presented with the water quality objectives for the Project as discussed in Section 3.3. The data collected shows the existing water quality is characterised as:

- Very slightly acidic with an average pH of 6.73 and ranging between 6.22 and 7.43.
- Low salinity with an average total dissolved solids of 54.5 mg/L and electrical conductivity of 84 µS/cm.
- Elevated concentrations of nutrients with the default water quality objectives exceeded for Ammonia, Total Nitrogen and Total Phosphorus.
- Detectable concentrations of dissolved metals including Aluminium (Al), Barium, Copper, Manganese, Nickel and Iron.
- Dissolved concentrations of Aluminium and Iron regularly exceeded the default guideline value water quality objectives for aquatic ecosystem protection.
- Detectable concentrations of hydrocarbons in a small number of samples.

The available monitoring data is not sufficient to define site specific water quality objectives. The remote location of the Project area and the highly ephemeral nature of the waterways have inevitably constrained the number of flow events available for sampling over the past two years. Recently six (6) rising stage samplers have been installed which are able to collect water samples during high flow events when access is restricted. Sampling using the rising stage samplers and grab samples (when access permits) will continue in order to collect sufficient data to define site specific water quality objectives.

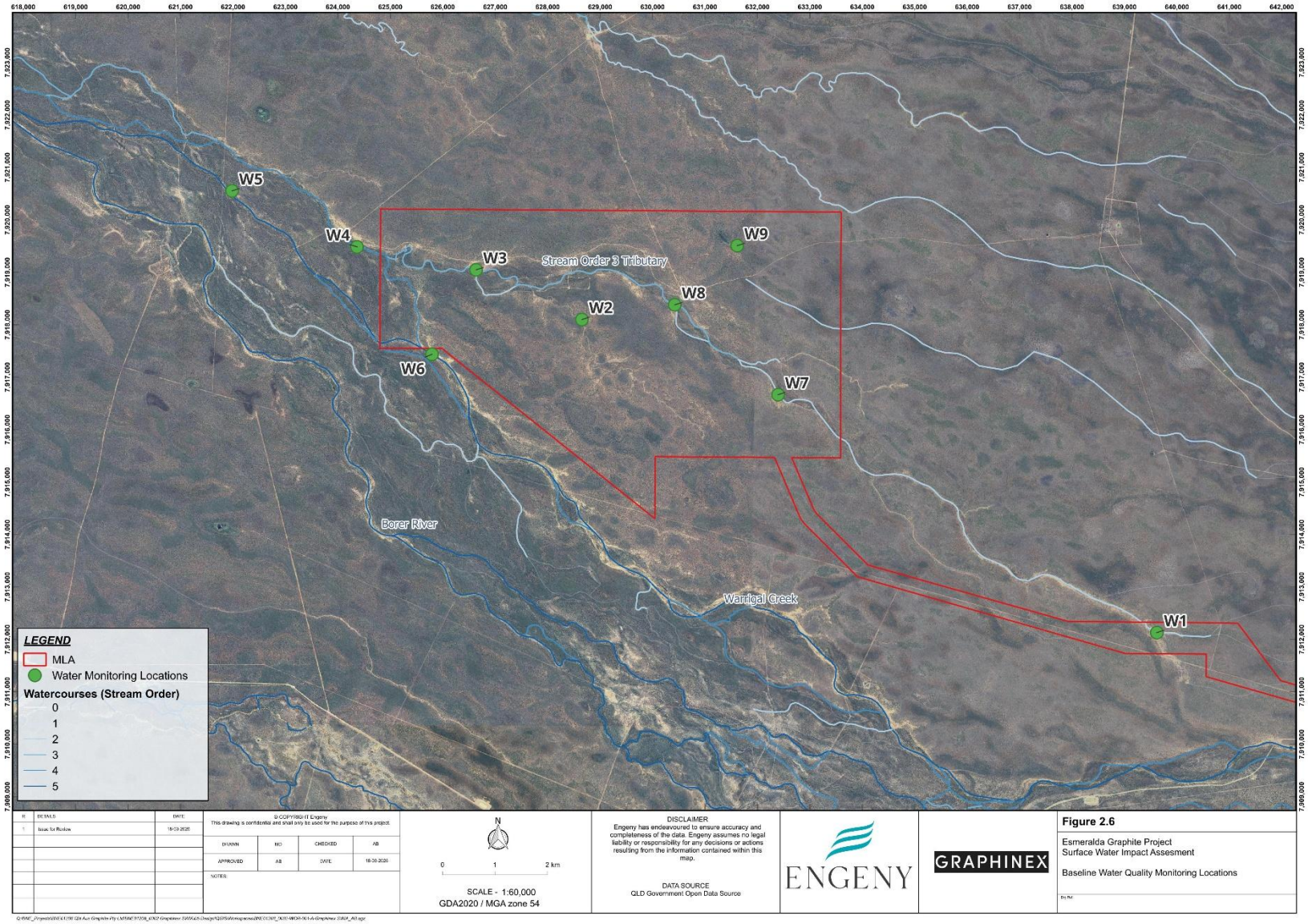



**Figure 2.6: Surface Water Quality Monitoring Locations**

**TABLE 2.4: SURFACE WATER QUALITY MONITORING RESULTS**

| Analyte grouping/Analyte | Unit | LOR | WQO | 15/02/2025 | | | | | | | | | 22/01/2026 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | W1 | W2 | W3 | W4 | W5 | W6 | W7 | W8 | W9 | W1 | W2 | W3 | W4 | W5 | W6 | W7 | W8 | W8_01 | W20 |
| pH Value | pH Unit | 0.01 | 6.0-7.5 | 6.31 | 6.59 | 6.39 | 6.55 | 6.56 | 6.56 | 6.46 | 6.62 | 6.22 | 6.93 | 7.09 | 6.85 | 6.72 | 6.9 | 6.9 | 6.95 | 6.97 | 6.96 | 7.43 |
| Electrical Conductivity @ 25°C | µS/cm | 1 | 550 | 93 | 191 | 85 | 78 | 84 | 84 | 116 | 98 | 37 | 45 | 101 | 54 | 53 | 71 | 73 | 53 | 56 | 56 | 168 |
| Total Dissolved Solids (Calc.) | mg/L | 1 | 500 | 60 | 124 | 55 | 51 | 55 | 55 | 75 | 64 | 24 | 29 | 66 | 35 | 34 | 46 | 47 | 34 | 36 | 36 | 109 |
| Total Hardness as CaCO3 | mg/L | 1 | 200 | <1 | 13 | <1 | 13 | 13 | 13 | 13 | 9 | 9 | 16 | 18 | 18 | 16 | 9 | 9 | 18 | 18 | 18 | 34 |
| Hydroxide Alkalinity as CaCO3 | mg/L | 1 | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Carbonate Alkalinity as CaCO3 | mg/L | 1 | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Bicarbonate Alkalinity as CaCO3 | mg/L | 1 | - | 13 | 24 | 12 | 18 | 23 | 24 | 22 | 16 | 12 | 21 | 33 | 19 | 20 | 21 | 21 | 19 | 22 | 23 | 36 |
| Total Alkalinity as CaCO3 | mg/L | 1 | - | 13 | 24 | 12 | 18 | 23 | 24 | 22 | 16 | 12 | 21 | 33 | 19 | 20 | 21 | 21 | 19 | 22 | 23 | 36 |
| Sulfate as SO4 | mg/L | 1 | 25 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | 7 |
| Chloride | mg/L | 1 | 250 | 18 | 32 | 16 | 10 | 12 | 12 | 22 | 18 | 2 | 4 | 23 | 5 | 5 | 23 | 24 | 5 | 5 | 5 | 26 |
| Calcium | mg/L | 1 | - | <1 | 2 | <1 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 4 | 4 | 3 | 2 | 2 | 4 | 4 | 4 | 7 |
| Magnesium | mg/L | 1 | - | <1 | 2 | <1 | 2 | 2 | 2 | 2 | 1 | 1 | 2 | 2 | 2 | 2 | 1 | 1 | 2 | 2 | 2 | 4 |
| Sodium | mg/L | 1 | 30 | 14 | 30 | 14 | 9 | 11 | 11 | 18 | 14 | <1 | 3 | 14 | 4 | 5 | 11 | 13 | 4 | 4 | 4 | 22 |
| Potassium | mg/L | 1 | - | 1 | 3 | 2 | 3 | 3 | 3 | 2 | 2 | 6 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 1 |
| Mercury (dissolved) | mg/L | 0.0001 | 0.0006 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Mercury (total) | mg/L | 0.0001 | 0.001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Silver | µg/L | 0.01 | 0.05 | 0.01 | 0.02 | <0.01 | <0.01 | <0.01 | <0.01 | 0.01 | <0.01 | <0.01 | 0.14 | 0.01 | 0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 9.62 |
| Silver (total) | µg/L | 0.01 | - | 0.04 | 0.04 | 0.03 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | <0.01 | <0.01 | <0.01 | 0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 11 |
| Fluoride | mg/L | 0.1 | 1 | <0.1 | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Ammonia as N | mg/L | 0.01 | 0.02 | <0.01 | 0.23 | 0.34 | 0.25 | <0.01 | 0.42 | 0.13 | <0.01 | 0.02 | 0.01 | <0.01 | 0.03 | 0.02 | <0.01 | <0.01 | 0.03 | <0.01 | 0.03 | <0.01 |
| Nitrite as N | mg/L | 0.01 | 3 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.03 |
| Nitrate as N | mg/L | 0.01 | 1.1 | <0.01 | <0.01 | <0.01 | 0.02 | 0.09 | 0.04 | <0.01 | <0.01 | <0.01 | <0.01 | 0.04 | 0.03 | 0.07 | 0.19 | 0.23 | 0.04 | 0.05 | 0.11 | 0.48 |
| Nitrite + Nitrate as N | mg/L | 0.01 | - | <0.01 | <0.01 | <0.01 | 0.02 | 0.09 | 0.04 | <0.01 | <0.01 | <0.01 | <0.01 | 0.04 | 0.03 | 0.07 | 0.19 | 0.23 | 0.04 | 0.05 | 0.11 | 0.51 |
| Total Kjeldahl Nitrogen as N | mg/L | 0.1 | - | 0.4 | 1.3 | 0.8 | 0.8 | 0.8 | 1.4 | 0.9 | 0.4 | 2.3 | 0.9 | 0.7 | 0.8 | 0.7 | 0.4 | 0.5 | 0.7 | 0.8 | 0.7 | <0.1 |
| Total Nitrogen as N | mg/L | 0.1 | 0.5 | 0.4 | 1.3 | 0.8 | 0.8 | 0.9 | 1.4 | 0.9 | 0.4 | 2.3 | 0.9 | 0.7 | 0.8 | 0.8 | 0.6 | 0.7 | 0.7 | 0.8 | 0.8 | 0.5 |
| Total Phosphorus as P | mg/L | 0.01 | 0.05 | 0.05 | 0.1 | 0.07 | 0.05 | 0.04 | 0.04 | 0.06 | 0.03 | 0.17 | 0.03 | 0.05 | 0.05 | 0.04 | 0.03 | 0.04 | 0.04 | 0.05 | 0.02 | 0.03 |
| Reactive Phosphorus as P | mg/L | 0.01 | 0.02 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.02 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.01 |
| Total Anions | meq/L | 0.01 | - | 0.77 | 1.38 | 0.69 | 0.64 | 0.8 | 0.82 | 1.06 | 0.83 | 0.3 | 0.53 | 1.31 | 0.52 | 0.54 | 1.07 | 1.1 | 0.52 | 0.58 | 0.6 | 1.6 |
| Total Cations | meq/L | 0.01 | - | 0.63 | 1.65 | 0.66 | 0.73 | 0.82 | 0.82 | 1.1 | 0.84 | 0.34 | 0.52 | 1.05 | 0.61 | 0.61 | 0.74 | 0.82 | 0.61 | 0.61 | 0.61 | 1.66 |
| **Dissolved Metals and Metalloids** | | | | | | | | | | | | | | | | | | | | | | |
| Aluminium | mg/L | 0.01 | 0.055 | 0.34 | 0.63 | 0.25 | 0.09 | 0.06 | 0.07 | 0.36 | 0.29 | 0.07 | 0.23 | 0.15 | 0.22 | 0.27 | 0.11 | 0.15 | 0.23 | 0.26 | 0.22 | <0.01 |

| Analyte grouping/Analyte | Unit | LOR | WQO | 15/02/2025 | | | | | | | | | 22/01/2026 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | W1 | W2 | W3 | W4 | W5 | W6 | W7 | W8 | W9 | W1 | W2 | W3 | W4 | W5 | W6 | W7 | W8 | W8_01 | W20 |
| Arsenic | mg/L | 0.001 | 0.013 | <0.001 | 0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Beryllium | mg/L | 0.001 | 0.00013 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Barium | mg/L | 0.001 | - | 0.026 | 0.024 | 0.014 | 0.038 | 0.033 | 0.032 | 0.031 | 0.018 | 0.008 | 0.014 | 0.018 | 0.025 | 0.026 | 0.032 | 0.034 | 0.026 | 0.024 | 0.024 | 0.008 |
| Cadmium | mg/L | 0.0001 | 0.0002 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Chromium | mg/L | 0.001 | 0.0033 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Cobalt | mg/L | 0.001 | 0.0014 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | 0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Copper | mg/L | 0.001 | 0.0014 | <0.001 | 0.002 | <0.001 | 0.001 | 0.001 | 0.001 | 0.001 | <0.001 | 0.002 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Lead | mg/L | 0.001 | 0.0034 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Manganese | mg/L | 0.001 | 1.9 | 0.004 | 0.045 | 0.009 | 0.059 | 0.017 | 0.009 | 0.076 | 0.009 | 0.022 | 0.002 | 0.002 | 0.018 | 0.011 | 0.005 | 0.005 | 0.013 | 0.018 | 0.017 | 0.012 |
| Molybdenum | mg/L | 0.001 | 0.034 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Nickel | mg/L | 0.001 | 0.011 | <0.001 | 0.002 | <0.001 | 0.001 | 0.002 | 0.001 | 0.003 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Selenium | mg/L | 0.01 | 0.011 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.010 | <0.010 | <0.010 | <0.010 | <0.010 | <0.010 | <0.010 | <0.010 | <0.010 | <0.010 |
| Uranium | mg/L | 0.001 | 0.0005 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Vanadium | mg/L | 0.01 | 0.006 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Zinc | mg/L | 0.005 | 0.008 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | 0.006 |
| Boron | mg/L | 0.05 | 0.94 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Iron | mg/L | 0.05 | 0.28 | 0.13 | 0.86 | 0.22 | 0.28 | 0.33 | 0.42 | 0.27 | 0.23 | 0.74 | 0.27 | 0.37 | 0.72 | 0.53 | 0.68 | 0.73 | 0.61 | 0.73 | 0.71 | <0.05 |
| **Total Metals and Metalloids** | | | | | | | | | | | | | | | | | | | | | | |
| Aluminium | mg/L | 0.01 | 0.2 | 4.66 | 3.33 | 1.87 | 1.13 | 1.04 | 0.93 | 1.52 | 2.58 | 0.1 | 0.47 | 0.74 | 0.55 | 0.56 | 0.65 | 1.11 | 0.47 | 0.48 | 0.53 | <0.01 |
| Arsenic | mg/L | 0.001 | 0.01 | <0.001 | 0.001 | <0.001 | 0.001 | 0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Beryllium | mg/L | 0.001 | 0.06 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Barium | mg/L | 0.001 | - | 0.063 | 0.043 | 0.026 | 0.052 | 0.044 | 0.044 | 0.049 | 0.027 | 0.008 | 0.016 | 0.024 | 0.031 | 0.029 | 0.039 | 0.043 | 0.028 | 0.026 | 0.026 | 0.008 |
| Cadmium | mg/L | 0.0001 | 0.002 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Chromium | mg/L | 0.001 | 0.05 | 0.002 | 0.003 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | <0.001 | <0.001 | <0.001 | <0.001 | 0.001 | 0.002 | 0.002 | <0.001 | <0.001 | <0.001 | <0.001 |
| Cobalt | mg/L | 0.001 | 0.05 | 0.001 | 0.002 | <0.001 | 0.002 | <0.001 | <0.001 | 0.002 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Copper | mg/L | 0.001 | 0.2 | 0.002 | 0.003 | 0.002 | 0.002 | 0.002 | 0.004 | 0.002 | 0.002 | 0.001 | 0.002 | 0.002 | 0.001 | 0.001 | 0.002 | 0.002 | 0.001 | <0.001 | 0.001 | <0.001 |
| Lead | mg/L | 0.001 | 0.005 | 0.002 | 0.002 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | 0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Manganese | mg/L | 0.001 | 0.1 | 0.017 | 0.063 | 0.02 | 0.074 | 0.028 | 0.022 | 0.131 | 0.025 | 0.025 | 0.008 | 0.019 | 0.044 | 0.033 | 0.017 | 0.025 | 0.021 | 0.027 | 0.024 | 0.013 |
| Molybdenum | mg/L | 0.001 | 0.02 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Nickel | mg/L | 0.001 | 0.02 | 0.001 | 0.002 | 0.001 | 0.002 | 0.002 | 0.002 | 0.002 | 0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | 0.001 | 0.002 | <0.001 | <0.001 | <0.001 | <0.001 |
| Selenium | mg/L | 0.01 | 0.004 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.010 | <0.010 | <0.010 | <0.010 | <0.010 | <0.010 | <0.010 | <0.010 | <0.010 | <0.010 |
| Uranium | mg/L | 0.001 | 0.01 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Vanadium | mg/L | 0.01 | 0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |

| Analyte grouping/Analyte | Unit | LOR | WQO | 15/02/2025 | | | | | | | | | 22/01/2026 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | W1 | W2 | W3 | W4 | W5 | W6 | W7 | W8 | W9 | W1 | W2 | W3 | W4 | W5 | W6 | W7 | W8 | W8_01 | W20 |
| Zinc | mg/L | 0.005 | 2 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Boron | mg/L | 0.05 | 0.5 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Iron | mg/L | 0.05 | 0.2 | 3.34 | 2.96 | 2 | 1.89 | 2.13 | 2.08 | 2.44 | 1.69 | 0.94 | 0.4 | 1.05 | 1.34 | 1.17 | 1.58 | 2.07 | 0.89 | 1.03 | 1.04 | <0.05 |
| **Total Petroleum Hydrocarbons** | | | | | | | | | | | | | | | | | | | | | | |
| C6 - C9 Fraction | µg/L | 20 | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| C10 - C14 Fraction | µg/L | 50 | - | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 |
| C15 - C28 Fraction | µg/L | 100 | - | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 | 120 | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 |
| C29 - C36 Fraction | µg/L | 50 | - | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 |
| C10 - C36 Fraction (sum) | µg/L | 50 | - | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | 120 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 |
| **Total Recoverable Hydrocarbons** | | | | | | | | | | | | | | | | | | | | | | |
| C6 - C10 Fraction | µg/L | 20 | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| C6 - C10 Fraction minus BTEX (F1) | µg/L | 20 | - | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| >C10 - C16 Fraction | µg/L | 100 | - | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 |
| >C16 - C34 Fraction | µg/L | 100 | - | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 | 150 | <100 | 100 | 120 | <100 | <100 | <100 | 110 | 110 | 110 | <100 |
| >C34 - C40 Fraction | µg/L | 100 | - | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 |
| >C10 - C40 Fraction (sum) | µg/L | 100 | - | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 | 150 | <100 | 100 | 120 | <100 | <100 | <100 | 110 | 110 | 110 | <100 |
| >C10 - C16 Fraction minus Naphthalene (F2) | µg/L | 100 | - | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 |
| **BTEXN** | | | | | | | | | | | | | | | | | | | | | | |
| Benzene | µg/L | 1 | 950 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Toluene | µg/L | 2 | 180 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 |
| Ethylbenzene | µg/L | 2 | 80 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 |
| meta- & para-Xylene | µg/L | 2 | 75 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 |
| ortho-Xylene | µg/L | 2 | 350 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 |
| Total Xylenes | µg/L | 2 | - | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 |
| Sum of BTEX | µg/L | 1 | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Naphthalene | µg/L | 5 | 16 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 |
| **TPH(V)/BTEX Surrogates** | | | | | | | | | | | | | | | | | | | | | | |
| 1.2-Dichloroethane-D4 | % | 2 | - | 107 | 109 | 110 | 114 | 115 | 111 | 110 | 113 | 115 | 88.1 | 94.7 | 90.9 | 90.2 | 93.1 | 93.6 | 93 | 94.9 | 91.2 | 88.3 |
| Toluene-D8 | % | 2 | - | 92.7 | 96.2 | 95.3 | 95.2 | 95.6 | 95.7 | 93.5 | 93.7 | 94.3 | 99.5 | 104 | 99.9 | 98 | 103 | 105 | 98.2 | 101 | 102 | 97 |
| 4-Bromofluorobenzene | % | 2 | - | 104 | 110 | 106 | 108 | 111 | 108 | 106 | 106 | 107 | 101 | 103 | 105 | 97.5 | 106 | 109 | 103 | 105 | 103 | 95.5 |

# 2.5 Water Use

## 2.5.1 Water Sharing

The Water Plan (Gulf) 2007 provides a framework for the sustainable management of water resources by providing sustainable water allocation while protecting ecological values in the river basins flowing into the Gulf of Carpentaria. The Gulf Water Plan provides information regarding the outcomes for sustainable management of water, performance indicators and objectives, strategies for achieving outcomes, and monitoring and reporting requirements. Water entitlements in the Gulf Water Plan area falls within one of the following three categories:

- Supplemented water – surface water supplied under an interim resource operation licence, resource operations licence or any other authority to operate infrastructure in relation to designated supplemented water supplies. There are two supplemented water supply schemes which are situated within the Leichhardt River basin, and therefore not applicable to this study.
- Un-supplemented water – water that is not supplemented.
- Unallocated water – A volume of water that is reserved for other future uses, such as regional development, industrial or agricultural use.

The Project is within the Norman River catchment which falls within the Gulf Water Plan area shown in Figure 2.7.

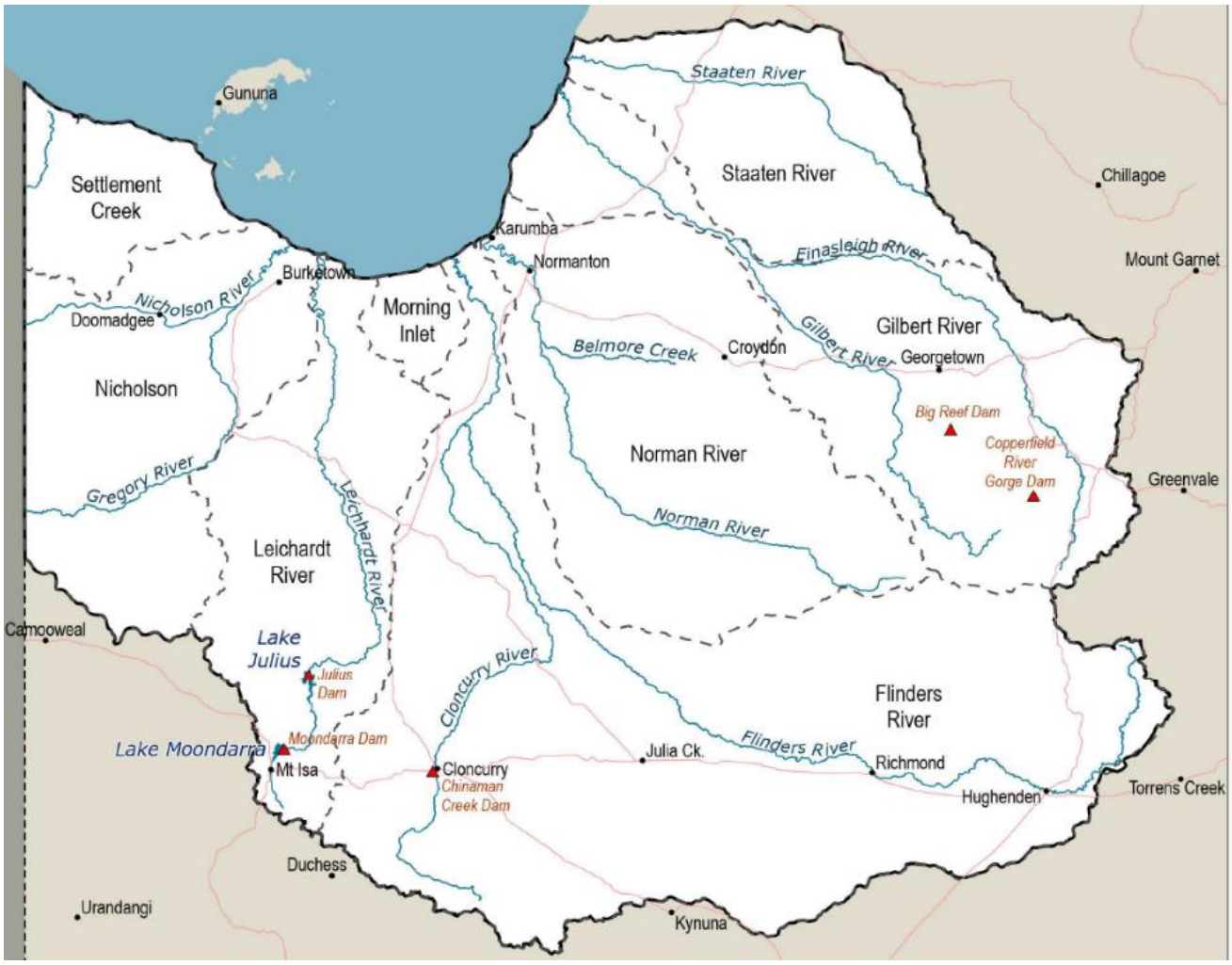



**Figure 2.7: Norman River Basin, within the greater Gulf drainage region (Water Plan (Gulf) 2007) (Queensland Government, 2007)**

## 2.5.2 Existing Surface Water Entitlements

There are two existing water licences downstream of the Project in the Norman River Catchment. The two licences are attached to the same property (8/NM142) and are located approximately 170 km downstream of the Project. The licences are held by Carpentaria Shire Council and authorise the impoundment and extraction of un-supplemented water from the Glenore Weir. The existing licences have a combined annual entitlement (Annual Volumetric Limit) of 4,100 ML and are authorised for any use. The details of these licences are presented in Table 2.5 and the property location to which these licences are attached is shown in Figure 2.8.

**TABLE 2.5 DETAILS OF EXISTING SURFACE WATER LICENCES**

| Authorisation Number | Authorisation Type | Management Subgroup | Management Group | Authorised Purpose | Location (Lot/ Plan) | Annual Volumetric Limit (ML) |
|---|---|---|---|---|---|---|
| 176322 | Licence to Take Water | Norman River Catchment | Gulf Water Resource Plan Area | Any | 8/NM142 | 4,100<br>The daily volumetric limit that may be taken under this licence is 17.2 megalitres. |
| 613666 | Licence to interfere by impounding-Embankment or Wall | | | Impound Water | 8/NM142 | |

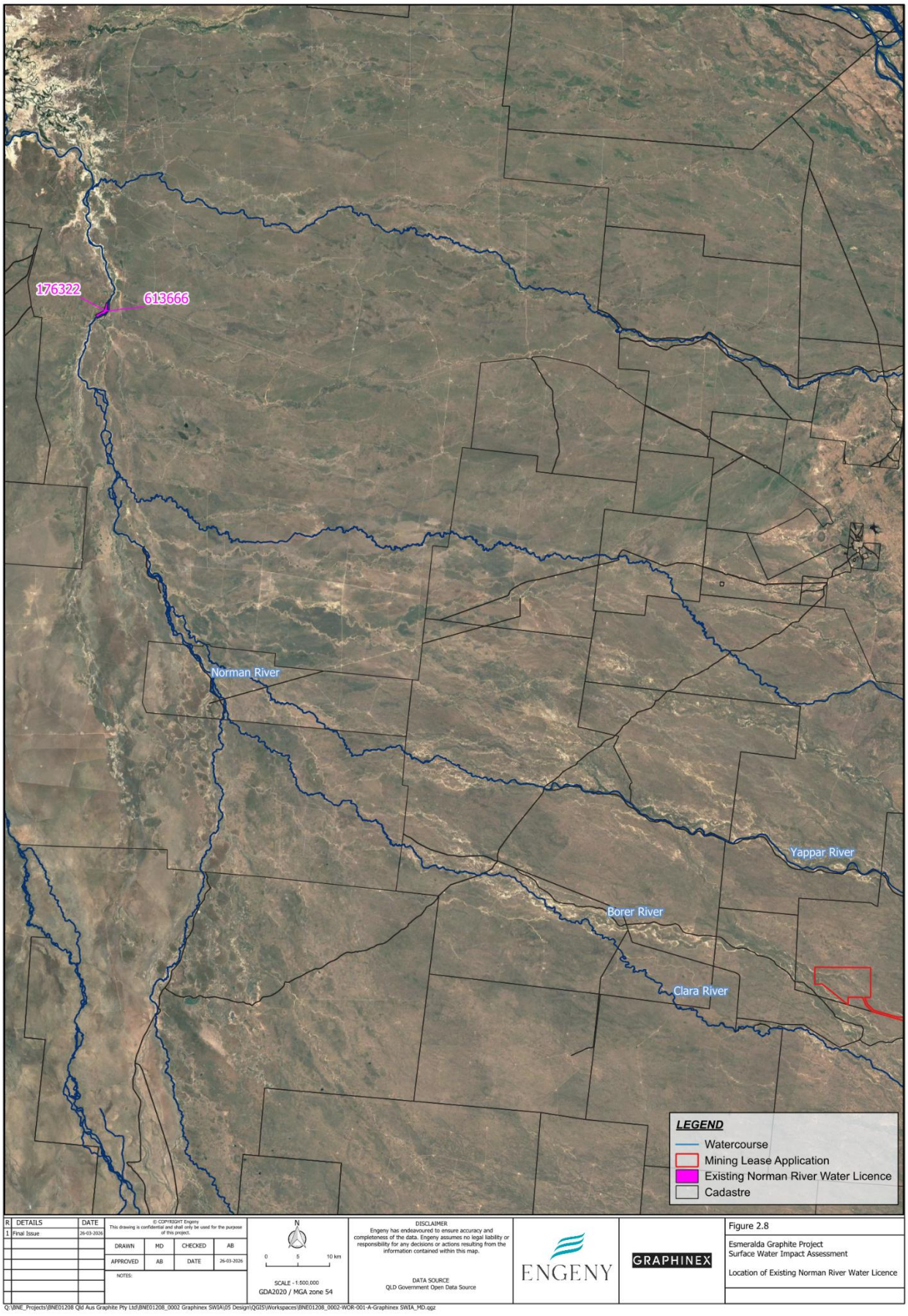



**Figure 2.8: Location of Existing Norman River Water Licence**

## 2.6 Wetlands

The Map of Queensland wetland environmental values is a state-wide statutory map under the Environmental Protection (Water and Wetland Biodiversity) Policy 2019. It identifies wetlands of high ecological significance (HES) and general ecological significance (GES) across the state.

Matters of State Environmental Significance (MSES) HES wetlands and GES wetlands and Vegetation Management Wetlands in the locality of the Project are shown in Figure 2.9 and Figure 2.10.

There are no HES wetlands mapped within the proximity of the Project's MLAs, nor are there any downstream until reaching the Gulf. The MLA boundary overlaps with a small number of GES and Management wetlands, mostly aligning with the watercourses identified to flow through the site.

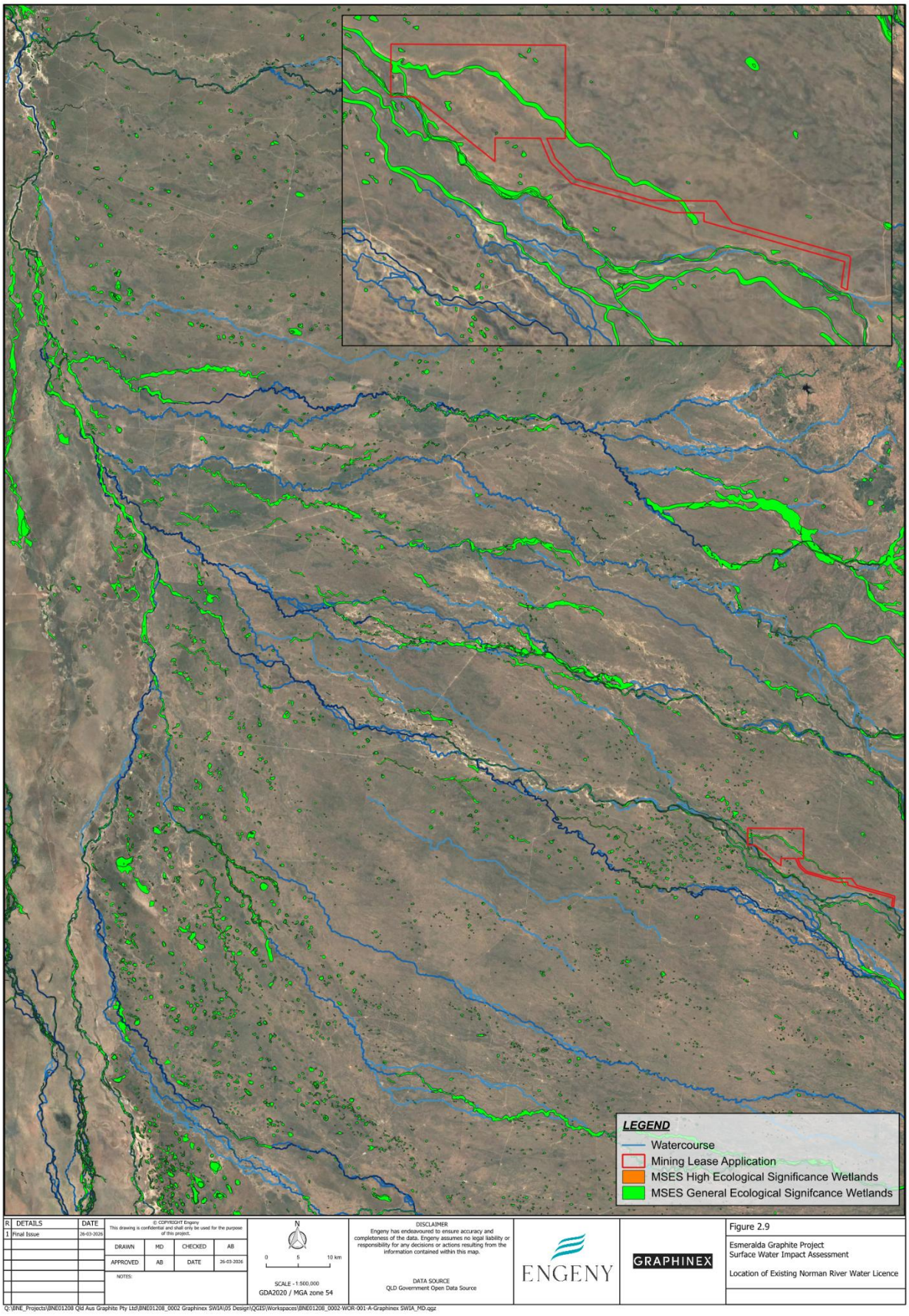



**Figure 2.9: Wetlands of Ecological Significance**

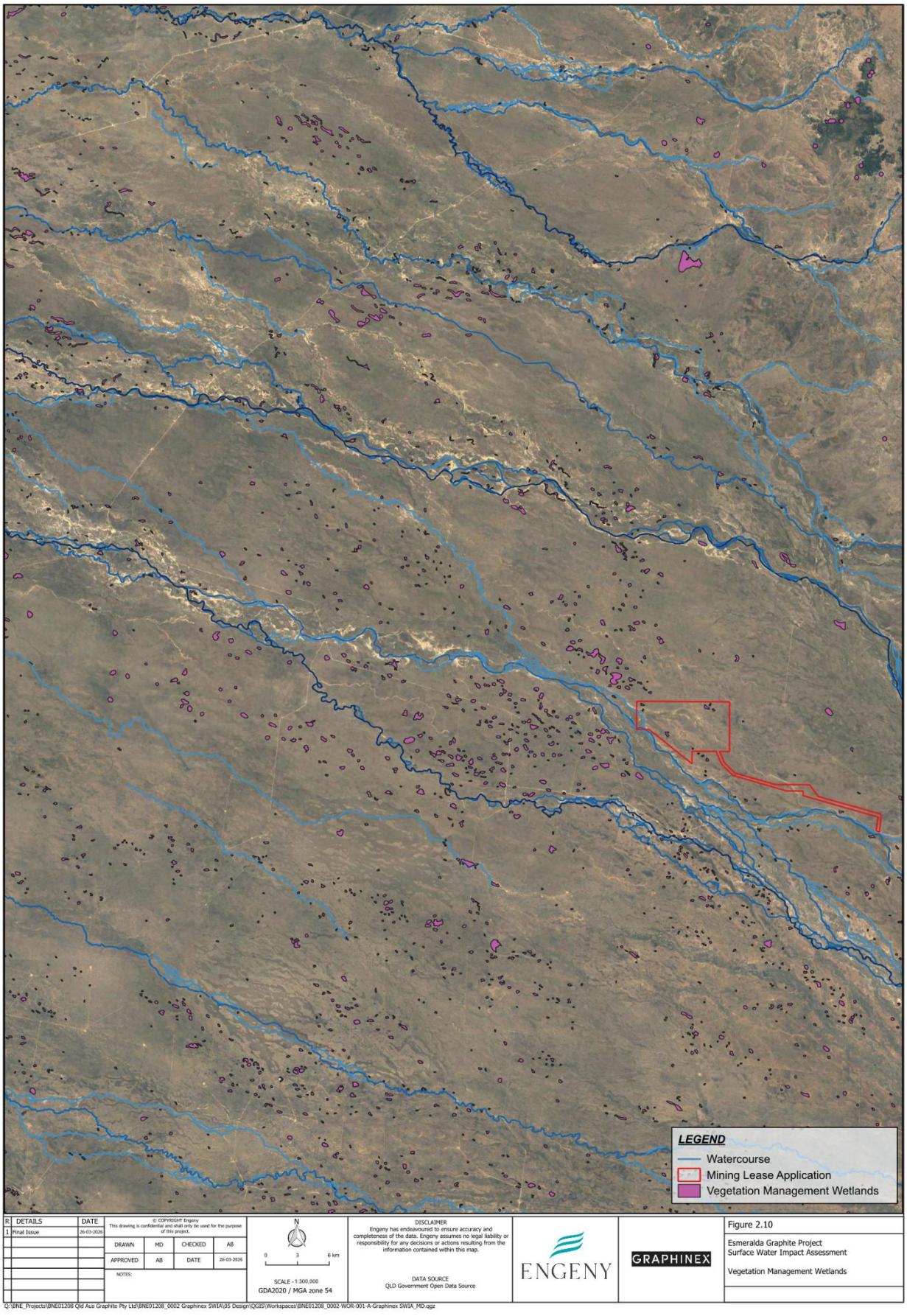



**Figure 2.10: Vegetation Management Wetlands**

Table 6.7: Climate change Sensitvity - model parameters..... 76

## 2.7 Land use

### 2.7.1 Agriculture

The land within and surrounding the Project area is designated as 'Rural' zone under the Croydon Shire Planning Scheme (Croydon Shire Council, 2019).

The Queensland Government's land use mapping (Queensland Globe) indicates current and potential areas for sown pasture within the Project MLAs under the QLD Agricultural Land Audit. However, QLD Agricultural Land Classes did not identify the region to be considered crop land. The mapping shows that the Agricultural Land Audit has not classified the region within and surrounding the site boundary as "Important Agricultural Area" and was not noted for agricultural development (Figure 2.11). Potential agricultural regions mapped in the Project area include:

- QLD Agricultural Land Classes – Class C2: Pastureland- native pastures.
- QLD Agricultural Land Audit – Sown Pastures- Potential and Current.

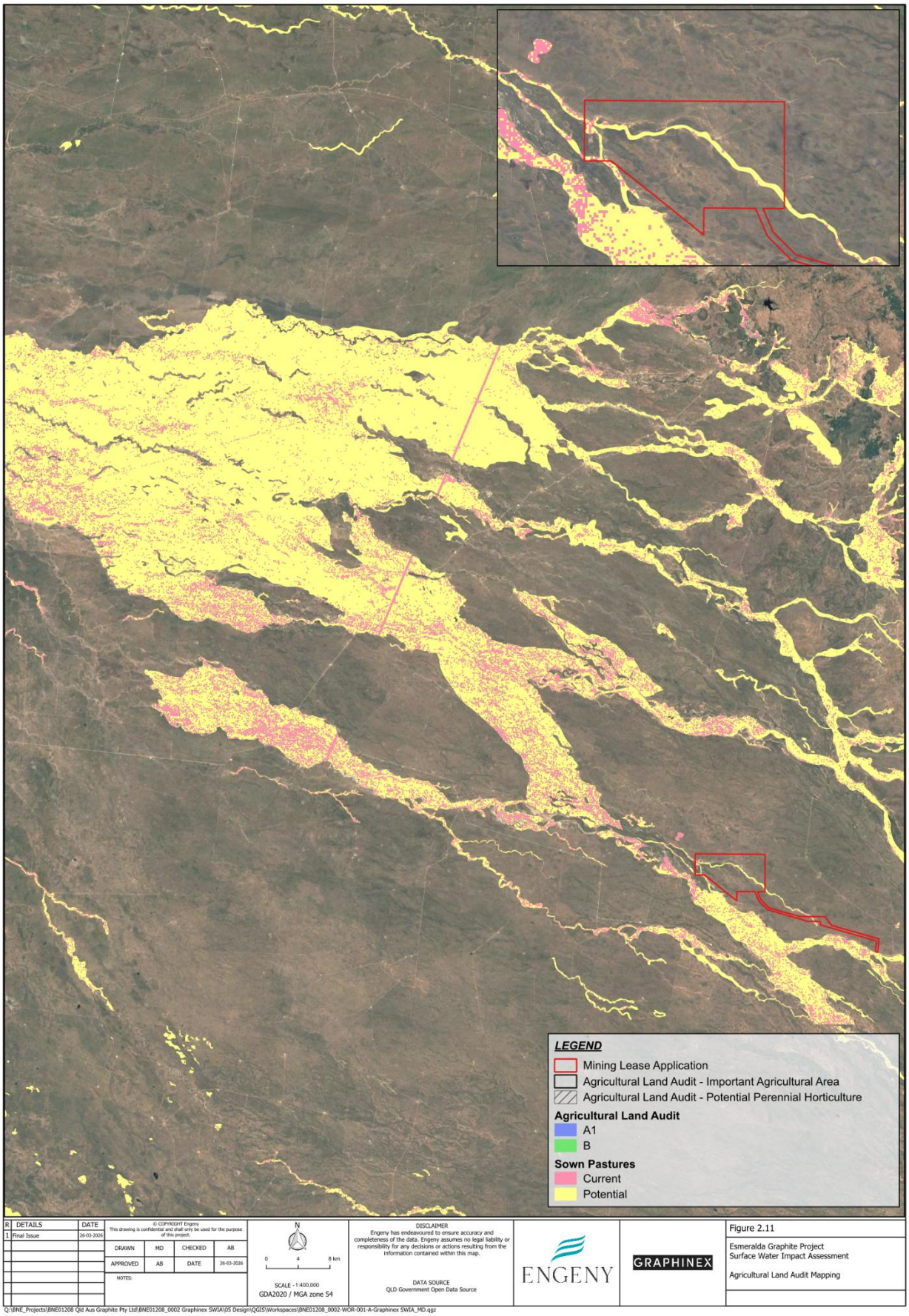



**Figure 2.11: Agricultural Land Audit Mapping**

## 2.7.2 Nearby Mines and Industry

The Project will be the only mining operation located in the Borer River catchment if approved, however there are several approved, active and inactive mineral mines located in nearby catchments. Several mines are within the larger Norman River Catchment, located along a downstream tributary in the Croydon Township. Outside of the Norman Catchment, mining sites exist ~ 150km away in the upstream tributaries of the Flinders River and to the east within the Gilbert River Catchment. Table 2.6 provides a summary of mines within 150 km of the Project.

**TABLE 2.6: NEARBY MINES**

| Name | Proximity | Activity |
|---|---|---|
| Croydon | 70 km (Norman River Catchment) | Gold, Silver |
| Croydon King | 65 km (Norman River Catchment) | Gold, Silver |
| Shamrock | 150 km (Flinders River Catchment) | CU,PB,ZN,AG,AU |
| Soapspar | 150 km (Flinders River Catchment) | CU,PB,TI,ZN,AGAU |
| Northstar | 150 km (Flinders River Catchment) | CU,PB,ZN,AG,AU |
| Sandy Creek | 150 km (Flinders River Catchment) | CU,PB,ZN,MINS,AG,AU |
| Flat Creek | 150 km (Flinders River Catchment) | CU,PB,ZN,MINS,AG,AU |
| Agate Creek | 130 km (Gilbert River Catchment) | CU,PB,ZN,AG,AU |
| Diggers Creek | 130 km (Gilbert River Catchment) | SN,AU |

# 3. ENVIRONMENTAL VALUES AND WATER QUALITY OBJECTIVES

## 3.1 Relevant Legislation

### 3.1.1 Environmental Protection Act 1994 (EP Act)

The EP Act defines environmental value as:

- A quality or physical characteristic of the environment that is conducive to ecological health or public amenity or safety; or
- Another quality of the environment identified and declared to be an environmental value under an environmental protection policy or regulation.

### 3.1.2 Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

The Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) defines the legal framework to protect and manage nationally and internationally important flora, fauna and ecological places defined as Matters of National Environmental Significance (MNES).

The Project was determined 'not a controlled action' (EPBC reference 2025/10140) under the EPBC Act on 23 June 2025.

### 3.1.3 Environmental Protection Regulation (EP Regulation) 2019

The Environmental Protection Regulation (EP Regulation) 2019 further defines specified environmental objectives and performance outcomes for key environmental aspects. The Water and Wetlands environmental objectives and performance outcomes are summarised in Section 3.3.3.

### 3.1.4 Environmental Protection (Water and Wetland Biodiversity) 2019

The purpose of the Environmental Protection (Water and Wetland Biodiversity) Policy 2019 (EPP) is to identify environmental values (EV) and associated water quality objectives (WQO) for Queensland waters. The Project is located within the Norman River sub-catchment of the Gulf Rivers basin. A Program to define EVs and WQOs for the Norman River sub-catchment has not currently been completed and therefore EVs and WQOs are not currently scheduled under the EPP.

### 3.1.5 Water Act 2000

The Water Act 2000 is the key regulatory document in Queensland for the allocation and use of water resources. The Water Act provides a range of plans, licences and permits for surface and groundwater resources throughout the state. These include Water Plans and Resource Operations Plans/Water Management Protocols.

### 3.1.6 Water Plan (Gulf) 2007

Water resources within the Norman River catchment are managed under the Water Plan (Gulf) 2007. The purposes of the plan are defined as:

- To define availability of water in the plan area.
- To provide a framework for sustainably managing water and the taking of water.
- To identify priorities and mechanisms for dealing with future water requirements.
- To provide a framework for establishing water allocations to take supplemented surface water.
- To provide a framework for reversing, where practicable, degradation of natural ecosystems.
- To regulate the taking of overland flow water.

- To regulate the taking of groundwater.

The Plan defines Environmental Flow Objectives (EFOs) which define the flow conditions which must be maintained at defined management Nodes in the Gulf basin. EFOs are defined for a range of conditions including flow volume, flow duration, low flow, medium to high flow and wet season flow events.

As listed in schedule 4, section 10, There are no Nodes located within the Norman River Catchment. The nearest node is 7 which is the Flinders River at Walkers Bend gauging station. The Norman River Catchment also has no Water Allocation Security Objectives (WASOs) defined under the Water Plan (Gulf) 2007.

### 3.1.7 Gulf Resource Operations Plan 2010

The Gulf Resource Operations Plan (ROP) 2010 is a document prepared to outline strategies for the implementation of the Water Plan (Gulf) 2007. The Gulf ROP regulates water allocations and licensing within the Gulf basin. The ROP sub-divides the Gulf Basin into water management areas and zones. The Project is located within the Norman River Water Management Area (refer Figure 2.7).

### 3.1.8 Water Plan (Great Artesian Basin and Other Regional Aquifers) 2017

Groundwater resources with the Norman River sub-basins are managed under the Water Plan (Great Artesian Basin and Other Regional Aquifers) 2017. The purposes of the Plan are defined as:

- To define availability of water in the plan area.
- To provide a framework for sustainably managing water and the taking of water in the plan area; and
- To identify priorities and mechanisms for dealing with future water requirements; and
- To provide a framework for reversing, if practicable, the degradation of groundwater-dependent ecosystems.

The Plan's main outcomes are to allocate (using water permits and licenses) and manage water in a way to mitigate the impact on groundwater-dependent ecosystems due to taking and interfering with water. The Plan aims to achieve a sustainable balance between the following outcomes:

- To protect the flow of water to groundwater-dependent ecosystems that support significant cultural or environmental values.
- To protect the continued use of authorisations to take or interfere with water.
- To maintain, and if practicable increase, water pressure in aquifers to preserve the supply of water to bores.
- To make water available for future development and social and cultural activities that depend on water, including for the aspirations of Aboriginal peoples and Torres Strait Islanders.
- To encourage the efficient use of water by requiring water bores to have watertight delivery systems or be controlled.
- To facilitate the operation of efficient water markets and opportunities for the temporary or permanent movement of water.

### 3.1.9 Great Artesian Basin and Other Regional Aquifers Water Management Protocol 2017

The Great Artesian Bains and Other Regional Aquifers Water Management Protocol (The Protocol) 2017 is a document prepared to implement parts of the Water Plan (Great Artesian Basin and Other Regional Aquifers) 2017. The protocol regulates groundwater allocations and licensing as well as protection and monitoring of groundwater-dependent ecosystems within the Plan area.

## 3.2 Environmental Values

As there are no prescribed environmental values for the Norman River catchment under the EPP, the following sections justify and outline the perceived environmental values for the Project surface waters based on all available information and legislative requirements.

### 3.2.1 Aquatic Ecosystem

Aquatic ecosystem health is considered to be an environmental value for the Project. There are no published ecosystem condition categories of the waterways surrounding Project under the EPP or other Queensland guidelines such as the Queensland Water Quality Guidelines 2009 (QWQG). The ecosystem condition categories are used to define the value of the aquatic ecosystem (and consequent objectives for its protection) and are based on a number of factors including water quality and extent to which the waterway has been modified by human activity.

The EPP defines the categories as follows:

- High ecological value waters: waters in which the biological integrity of the water is effectively unmodified or highly valued.
- Slightly disturbed waters: waters that have the biological integrity of high ecological value waters with slightly modified physical or chemical indicators but effectively unmodified biological indicators.
- Moderately disturbed waters: waters in which the biological integrity of the water is adversely affected by human activity to a relatively small but measurable degree.
- Highly disturbed waters: waters that are significantly degraded by human activity and have lower ecological value than high ecological value waters or slightly or moderately disturbed waters.

The Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG) and the QWQG provide further guidance for classification of aquatic ecosystem condition where:

- High value ecosystems are effectively unmodified or other highly valued systems, typically (but not always) occurring in national parks, conservation reserves or in remote and/or inaccessible locations (ANZG, 2018).
- Slightly to moderately disturbed ecosystems for freshwater systems would have slightly to moderately cleared catchments and/or reasonably intact riparian vegetation. This could include rural streams receiving runoff from land disturbed to varying degrees by grazing or pastoralism (ANZG, 2018).
- Highly disturbed ecosystems are measurably degraded systems, for example shipping ports, urban streams or rural streams receiving runoff from intensive horticulture (ANZG, 2018).

Based on the above definitions and guidance, the waterways surrounding the Project are likely to be classed as ‘slightly to moderately disturbed’ as the surrounding areas are pasture land- native pastures (with areas of current and potential sown pastures) and are therefore modified (not high value waters) but likely not to the extent to be classified as highly disturbed.

### 3.2.2 Aquaculture and Human Consumption

The Glenore Weir is located at the tidal break of the Norman River separating fresh and sea waters. Commercial fishing operations are known to be located downstream of the weir however no commercial fishing operations are known upstream of the weir in the fresh waters. Water from the weir impoundment is blended with Artesian Bore water and treated to supply Normanton and Karumba Townships (Carpentaria Shire Council, 2025). Because of the downstream commercial fishing operations Human consumption is considered to be a likely environmental value for the Project.

### 3.2.3 Crop Irrigation

There are no known cropping or irrigation operations that source water from the Norman River downstream of the Project location. Therefore, crop irrigation is not considered to be a likely environmental value for the Project.

### 3.2.4 Agriculture

There are two existing surface water entitlements authorised under the Water Plan (Gulf) 2007 on the Norman River, 170 km downstream of the Project that have an authorised purpose for ‘any’ purpose (Refer Section 2.7). Based on this, the agriculture in the form of grazing and farm supply/use is considered to be a relevant environmental value for the Project.

### 3.2.5 Recreational Uses

Flow within the Borer River is seasonal however segregated waterholes within the river channel can persist for longer periods of time into the dry season without additional inflows. It is not known if the Borer River is used for recreational use however it is possible that, when

water persists within the channel, recreational purposes would include activities such as swimming (primary recreational use) and fishing (secondary recreational use). For this reason, primary and secondary recreational use are considered to be relevant environmental values for the Project.

### 3.2.6 Drinking Water

The Glenore Weir is located 170 km downstream of the Project and is used for drinking water supplies. The water obtained by the existing surface water entitlements and blended with Artesian Bore water are treated and used to supply Normanton and Karumba Townships (Carpentaria Shire Council, 2025). Based on this, drinking water is considered to be a likely environmental value for the Project.

### 3.2.7 Industrial Use

There is no known surface water supply for industrial purposes or mining activities downstream of the Project from the Borer River or Norman River. Therefore, industrial use is not considered to be a likely environmental value for the Project.

### 3.2.8 Visual Recreation

It is possible that the Borer River provides aesthetic quality or recreational fishing for visual recreational use. For this reason, visual recreation is considered to be a relevant environmental value for the Project.

### 3.2.9 Cultural and Spiritual Values

It is possible that the waterways provide cultural and spiritual value. For this reason, cultural and spiritual values are considered to be a relevant environmental value for the Project.

## 3.3 Water Quality Objectives and Environmental Objectives

Water Quality Objectives (WQOs) for protection of the identified category of waters (including specific thresholds for water quality parameters) are usually scheduled under the EPP (Water and Wetland Biodiversity) for the relevant catchment. WQOs for the Gulf Catchment are yet to be derived and scheduled under the EPP (Water and Wetland Biodiversity). In the absence of scheduled WQOs, the EPP (Water and Wetland Biodiversity) requires WQOs to be a set of water quality guidelines for all indicators that will protect all environmental values for the water.

The Australian and New Zealand guidelines for fresh and marine water quality (ANZG) (ANZG, 2018) and QWQG (DEHP, 2009) provide broad-scale thresholds for water quality parameters for varying levels of ecosystem protection. However, both guidelines strongly encourage the collection of local data, where available, to develop guidelines relevant to the area in question (DEHP, 2009) and provide guidance on minimum monitoring program requirements to obtain suitable water quality datasets that capture both spatial and temporal variation. A surface water monitoring program for the Project has been developed in Section 10.2 to meet these objectives. The water quality monitoring program outlines water quality monitoring locations and indicators which will allow development of site-specific WQOs during the project commencement.

The ANZG were updated in late 2018 for the purposes of updating the water quality management framework and revising some of the default guideline values based on more recent, and longer, water quality datasets.. The Project will address and incorporate the future revisions and releases of the ANZG as part of the ongoing surface water monitoring program for the Project (refer Section 10.2).

The ANZG categorises the water types for several broad regions based on physio-chemical parameters. The Project is classified as lowland freshwater based on the Project being situated at 120 m AHD and the transition between highland and lowland being 150 m AHD.

### 3.3.1 Draft Water Quality Objectives

WQOs for the Project have been adopted from guideline values for protection of the EVs described in Section 3.2 from the ANZG (2018). This is due to absence of published WQOs for the Gulf catchment under the EPP (Water and Wetland Biodiversity) and insufficient existing water quality monitoring data at the time of preparing this report for the development of site-specific WQOs. The draft WQOs developed for the Project are presented in Table 3.1.

The ANZG default guideline values for each of the Project EVs were reviewed, and the most conservative threshold was adopted to ensure all EVs were considered and protected. Table 3.1 Includes all water and sediment quality indicators that have documented default guideline values within the ANZG.

Water monitoring data collected as part of the Project is currently limited with insufficient number of sampling rounds to prepare site specific WQOs. Ongoing sampling is to be completed at locations upstream and downstream of the project for the future development of site specific WQOs. The remote Project locality and ephemeral nature of the waterways have limited the sampling opportunities.

Although there is insufficient data to develop site-specific WQOs, the current data is presented to identify contaminants that are likely to exceed the default guidelines values and will be revised once more data is collected.

Indicators listed in Table 3.1 that don't have ANZG default guideline values (e.g., dissolved organic carbon) will have appropriate thresholds developed once sufficient representative baseline data has been collected for the Project.

**TABLE 3.1: DRAFT SURFACE WATER QUALITY OBJECTIVES**

| Indicator | Draft Water Quality Objectives | | Water Quality Objectives for individual Environmental Values | | | |
|---|---|---|---|---|---|---|
| | WQO | Corresponding EV | Aquatic Ecosystems | Drinking Water | Irrigation (Long - Short Term) | Stock Watering |
| pH | 6.0-7.5 | Aquatic Ecosystems | 6.0-7.5 | 6.5-8.5 | - | - |
| Electrical Conductivity | | Aquatic Ecosystems | 550 µS/cm | 400 µS/cm | - | |
| Total Dissolved Solids | 500 mg/L | Aquatic Ecosystems | 500 mg/L | 600 mg/L | - | Cattle: 2,400 mg/L |
| Ammonia N | 20 µg/L | Aquatic Ecosystems | 20 µg/L | 500 µg/L | - | - |
| Oxidised N | - | Aquatic Ecosystems | - | - | - | - |
| Organic N | - | Aquatic Ecosystems | | - | - | - |
| Nitrate | 1.1 mg/L | Aquatic Ecosystems | 1.1 mg/? | 50 mg/L | - | - |
| Nitrite | 3 mg/L | Drinking Water | 3 mg/L | 3 mg/L | - | - |
| Total Nitrogen | 500 µg/L | Aquatic Ecosystems | 500 µg/L | - | - | - |
| Reactive Phosphorus | 20 µg/L | Aquatic Ecosystems | 4 µg/L | - | - | - |
| Total Phosphorus | 50 µg/L | Aquatic Ecosystems | 10 µg/L | - | - | - |
| Dissolved Oxygen | <4mg/L at surface | Drinking Water | - | <4mg/L at surface | - | - |
| Turbidity | 5 NTU | Aquatic Ecosystems | - | 5 NTU | - | - |
| Suspended Solids | 10 mg/L | Aquatic Ecosystem | 10 mg/L | - | - | |
| Sulfate | 25 mg/L | Aquatic Ecosystem | 25 mg/L | 200 mg/L | - | - |
| Cryptosporidium | 0 cysts | Drinking Water | - | 0 cysts | - | - |
| Blue-green Algae | - | Drinking Water | - | - | - | - |
| Algal Toxin | - | Drinking Water | - | - | - | - |
| | - | | - | - | | |
| Colour | - | Drinking Water | - | - | - | - |
| Hardness (as $CaCO_3$) | 200 mg/L | Drinking Water | - | 200 mg/L | - | - |

| Indicator | Draft Water Quality Objectives | | Water Quality Objectives for individual Environmental Values | | | |
|---|---|---|---|---|---|---|
| | WQO | Corresponding EV | Aquatic Ecosystems | Drinking Water | Irrigation (Long - Short Term) | Stock Watering |
| Sodium | 30 mg/L | Drinking Water | - | 30 mg/L | - | - |
| Chloride | 250 mg/L | Drinking Water | - | 250 mg/L | - | - |
| Aluminium (Dissolved) | 55 µg/L | Aquatic Ecosystems | 55 µg/L | - | - | - |
| Aluminium (Total) | 200 µg/L | Drinking Water | - | 200 µg/L | 5,000 µg/L - 20,000 µg/L | 5,000 µg/L |
| Arsenic (Dissolved) | 13 µg/L | Aquatic Ecosystems | 13 µg/L | - | - | - |
| Arsenic (Total) | 10 µg/L | Drinking water | - | 10 µg/L | 100 µg/L - 200 µg/L | 500 µg/L – 2,000 µg/L |
| Beryllium (Dissolved) | - | Aquatic Ecosystems | - | - | - | |
| Beryllium (Total) | 60 µg/L | Drinking Water | - | 60 µg/L | 100 µg/L - 500 µg/L | ND |
| Boron (Dissolved) | 940 µg/L | Aquatic Ecosystems | 0.94 mg/L | - | - | - |
| Boron (Total) | 500 µg/L | Irrigation | - | 4,000 µg/L | 500 µg/L - 15,000 µg/L | 5,000 µg/L |
| Cadmium (Dissolved) | 0.2 µg/L | Aquatic Ecosystems | 0.2 µg/L | - | - | - |
| Cadmium (Total) | 2 µg/L | Drinking Water | - | 2 µg/L | 10 µg/L - 50 µg/L | 10 µg/L |
| Chromium (Dissolved) | 1 µg/L | Aquatic Ecosystems | 1 µg/L | - | - | - |
| Chromium (Total) | 50 µg/L | Drinking Water | - | 50 µg/L | 100 µg/L - 1,000 µg/L | 1,000 µg/L |
| Cobalt (Dissolved) | 1.4 µg /L | Aquatic Ecosystems | 1.4 µg /L | - | - | - |
| Cobalt (Total) | 50 µg /L | Irrigation | - | - | 50 µg /L - 100 µg /L | 1,000 µg /L |
| Copper (Dissolved) | 1.4 µg/L | Aquatic Ecosystems | 1.4 µg/L | - | - | - |
| Copper (Total) | 200 µg /L | Irrigation | - | 2,000 µg/L | 200 µg /L – 5,000 µg /L | 1,000 µg/L (cattle) |
| Fluoride | 1,000 µg/L | Irrigation | 1,700 µg/L | 1,500 µg/L | 1,000 µg/L - 2,000 µg/L | 2,000 µg/L |
| Iron (Dissolved) | 280 µg/L | Aquatic Ecosystems | 280 µg/L | - | - | - |
| Iron (Total) | 0.2 mg/L | Irrigation | - | 300 µg/L | 200 µg/L - 10,000 µg/L | Not sufficiently toxic |
| Lead (Dissolved) | 3.4 µg/L | Aquatic Ecosystems | 3.4 µg/L | - | - | - |
| Lead (Total) | 5 µg/L | Drinking Water | - | 5 µg/L | 2,000 µg/L - 5,000 µg/L | 100 µg/L |
| Lithium (total) | 2.5 µg/L | Irrigation | - | - | 2,500 µg/L | - |

| Indicator | Draft Water Quality Objectives | | Water Quality Objectives for individual Environmental Values | | | |
|---|---|---|---|---|---|---|
| | WQO | Corresponding EV | Aquatic Ecosystems | Drinking Water | Irrigation (Long - Short Term) | Stock Watering |
| Manganese (Dissolved) | 1.9 mg/L | Aquatic Ecosystems | 1.9 mg/L | - | - | - |
| Manganese (Total) | 0.1 mg/L | Drinking Water | - | 300 µg/L | 300 µg/L - 10,000 µg/L | - |
| Mercury (Dissolved) | 0.6 µg/L | Aquatic Ecosystems | 0.6 µg/L | - | - | - |
| Mercury (Total) | 1 µg/L | Drinking Water | - | 1 µg/L | 2 µg/L | 2 µg/L |
| Molybdenum (Dissolved) | 34 µg/L | Aquatic Ecosystems | 34 µg/L | - | - | - |
| Molybdenum (Total) | 20 µg/L | Irrigation | - | 50 µg/L | 20 µg/L - 50 µg/L | - |
| Nickel (Dissolved) | 11 µg/L | Aquatic Ecosystems | 11 µg/L | - | - | - |
| Nickel (Total) | 20 µg/L | Drinking Water | - | 20 µg/L | - | 1 mg/L |
| Selenium (Dissolved) | 11 µg/L | Aquatic Ecosystems | 11 µg/L | - | - | - |
| Selenium (Total) | 4 µg/L | Drinking Water | - | 4 µg/L | 10 µg/L - 50 µg/L | 20 µg/L |
| Uranium (Dissolved) | 0.5 µg/L | Aquatic Ecosystems | 0.5 µg/L | - | - | - |
| Uranium (Total) | 10 µg/L | Irrigation | - | 20 µg/L | 10 µg/L - 100 µg/L | - |
| Vanadium (Dissolved) | 6 µg/L | Aquatic Ecosystems | 6 µg/L | - | - | - |
| Vanadium (Total) | 100 µg/L | Irrigation | - | - | 100 µg/L - 500 µg/L | - |
| Zinc (Dissolved) | 8 µg/L | Aquatic Ecosystems | 8 µg/L | - | - | - |
| Zinc (Total) | 2,000 µg/L | Irrigation | - | 3,000 µg/L | 2,000 µg/L - 5,000 µg/L | 20,000 µg/L |

### 3.3.2 Environmental Flow Objectives

The Water Plan (Gulf) 2007 prescribes Environmental Flow Objectives (EFOs) for the catchment areas of the Gulf Water Plan Area for the sustainable management of ecological outcomes. The Water Plan (Gulf) 2007 however does not prescribe EFOs for the Norman River catchment.

### 3.3.3 Environmental Objectives and Performance Outcomes

Schedule 8, Part 3 of the EP Regulation lists environmental objectives and associated performance outcomes that will guide the development of the Project water management system. These are summarised in Table 3.2. The environmental objective is considered achieved if Item 1 or Item 2 of the performance outcomes are achieved by the Project application.

**TABLE 3.2: EP REGULATION ENVIRONMENTAL OBJECTIVES AND PERFORMANCE OUTCOMES**

| Category | Environmental Objective | Performance Outcomes (must achieve Item 1 or Item 2) |
|---|---|---|
| Water | The activity will be operated in a way that protects environmental values of waters. | Item 1 - There is no actual or potential discharge to waters of contaminants that may cause an adverse effect on an environmental value from the operation of the activity. |
| | | Item 2 - All of the following—<br>(a) the storage and handling of contaminants will include effective means of secondary containment to prevent or minimise releases to the environment from spillage or leaks<br>(b) contingency measures will prevent or minimise adverse effects on the environment due to unplanned releases or discharges of contaminants to water<br>(c) the activity will be managed so that stormwater contaminated by the activity that may cause an adverse effect on an environmental value will not leave the site without prior treatment<br>(d) the disturbance of any acid sulfate soil, or potential acid sulfate soil, will be managed to prevent or minimise adverse effects on environmental values<br>(e) acid producing rock will be managed to ensure that the production and release of acidic waste is prevented or minimised, including impacts during operation and after the environmental authority has been surrendered<br>(f) any discharge to water or a watercourse or wetland will be managed so that there will be no adverse effects due to the altering of existing flow regimes for water or a watercourse or wetland<br>(g) for a petroleum activity, the activity will be managed in a way that is consistent with the coal seam gas water management policy, including the prioritisation hierarchy for managing and using coal seam gas water and the prioritisation hierarchy for managing saline waste<br>(h) the activity will be managed so that adverse effects on environmental values are prevented or minimised. |
| Wetlands | The activity will be operated in a way that protects the environmental values of wetlands. | Item 1 - There will be no potential or actual adverse effect on a wetland as part of carrying out the activity. |
| | | Item 2 - The activity will be managed in a way that prevents or minimises adverse effects on wetlands. |
| Critical Design Requirements Sediment and Soil | The design of the facility permits the operation of the site, at which the activity is to be carried out, in accordance with best practice environmental management. | Item 1 - The activity does not involve the storage, production, treatment or release of hazardous contaminants, or involve a regulated structure. |
| | | Item 2 - All of the following apply—<br>(a) all storage provided for hazardous contaminants includes secondary containment to prevent or minimise releases to the environment from spillage or leaks<br>(b) regulated structures comply with the document called 'Manual for assessing consequence categories and hydraulic performance of structures', published by the department<br>(c) containers are provided for the storage of hazardous contaminants that are secured to prevent the removal of the containers from the site by a flood event<br>(d) the design of the facility prevents or minimises the production of hazardous contaminants and waste<br>(e) if the production of hazardous contaminants and waste is not prevented or minimised under paragraph (d)—the design of the facility contains and treats hazardous contaminants rather than releasing them. |

# 4. CONTAMINANT SOURCES

## 4.1 Potential Contaminant Sources

Potential contaminant sources associated with the Project include:

- Surface runoff from disturbed areas.
- Surface runoff from mine waste or ore.
- Accumulated water in the mining pits.
- Incidental runoff from chemical/hydrocarbon spills within the processing plant area.
- Process waste streams and entrained water.
- Seepage, overtopping or dam failure of mine water storages.

### 4.1.1 Surface Runoff from Disturbed Areas

Disturbance activities for the Project will include an open cut mining pit, overburden dumps, ROM stockpiles, mine infrastructure hardstand areas, access and haul roads, disturbance for water management storages, infrastructure corridors and the processing plant. Runoff from these areas could contain sediment and other contaminants above natural surface water runoff concentrations. The source of the runoff will influence the contaminant types and concentrations, however, generally there are two overarching categories:

- Runoff from cleared areas, overburden dumps or roads that would be expected to have elevated sediment load.
- Runoff from processing areas and/or mine pits that may contain other contaminants in addition to sediment (e.g. dissolved salts and metals, hydrocarbons, nutrients etc).

The strategies for the mitigation and management of these two categories will therefore differ to ensure they are suitably managed to protect the receiving environment and associated environmental values. Typically, erosion and sediment control strategies are implemented for runoff in which sediment is the primary contaminant of concern for treatment before release, whereas more comprehensive mine water management systems are developed for waters containing other contaminants to prevent releases.

### 4.1.2 Processing

The mining and processing of the ore at the Project will include a concentrator which involves crushing and screening of the ore followed by a series of flotation stages. The concentrate will then be flash dried before being trucked to Townsville for export from the Port of Townsville (Wave International, 2025). Water used in the concentrator processing plant will be recycled through the various stages and discharged with the tailings material to the four TSFs over the project life.

The process plant will use several reagents in the flotation and tailings thickening phase that may produce contaminants in water recycled to the process water pond and TSFs. Diesel is proposed for use as a collector and Methyl Isobutyl Carbinol (MICB) as a frother in the flotation treatment phases and flocculant is proposed for use in the tailings thickening stages. The Contaminants of Concern (CoC) associated with these reagents include:

Diesel – aliphatic and aromatic hydrocarbons and a small potential for thiophenes and thiolanes:

- MICB – aromatic hydrocarbons
- Flocculant.

The processing material also has potential to produce CoC with contact water due to the geochemistry of the ore body. Testing of the ore materials captured as part of the geochemical assessment (RGS, 2026) has been reviewed to characterise the quality of tailings decant and recycled plant water, as well as runoff or seepage from the processing plant and ore stockpiles. The assessment concluded the following on the geochemistry of the ore body materials (RGS, 2026):

- Some of the mine material samples of Ore Body are classified as potentially acid forming (PAF) - low capacity (PAF-LC) (2 %) or PAF (38 %).
- Solid mine materials and tailing samples may have some enrichment, compared to the median crustal abundance in unmineralised soils, in the following - Copper (Cu) Molybdenum (Mo), Rhenium (Re), Sulphur (S) and Tellurium (Te).

- Metal/metalloid concentrations are generally below detection limits, although may contain slightly elevated concentrations of Aluminium (Al), Arsenic (As), and Zinc (Zn).
- Tailing samples behave as a sand. They are likely to be permeable, to drain quickly, and have low water retention characteristics. They are classified as Emerson Class 3 and are expected to have good structure and stability with limited shrink / swell behaviour, and to settle reasonably quickly.

Water returned from the process plant and TSFs (to Process Water Pond) is expected to have these potential CoCs. Similarly, runoff from the process plant area and ore stockpile areas will likely contain contaminants associated with the ore geochemistry.

### 4.1.3 Chemical and Hydrocarbon Storage

The storage of chemicals and hydrocarbons will be required as part of ongoing operations. A dedicated fuel and lube facility will be required, which will be constructed in line with the containment and spill response requirements of Australian Standard 1940 – The Storage and Handling of Flammable and Combustible Liquids, however, will still remain a potential source of contaminants for the Project.

### 4.1.4 Seepage, Overtopping and Failure of Storages

Mine water will be stored in dams on site and is a potential contaminant source via pathways of seepage, overtopping and dam failure. Preliminary consequence category assessments for seepage, overtopping and dam failure scenarios for the proposed dams is provided in Section 9. The dams will be suitably engineered to minimise the likelihood of the potential failure pathways based on the outcomes of the consequence category assessment. Detailed descriptions of the proposed dams is provided in Section 5.3 and the performance of the proposed dams is provided in Section 6.1.8.

### 4.1.5 Waste Rock Material Runoff and Seepage

Mine waste materials from the excavation of the pit will be placed in out of pit dumps adjacent to the mining void. Rainfall runoff and infiltration will be collected via drains and report to sedimentation ponds. Two out of pit dumps are proposed to the south east and south west of the mining pit with a maximum total area of 104 ha and will be mostly constructed in the first 18 years of the project. An estimated 170 Mt will be moved during the 53 year operating life. The out of pit dumps will be constructed with soils, overburden materials and waste rock from the ore body as part of the excavation of the mining pit. At closure, the final landform will be reshaped, topsoiled and vegetated to aim to return the land to a grazing PMLU where possible.

Testing of potential waste rock materials captured as part of the geochemical assessment (RGS, 2026) has been reviewed to characterise the quality of potential seepage from the spoil dump and the risk on sediment dam water quality and downstream water quality. The geochemical assessment of the Project area included analysis of material samples for soils, overburden and orebody and underlying geology. The assessment concluded the following on potential seepage from the out of pit dump waste materials (RGS, 2026):

- Soil, overburden, and waste rock materials typically have low total sulfur content and are classified as non-acid forming (NAF Barren) (58% of all material samples). These materials have a negligible risk of acid generation and a high factor of safety with respect to potential for acidic drainage.
- Slightly alkaline and low salinity.
- Metal/metalloid concentrations are generally below detection limits, although may contain slightly elevated concentrations of the following metals compared to the draft WQO:
  - Aluminium (Al), seepage tests indicate an average dissolved concentration of 0.22 mg/L from the waste rock material. Water quality data for the receiving waterways indicates average aluminium concentrations (0.22 mg/L) are equivalent to the concentrations expected from waste rock materials and reach as high as 0.63 mg/L.
  - Arsenic (As), seepage tests indicate an average dissolved concentration of 0.047mg/L from the waste rock material
  - Zinc (Zn). Seepage tests indicate an average dissolved concentration of 0.007 mg/L from the waste rock material. However, the surface soil sample shows a concentration of 0.026 mg/L which indicates Zinc is less abundant in the deeper waste rock materials compared to the existing surface soil.

### 4.1.6 Groundwater

The mining pit is expected to receive groundwater inflows which will be dewatered to the mine water managements system. Any contaminants associated with groundwater may be present in the mine water system. The groundwater assessment report for the Project assessed groundwater inflow rates to operations and expected water quality based on groundwater monitoring data. The groundwater quality near the Project area is provided in Appendix C of the groundwater assessment report (Hydrogeologist.com.au, 2026). Table 4.1 presents potential CoC from groundwater based on the monitoring data. It is noted for a very small number of samples, several contaminants were noted to slightly exceed the draft WQOs for surface water, however, were samples were predominantly below the draft WQOs and therefore were not considered a risk to surface water quality. These include Chromium, Cobolt, Molybdenum and Vanadium.

Table 4.1: Potential Contaminants in Groundwter

| Analyte | Average Concentration (min max range) | Draft Surface Water WQO (refer Table 3.1) | Percent of samples that exceeded the draft WQOs[2] |
|---|---|---|---|
| TDS | 857 mg/L (492 -2050) | 500 mg/L | 96% |
| Sodium | 246 mg/L (3 - 566) | 30 mg/L | 83% |
| Chloride | 196 mg/L (32 - 781) | 250 mg/L | 21% |
| Fluoride | 18 mg/L (3.5 - 26.6) | 1.6 mg/L | 100% |
| Aluminium | 0.176 mg/L (below LOR[1] - 4.5) | 0.055 mg/L | 41% |
| Arsenic | 0.008 mg/L (below LOR[1] - 0.025) | 0.013 mg/L | 20% |
| Zinc | 0.015 mg/L (below LOR[1] - 0.048) | 0.008 mg/L | 64% |

[1] Limit of Reporting

[2] Total number of samples range between 44 and 47

## 4.2 Contaminants of Concern

The CoC for the Project have been presented in Table 6 and are based on the expected mining materials and processing described in the above sections. The contaminants of concern have been used to determine potential risks for the Project and inform the ongoing monitoring during the EIS process and the Project operation.

**TABLE 4.2: CONTAMINANTS OF CONCERN**

| Contaminant | Source | Water Type/Destination |
|---|---|---|
| Total Suspended Solids | May be produced from rainfall runoff on exposed soils or limited vegetation cover. | Sediment Dams |
| pH | May be produced from water in contact with the ore body and tailings materials which is partially PAF (38%). | MAW system |
| Electrical Conductivity | Groundwater and a small number of mine material samples have slightly elevated EC compared to the background monitoring. | MAW system |
| Total Dissolved Solids | Groundwater and a small number of mine material samples have very slightly elevated concentrations of TDS compared to the background monitoring. | MAW system |
| Sodium | Groundwater and a small number of mine material samples indicate elevated concentrations of sodium associated with the elevated salinity. | MAW System |
| Chloride | Groundwater sampling indicates elevated concentrations of chloride. | MAW System |
| Fluoride | Groundwater sampling indicates elevated concentrations of Fluoride. | MAW System |
| Aluminium | Potential to be present in MAW storages due to groundwater and the ore body containing slightly elevated concentrations. | MAW system |
| Arsenic | | MAW system |
| Zinc | | MAW system |

| Contaminant | Source | Water Type/Destination |
|---|---|---|
| Sulfur | May be present in MAW because solid mine materials and tailing samples may have some enrichment, compared to the median crustal abundance in unmineralised soils | MAW system |
| Copper | | MAW system |
| Molybdenum | | MAW system |
| Rhenium | | MAW system |
| Tellurium | | MAW system |
| Aliphatic Hydrocarbons | Potential to be present in recycled water in the processing plant and TSFs due to use of diesel as a collector | MAW system |
| Aromatic Hydrocarbons | Potential to be present in recycled water in the processing plant and TSFs due to use of diesel as a collector and MICB as a frother | MAW system |

# 5. WATER MANAGEMENT SYSTEM

## 5.1 Objectives

The water management system for the Project has been developed to preserve the environmental values of the receiving environment as well as to provide runoff containment and meet the water demands of the Project. The objectives of the mine water management strategy include:

- Minimise capture of clean surface water from external catchments via drainage diversion.
- No uncontrolled release of mine affected water.
- Maintain supply to Project water demands with preferential supply from site water storages over external raw water supply.
- Maximise recycle and reuse of first mine affected water, then sediment runoff, for site demands including processing and dust suppression.
- Maintain pit operability through pit dewatering.

## 5.2 Surface Water Categories

The mine water management strategy for the Project provides separation of water types based on anticipated water quality. The proposed water management system has separation of water types by:

- Mine Affected Water - Mine affected water is defined as water which has interacted with mining activities consistent with the Mine Affected Water definition from the Queensland Model Mining Conditions (DESI, 2024). This includes water runoff and groundwater collected within the mining pit, recycled water from the processing plant, runoff from the process plant area (MIA) and ore stockpiles and decant water in the tailings storage facilities.
- Sediment Water - rainfall and runoff generated by disturbed landforms including waste rock dumps, pre-cleared areas and rehabilitation that is not yet established. This water does not contain elevated concentrations of contaminants other than suspended solids and must be treated through the erosion and sediment control system.
- Clean Water – runoff from undisturbed or established rehabilitation areas.

## 5.3 Water Management System

### 5.3.1 Proposed Water Management Strategy Overview

The water management system includes mine affected water storages, sediment storages, raw water storage and drainage diversion of undisturbed catchments. The water management strategy for the Project is summarised as:

- Diversions of clean water around mine infrastructure and disturbed land through diversion drains to reduce external catchment area reporting to the mining pit and site storages.
- Containment of mine affected water in dedicated storages for reuse in the Project.
- Dedicated storage (Process Water Pond) for recirculation of water used in various stages of the processing circuit.
- Recycling of tailings decant water to minimise water stored on the tailings beach and maximise reuse in the plant.
- An on-site raw water storage (Raw Water Dam) to supply raw water demands.
- Capture and treatment of sediment water in sediment basins and other sediment control infrastructure.
- Preferential re-use of mine affected water and sediment water captured by the Project to supply operational water demands.
- Progressive rehabilitation/stabilisation of waste rock dump and mine infrastructure areas to reduce the generation of sediment water.

A schematic of the Project water management system is provided in Figure 5.1 and staged layout plans of the water management system are shown in Figure 5.2 to Figure 5.9. The proposed water management infrastructure is summarised in the following sections.

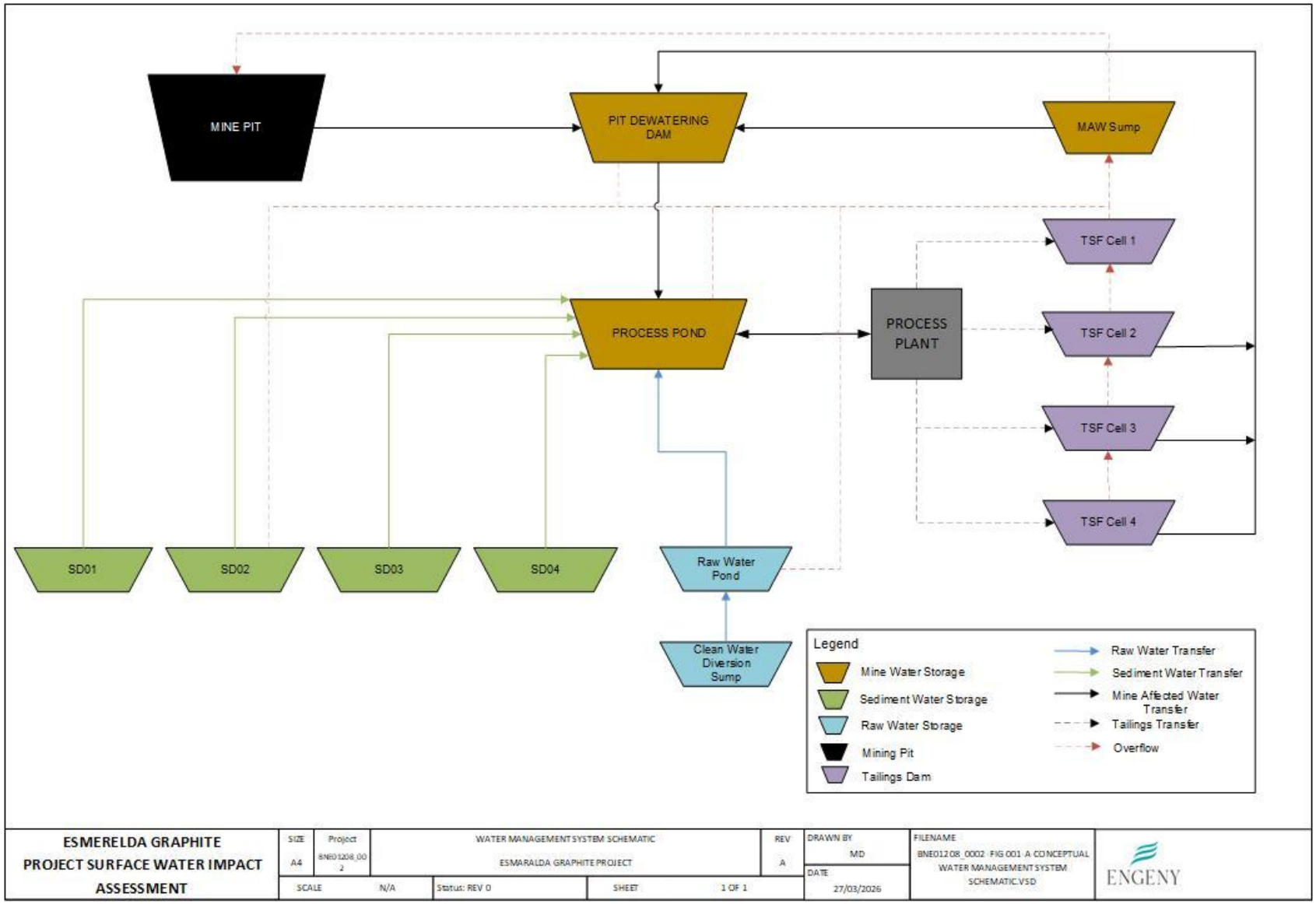



**Figure 5.1: Water Management System Schematic**

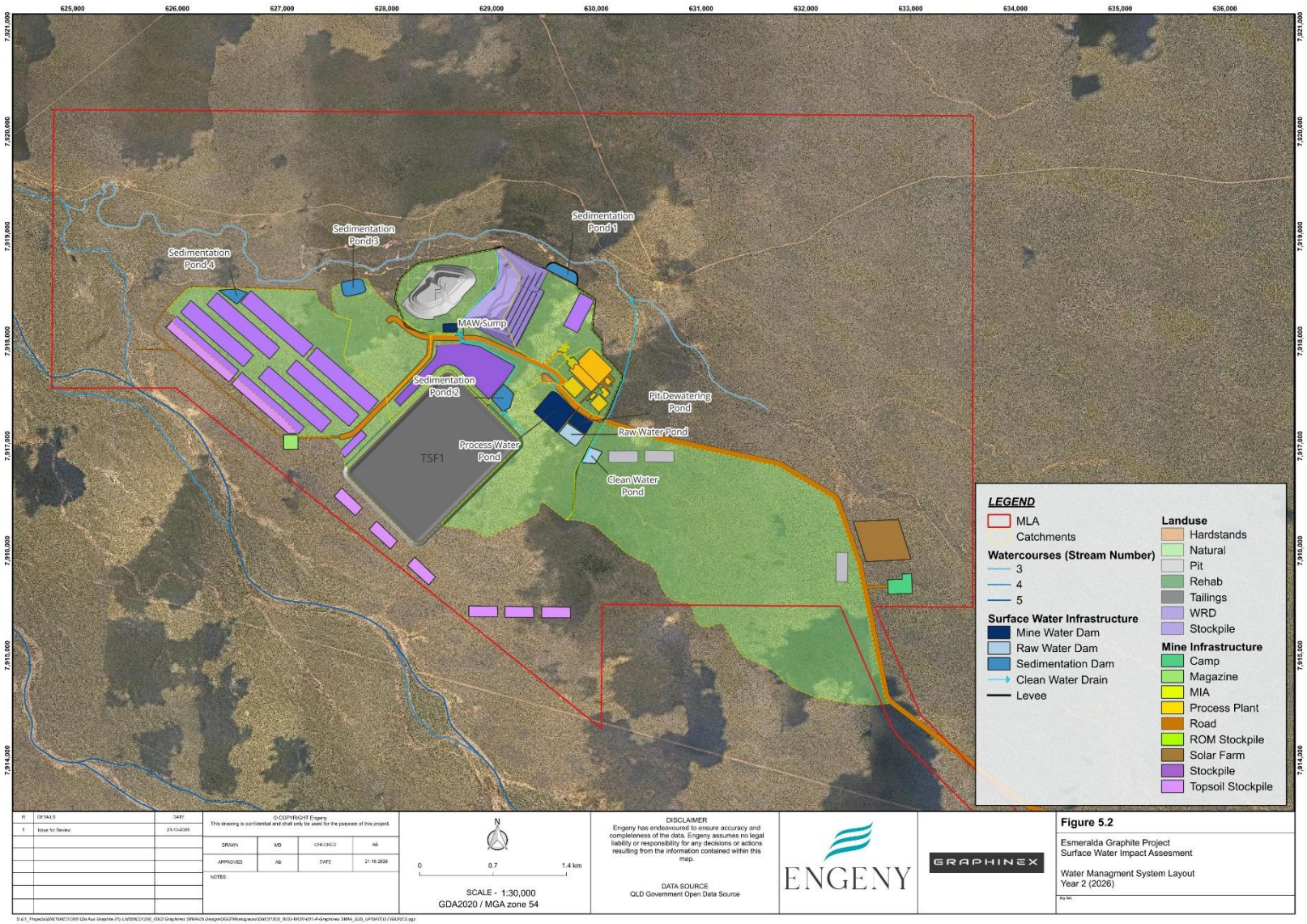



**Figure 5.2: Year 2 Water Management Infrastructure**

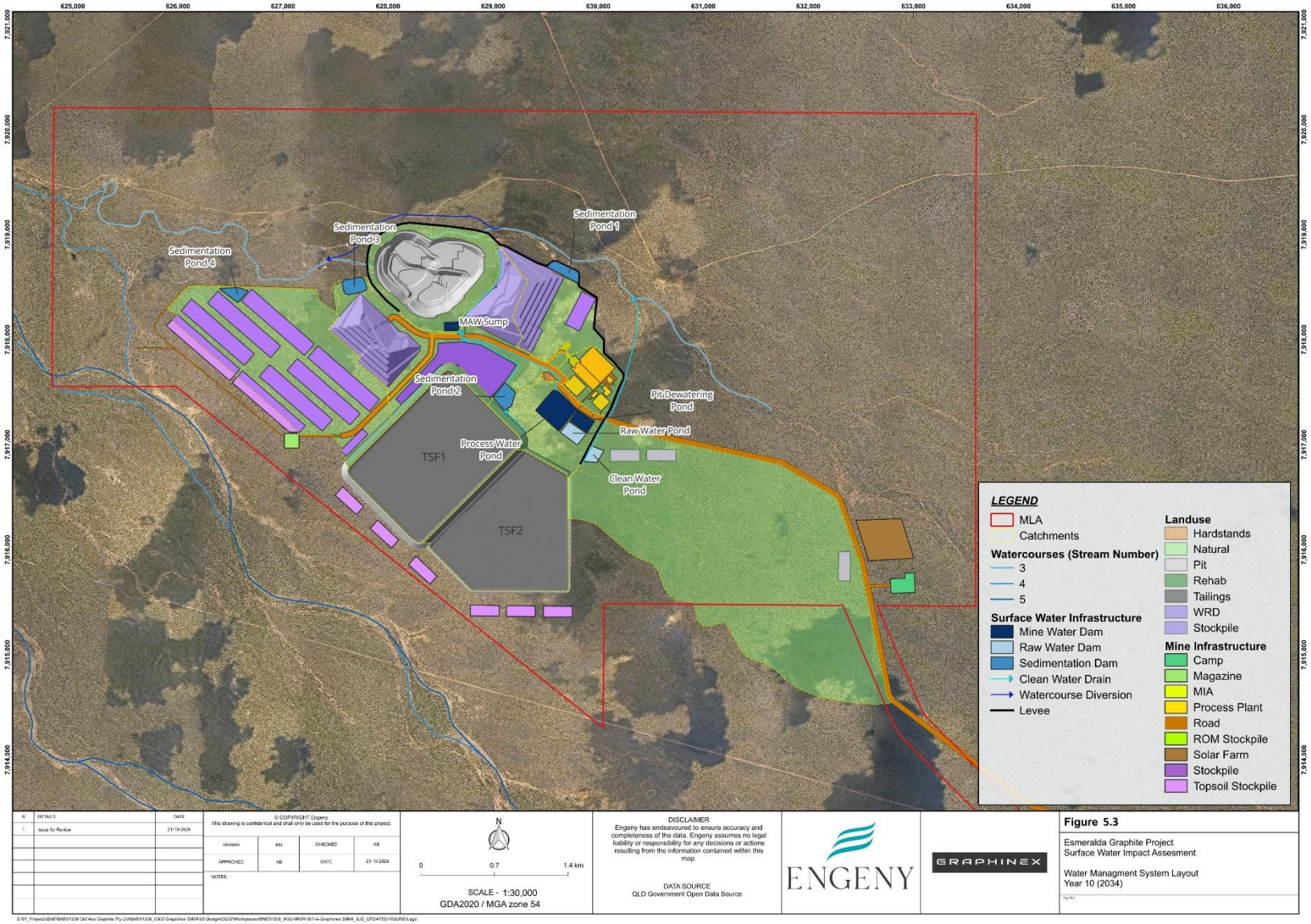



**Figure 5.3: Year 10 Water Management Infrastructure**

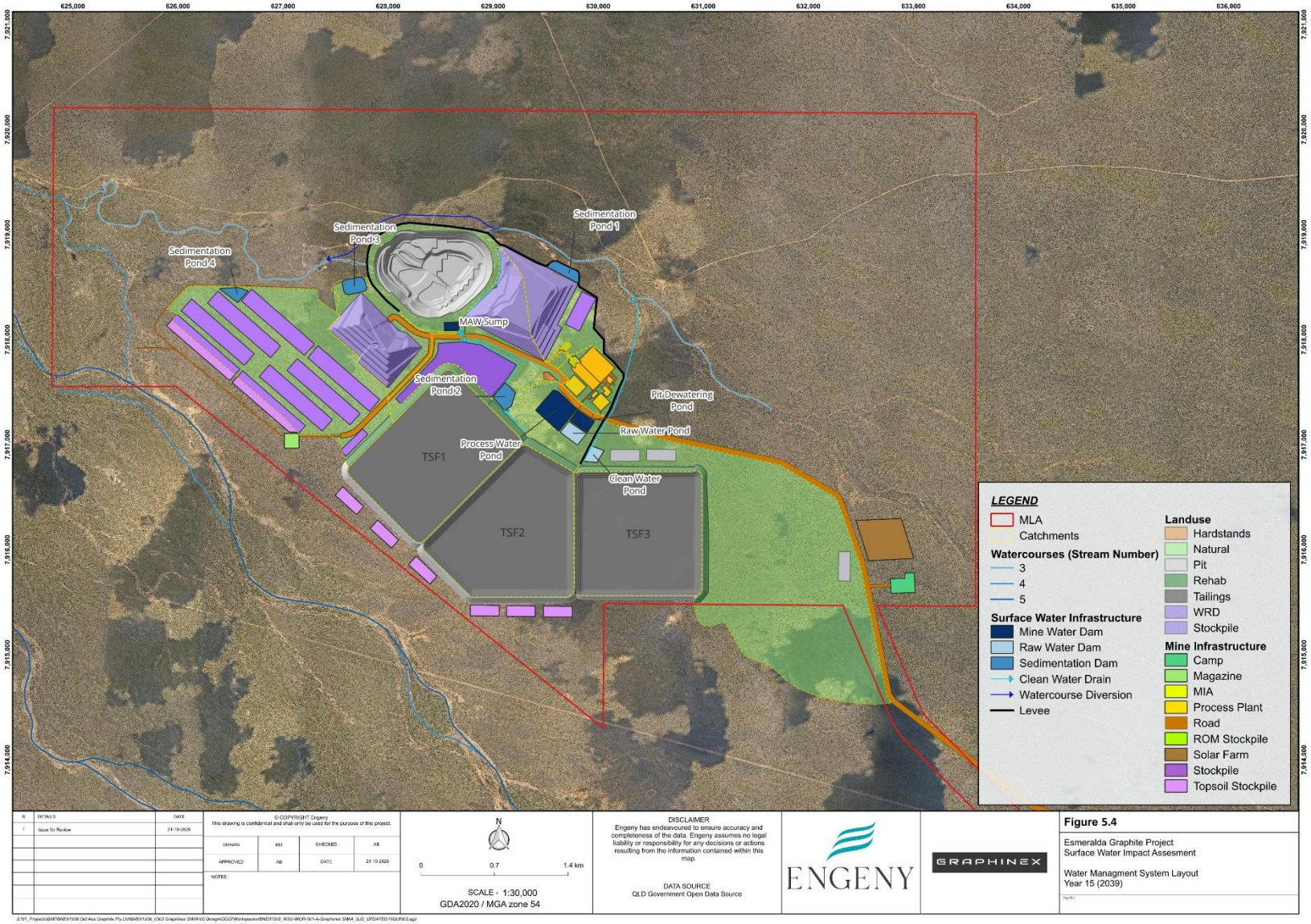



**Figure 5.4: Year 15 Water Management Infrastructure**

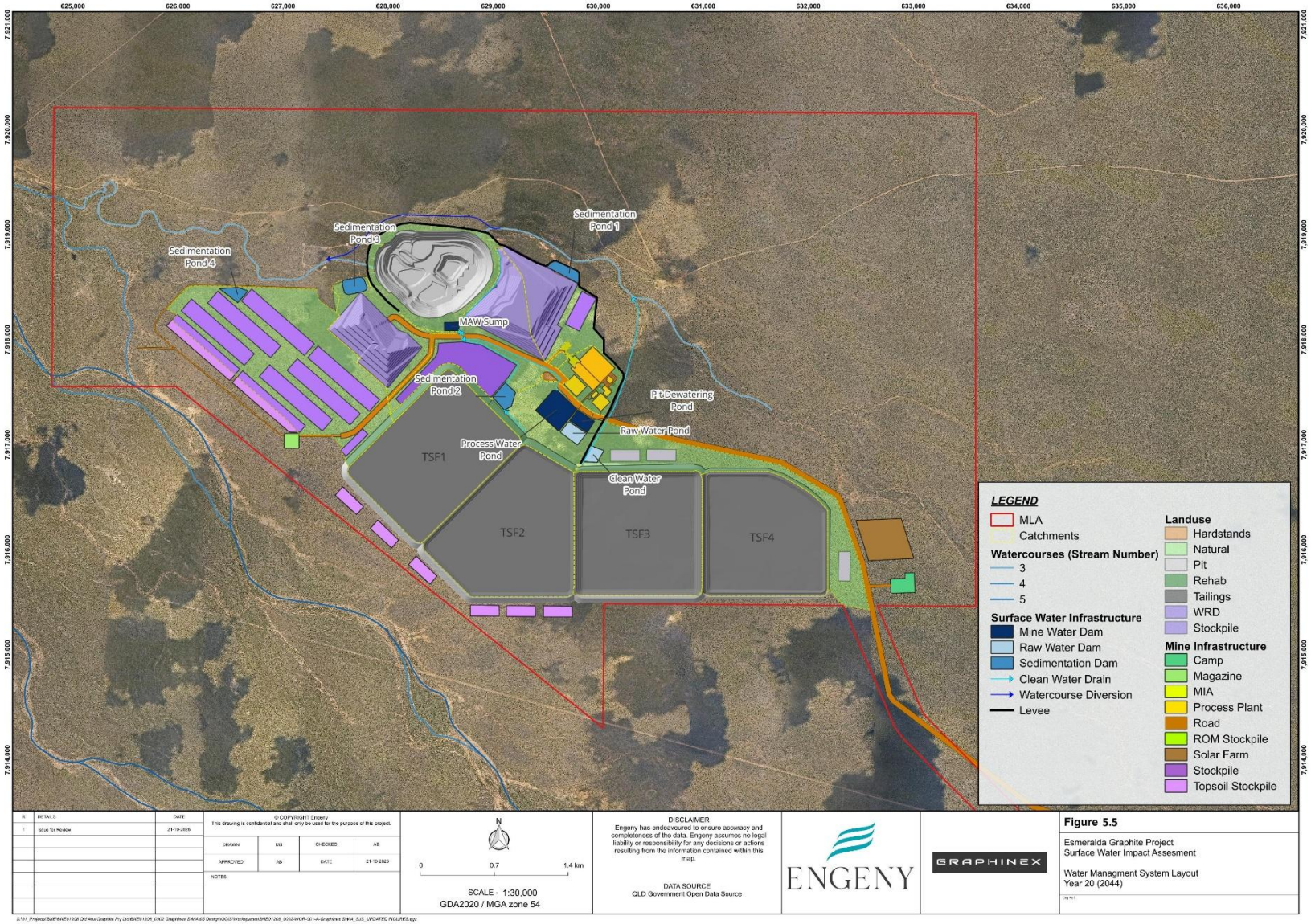



**Figure 5.5: Year 20 Water Management Infrastructure**

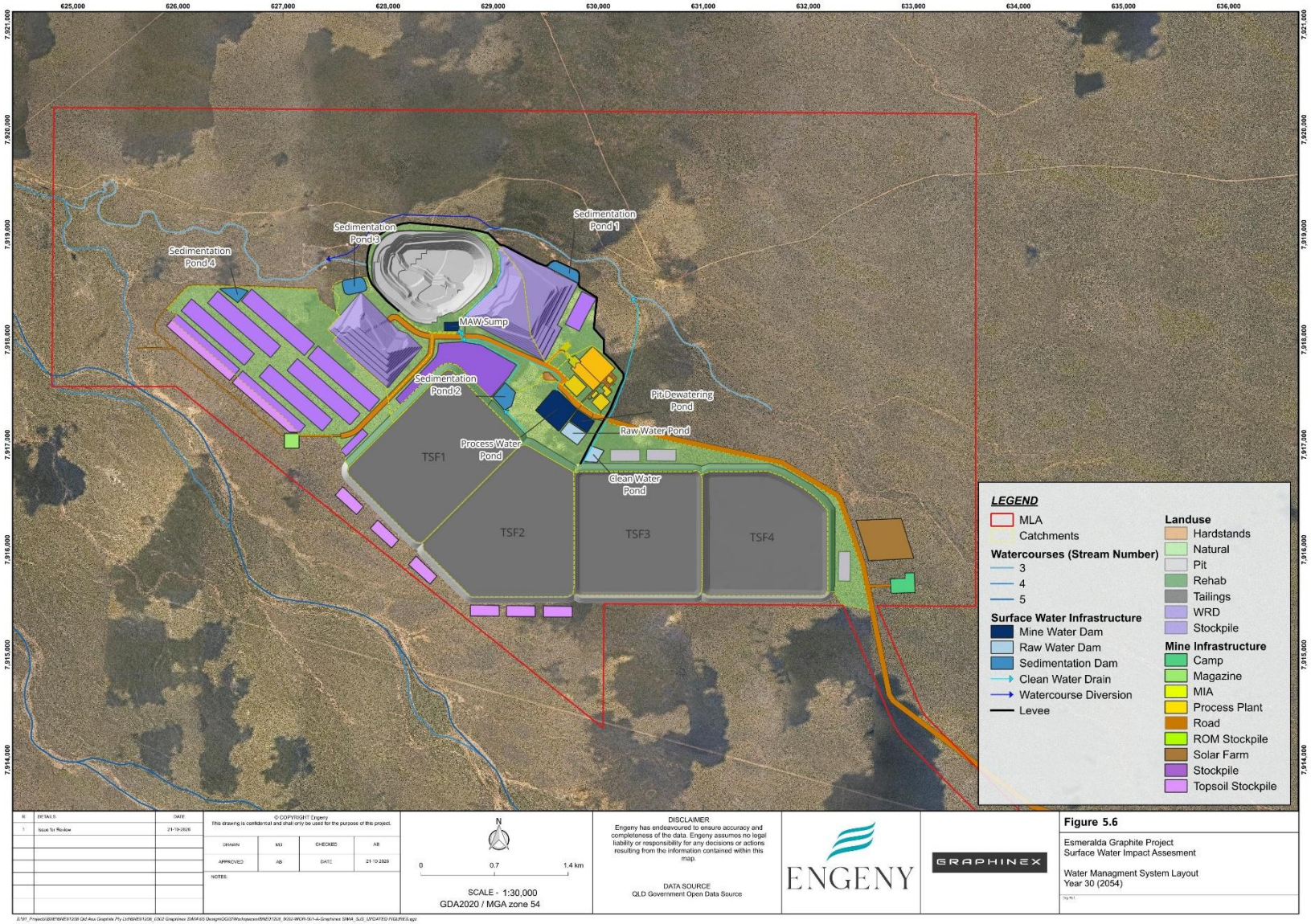



**Figure 5.6: Year 30 Water Management Infrastructure**

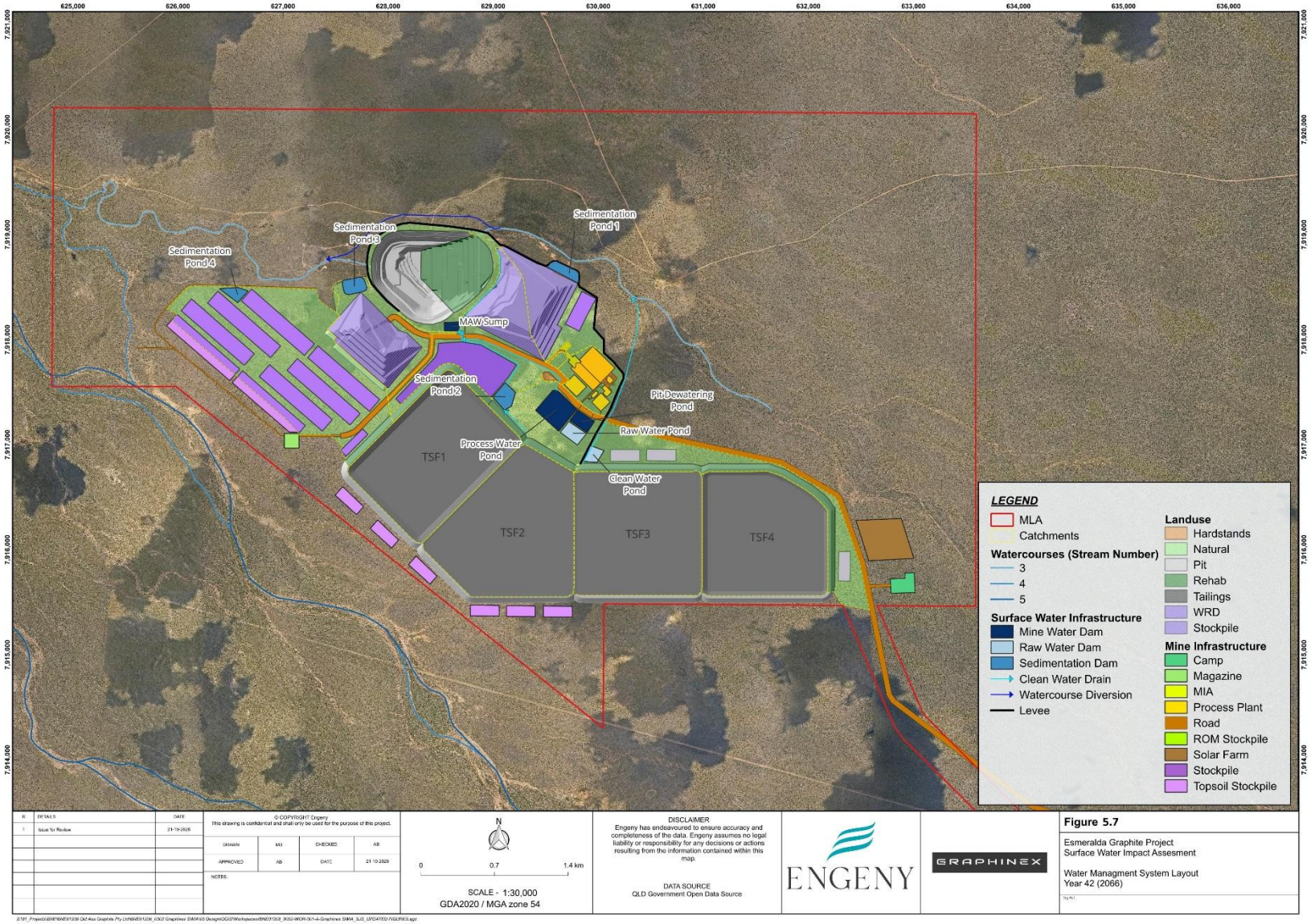



**Figure 5.7: Year 42 Water Management Infrastructure**

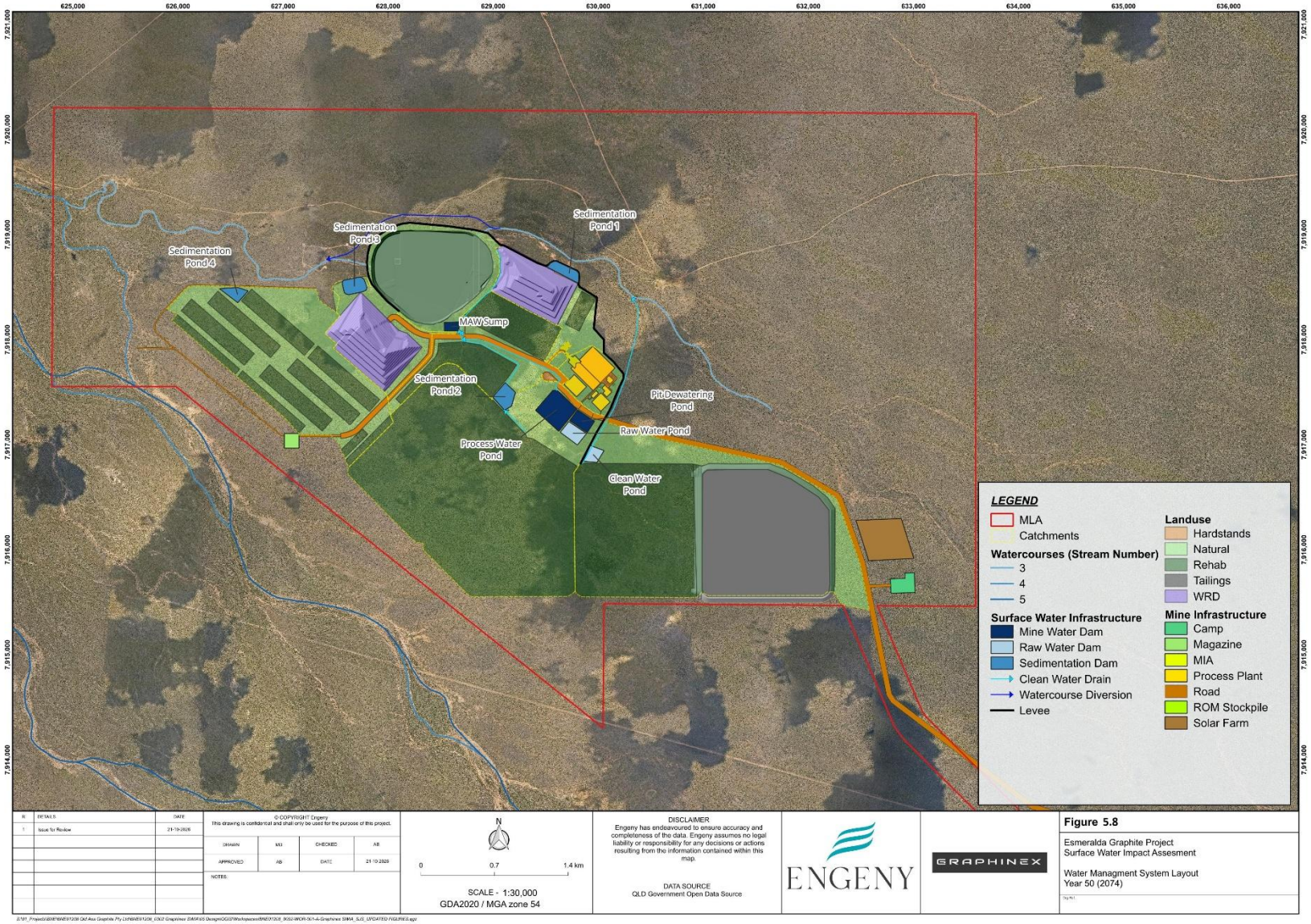



**Figure 5.8: Year 50 Water Management Infrastructure**

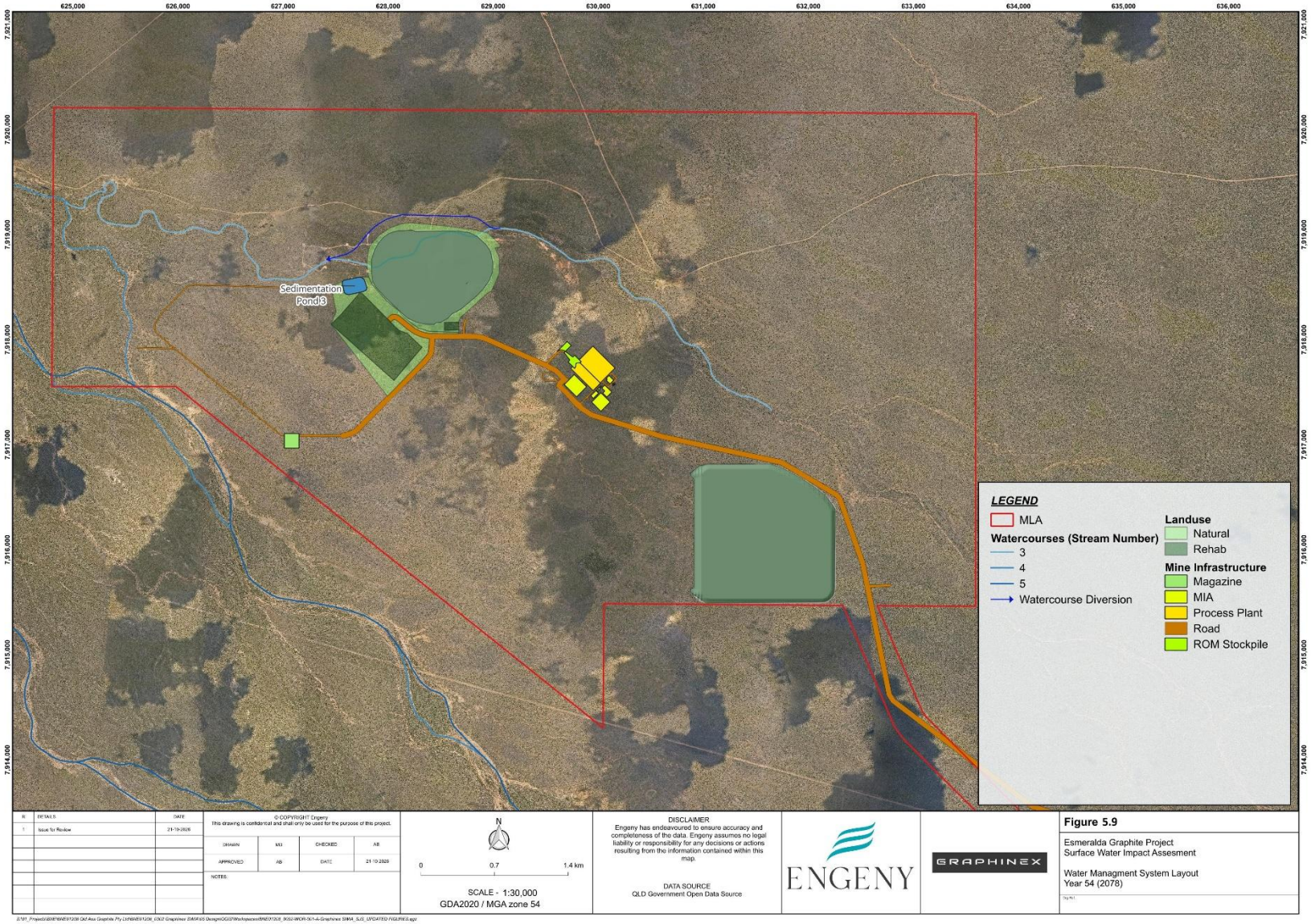



**Figure 5.9: Year 54 Water Management Infrastructure**

### 5.3.2 Mine Water Storages

Mine water storages will be used to contain surface water runoff and groundwater collected within the mining pit, recycled water from the processing plant, and runoff from the industrial areas. Site storages for the management of mine affected water are summarised in Table 5.1. All overflows from MAW dams will flow to the pit, containing all MAW onsite and preventing uncontrolled environmental release. MAW storages therefore have been sized for operational performance.

Process Water Dam (PWD) is the central storage to the processing plant and is used for supply of water to the plant and collection of return flows. The PWD is supplied from the pit dewatering dam as first priority, followed by the sediment dams and raw water dams. It is proposed to line the PWD and PDD to reduce the risk of environmental harm due to seepage. The preliminary consequence category assessment determined PWD as having a "significant" consequence category for the "failure to contain – Seepage" (Section 9), therefore a liner is proposed for the dam.

Water collected within the pits from rainfall runoff and groundwater ingress is dewatered to the Pit Dewatering Dam (PDD) which is then transferred to the PWD for use in the processing plant. As a second priority, supernatant water from tailings deposition and rainfall is pumped from the TSFs to the PDD.

The PWD and PDD overtop to the MAW sump, a small storage that recirculates MAW back to the PDD. By intercepting MAW flows towards the mine pit, the MAW sump improves pit operability.

The preliminary consequence category assessment of the dams (Section 9) determined each dam as having a "low" consequence for the "failure to contain – overtopping" scenario and therefore the dams are not required to provide a design storage allowance (containment standard). The mine affected water storages however have been sized to enable continuous dewatering of the TSFs and the mining pit. The PWD, PDD and MAW sump all overflow to the mining pit. The mining pit has excess storage capacity and will contain any overflows from these storages and prevent any MAW discharges from entering the receiving environment. The performance of the mine water system is assessed in Section 6.1.10 which shows no predicted spills of mine water to the receiving environment. The following sections outline the concept design details of the MAW storages and presents typical design sections which are subject to change with detailed engineering design.

**TABLE 5.1: MINE AFFECTED WATER STORAGES**

| ID | Description | Full Supply Volume | Estimated Maximum Embankment Height |
|---|---|---|---|
| Process Water Dam (PWD) | Lined excavated storage within the processing plant area used to supply process water demands and receive recycled water flows from the plant. The process water dam will also capture runoff from the plant area and receives pump inflows from the other site storages to maintain supply to water demands. | 400 ML | 0.5m for spillway freeboard. |
| Pit Dewatering Dam (PDD) | Excavated storage used for pit dewatering and supply of water to the process plant via the PWD. The PDD capacity has been sized to maximise pit dewatering and pumping of MAW from the TSFs. | 200 ML | 0.5m for spillway freeboard. |
| MAW Sump | The MAW sump collects runoff from the ore stockpile area and any overtopping flows from the PWD and PDD. The sump acts to improve pit operability by collecting runoff and dewatering of waters draining from the stockpile area towards the pit. | 100 ML | Nil |

#### 5.3.2.1 Process Water Dam

The Process Water Dam (PWD) is located within the processing area and used to supply process water demands and receive recycled water flows from the plant. The PWD will also capture runoff from the plant area and receives pump inflows from the other site storages to maintain supply to water demands. The PWD overflows to the MAW Sump which ultimately overflows to the mining pit with excess capacity to precent offsite discharge.

Water quality in PWD is expected to be poor and contain various contaminants associated with ore body geochemistry. The dam is expected to receive and recycle process flows from the Tails and Concentrate Thickeners and water recovered from the Concentrate Filter. Characterisation of the process streams has been completed as part of the process residue geochemical assessment (RGS, 2026) and

summarised in Section 4.1.2. The assessment indicates the process water recycled through PWD will be low salinity and may contain elevated concentrations of Copper (Cu), Molybdenum (Mo), Rhenium (Re) Sulphur (S) and Tellurium (Te) as well as the possible generation of acid mine drainage. Reagents used in the process plant (diesel, MIBC and flocculant) may also be collected by the process water dam resulting in increased hydrocarbons.

The dam will be lined to prevent seepage and potential environmental harm. The dam will be mostly excavated with a low-height perimeter bund for spillway freeboard.

A typical section for the PWD is shown in Figure 5.10 and the concept design details include:

- 8.2 ha footprint.
- 5 m excavation below ground and 0.5 m high embankment to provide spillway freeboard.
- A spillway to provide 1% AEP flood capacity with 0.5 m freeboard.
- Lined dam impoundment to prevent seepage.

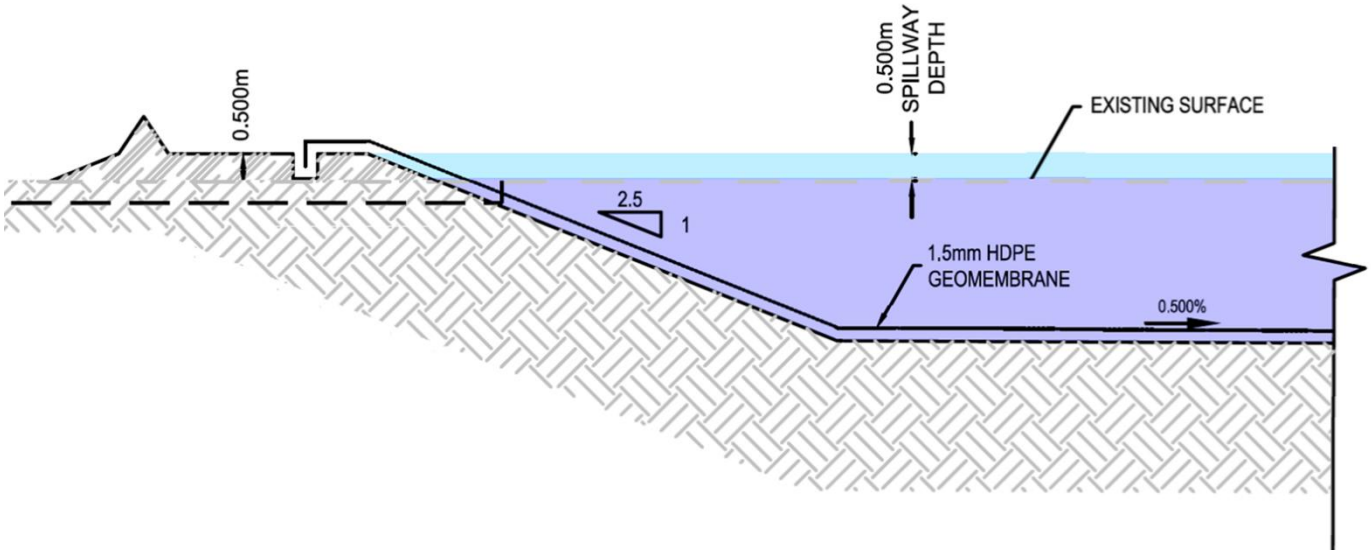



**Figure 5.10: Process Water Dam Typical Section**

### 5.3.2.2 Pit Dewatering Dam

The Pit Dewatering Dam (PDD) is located to the south of processing area and will be used for receiving dewatering from the mining pit and TSFs to supply process water demands. The PDD has been sized with the PWD to maintain dewatering of the mining pit and TSFs as well as prevent overflows to the mining pit.

The PDD will typically be operated at low storage levels as it will supply process water demands in priority of raw water. Water quality of PDD will be influenced by groundwater quality and MAW seepage into the pit sump, as well as contaminants in the tailings output. The water quality will have similar contaminants as the PWD. The dam will be an excavated storage with a perimeter bund to provide spillway freeboard.

The PDD typical design section will be similar to that shown in Figure 5.10. The PDD concept design details include:

- 4 ha storage footprint.
- 6 m excavation below ground and 0.5 m high embankment to provide spillway freeboard.
- A spillway to provide 1% AEP flood capacity at approximately 0.5m deep.
- Lined dam impoundment to prevent seepage.

### 5.3.2.3 MAW Sump

The MAW Sump is located upstream of the mine pit and recirculates MAW overflows back to the PDD. By intercepting MAW flows towards the mine pit, the MAW Sump improves pit operability.

### 5.3.3 Sediment Storages

Sedimentation ponds are proposed as the primary mechanism to manage runoff from overburden and disturbed areas, which have elevated concentrations of suspended solids. The sedimentation ponds form a key part of the erosion and sediment control management strategy to protect the environmental values of the receiving environment. The principles to be implemented for the Project in managing erosion and sediment control include:

- Minimising surface disturbance.
- Progressive rehabilitation of disturbed areas to minimise sediment generation.
- Separation of runoff from disturbed and undisturbed areas through drainage controls.
- Construction of sediment dams to contain and treat sediment laden runoff.

The principles for managing erosion and sediment control for the Project are to first minimise the generation of sediment runoff through minimising disturbance, progressive rehabilitation and separation of water types and then secondly treating sediment runoff using sediment dams when prevention is not possible or practical.

Sedimentation ponds will be required to capture runoff from disturbed areas including access roads, unrehabilitated spoil and cleared land. Sediment dams will be constructed at the start of mining to the maximum required capacity to allow capture of runoff or unplanned disturbance in the catchment. The sedimentation ponds are located at the lowest discharge point within the northern section of the Project's Production ML which ensures all sediment water discharging from the operational areas will pass through one of the four sedimentation ponds. Multiple drains are also proposed to capture and direct runoff from disturbed areas into the sedimentation ponds.

Four sedimentation ponds have been included in the erosion and sediment control plan. Two of these ponds (sedimentation ponds 1 and 3) are required around the out-of-pit waste rock dumps to treat sediment laden runoff. Sedimentation pond 3 overflows offsite and sedimentation pond 1 is confined behind the levee and overflows towards the mining pit. Sedimentation pond 2 captures runoff from disturbed and natural areas within the central region of the site. Water captured in sedimentation pond 2 remains onsite, with the pond discharging to the mine pit as the topographical low point downstream. Sedimentation pond 4 is located at the western region of the site and collects runoff from topsoil stockpiles. The topsoil stockpiles and surrounding areas reporting to sedimentation pond 4 is not expected to produce contaminants besides sediment.

The sedimentation ponds are sized to contain runoff generated by a 24-hour storm event with an Annual Exceedance Probability (AEP) of 10% (DESI, 2024) plus 10% of settling volume for sediment storage. The 10% AEP, 24-hour storm event rainfall at the Project location is estimated to be 164 mm (Bureau of Meteorology, 2024) and a volumetric runoff coefficient of 50% was assumed. This containment standard is adopted from the stormwater guidelines for Environmentally Relevant Activities (ERA) with consideration of incorporating sediment storage design standards from the International Erosion Control Association Guidelines (IECA, 2018). Therefore, no further authorisation under an Environmental Authority is anticipated for water overflows from sediment dams, when operated in accordance with this design basis and under a future WMP/ESCP.

Sedimentation ponds will also be dewatered to the PWD to supply processing water demands, which enables the dams to be operated at low volumes improving their availability to contain and treat sediment-affected runoff. Under normal operating conditions the sedimentation ponds will dewater to the mine water system to maintain water supply for processing and miscellaneous dust-suppression demands to reduce reliance on the raw water supply system. In large rainfall events sedimentation ponds 3 and 4 will overflow to the receiving environment (sedimentation ponds 1 and 2 overflows to the pit).

Site storages for the management and treatment of sediment water are summarised in Table 5.2 and provides details of the concept pond arrangements. The sedimentation ponds are expected to be entirely excavated with an excavated spillway channel. The sedimentation ponds will be utilised for the entire mine life and during closure until surface water runoff from the rehabilitated final landform is suitable for discharge without treatment.

The following section details the concept design details of the sedimentation ponds used for this assessment and presents typical design sections which are subject to change with detailed engineering design. The pond configuration will be reviewed as part of the future detailed design for each dam however is not expected to differ significantly from the arrangement described in this report.

**TABLE 5.2: SEDIMENT DAM DETAILS**

| ID | Description | Overflow Destination | Maximum Catchment Area During Operation Life | Full Supply Volume | Embankment Height | Associated Mine Stages |
|---|---|---|---|---|---|---|
| Sedimentation Pond 1 | Manage sediment runoff generated from the northeast waste rock dump | Mining Pit | 64 ha (Year 2 of Mining) | 60 ML | Contained behind the flood protection levee. | Year 1 – Year 53 |
| Sedimentation Pond 2 | Manage sediment runoff generated from southern areas of the Project | Mining Pit | 100 ha (Year 2 of Mining) | 94 ML | Small embankment for spillway freeboard. | Year 1 – Year 53 |
| Sedimentation Pond 3 | Manage sediment runoff generated from the northwest waste rock dump | Tributary 3 (downstream of diversion) | 73 ha (Year 50 of Mining) | 80 ML | 1.7m embankment to the north | Year 1 – Year 53 |
| Sedimentation Pond 4 | Manage sediment runoff generated from the western topsoil stockpiles | Tributary 3 (downstream of diversion) | 189 ha (Year 2 of Mining) | 60 ML | Small embankment for spillway freeboard. | Year 1 – Year 53 |

### 5.3.3.1 Sediment Dam Concept Design

Sedimentation Ponds 1 and 3 will capture runoff from the waste rock dumps. The largest catchment area for sedimentation pond 1 will be during year 2, however as the eastern waste rock dump expands and then undergoes rehabilitation, run off will be conveyed west resulting in year 50 having the largest catchment area for sedimentation pond 3. The catchment area reporting to these sediment dams will become fully rehabilitated at the end of mining following backfill of the mine void.

Sedimentation Pond 2 will capture runoff from the southern catchments. The Sedimentation Pond overflows towards the pit, therefore has no associated environmental discharge. To maximise pit operability, the pond has conservatively been designed for containment for the largest catchment (year 2) during the processing life.

Sedimentation Pond 4 captures the runoff from the topsoil stockpiles to the west of the site. These topsoil stockpiles are considered to have a good runoff water quality and not of consequence to the environmental values downstream of the site. The sedimentation pond has been included in the water management plan as a conservative measure in minimising potential sources of sediment in environmental release; however, is not required in meeting environmental standards. No authorisation is anticipated for water overflows from this sedimentation pond.

The sedimentation ponds will be entirely excavated with an excavated spillway channel as the flat grade of the topography does not allow for an embankment containment dam. The dams will include a drain inlet with suitable erosion protection.

A typical section of the sediment dams concept design is shown in Figure 5.11. Additional details include:

- Sedimentation pond 1 will be constructed behind the flood protection levee and be formed with a 3m high embankment.
- Sedimentation pond 2 will be mostly excavated (3m below ground) and incorporate a small embankment for spillway freeboard.
- Sedimentation pond 3 will incorporate a 1.7m high embankment and a by-wash spillway around the western side of the dam.
- Sedimentation pond 4 will incorporate a small embankment around the northern side of the dam with impoundment excavation.
- All sediment dams will have a spillway with 1% AEP flood capacity.

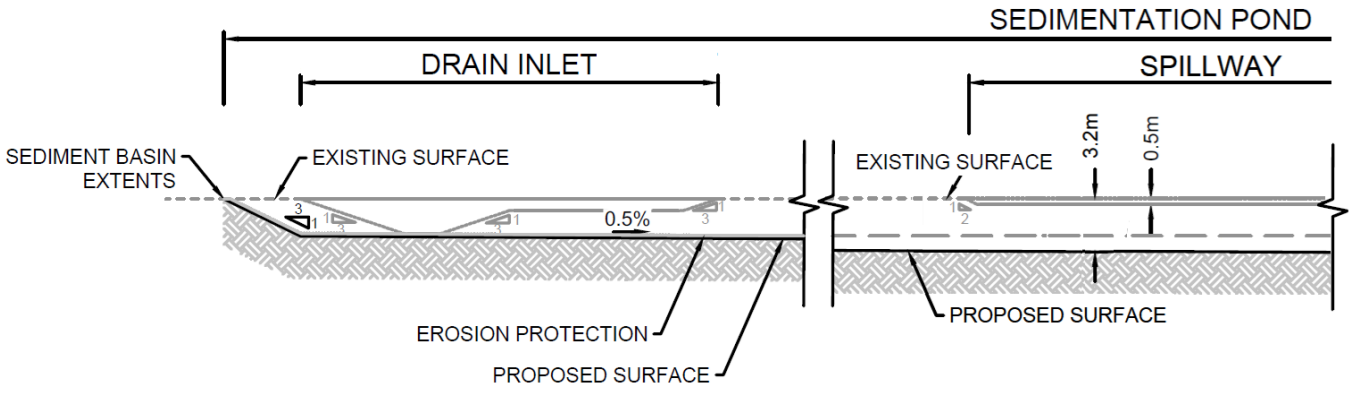



**Figure 5.11: Sediment Dam Typical Section**

## 5.3.4 Raw Water System

To facilitate the Project, a sufficient and reliable water supply is required for both the construction and operational stages of the mine and associated infrastructure. The processing plant has a high level of water recovery through tailings. In addition, Project water demands are proposed to be supplied directly from groundwater inflows to the mining pit and rainfall runoff volumes collected in onsite storages. When required to meet processing demands, inflows are to be supplemented by raw water. Two raw water storages have been designed for the project.

The Clean Water Sump is proposed to be located on the central clean water drain. The sump collects runoff from upstream natural catchments. The sump is designed to have a spillway, which in rainfall events greater than the 50% AEP 24hr storm, allows overflows towards the clean water diversion drain, ultimately entering unnamed tributary 3. Water collected in the sump is pumped to the Raw Water Dam. The Raw Water Dam is proposed for storage of raw water, as well as supplementary pumped inflows from the Clean Water Sump. The Raw Water Dam is nominally sized to store 200 ML of water however could be resized based on the raw water demand and backup storage requirements. Details of the Raw Water Dam are provided in Table 5.3. The Raw Water Dam will be a turkes nest dam and incorporate a small spillway for any overflows. The Clean Water Sump will be an excavated storage and overflow at natural ground level into the central clean water drain.

**TABLE 5.3: RAW WATER DAM DETAILS**

| Item | Clean Water Sump | Raw Water Dam |
|---|---|---|
| Capacity | 100 ML | 200 ML |
| Construction | Excavated storage approximately 4m deep<br>(Geotechnical investigations and detailed design to confirm arrangement) | |

## 5.3.5 Tailings Storage Facilities

The Project includes four tailings storage cells which will operate independently. The cells will sequentially be used for the deposition of tailings fines and recovery of water to supply water demands. Tailings cells 1 to 3 will be removed and rehabilitated as part of the pit backfill for mine closure. Tailings Cell 4 will be capped and remain in place at closure.

The cells all overflow towards the mining pit and do not discharge from site. Design of the Project tailings storage facilities has been completed by Soil & Rock Engineering Pty Ltd (SRE) including a consequence category assessment (Soil & Rock Engineering Pty Ltd, 2026). Key design details of the tailings storage facilities relevant to surface water include:

- High-Density Polyethylene (HDPE) Dam Liner to reduce the risk of seepage.
- Design Storage Allowance (DSA) of 1.62 GL to 1.70 GL to achieve 1:100 AEP wet season containment to reduce the risk of overflow.
- Emergency Storm Storage (ESS) of 0.75m in each dam to provide containment of the 1:100 72 hour storm event.
- Spillway width of 25 m to convey a storm event rarer than the 0.1% AEP event with suitable wave freeboard allowance.

## 5.3.6 Clean Water Management

Overland flows from clean catchments will be diverted to prevent clean catchment runoff from entering the active mining pit and the mine water management system. Clean water will be diverted using diversion drains and bunds that will redirect overland drainage around the active mining operations. There are two clean water drains including:

- The Central Clean Water Drain and bund which diverts a smaller tributary that flows towards the pit extent towards the stream order 3 tributary to the north-east.
- Minor overland catchment diversion drains and bunds which are used to redirect undefined overland flow paths away from infrastructure areas and water storages.

The clean water diversions will be designed and constructed to convey the 0.1% AEP flood event with 500mm freeboard above the design flood height. A typical section of the Central Clean Water Drain and bund configuration is shown in Figure 5.12. Typical details include the following, subject to detailed design:

- Drain length = 1800m
- Drain base width = 5m
- Average drain depth = 2m (maximum 3 m)
- Batter slopes = 1V:4H
- Longitudinal grade = 0.11%
- Average bund height = 2m
- Containment standard = 0.1% AEP flood event with 0.5m freeboard
- Bund crest width = 5m

The smaller clean water drains will adopt a similar design configuration with reduced dimensions based on the diverted catchment size and estimated design flows at detailed design.

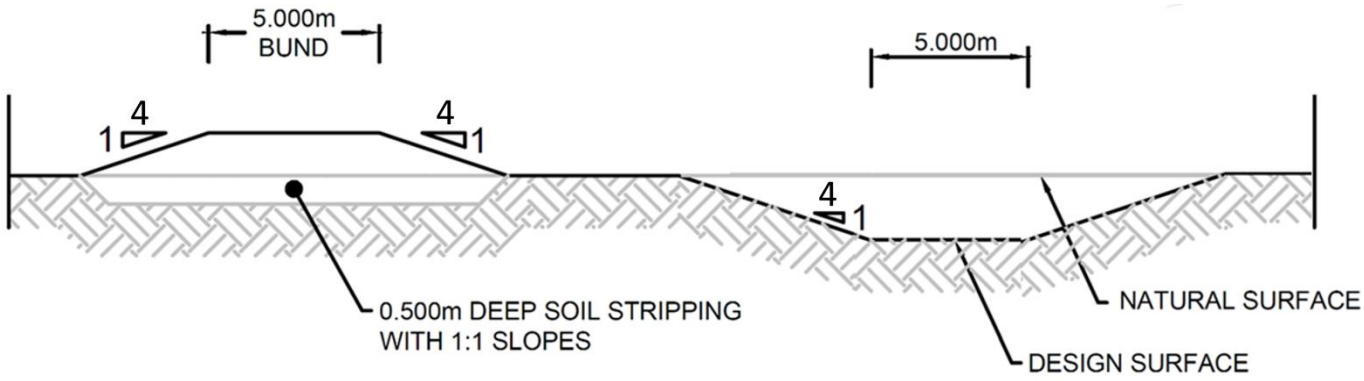



**Figure 5.12: Central Clean Water Drain and Bund Typical Section**

## 5.3.7 Flood Protection Levee

The Project disturbance and infrastructure will be located within the 0.1% AEP flood extent from Warrigal Creek/Borer River and the local stream order 3 tributary passing through the site. It is proposed to protect the Project from flooding by constructing a flood protection levee along the northern and eastern extents of the Project to provide 0.1% AEP pit flood protection. The first three years will include a temporary section of levee located between the southern bank of the stream order 3 waterway and the mining pit extent. After the first 3 years of the Project, the watercourse diversion for the stream order 3 waterway will be constructed and the levee will be completed around the entire ultimate mining pit extent. The flood protection levee will remain in place until the end of mining.

The levee alignment was selected based on flood modelling results and the natural topography within the Project area. The levee follows the natural ridgeline along the western Project boundary to prevent any ponding and minimize flooding impacts. The levee then wraps around the ultimate pit extent. The temporary levee alignment is shown in Figure 5.2 (year 2 infrastructure layout plan) and the ultimate levee alignment is shown in Figure 5.3 to Figure 5.8.

The site access road crosses over the central clean water drain and levee near the process plant. The road will locally ramp up and over the levee with sufficient fill to not impact the levee construction. Culverts will need to be constructed under the road in the central clean water drain to maintain the drain flow capacity.

The levee will need to be constructed with non-dispersive and low permeablility earth fill (clay) with foundation stripping and a cutoff trench to prevent piping. A typical section of the levee is shown in Figure 5.13. Concept design details of the levee include the following:

- Length = 5.4 km
- Crest width = 6m
- Crest elevations = Starting at 127.1 m AHD (flood level of 126.6 m AHD) decreasing down to 121.7m AHD (flood level of 121.2 m AHD)
- Batter slopes = 1V:4H
- Containment standard = 0.1% AEP flood event with 0.5m freeboard

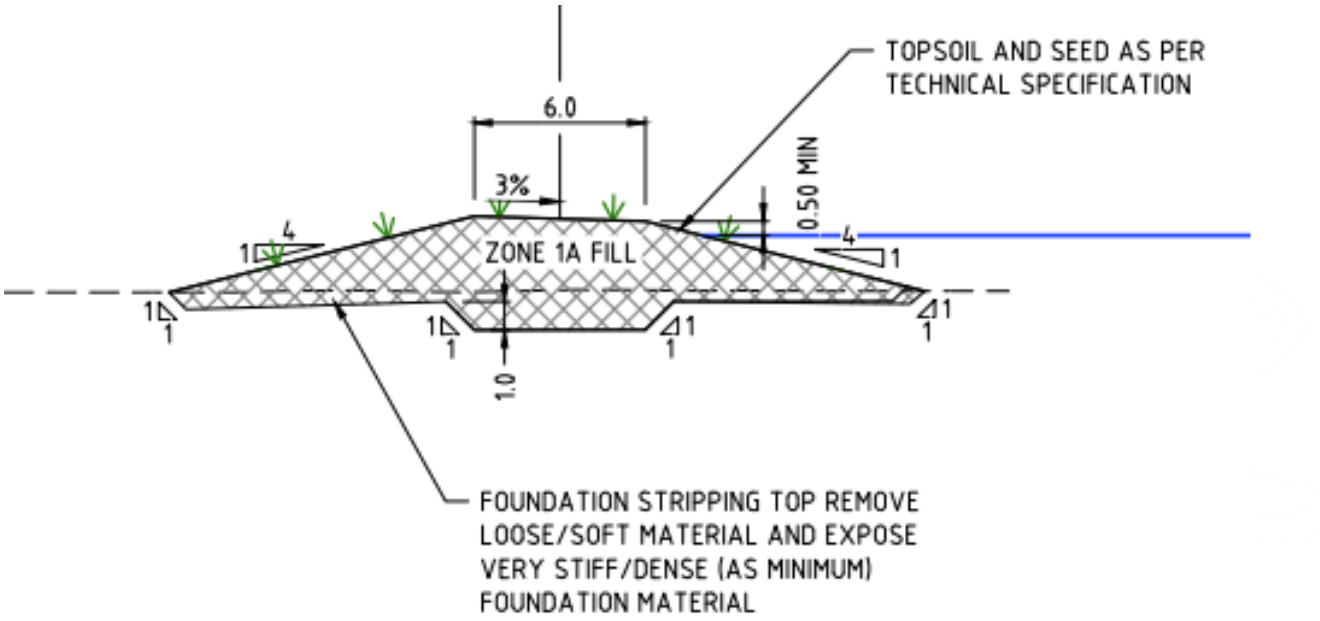



**Figure 5.13: Levee Typical Section**

### 5.3.8 Watercourse Diversions

There is a stream order 3 waterway that will be intercepted by the mining pit by late in year 4 of the Project. The waterway is considered a watercourse under the Water Act 2000 and therefore requires a permanent watercourse diversion as part of the Project. It is proposed to construct the watercourse diversion and the final pit flood protection levee prior to the pit intercepting the watercourse in year 3. The watercourse diversion design and details are provided in the functional design report for the watercourse diversion (Engeny, 2026). The watercourse diversion alignment is shown in Figure 5.2 to Figure 5.9.

The diversion will collect the existing waterway, east of the pit and divert it around the pit's northern extent to tie back into the original waterway. The diversion is designed in accordance with the DNRME guidelines for permanent watercourse diversions to maintain the existing hydrology, hydraulic, geomorphic and ecological features of the existing waterway (DNRME, 2019). The diversion will remain at closure and will be approved under the future Environmental Authority for the Project.

## 5.4 Water Demands

The proposed life-of-mine (LOM) is approximately 65 years, including construction (2 years), operation (53 years), and final rehabilitation (10 years). Water demands for the Project include:

- Construction of off-lease and on-lease infrastructure, including dust suppression, washdown, earthworks, civil works, firewater system, and commissioning,
- Potable water supply to meet the needs of the workers, and
- Operation of the mine, including mineral processing, dust suppression (stockpiles, transfer stations, and roads), residue management, equipment and vehicle washdown.

The water demands will vary with the mining sequence and backfill of the pit. The Project schedule and demands assumed for the surface water assessment is shown in Table 5.4.

**TABLE 5.4: PROJECT SCHEDULE**

| Project Year | Project phase | Water Demands |
|---|---|---|
| Year -2 to Year -1 | Mine construction including pre-strip, topsoil stockpiling, development of on-site accommodation, mine infrastructure area and mine-access road, and waste/overburden removal in Year -1. | Construction Water Demands |
| Year 1 | Operation, mining production commences | Processing, dust suppression and potable. |
| Year 3 | Ramping up to full production of 3.5 Mtpa plant feed | Processing, dust suppression and potable. |
| Year 25 | In-pit waste backfill commences on small scale. Ex-pit tailings will be progressively reclaimed to fill the large pit void | Processing, dust suppression and potable. |
| Year 35 | All waste and ore are depleted within pit; mid-grade stockpile is reclaimed to feed plant between years 36 and 48 | Processing, dust suppression and potable. |
| Year 46 | In-pit waste backfill ramped up | Processing, dust suppression and potable. |
| Year 48 – Year 53 | Mining operations progressively cease. Plant and vehicle movements continue, associated with use of processing remaining stockpile through to year 53. | Reduced production water demands, dust suppression and potable. |
| Year 54 – Year 63 | Decommissioning and removal of infrastructure, final rehabilitation and ongoing monitoring and maintenance works. | Dust suppression and potable. |

### 5.4.1 Construction Water Demands

Construction water demands for the Project will be required for the civil construction works of:

- Roads and hardstand pads
- Levees and dam embankments
- Dust suppression

The Project plans 6,045 hours of water cart operation during the construction phase. The estimated water demand during this period is 450ML based on the assumed water cart consumption rates described in Section 5.4.3. Construction water demands are expected to be low compared to operational water demands described in the following sections. Water supply for construction works is expected to be supplied by water collected in the initial impoundment excavation of Sedimentation Pond 2 which is located on a small tributary within the MLA and early de-watering of the pit area as initial overburden is removed.

### 5.4.2 Process Plant Water Demand

Process water demands have been determined from a mass and water balance of the process plant and details of the tailings dam design and operation. All water streams in the process are recycled before ultimately being deposited with tailings in the four (4) TSFs over the Project duration. The tailings materials will consolidate in the TSFs with supernatant water draining to a reclaim pond and recycled in the processing plant via the PWD. The process plant has a small net water loss from steam in the product concentrate dryer. The key inputs for the process plant mass and water balance include the following:

- Raw feed ore moisture content – 3%
- Moisture content of tailings material sent to TSFs – 40%
- Settled tailings moisture content (based on a settled dry density of 1.6 tonnes/$m^3$) – 20%
- Product concentrate moisture content before drying – 20%
- Product concentrate moisture content after drying – 0%

Table 5.5 presents the process plant water demand calculations based on the parameters above and the planned processing tonnes for the Project. The project will process 1.25 Mtpa of materials in year 1 and increase to 3.5 tonnes by year 3 which will remain constant until year 48. Mining operations progressively cease during year 48. Processing continues for a small volume of low grade ROM stockpile until operation cease in year 54.

The net processing water demand is expected to increase from 316 ML/year in year one to 744 ML/year in year 3 and remain relatively constant for the project duration. The tailings system is expected to recover 62.5% of the disposed tailings water which will be subject to further evaporation.

**TABLE 5.5: PROJECT NET WATER DEMAND CALCULATION**

| Project Years | Ore Feed (tonnes) | Tailings (tonnes) | Feed Ore Water (ML) | Tailings Delivery Water (ML) | Entrained Water with Settled Tailings (ML) | Product Drying Water Loss (ML) | Gross Water Demand (ML/year) | Tailings Supernatant Return Water (ML/year) | Net Water Demand (ML/year) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1,250,000 | 1,186,220 | *38* | *791* | *297* | *7* | 760 | 494 | 316 |
| 2 | 2,500,000 | 2,352,633 | *75* | *1,568* | *588* | *18* | 1512 | 980 | 632 |
| 3 | 3,500,000 | 3,298,394 | *105* | *2,199* | *825* | *24* | 2,118 | 1374 | 744 |
| 10 | 3,500,000 | 3,313,076 | *105* | *2,209* | *828* | *20* | 2,124 | 1380 | 744 |
| 15 | 3,500,000 | 3,329,164 | *105* | *2,219* | *832* | *16* | 2,131 | 1387 | 744 |
| 20 | 3,500,000 | 3,317,477 | *105* | *2,212* | *829* | *19* | 2,126 | 1382 | 744 |
| 30 | 3,500,000 | 3,325,060 | *105* | *2,217* | *831* | *17* | 2,129 | 1385 | 744 |
| 40 | 3,500,000 | 3,353,047 | *105* | *2,235* | *838* | *10* | 2,141 | 1397 | 744 |
| 45 | 3,500,000 | 3,399,947 | *105* | *2,256* | *846* | *3* | 2,154 | 1410 | 744 |
| 48 | 2,518,977 | 2,446,968 | *76* | *1,631* | *612* | *3* | 1,558 | 1,004 | 539 |
| 49 | 400,000 | 400,000 | *12* | *267* | *100* | *3* | 257 | 167 | 91 |
| 53 | 400,000 | 400,000 | *12* | *267* | *100* | *3* | 257 | 167 | 91 |

### 5.4.3 Dust Suppression Water Demands

Dust suppression site water demands have been estimated based on the projected water cart operating hours and cart capacity. It was assumed the water carts would typically empty the full water holding capacity once per hour of operation. The project is expected to operate HD785 water carts with an estimated water holding capacity of 74 kL. The trucks are expected to operate at 6,045 hours/year until year 17 of the Project which reduces to 4,533 hours/year from year 18. The forecast dust suppression water demands for the Project are shown in Figure 5.14.

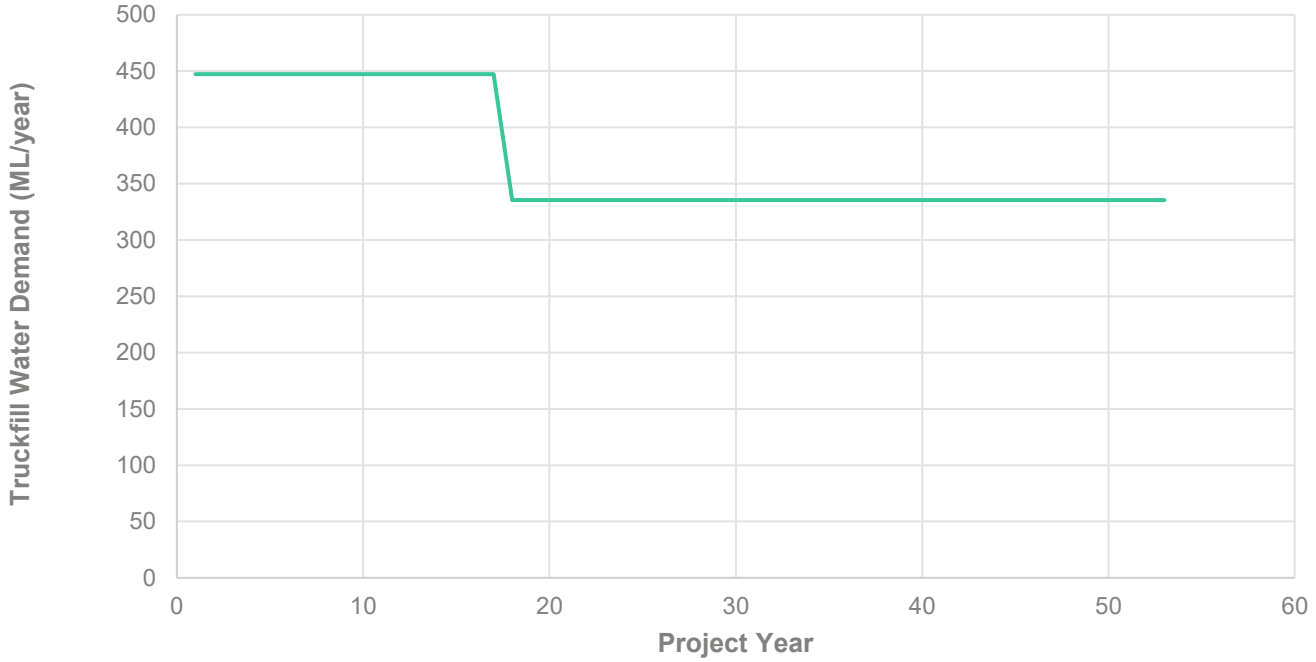



**Figure 5.14: Dust Suppression Water Demand**

### 5.4.4 Potable Water Demands

Potable water demands will be required for miscellaneous water usage at the workshops and administration areas. Potable water demands have been assumed to be a constant 50 kL per day for the project. Potable water will be supplied from the Raw Water Dam via a small water treatment plant.

# 6. WATER BALANCE MODEL

## 6.1 Operational Water Balance Model

A daily site water balance model was developed using the GoldSim modelling software to represent the water management system and surrounding waterways over the operational life of mine. The model was used to assess the performance of the water management system and potential impacts associated with accumulation of mine affected water and overflows from site storages. Key model outputs used to assess the water management system include:

- Containment performance of key water storages.
- Pit inundation frequency, volume, and duration.
- Water supply demands and shortfalls.
- External water supply requirements.
- Changes to streamflow regime in surrounding waterways.

The general water management system operation is described in Table 6.1 below. A schematic of the water management system is provided in Figure 5.1. The water balance model replicates the transfer rates and destinations of the schematic. Figure 5.2 to Figure 5.9 show conceptual layouts of the water management system at key mine stage horizons and post closure. For detailed descriptions and design standards for the storages refer to Section 5.3.

**TABLE 6.1: WATER MANAGEMENT SYSTEM OPERATION OF STORAGES**

| ID | Storage Capacity (ML) | Pump Rate (L/s) | Maximum Catchment Area (ha) | Pump Destination | Years Active |
|---|---|---|---|---|---|
| Process Water Dam (PWD) | 400 | 150 | 34.0 | Processing Plant | Year 1 – Year 53 |
| Pit Dewatering Dam (PDD) | 200 | 150 | 2.53 | PWD | Year 1 – Year 53 |
| MAW Sump | 100 | 100 | 90.5 | PDD | Year 1 – Year 53 |
| Sedimentation Pond 1 | 60 | 100 | 64.9 | PWD | Year 1 – Year 53 |
| Sedimentation Pond 2 | 94 | 100 | 99.8 | PWD | Year 1 – Year 53 |
| Sedimentation Pond 3 | 80 | 100 | 70.1 | PWD | Year 1 – Year 53 |
| Sedimentation Pond 4 | 60 | 70 | 188.9 | PWD | Year 1 – Year 53 |
| TSF1 | 1620[3] | 150 | 141.1 | PDD | Year 1 – Year 13 |
| TSF2 | 1710[3] | 150 | 148.3 | PDD | Year 12 – Year 25 |
| TSF3 | 1700[3] | 150 | 142.8 | PDD | Year 25 – Year 36 |
| TSF4 | 1700[3] | 150 | 132.8 | PDD | Year 36 – Year 53 |
| Raw Water Dam | 200 | 150 | 2.7 | Raw water demands | Year 1 – Year 53 |
| Clean Water Diversion Sump | 100 | 70 | 441.5 | Raw Water Dam | Year 1 – Year 53 |
| Mine Pit | -[2] | 150 | 97.4 | PDD | Year 1 – Year 53 |

[1] *Pit storage volume varies and is actively dewatered.*
[2] *Sediment dam volume includes sediment storage volume and settling zone volume.*
[3] *Design Storage Allowance as determined from the TSF design* **(Soil & Rock Engineering Pty Ltd, 2026)**.

### 6.1.1 Climate Inputs

Climate data inputs to the water balance model were sourced from Silo Data Drill (DES, 2026). A continuous daily rainfall series was developed to allow continuous simulation of scenarios corresponding to the historical period 1889 to 2026. Daily lake evaporation and evapotranspiration data were also input to the water balance model for the purpose of estimating evaporation losses from storages and informing the daily rainfall runoff model (AWBM) respectively. 136-year data sets for these data types were sourced from SILO Data Drill (DES, 2026). Monthly average rainfall, lake evaporation and potential evapotranspiration for the Project are summarised in Table 6.2.

**TABLE 6.2: MONTHLY AVERAGE CLIMATE DATA**

| Month | Rainfall (mm) | Lake Evaporation (mm) | Potential Evapotranspiration (mm) |
|---|---|---|---|
| January | 188 | 215 | 203 |
| February | 168 | 187 | 179 |
| March | 92 | 195 | 186 |
| April | 17 | 162 | 155 |
| May | 9 | 133 | 127 |
| June | 7 | 111 | 105 |
| July | 4 | 122 | 116 |
| August | 2 | 151 | 143 |
| September | 4 | 182 | 171 |
| October | 12 | 222 | 207 |
| November | 38 | 227 | 211 |
| December | 102 | 230 | 214 |
| **Annual Totals** | **642** | **2,137** | **2,016** |

### 6.1.2 Catchment Runoff

Catchment runoff has been simulated using the Australian Water Balance Model (AWBM). The model represents the catchment using three surface stores to simulate partial areas of runoff. The water balance of each surface store is calculated independently of the others. The model calculates the water balance of each partial area at daily time steps. At each time step, rainfall is added to each of the three surface stores and evapotranspiration is subtracted from each store. If the value of water in the store exceeds the capacity of the store, the excess water becomes runoff. Part of this runoff becomes recharge of the base flow store if there is a base flow component to the stream flow. A schematic representation of the AWBM model is provided in Figure 6.1.

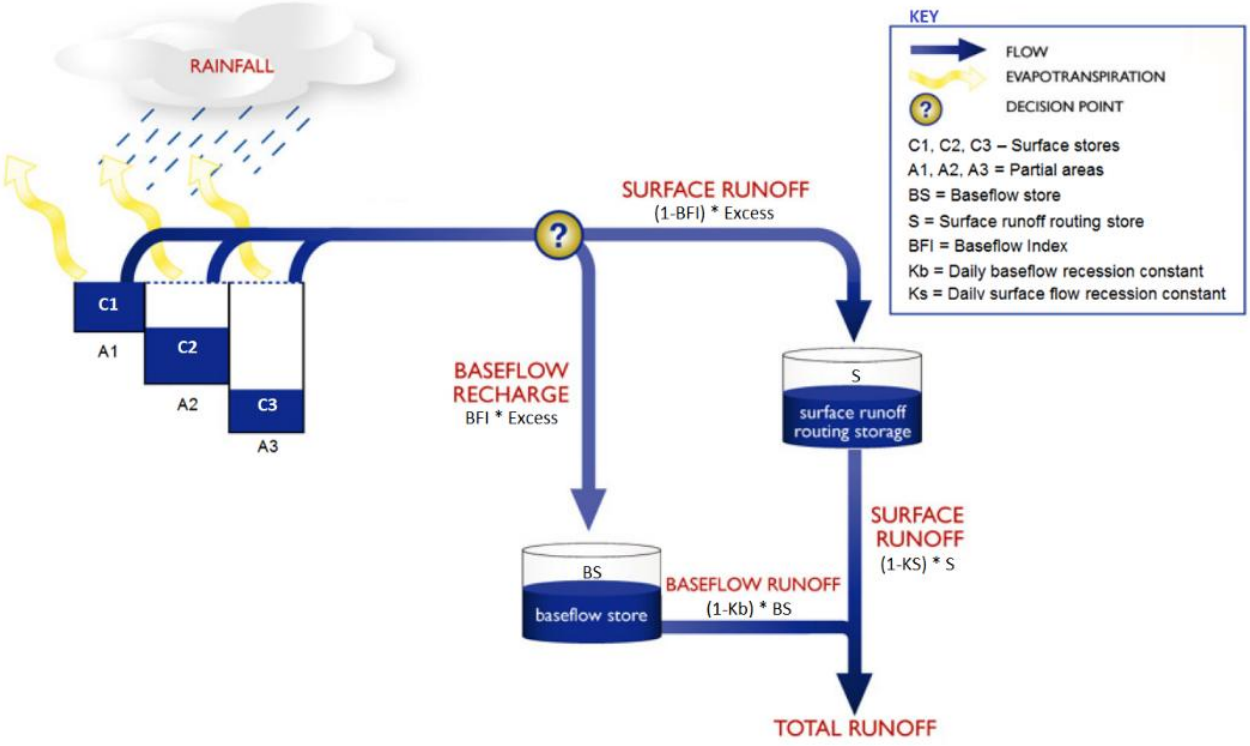



**Figure 6.1: AWBM Schematic**

No gauges were available for the calibration of natural and rehabilitation land use AWBM parameters. In the absence of local information, all AWBM parameters have been sourced from recent mining projects Engeny has completed in the region. The adopted AWBM parameters are shown in Table 6.3.

**TABLE 6.3: AWBM PARAMETERS**

| Parameter | Natural | Waste Dump and Stockpiles | Hardstands, Pit and Tailings | Rehabilitation |
|---|---|---|---|---|
| A1 | 0.134 | 0.134 | 0.134 | 0.134 |
| A2 | 0.433 | 0.433 | 0.433 | 0.433 |
| A3 | 0.433 | 0.433 | 0.433 | 0.433 |
| C1 (mm) | 40 | 10 | 5 | 40 |
| C2 (mm) | 290 | 100 | 10 | 290 |
| C3 (mm) | 370 | 400 | 25 | 370 |
| BFI | 0.5 | 0.8 | 0.1 | 0.5 |
| Kb | 0.75 | 0.5 | 0.5 | 0.75 |
| Ks | 0.05 | 0.05 | 0.05 | 0.05 |
| **Average annual runoff coefficient** | **0.07** | **0.13** | **0.41** | **0.07** |

The AWBM runoff parameters represent the surface rainfall runoff component of the catchment areas. The deep seepage volume that reports to the pit floor from the rehabilitation and spoil areas was considered to be negligible as described in Section 6.1.4.

The performance of the adopted AWBM parameters will continue to be validated as part of the model update and review program described in Section 10.1.

### 6.1.3 Catchment Areas

Catchment areas were determined for all storages across the life of the mine. Catchment boundaries were defined using the proposed mine and dump planning in conjunction with topographical survey of the Project area. A summary of the site storage catchment areas is presented in Table 6.4.

**TABLE 6.4: TOTAL SITE STORAGE CATCHMENT AREA BY LANDUSE AND MINING STAGE (HECTARES)**

| Landuse | Year 2 | Year 10 | Year 15 | Year 20 | Year 30 | Year 42 | Year 53 |
|---|---|---|---|---|---|---|---|
| Hardstands | 63.6 | 63.6 | 61.8 | 61.8 | 61.8 | 61.8 | 61.8 |
| Natural | 820.7 | 674.7 | 527.1 | 270.7 | 251.2 | 250.6 | 247.3 |
| Pit | 23.2 | 61.9 | 72.6 | 72.6 | 79.3 | 45.2 | - |
| Rehab | 11.3 | 18.2 | 33.7 | 33.5 | 44.7 | 79.6 | 647 |
| Tailings | 141.1 | 271.9 | 432.1 | 565.0 | 565.0 | 565.0 | 170.0 |
| WRD | 156.8 | 204.7 | 217.3 | 217.4 | 218.9 | 218.9 | 77.4 |
| **Total Area** | **1216.8** | **1295.0** | **1344.7** | **1221.0** | **1221.0** | **1221.1** | **1231.3** |

### 6.1.4 Groundwater

Groundwater ingress into the mining pit is expected with inflows estimated through a numerical groundwater model (hydrogeologist.com.au, 2026). Groundwater inflows to the open pit throughout the model simulated mine life are predicted to be approximately 2,000 ML/year for the first 5 years which decreases over the Project life to between 550 and 700 ML/year. The groundwater model predictions provide an estimate of the total groundwater "loss" to the mining pit instead of the pumpable groundwater volume. The groundwater inflows were reduced by 10% for the water balance model to account for additional losses from evaporation off the pit floor and water retained in waste and mined materials. To reduce the head of groundwater reporting to the pit, groundwater bores would be placed adjacent to the pit as informed by a suitably qualified person (SQP).

It was also assumed groundwater is not pumpable when mining operations begin to cease and the ramping up of the pit backfill occurs, in year 48. The backfill material will be placed in the pit with a relatively low moisture content. As the groundwater level recovers the backfill material will need to be saturated before groundwater ponds on the pit floor and becomes pumpable. During this period, it is still assumed the pit is continually dewatered for the backfill activities.

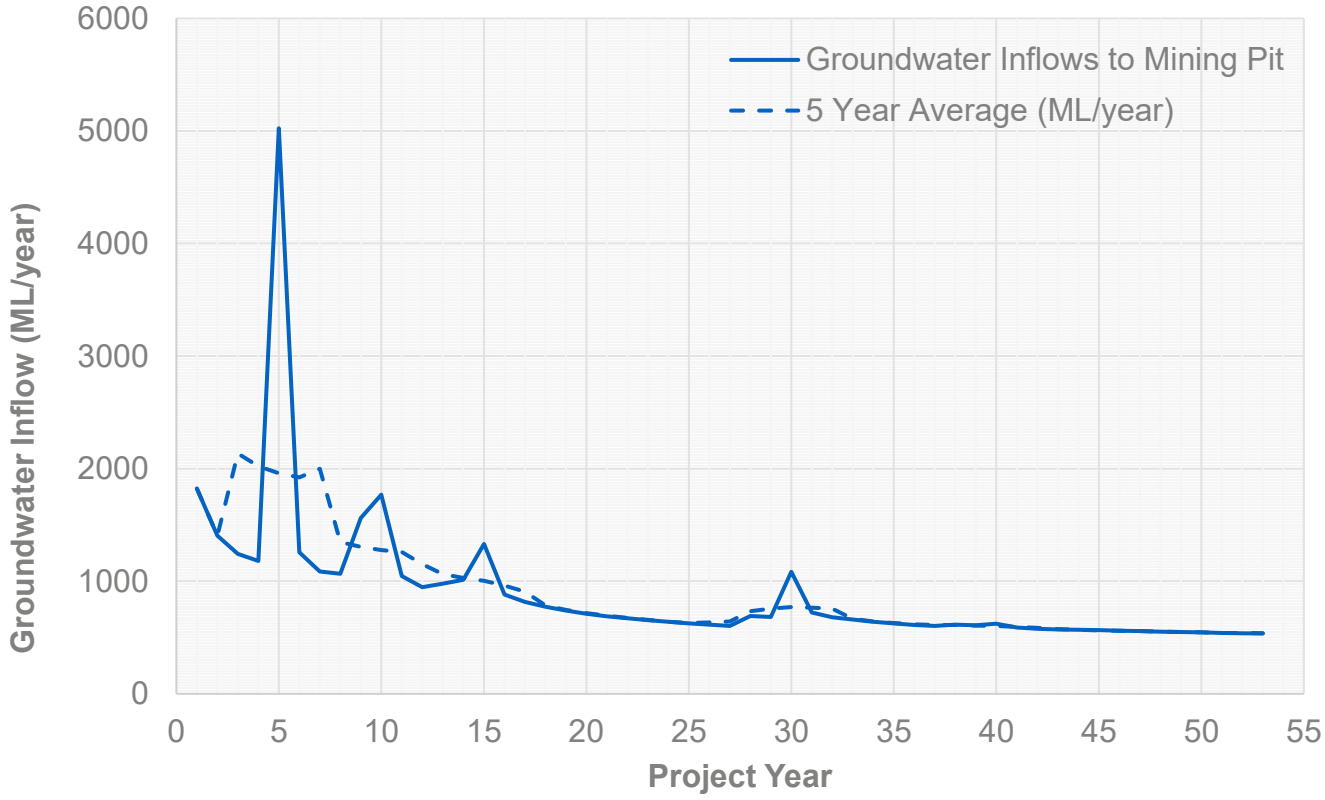



**Figure 6.2: Groundwater Inflows to Mining Pit**

### 6.1.5 Water Storage Seepage Losses

No seepage losses have been included in the model. Seepage rates are highly dependent on the geotechnical conditions under the dam impoundment and will be determined through targeted investigations during detailed design. No seepage losses were conservatively modelled from the mine water storages.

### 6.1.6 Starting Conditions

All storages were assumed to be empty at the start of the simulation.

### 6.1.7 Simulation Details

The GoldSim model was run with a daily timestep as a probabilistic simulation for a period of 53 years, for the operational life of the mine. The model was simulated for 135 realisations stepping through 53-year sequences of the 136 years of available climate data for the mine site (1889 to 2019). The first model simulation realisation uses climate data from 1889 to 1942, the second realisation uses climate data from 1890 to 1943 and so on. Climate data was not "wrapped" to allow for additional realisations because the interannual climate patterns captured by running a simulation for an extended period cannot be accurately modelled using non-consecutive climate years.

### 6.1.8 Water Management System Performance

The Project average annual water balance (inflows and outflows) for the key mine plan stages are summarised in Table 6.5 and shown for year 15 in Figure 6.3. The average annual balance summary is based on a reporting period from July to June. The average annual water balance provides an indication of the interaction between the mine plan and the water demands and supply. The key outcomes from the average annual water balance include:

- The water management system has been modelled to have no annual shortfalls to supply water demands in 95% of years during mine operation years.
- Shortfalls slightly increase after year 48, with approximately 10% of years experiencing some shortall to supply water demand.

- The site water balance is slightly negative in the last few years of the Project which assists in reducing MAW inventories leading up to closure.
- Rainfall and runoff volumes are highest when all TSFs are operational due to the greater proportion of disturbed land use. Whilst the rehabilitation and pre mining catchment areas have similar total catchment areas, the natural/rehab land use has high associated losses.
- Rainfall and runoff collected in site storages accounts for on average 52% of total water inflows to the system with the remainder being supplied from groundwater inflows to the mine pit and tailings supernatant water.
- Process water demands are the largest system outflow followed by evaporation.

**TABLE 6.5: AVERAGE ANNUAL WATER BALANCE (ML/YEAR)**

| Inflow/Outflow | Year 2 | Year 10 | Year 15 | Year 20 | Year 30 | Year 42 | Year 49 | Year 53 |
|---|---|---|---|---|---|---|---|---|
| Direct rainfall | 362 | 339 | 377 | 488 | 487 | 435 | 146 | 130 |
| Rainfall runoff | 644 | 1,003 | 1,346 | 1,655 | 1,654 | 1,597 | 726 | 599 |
| Pumpable groundwater from mining pit | 1,453 | 1,162 | 915 | 659 | 671 | 531 | -[1] | -[1] |
| Tailings water recovery | 735 | 1,375 | 1,382 | 1,382 | 1,385 | 1,403 | 167 | 167 |
| **Total Inflows** | **3,193** | **3,879** | **4,020** | **4,185** | **4,196** | **3,967** | **1,039** | **896** |
| Evaporation | 1,179 | 1,228 | 1,401 | 1,771 | 1,790 | 1,549 | 527 | 467 |
| Seepage | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Project Water Demands (Gross) | 1,579 | 2,565 | 2,572 | 2,463 | 2,463 | 2,481 | 592 | 592 |
| Sediment dam overflow | 24 | 41 | 33 | 30 | 25 | 15 | 0 | 0 |
| Mine water storage overflows | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total outflows** | **2,781** | **3,834** | **4,005** | **4,264** | **4,278** | **4,045** | **1,119** | **1,059** |
| **Balance** | **412** | **45** | **14** | **-79** | **-81** | **-78** | **-80** | **-163** |

[1] When backfill of the mining pit commences, the pit continues to be dewatered but groundwater entering the pit is assumed to saturate the backfill mateirals. Any groundwater that collects at the pit floor will be dewatered during the backfill period.




**Figure 6.3: Average Annual Inflow/Outflow – Year 15**

## 6.1.9 Site Water Inventory

Modelled total site inventory and the mine water inventory are presented in Figure 6.4 and Figure 6.5 respectively for the project duration. The total site inventory shows median inventory sits between 800 ML and 2,000 ML over the Project life with 95$^{th}$ percentile inventories reaching 5.4GL. The results show after a large wet season event (95$^{th}$ percentile result), site inventories can be reduced quickly back to the normal operating range due to site water demands. This shows there is a low risk of MAW accumulation for the Project which may impact pit operability.

The total 95$^{th}$ percentile mine water inventory (including the mining pit) is expected to peak at approximately 3.9 GL in Year 20 to Year 41. Again the results show the 95$^{th}$ percentile trend is reduced back to mine operating volume during each dry season due to preferential reuse of mine water over raw water. The median mine water inventory remains low and is only expected to increase during significant rainfall events.

When out-of-pit mine water storage inventory is exceeded, mine water will be stored temporarily in the mining void. Water balance modelling indicates a peak pit inventories following rainfall events generally remain below 800 ML in 95% of years.

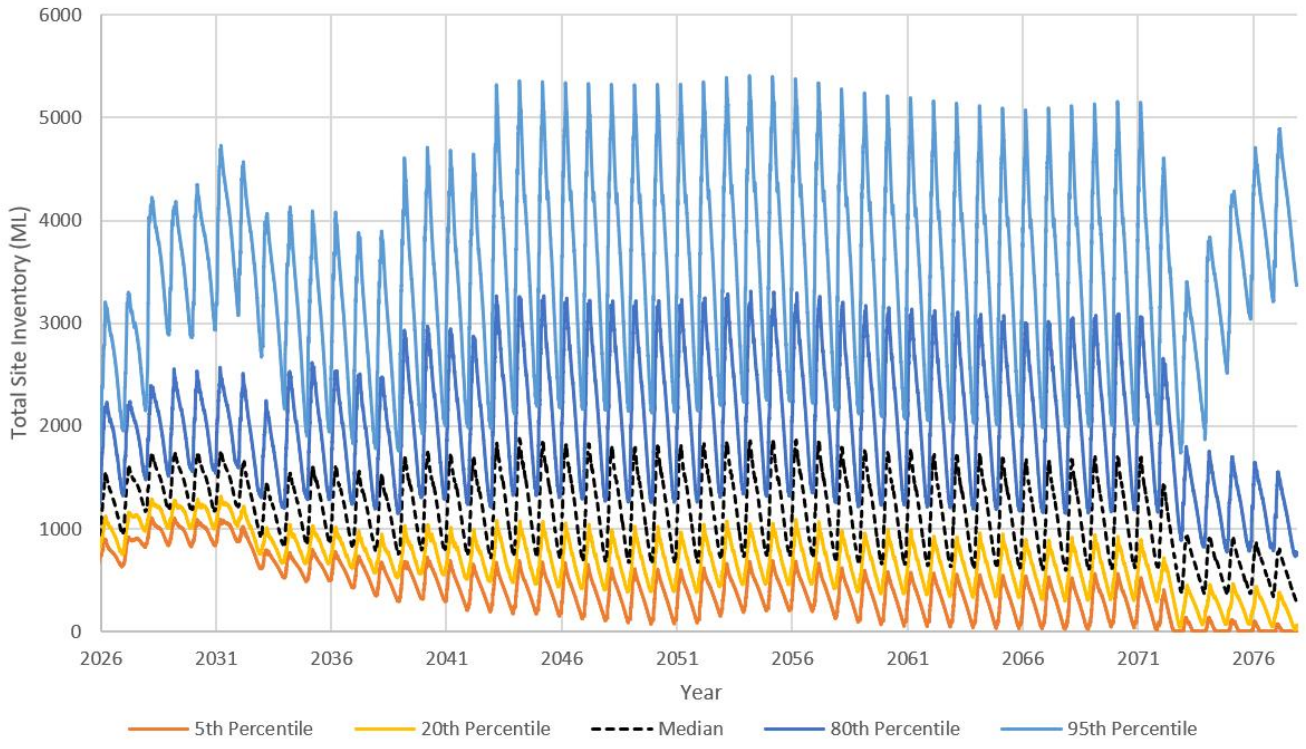



**Figure 6.4: Total Site Inventory Results**

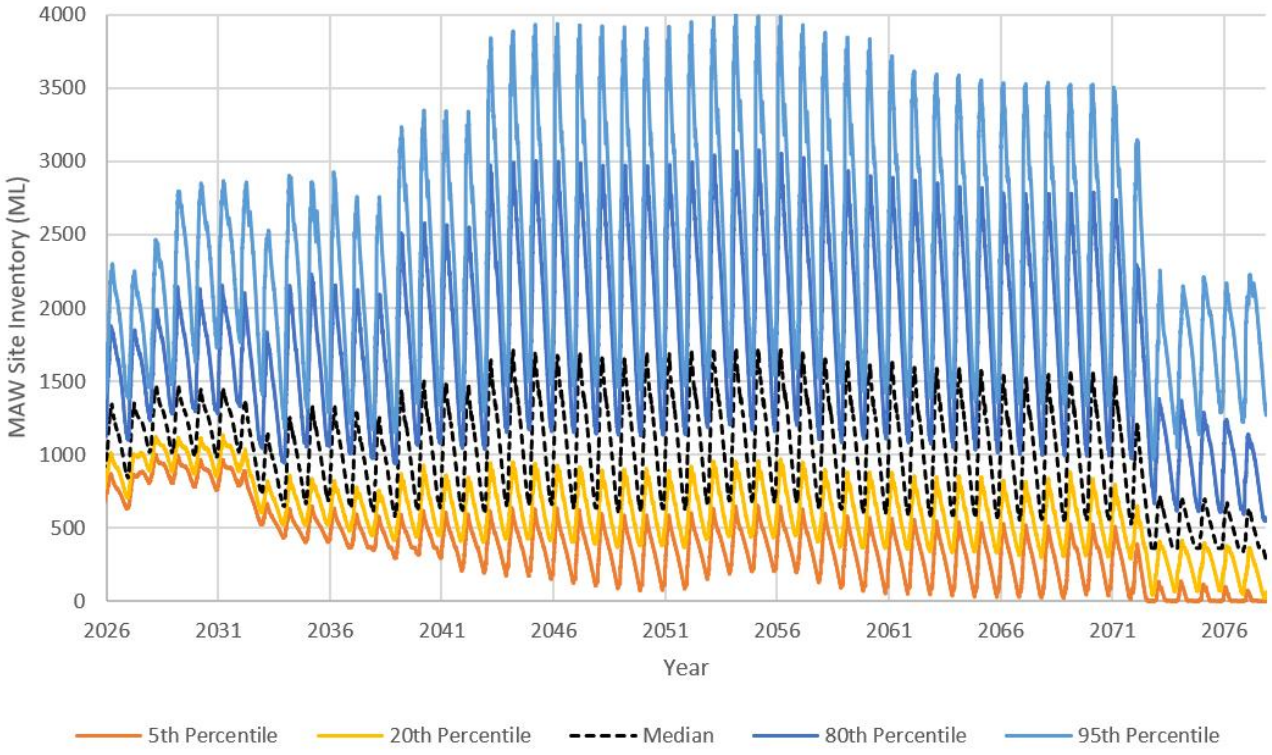



**Figure 6.5: Mine Water Storage Inventory Results**

## 6.1.10 Mine Water Dams Containment

The site water balance model was then used to determine the overflow frequency of the mine water storages. The MAW Storages all overflow to the mining pit which has excess storage capacity for containment. The water balance model results show no MAW overflows from the mining pit.

## 6.1.11 Sedimentation Pond Overflows

Sedimentation ponds 1-3 were designed to contain the 10% AEP 24-hour rainfall depth with allowance for sediment storage (see Section 5.3.3). The overflow frequency of the sediment dams was assessed in the operational water balance model to confirm the containment standard and determine potential overflow volumes. The predicted annual overflow frequency of the sediment dams for the key mine stages is provided in Table 6.6. Figure 6.6 shows modelled sediment dam overflow volumes in large wet years. It is noted sedimentation ponds 1 and 2 overflow to the mining pit and sedimentation ponds 3 and 4 overflow to the stream order 3 tributary downstream of the proposed watercourse diversion.

Sedimentation pond 3 has been designed for the 10% AEP containment due to their associated captured sediment loads and the environmental release. The operational water balance model results show a maximum annual overtopping frequency of $\leq$ 10% during the high operating years of 1 – 53. Following year 48, the site begins rehabilitation alongside the processing of low grade stockpile. A higher annual overflow frequency has been modelled in sediment pond 3 during this phase, however the sediment load will be reduced during rehabilitation.

Sedimentation pond 4 has a high overflow probability of above 50%, however captures water from a low sediment generating catchment and therefore the pond has been designed accordingly.

Sedimentation ponds 1 and 2 have a maximum annual overtopping frequency generally less than 10% which then increases at the end of the Project life due to rehabilitation of the TSFs and reduced water demands. Overflows from these two storages is however captured in the MAW sump and mining pit and pumped back into the PDD to supply demands.

During overtopping events, coarse sediments will continue to settle out as water flows through the dam reservoirs providing residence time. Sediment dams will be designed such that overtopping velocities are managed so they do not cause scour in the overtopping flow paths. Spillway control structures may include or be a combination of rock chutes, rock aprons and/or level spreaders.

**TABLE 6.6: SEDIMENT DAM OVERFLOW PROBABILITY**

| Sediment Dam | Annual Overflow Probability (%) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Year 2 | Year 10 | Year 15 | Year 20 | Year 30 | Year 42 | Year 48 | Year 53 |
| Sedimentation Pond 1[1] | 8% | 7% | 7% | 7% | 6% | 6% | 8% | 10% |
| Sedimentation Pond 2[1] | 15% | 7% | 7% | 7% | 8% | 7% | 39% | 36% |
| Sedimentation Pond 3 | 6% | 8% | 9% | 9% | 9% | 9% | 12% | 16% |
| Sedimentation Pond 4[2] | 61% | 71% | 67% | 65% | 64% | 59% | 59% | 31% |

[1] Sedimentation ponds 1 and 2 overflows towards the MAW Sump and ultimately the mine pit. No release environmental releases.

[2] Sedimentation pond 4 captures water from topsoil stockpiles and natural catchments. The design of the pond reflects the associated sediment loads.

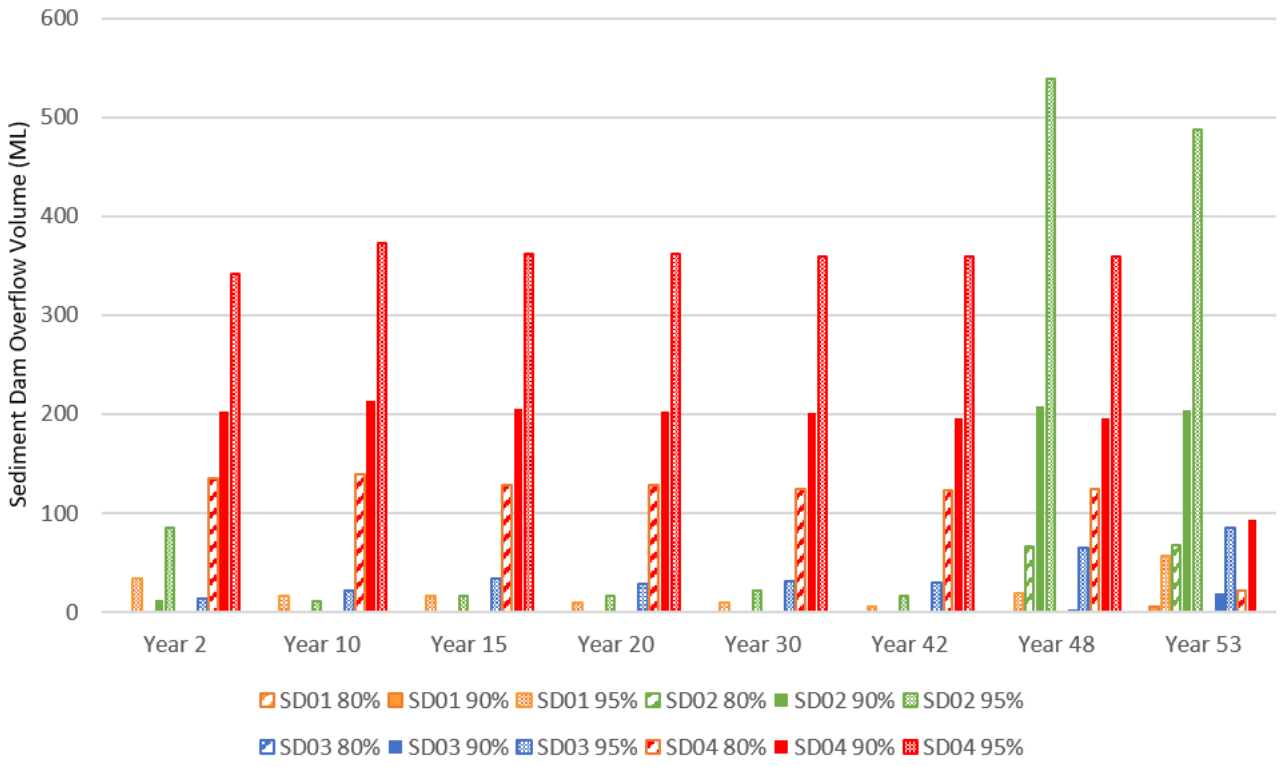



**Figure 6.6: Modelled Sediment Dam Annual Overflow Volumes**

# 6.2 Climate Change Sensitivity Assessment

A climate change sensitivity assessment was undertaken to understand the impact of climate change on the outcomes derived from the operational water balance assessments. The model climate data inputs were adjusted using the methodologies outlined in "Climate Change in Australia Technical Report" (CSIRO, 2015) to undertake the sensitivity assessment. The adopted methodology has utilised the latest Coupled Model Intercomparison Project (CMIP6) estimations from the International Panel on Climate Change (IPCC) which provide projections of future climate variables for several greenhouse gas and aerosol emission pathway scenarios (Shared Socioeconomic Pathways). These pathways align with climate change pathways adopted for the flood modelling.

**TABLE 6.7: CLIMATE CHANGE SENSITVITY - MODEL PARAMETERS**

| | 2060-2079 | Median % Change | Adopted Model |
|---|---|---|---|
| Precipitation | SSP2-4.5 | -5.6% | GISS-E2-1-G |
| | SSP3-7.0 | -2.4% | ModAvg11_CCAM10_qld-10 |
| Evaporation | SSP2-4.5 | 14.8% | CMCC-ESM2 |
| | SSP3-7.0 | 16.4% | ModAvg11_CCAM10_qld-10 |
| Evapotranspiration | SSP2-4.5 | 5.6% | MRI-ESM2-0 |
| | SSP3-7.0 | 5.2% | CMCC-ESM2 |

## 6.2.1 Climate Change Sensitivity Results

The operational water balance model was updated to reflect the climate models for SSP2-4.5 and SSP3-7.0 climate pathways for the 2070 projection year. The adopted median climate change models forecast a decrease in the long-term annual precipitation and increasing evaporative rates for both SSP pathways. In modelling SSP2-4.5 climate predictions, an average decrease of 21% in total inventory was calculated for the operating lifespan of the site. Whilst an average decrease of 20% in total inventory was modelled for the SSP3-7.0 pathway (Figure 6.7). Climate change influences on local hydrology are expected to reduce total site inventories.

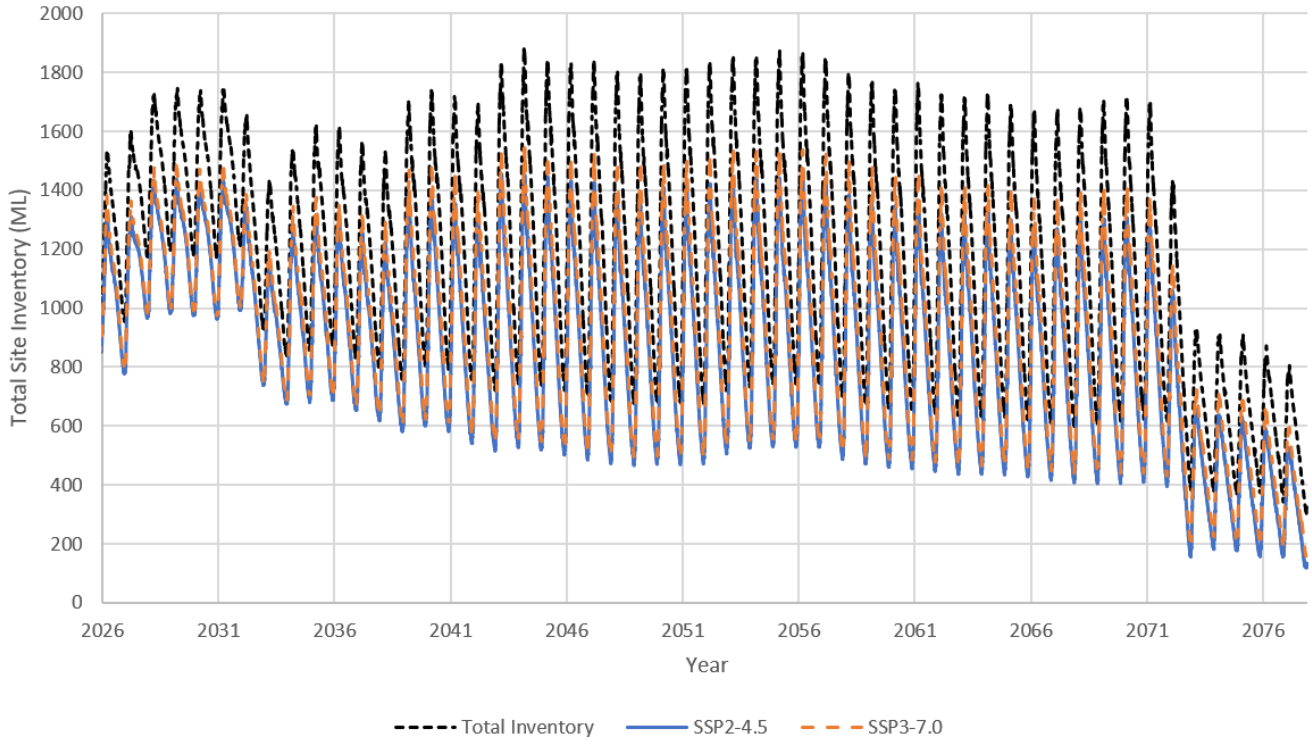



**Figure 6.7: Median Total Inventory – Climate Change Sensitivity**

Due to the lower stored inventory, overflow probabilities for the sediment dams have been modelled to decrease under the climate change scenarios. Table 6.8 presents the annual overflow probabilities for sedimentation ponds 3 and 4 which overflow to the stream order 3 tributary. The results show sedimentation pond 3 annual overflow probability reduces from on average 9% to between 4% and 6% for the SSP2-4.5 and SSP3-7.0 climate change pathways respectively. Similarly, the sedimentation pond 4 annual overflow probability is expected to reduce from on average 64% to between 49% and 51% for the SSP2-4.5 and SSP3-7.0 climate pathways. The results show that climate change impacts on hydrology will reduce the annual overflow probability of sediment dams.

**TABLE 6.8: CLIMATE CHANGE SENSITIVITY - OVERFLOW RISK**

| Sediment Dam | | Annual Overflow Probability (%) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Year 2 | Year 10 | Year 15 | Year 20 | Year 30 | Year 42 | Year 48 | Year 53 |
| Sedimentation Pond 3 | Historical Climate | 6% | 8% | 9% | 9% | 9% | 9% | 12% | 16% |
| | SSP2-4.5 | 3% | 5% | 4% | 4% | 4% | 4% | 6% | 9% |
| | SSP3-7.0 | 4% | 5% | 6% | 5% | 6% | 6% | 7% | 10% |
| Sedimentation Pond 4 | Historical Climate | 61% | 71% | 67% | 65% | 64% | 59% | 59% | 31% |
| | SSP2-4.5 | 52% | 53% | 51% | 49% | 48% | 44% | 44% | 20% |
| | SSP3-7.0 | 53% | 60% | 53% | 51% | 50% | 47% | 46% | 21% |

# 7. REGIONAL FLOOD ASSESSMENT

## 7.1 Overview

Flooding impacts associated with the Project have been assessed through the development of hydrologic and hydraulic models of the Norman River systems (Clara River, Warrigal Creek, Borer River and Yappar River) to assess extreme flooding and potential interactions with the Project. The Project is located on the northern side of the Warrigal Creek main channel. The main tributary that flows through the MLA is a stream order 3 tributary for Warrigal Creel/Borer River which flows in a western direction and is proposed to be diverted north of the pit. The surface topography is very flat and slopes north-west at an average grade of 0.2%. The flat topography results in widespread flooding with interactions between the major waterways during significant flood events.

Flooding at the Project location is dominated by breakout flooding from the northern banks of Warrigal Creek and the Borer River which are influenced by flooding interactions with other major waterways. Other key breakout flooding interactions relevant to the Project location are from Yapper River into Warrigal Creek (22 km and 40 km upstream of the Project) and from the Clara River into the Norman River (66 km upstream of the Project).

The subsequent sections describe historical flooding, the development and application of hydrologic and hydraulic models and the assessed flooding interactions and outcomes for the Project.

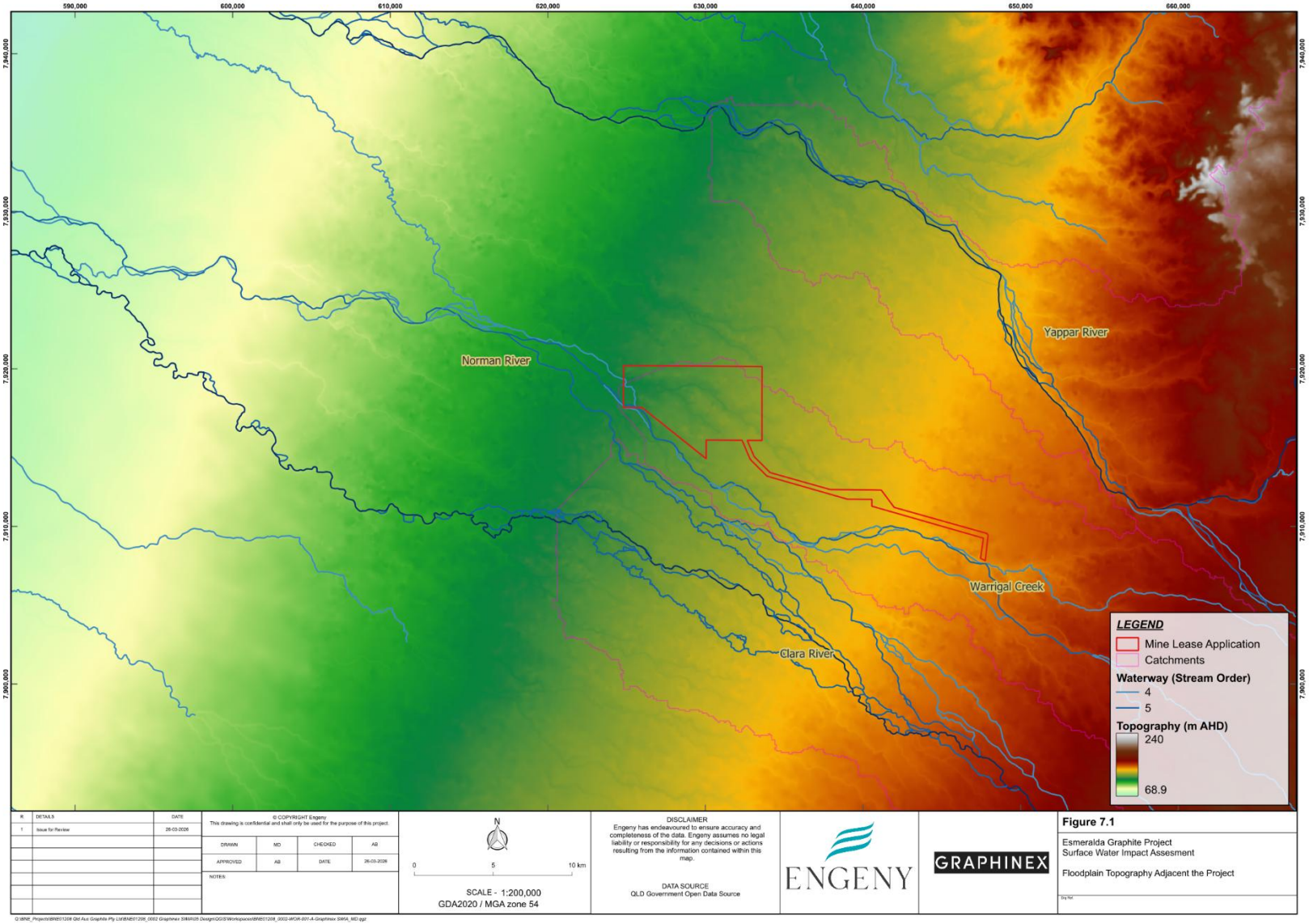



**Figure 7.1: Floodplain Topography Adjacent the Project**

## 7.2 Flooding History

Historical flooding information for the Warrigal Creek and other tributaries of Norman River is limited with active stream gauging currently only available at Glenore Weir, 170 km downstream of the Project.

Significant rainfall events recorded at the Yappar River Rainfall Gauging Station (29154) include January 2009, January 2021 and December-January 2025/26. The most recent event was caused by a tropical low pressure system tracking south from the Gulf Coast in late December 2025, resulting in a period of heavy rainfall. In January 2026, the remnant moisture interacted with a monsoon low and an embedded trough over western Queensland. During the 11-day period, significant widespread rainfall was recorded, with peak daily rainfall totals occurring on different days across the catchment. The following sections present the available data and satellite imagery for the flood event.

### 7.2.1 Stream Gauging Data

The only operational stream flow gauging station within the Norman River catchment is downstream of the MLA at Norman River at Glenore Weir Station (916001B). The recorded flood event in 2025/2026 is summarised in Table 7.1 and gauge location is shown in Figure 2.5. A peak flow of 2,545 m3/s was recorded on the 9th of January 2026.

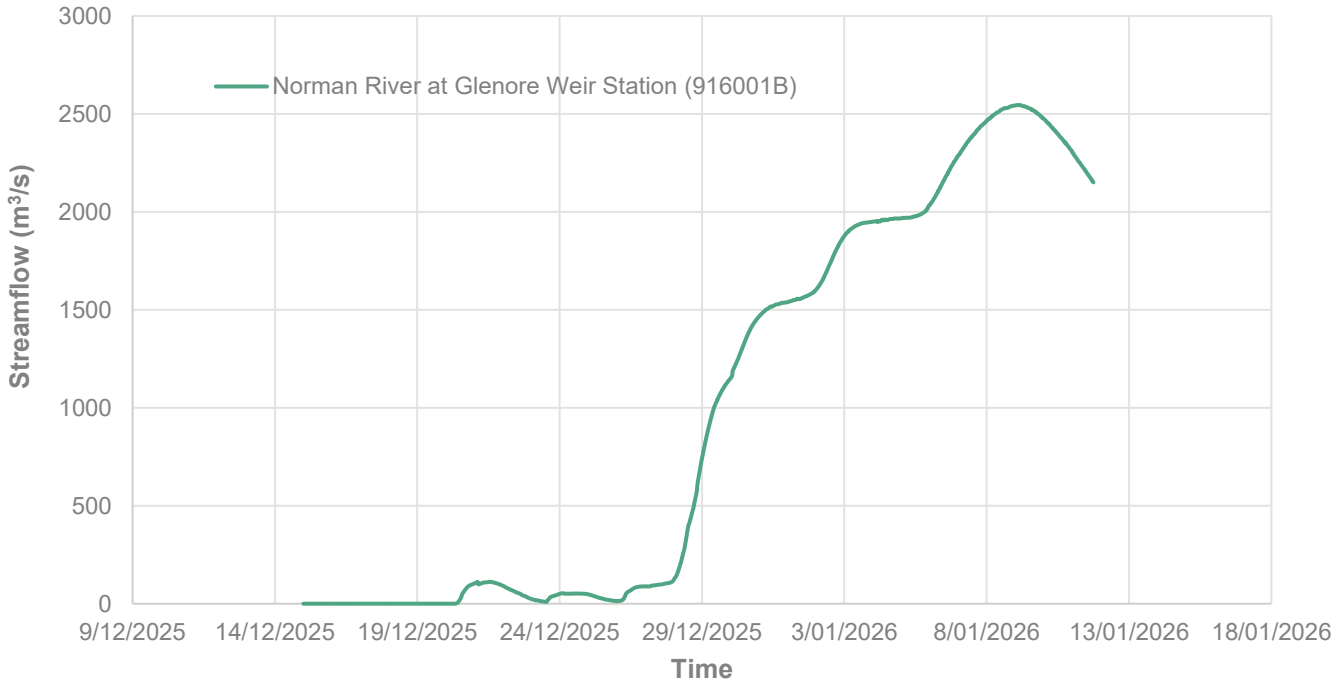



**Figure 7.2: Stream Gauge Data**

**TABLE 7.1: STREAM FLOW GAUGING DATA FOR THE JANUARY/FEBRUARY FLOOD EVENT**

| Station Number | Station Name | Catchment Area (km²) | Recorded Peak Flood Level (m RL) | Recorded Peak Flow Rate (m³/s) |
|---|---|---|---|---|
| 916001B | Norman River at Glenore Weir | 39,360 | 14.05 | 2,545 |

### 7.2.2 Recorded Rainfall

Operational pluviometer and daily rainfall stations in the Norman River catchments and surrounding areas are listed in in the table below. Note two weeks of missing rainfall data was noted at Croydon Township during late December to early January. Cumulative rainfall depth recorded by the pluviometer stations is shown in Figure 7.3. The rainfall data shows considerable spatial variation in rainfall during the event, with larger rainfall totals up to ~ 700mm recorded in the lower reaches of the Catchment. There are large distances between the pluviometer rainfall stations which provides uncertainty in the temporal distribution of rainfall during the event.

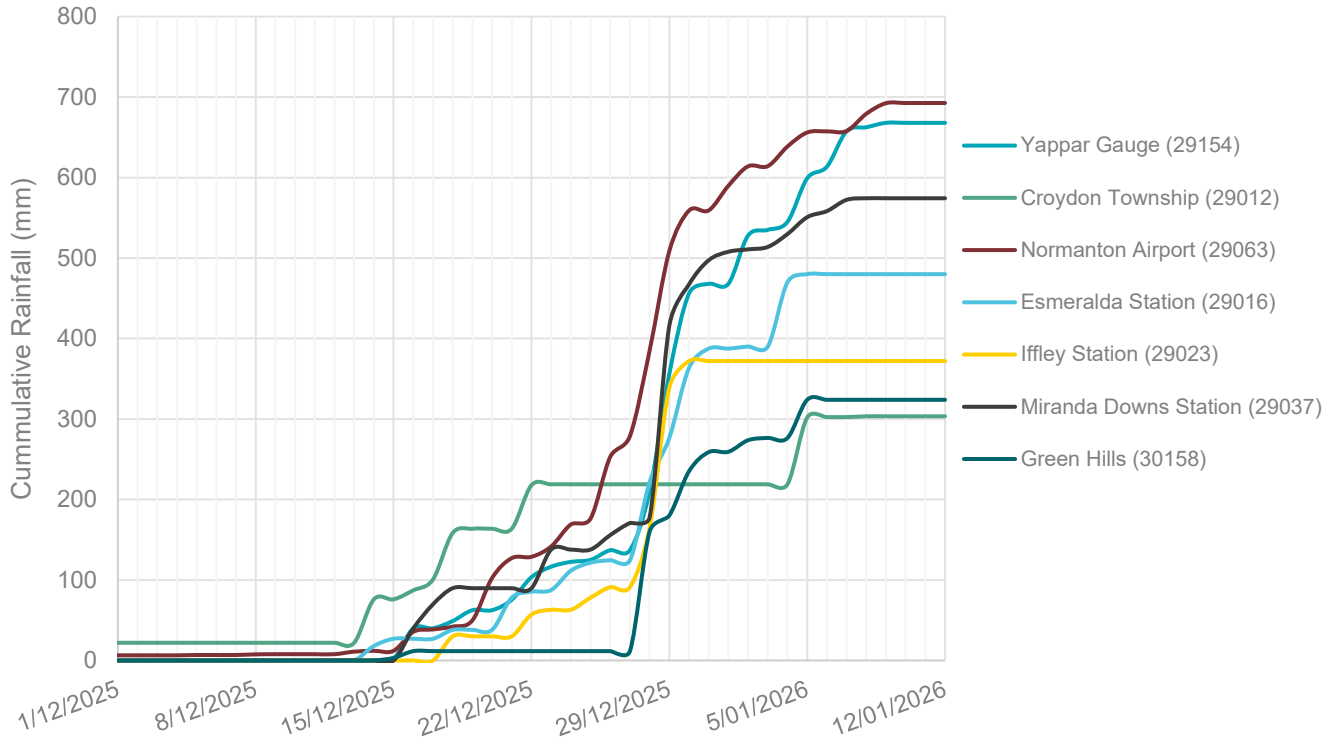



**Figure 7.3: Time Distribution of Rainfall – January/February 2019 Rainfall Event**

### 7.2.3 Satellite Imagery

Satellite imagery (Sentinel-2 L2A) of the Norman River captured on the 8th of January during the 2026 flood event is shown in Figure 7.4. Due to high cloud cover, the peak maximum flood extent at the MLA is not clearly shown. Flooding at the MLA has however been captured in the MODIS Corrected Reflectance imagery (12th January 2026) in Figure 7.5. The landscape is characterised by the braided channels with significant overland flooding. Sentinel-2 L2A imagery illustrates the extensive breakout flooding from the Warrigal Creek and Yappar Rivers downstream of the site. Cloud cover restricted the flood characterisation at the Project area during this event, however overland flooding across the Project area can be inferred in the image presented Figure 7.5.

An additional significant flood event was recorded at the site in February 2009 (Figure 7.6). Imagery illustrates breakout flooding from Warrigal Creek flowing towards the Project area, and the main channel of Warrigal Creek passing through the south-eastern corner of the Project area. Due to limited available data, it cannot be confirmed if this imagery captures the maximum flood extent.

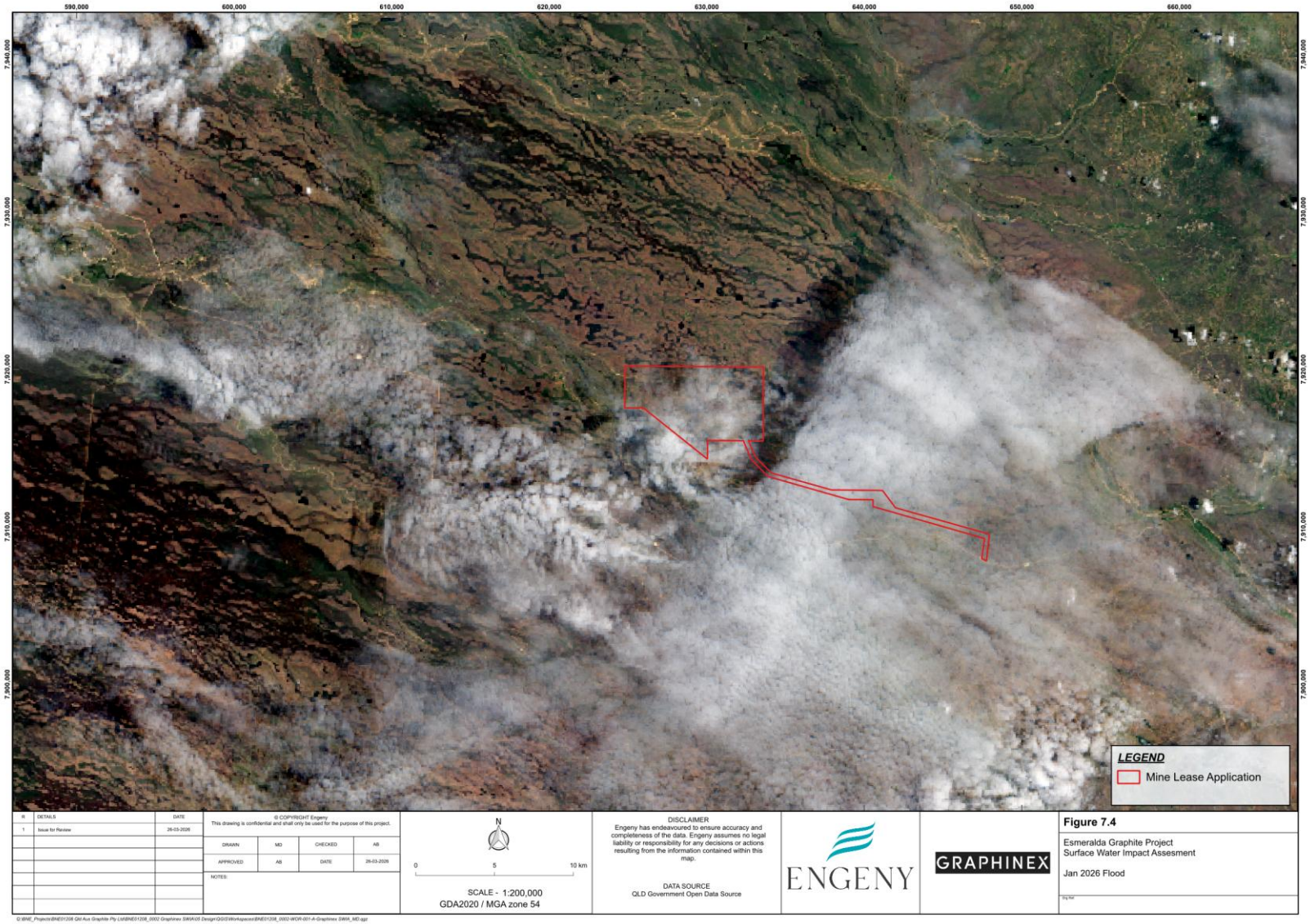



**Figure 7.4: Satellite Imagery (8th January 2026)**




**Figure 7.5: Satellite Imagery (12th January 2026)**




**Figure 7.6: Satellite Imagery (13th February 2009)**

# 7.3 Hydrology

## 7.3.1 Overview

The breakout flooding behaviour that changes the distribution of flood flows in each of the waterways makes it not practical to accurately assess flooding for the Project with separate hydrology and hydraulic models. Therefore the 'rain-on-grid' modelling approach was adopted for the assessment, where the model is used to simulate rainfall excess, catchment watershed and channelised flow hydraulics for the whole catchment. This allows simulation of the catchment hydrology while accounting for breakout flooding interactions in the upstream catchment. There is also very limited streamflow gauging in the overall Norman River catchment with no historical streamflow gauging data available for the waterways which provides limited opportunity for hydrology calibration.

## 7.3.2 Catchment Delineation

The Hydrologic Engineering Centre's Hydrologic Modelling System (HEC-HMS) was utilised to determine flow paths and catchment boundaries which produce flows through the proposed mining lease. Based on these catchment boundaries and flow paths, the extent of the TUFLOW ROG model was determined with sufficient downstream extent from the mining lease provided to capture changes in downstream flow behaviour as well as break out from adjacent catchments. The model extent is shown in Figure 7.7. The catchment area upstream of the MLA is very flat with poorly defined drainage paths. The rain on grid modelling approach accounts for storage within the flat topography which is not typically accounted for in separated hydrological and hydraulic assessments.

## 7.3.3 Design Rainfall

Design rainfall for the local flooding assessment was derived for rainfall events between the 65.2% AEP event and the PMP event. The design rainfall data was derived using the BOM IFD tool and the centroid location of the local flood model boundary (Latitude: -18.834, Longitude: 142.22).

**TABLE 7.2: DESIGN POINT RAINFALL DEPTHS**

| Duration | 50% AEP | 20% AEP | 10% AEP | 5% AEP | 2% AEP | 1% AEP | 0.1% AEP |
|---|---|---|---|---|---|---|---|
| 6 hour | 65.7 | 91.1 | 108 | 124 | 146 | 163 | 249 |
| 9 hour | 72.3 | 101 | 120 | 140 | 166 | 186 | 286 |
| 12 hour | 77.6 | 109 | 130 | 152 | 181 | 205 | 315 |
| 18 hour | 86.4 | 122 | 147 | 172 | 207 | 235 | 357 |
| 24 hour | 93.8 | 133 | 160 | 188 | 226 | 257 | 387 |
| 48 hour | 117 | 166 | 201 | 237 | 285 | 322 | 447 |
| 72 hour | 134 | 191 | 231 | 272 | 324 | 364 | 498 |
| 96 hour | 148 | 209 | 253 | 298 | 354 | 397 | 544 |

### 7.3.3.1 Climate Change

Global temperature increase from climate change is expected to impact the frequency and magnitude of flooding, primarily through increased intensity of severe storm events. The Australian Rainfall and Runoff (ARR) guideline was recently updated with new methodologies for considering climate change for design flood hydrology by adopting the latest studies into climate science by the International Pannel for Climate Change (IPCC) (J, et al., 2024). A sensitivity analysis of climate change has been undertaken on the assessed flood impacts of the Project.

The latest update of the ARR Guidelines (Version 4.2) provided updated considerations for assessing climate change impacts on design flood hydrology. Updated guidance includes consideration of future climate projections based on Shared Socioeconomic Pathways (SSP) to align with the IPCC. ARR V4.2 provides the following equation for scaling design rainfall depths and storm losses based on the rate of global temperature increase (Equation 1.6.1 of ARR V4.2):

$$I_p = I \times (1 + \frac{\alpha}{100})^{\Delta T}$$

Where;

- *Ip* is the project (future) design rainfall depth when accounting for climate change.
- α is the rate of change parameter, and varies with storm duration, starting at 1.15 for 1 hour and decreasing to 1.08 for 24 hours.
- *I* is the design rainfall depth or intensity in the absence of climate change.
- *ΔT* is the most up-to-date estimate of global temperature projection for the design period of interest and selected climate scenario relative to a baseline time period. When used with the 2016 IFD depths, the recommended baseline period is 1961-1990.

It is noted the same equation is used for determining scaling factors for initial loss (IL) and continuing loss (CL) with specific rate of change parameters (α) provided for various regions across Australia.

ARR recommends adjusting the baseline design rainfall estimates to current climate conditions based on the equation provided above. It is recommended this be done using the global temperature projection for the year 2030. This has been adopted for the baseline design hydrology and used for the design flood model simulations.

A future climate projection scenario was also assessed for the year 2090 which represents the 'long-term' climate projection. The climate change pathway SSP2-4.5 and SSP5-8.5 were selected for the climate change scenarios as they represent intermediate and worst-case climate change outcomes in terms of increase in flood magnitude respectively.
Rainfall and storm loss scaling factors calculated using the equation above are provided in Table 4.6.

**TABLE 7.3: CLIMATE CHANGE SCALING FACTORS**

| Item | | Baseline Climate Change (SSP2-4.5, year 2030) | Long-term Intermediate (SSP2-4.5, year 2090) | Long-term Worst Case (SSP5-8.5, year 2090) |
|---|---|---|---|---|
| Rainfall Scaling Factors | 6 hours | 1.12 | 1.26 | 1.49 |
| | 9 hours | 1.12 | 1.24 | 1.45 |
| | 12 hours | 1.11 | 1.23 | 1.42 |
| | >= 24 hour | 1.10 | 1.20 | 1.37 |
| Loss Scaling Factors | Initial Loss | 1.03 | 1.06 | 1.10 |
| | Continuing Loss | 1.05 | 1.11 | 1.19 |

### 7.3.3.2 Areal Reduction Factors

Areal Reduction Factors (ARFs) have been used to convert point rainfall estimates to areal rainfall estimates. ARFs for all the creeks have been calculated using the methodology for catchments between 10 km$^2$ and 30,000 km$^2$ for the Monsoonal North QLD Zone (J, et al., 2024). ARFs are calculated based on the total catchment area (lower rainfall for larger catchments) and therefore depending on the focal point (reporting location of peak flow) the ARF changes. ARFs were calculated at the project location based on the catchment area of Warrigal River (1,127 km$^2$). Adopting the Warrigal River catchment area provides a conservative methodology to assess design hydrology and flooding for the Project and is representative of average individual creek catchments to the project location.

### 7.3.3.1 Probable Maximum Flood

PMF rainfall estimates were calculated using the Revised Generalised Tropical Storm Method (GTSMR) (Bureau of Meteorology, 2003) for durations 24 hours and longer. Rainfall depths were calculated using the coastal summer depths and gridded GTSMR parameters based on the Warrigal Creek catchment area (1,127 km$^2$). Due to the size of the catchment, shorter durations have not been assessed. The design rainfall totals are as shown in Table 7.4.

**TABLE 7.4: PMP ESTIMATES**

| Duration (hours) | Initial Depth (mm) | PMP Estimate =D x TAF x DAF x MAF | Rounded PMP Estimate |
|---|---|---|---|
| 24 | 1,227 | 1,097 | 1,100 |
| 36 | 1,451 | 1,298 | 1,300 |
| 48 | 1,660 | 1,484 | 1,480 |
| 72 | 2,028 | 1,814 | 1,810 |
| 96 | 2,298 | 2,056 | 2,060 |
| 120 | 2,423 | 2,167 | 2,170 |

### 7.3.3.2 Design Temporal Patterns

Temporal patterns for the design storm events were assigned as follows:

- For 65.2% AEP to 0.1% AEP design storms, the AVM temporal patterns for "Monsoonal North" sourced from ARR Data Hub (Babister, Trim, Testoni, & Retallick, 2016) were applied.
- For the PMF event, the Coastal GTSMR AVM ensemble temporal pattern for a standard area of 1000 km$^2$ was applied (Bureau of Meteorology, 2003).

### 7.3.3.3 Design Rainfall Losses

The rainfall on grid model applies an initial and continuing loss model to the rainfall hyetograph to simulate rainfall excess. The ARR Datahub recommends an initial storm loss of 31 mm and a continuing loss of 5.6 mm/hr for the Project area. The ARR Datahub rainfall losses are determined based on regional studies and considering there is limited data near the Project the losses reported for the Project location are likely inaccurate. Therefore, design losses were refined from reconciliation of modelled peak flows against regional peak flow estimation techniques as discussed in Section 7.5, due to absence of local streamflow gauging information for model calibration.

The adopted rainfall losses with and without the climate change scaling factors are as follows:

- **Baseline losses:**
  - Initial loss: 16.6 mm.
  - Continuing loss: 3.2 mm/hr.
- **Climate change adjusted losses (current climate scenario):**
  - Initial loss: 17.1 mm.
  - Continuing loss: 3.3 mm/hr.

The design losses without the climate change scaling applied have been used for validation of the flood model. The losses were then scaled based on the climate change scaling factors for the design event simulation as described in Section 7.3.3.1.No initial loss and a continuing loss of 1 mm/hr were adopted for the PMF event.

## 7.4 Hydraulic Modelling

### 7.4.1 Overview

The flooding assessment was undertaken for the regional area to characterise flood behaviour within the Yappar River, Clara River and Borer River catchments. In addition to the existing conditions, the proposed developed scenario was modelled to assess changes to flooding. The flooding assessment utilised a direct rainfall ('rain on grid') modelling approach using the TUFLOW two-dimensional hydraulic modelling software to simulate flooding from the catchments for a range of design storm events. The rain on grid TUFLOW model extended to the top of the catchments to the east which flow towards the proposed mine lease area.

The overall methodology for the flood modelling undertaken for the local flood assessment is as follows:

- Modelling in accordance with the latest Australian Rainfall & Runoff (2019) Guidelines.
- Two-dimensional hydraulic modelling utilising rainfall on grid involving combined hydrology and hydraulic analysis within the model boundary.
- Assessment of the 65.2% to 0.1% AEP and PMF design flood events with the provision of flood depth, level and velocity grid results.
  - Different storm durations were modelled (12, 18, 24 and 48 hour durations) utilising a single AVM temporal pattern (TP) to determine the critical event. Areal Reduction Factors (ARFs) were utilised based on the upstream catchment of Warrigal Creek to the proposed mine lease area.

### 7.4.2 Modelling Software

This study has used the two-dimensional modelling software TUFLOW to quantify the flood behaviour and characteristics of each of the creek systems. Two dimensional models are best suited to scenarios where flow direction and water surface are not uniform across a section (i.e., floodplain and overbank areas).

### 7.4.3 Model Development

#### 7.4.3.1 Model Topography and Extent

The model bathymetry has been developed based on the following topography survey (order of priority):

- Site LiDAR- 5m cell size (December 2024).
- SRTM Hydrologically Enforced DEM.

The accuracy of the SRTM data used in the modelling is considered low and is not expected to provide correct definition of the river channels resulting in the model underestimating active channel flow capacity. The model has been used to model large flood events where the majority of flow engages the floodplain. Considering all this the survey data used in the model is only considered suitable to define indicative flood events and relative flooding impacts. Figure 7.7 shows the hydraulic model configuration and model extent.

#### 7.4.3.2 Boundary Conditions

Boundary conditions are required in the model to define flood hydrograph inflow locations, model outflow conditions and interfaces between the one dimensional and two-dimensional model domains. The following boundary conditions were used in the model:

- Inflow: Rainfall was applied over the model extent as the inflow boundary condition.
- Outflow: The outflow boundary conditions has been represented as a normal depth based on low flow channel grades at the downstream extent of the model. These boundaries are located a sufficient distance downstream to not influence the modelled flood behaviour adjacent to the Project.

The influence of the adopted downstream boundary condition was checked from reviewing the hydraulic model results which showed negligible change in hydraulic grade or velocity in the model cells upstream of the boundary. This indicated the adopted boundary conditions are unlikely to have a significant impact on model results in the vicinity of the Project.

### 7.4.3.3 Hydraulic Roughness

The Manning's coefficients used for hydraulic roughness in the model are based on visual observation of aerial photography of the site and Foliage Projective Cover (FPC) delineated from satellite observations (obtained from the Queensland Spatial Catalogue). FPC provides an estimate of mid- and over-story foliage cover which can be used to infer vegetation density. Roughness values have been tabulated in Table 7.5 The adopted hydraulic roughness extents are shown in Figure 7.8.

**TABLE 7.5: TUFLOW HYDRAULIC ROUGHNESS VALUES**

| Land Use Category | Manning's "n" |
|---|---|
| River channel | 0.035 |
| Open pervious areas, minimal vegetation (FPC <= 12) | 0.04 |
| Open pervious areas, moderate vegetation (12 < FPC < 19) | 0.06 |
| Open pervious areas, thick vegetation (FPC > 19) | 0.07 |

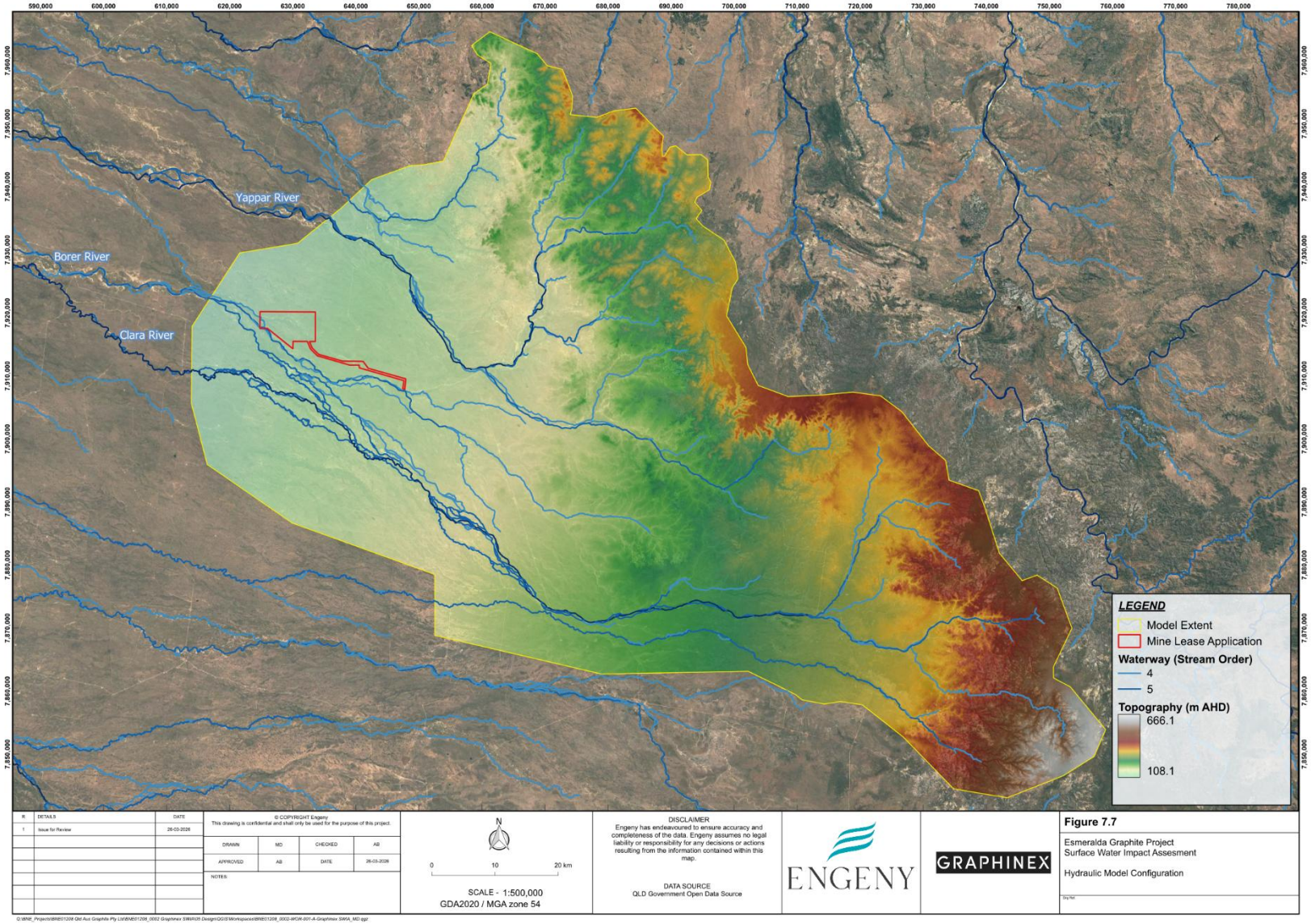



**Figure 7.7: Hydraulic Model Configuration**

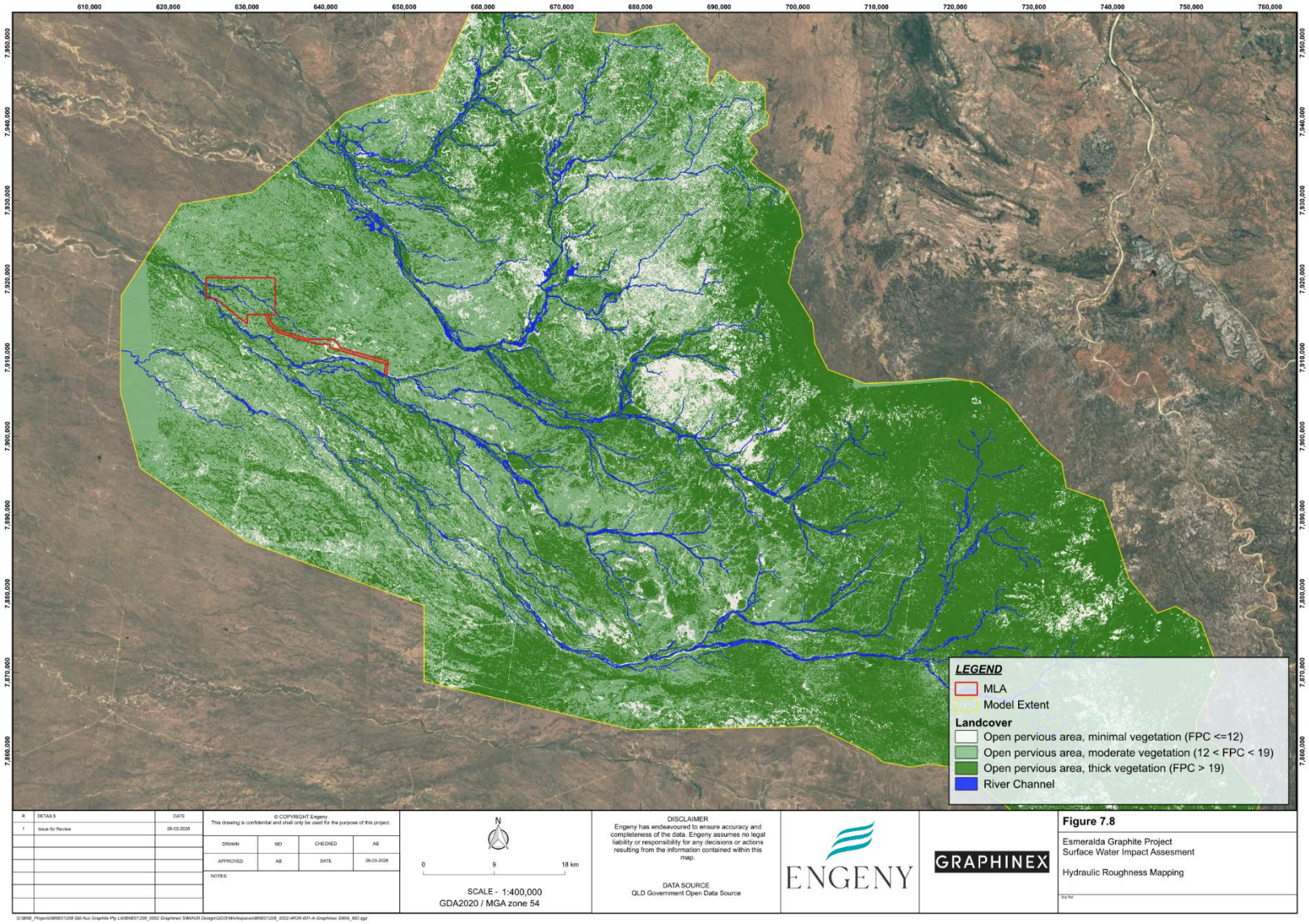



**Figure 7.8: Hydraulic Roughness Mapping**

## 7.5 Validation

Model validation was undertaken using regional peak flow estimation techniques and comparison against scaled Flood Frequency Analysis (FFA) of nearby gauges. There is no streamflow monitoring data within the catchment which makes it not possible to calibrate the flood model or undertake an at site FFA for validation. To obtain data for calibration a streamflow gauge must be installed, manually gauged to a large flow event, and remain operational for an extended period to capture a range of flow/flood events. In addition to the streamflow data, an operational pluviometric rainfall gauge is required near the catchment centroid to inform the model calibration (preferably more than 1 gauge). It was not possible to collect this data within the EIS process timeframes to inform a meaningful calibration. A streamflow gauge will be installed as part of the Project and capture data of the duration of operations. The data can be used to inform calibration as part of future model revisions.

Validation of the modelled peak flows using the 'rain-on-grid' approach was undertaken at two locations within the Project's upstream catchment where flows are relatively contained to the main waterway and not significantly impacted by breakout flooding. The following regional flood estimation techniques were used for the validation based on the limited streamflow gauging data for the waterways near the project:

- Regional Flood Frequency Estimation (RFFE)
- Quantile Regression Technique (QRT).

The two validation locations were selected based on not being significantly affected by breakout flooding and having an area less than 1,000 km$^2$ to align with the requirements of the RFFE and QRT. Results of the validation are shown in Figure 7.9 and Figure 7.10.

The results of the validation indicate the following:

- Modelled peak flows are within the RFFE estimate bounds and close to the QRT estimates for all AEPs.

Given the lack of available streamflow information within the Project's upstream catchment and the modelled peak flows are generally within the estimate bounds for RFFE, the hydraulic modelling approach is considered suitable for assessing flooding for the Project.

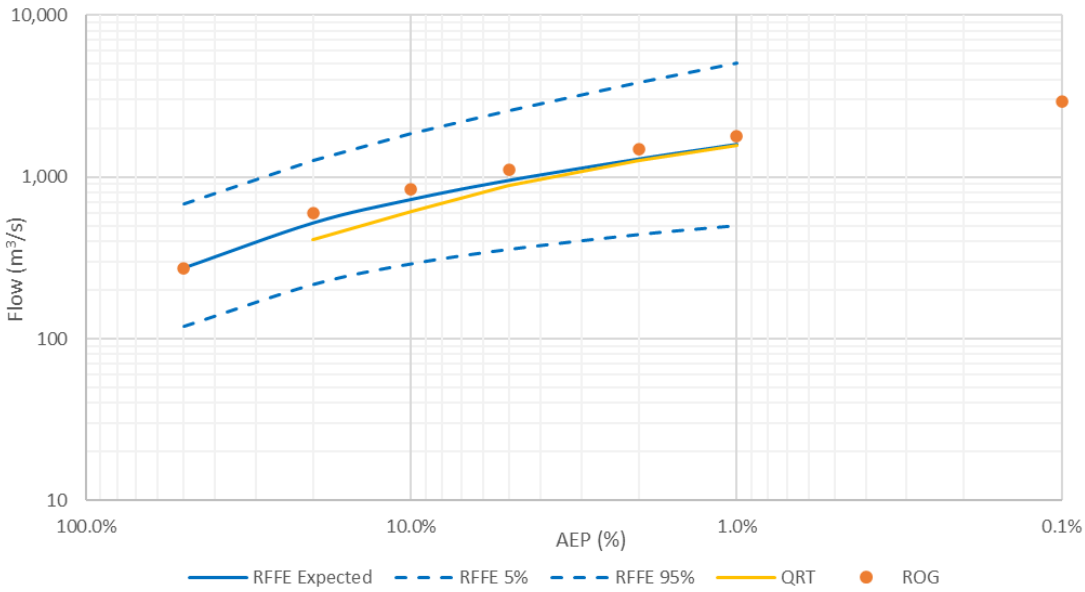



**Figure 7.9: Validation Result – Fog Creek (540 km$^2$)**

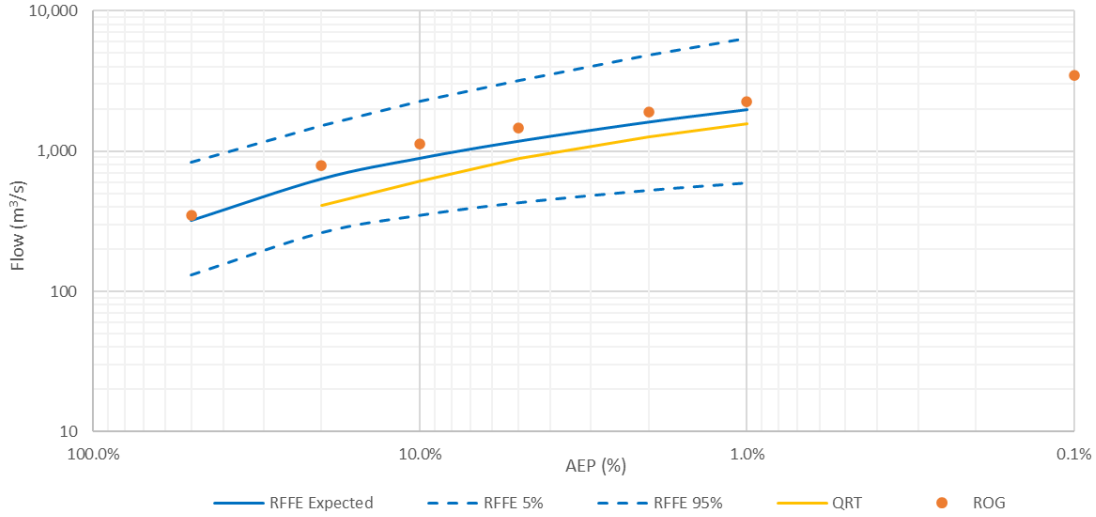



**Figure 7.10: Validation Result – Upstream Yappar River Catchment (680 km²)**

# 7.6 Flood Model Simulation and Results

The primary purpose of the flood model simulations is to assess peak flood conditions in the rivers adjacent to the Project and potential flood impacts associated with the Project. Due to the braided nature of the regional river channels in high flow events, Yappar River, Clara River and Warrigal Creek have been included in the flood model to capture potential interactions and break out that may affect flood behavior at the Project. The flood model was simulated for the critical 63.2%, 50%, 20%, 10%, 1% and 0.1% AEP design flood events and the PMF for these river catchments.

The flood model simulation adopted hydrology results simulated with an Areal Reduction Factors (ARF) for the Warrigal Creek catchment. This ARF is representative of the average ARF for the individual river catchment areas upstream of the site. Peak flood velocity and water surface contour mapping for the 0.1% AEP design flood event and the PMF event are provided in Figure 7.11 and Figure 7.12 respectively. Appendix A includes flood result mapping for all events for the Existing Case scenario. The flood model results show:

- The Project area is impacted by the breakout flooding from Warrigal Creek and the Yappar River flowing in the unnamed Stream Order 3 waterway, intersecting the site from the east. This waterway is required to be diverted around the proposed mining pit extent with consideration of breakout flows from Warrigal Creek.
- The proposed mining pit and final void location is within the 0.1% AEP flood extent on the unnamed waterway which is mostly produced by breakout flooding from Warrigal Creek (Stream Order 5).
- A clean water drain is required to manage flows within a minor drainage tributary that intersects the proposal tailings storage facilities. The 0.1% AEP peak flood depth in this area is 0.5m.
- The Project is outside of the Borer River 0.1% AEP flood extent at the south-west corner of EPM 28274.

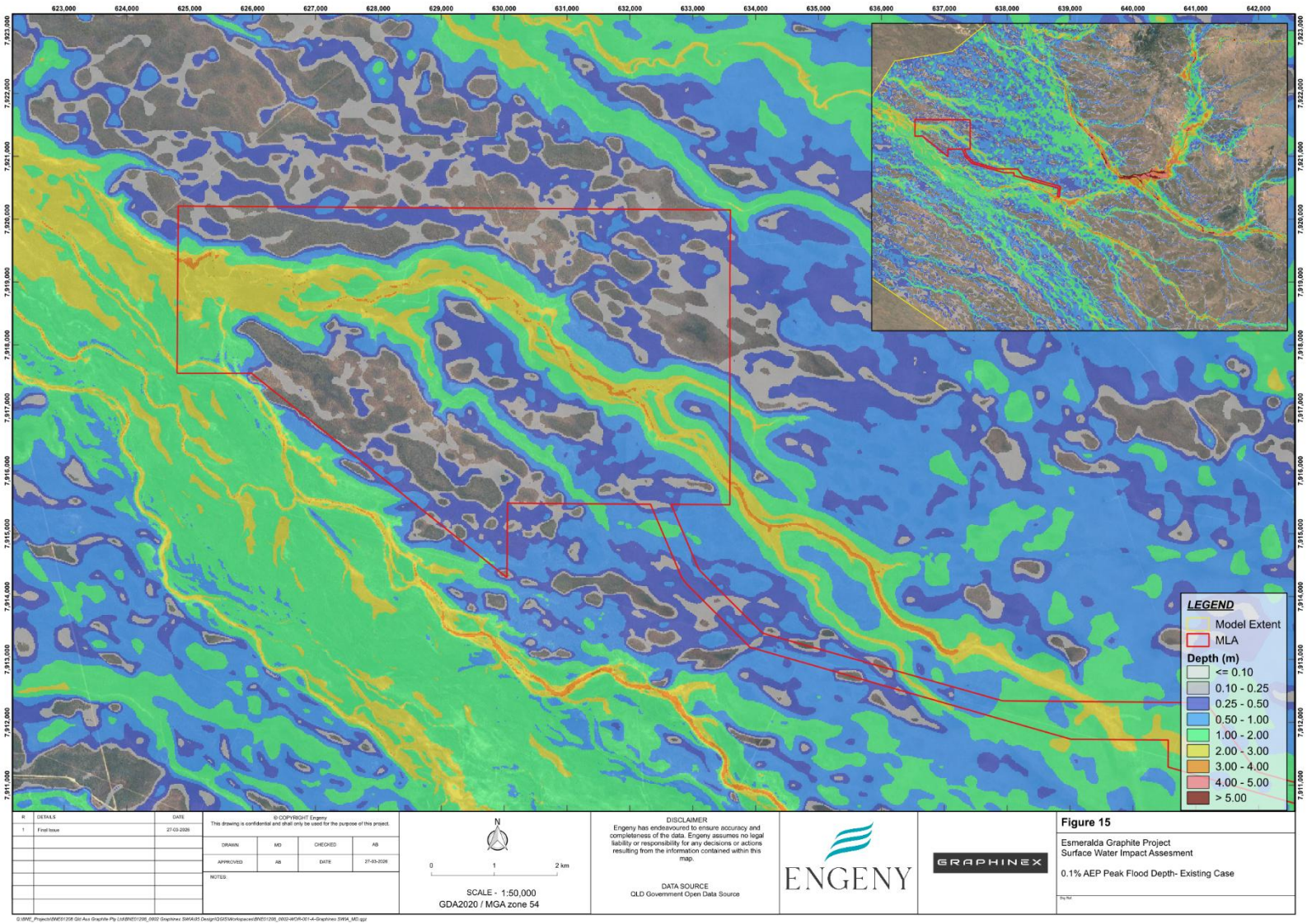



**Figure 7.11: 0.1% AEP Flood Model Results – Existing Case**

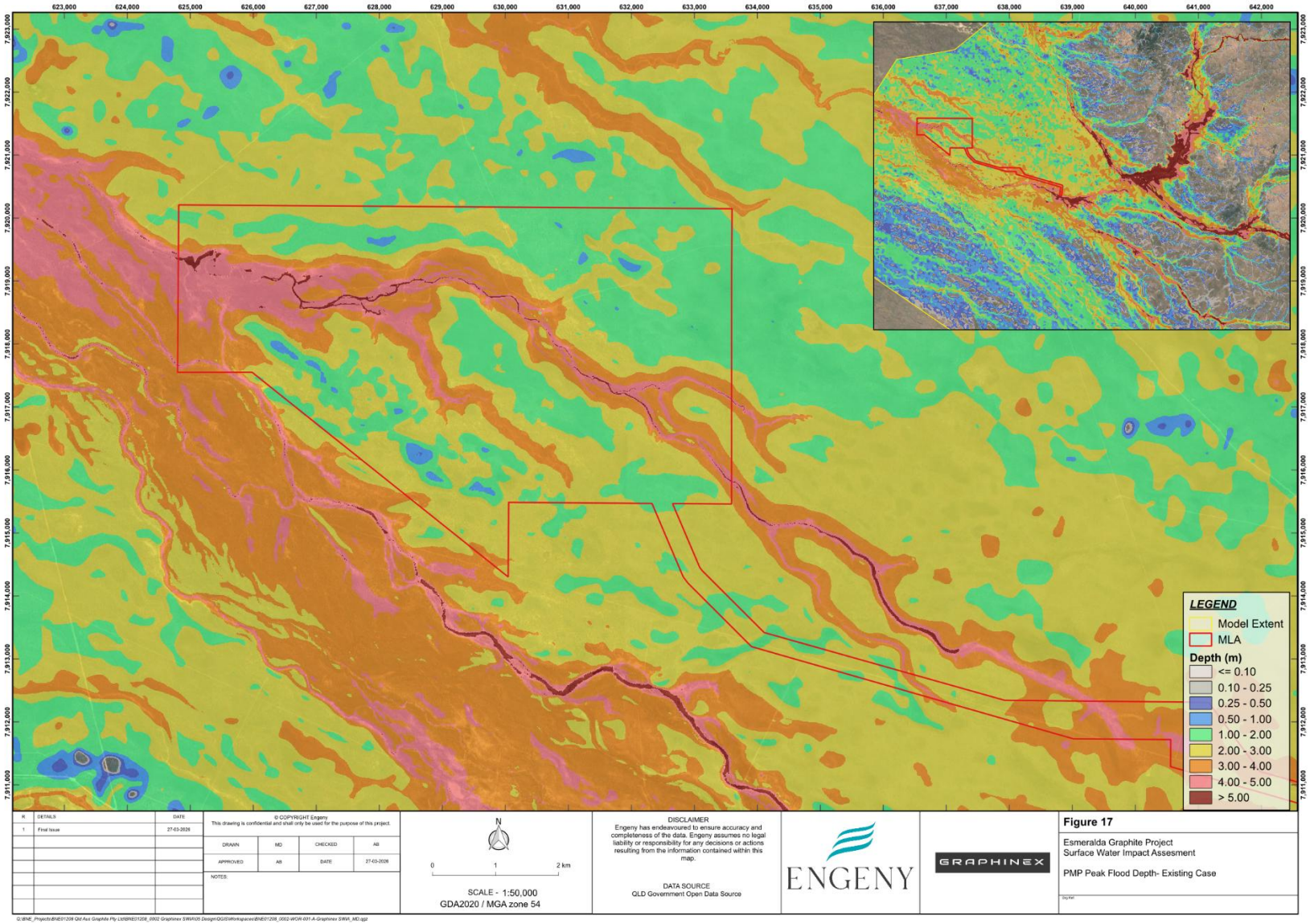



**Figure 7.12: Probable Maximum Flood Model Results – Existing Case**

## 7.6.1 Breakout Flow Analysis

An analysis of the proportion of breakout flows from Yappar River and Warrigal Creek to the Stream Order 3 waterway intersecting the site was undertaken. Peak flows were extracted at the breakout locations in Warrigal Creek and Yappar River and compared with the flows within the waterways at the breakout location. Flow hydrographs showing the magnitude of breakout flooding is shown in Figure 7.13 and the location of the reported hydrographs are shown in Figure 7.14. The breakout flooding results show:

- The proportion of breakout flow entering the Stream Order 3 waterway that intersects the site is significantly higher from Warrigal Creek relative to Yappar River (31% vs. 5% in the 1% AEP flood event).
- The breakout flows from Warrigal Creek are similar to those in the Stream Order 3 waterway at the Project.

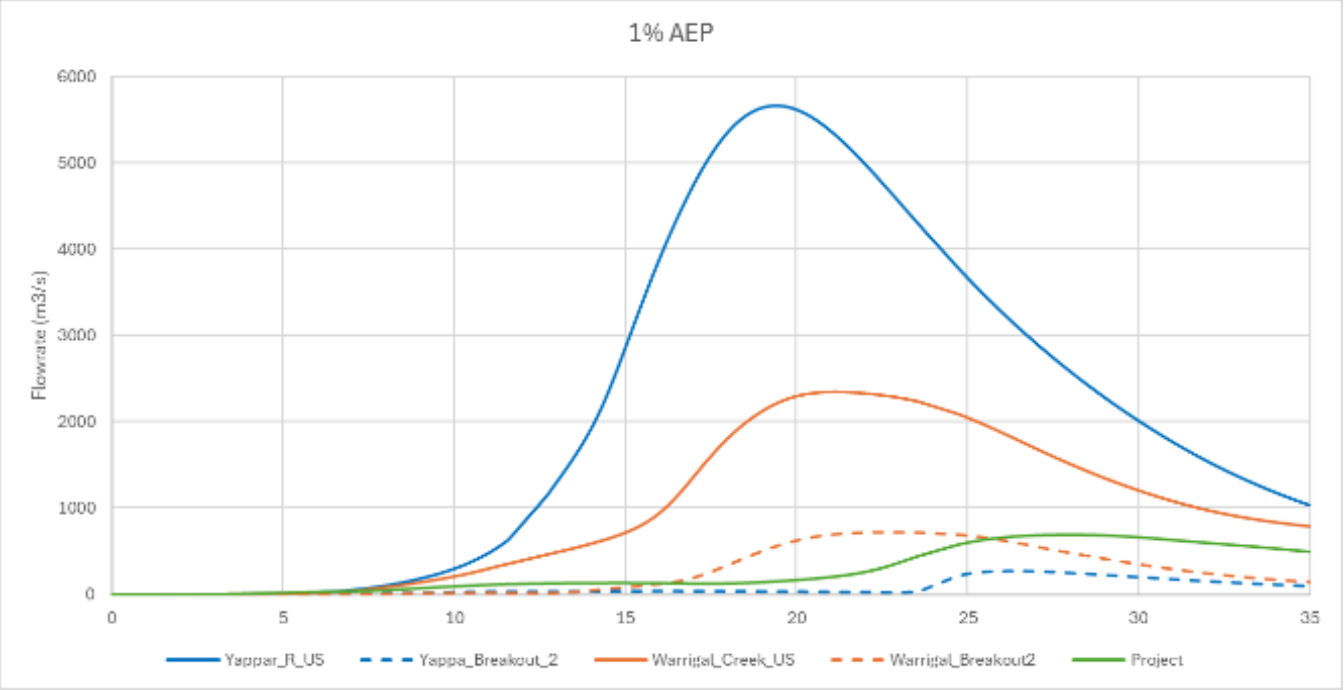



**Figure 7.13: Breakout Flow Hydrographs - 1% AEP**

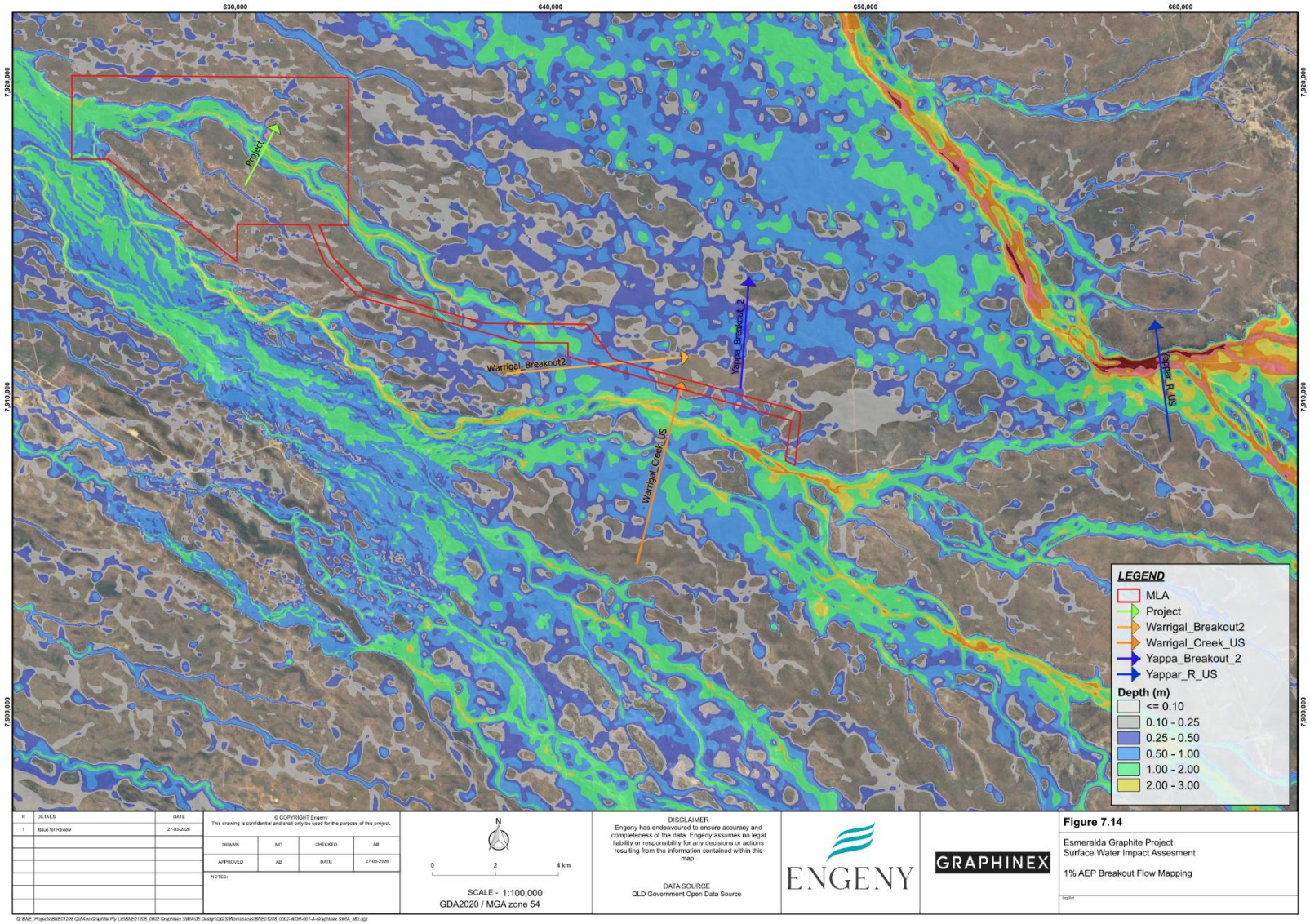



**Figure 7.14: Breakout Flow Mapping 1% AEP**

## 7.7 Mine Developed Case Scenarios

Two developed case scenarios have been run to represent flooding impacts from operational and closure phases of the project. The design basis for these scenarios is detailed in Table 7.6. The operational phase flood modelling provided blockage within the floodplain for the maximum disturbance extent that could result in downstream flooding impacts. The proposed watercourse diversion and clean water diversion drain were also incorporated into the model topography.

**TABLE 7.6: DEVELOPED CASE SCENARIOS**

| Design | Scenario 1 - Operational Phase | Scenario 2 - Closure Phase |
|---|---|---|
| Topography | Landform included in flood model surface to represent the maximum disturbance extent within the floodplain over the life of mine. The disturbance area was blocked from the model topography to provide a conservative estimate of potential flood impacts. | The final landforms have been included in the flood model to represent the rehabilitated surfaces. This landform illustrates the backfilling of the mine pit and the capping of TSF4. All other landforms have been assumed to have returned to the existing surfaces. |
| Water Management | All operation water management designs have been included in the model (Levee, Diversion Drain, Clean Water Drain) | The diversion drain has been designed to remain as a final landform and included in the flood model for the closure phase. |
| Climate Scenario | Current Day climate change parameters (SSP2-4.5 (2030)) has been adopted for allowance of direct comparison with the Existing Case Scenario. | Two climate change projections have been modelled to represent the median emission pathway (SSP2-4.5 (2090)) and a very high emission pathway (SSP5-8.5 (2090)). |

## 7.8 Operational Phase Flood Impacts

The Existing Case flood model was updated to represent the operational phase of the mine, with the inclusion of the flood levee around the Project perimeter and diversion drains as per design. The maximum disturbance footprint was represented with all TSFs included in the flood model. The Developed Case flood model was then simulated for the PMF and 63.2%, 50%, 20% 10%, 5%, 2%, 1% and 0.1% AEP design flood events. The Developed Case flood results were compared with the Existing Case results to produce change in flood height (afflux) and velocity result grids to determine the potential flooding impacts associated with the Project. The flood impact mapping for the design AEP events is provided in Appendix B, and the change in the 1% AEP peak flood depth and velocity are also shown Figure 7.15 and Figure 7.16. The flood impact assessment results show the following:

- The project will have minor impacts to Warrigal Creek and Borer River flooding due to the diversion of the unnamed waterway (stream order 3).
  - This impact is expected to include isolated increases in peak flood levels at the location of the diversion drain and south of the TSFs, as well as a minor decrease in flood levels in Warrigal Creek downstream of the Project site.
  - Breakout north from the diverted unnamed waterway (stream order 3) has been modelled in events greater than 2% AEP. Breakout flows into a tributary of the unnamed waterway, with a junction to the main channel located 3km downstream of the Project Site.
  - The impact in more frequent events (less than 2% AEP) is localised to the diverted unnamed waterway and regions to the south of the TSFs.
- Peak flood depth in Warrigal Creek decreases by a maximum of 0.03 m in the 1% AEP event.
- Increases in peak flood depth, in northern breakout of the diversion drain reaches 0.42 m in the 1% AEP event.
- The changes in flood depth are minor and not expected result in any adverse impacts to the waterway, surrounding properties or flood immunity of any third-party infrastructure.
- Increases to peak flood velocity are confined to the diversion drains and associated northern breakout flooding. Decreases in peak flood velocity have been modelled at the inlet and outlet of the diversion drain.
- Peak flood velocities in natural environments are expected to increase by a maximum of 0.5 m/s in the breakout flow path north of the watercourse diversion in the 1% AEP flood event however the absolute peak velocity in the operational phase model remains below 0.6m/s.

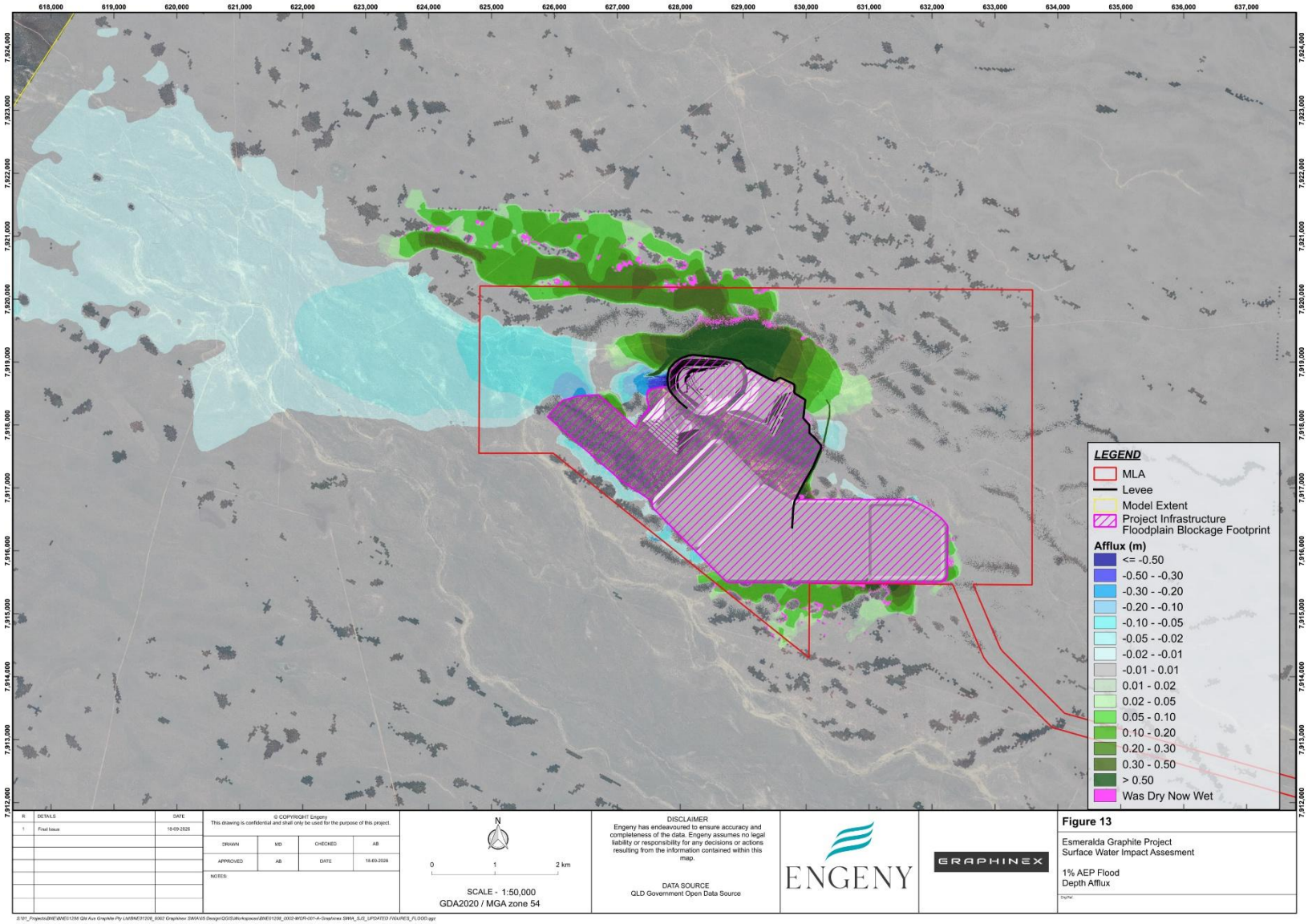



**Figure 7.15: 1% AEP Flood Afflux for the Operational Phase**

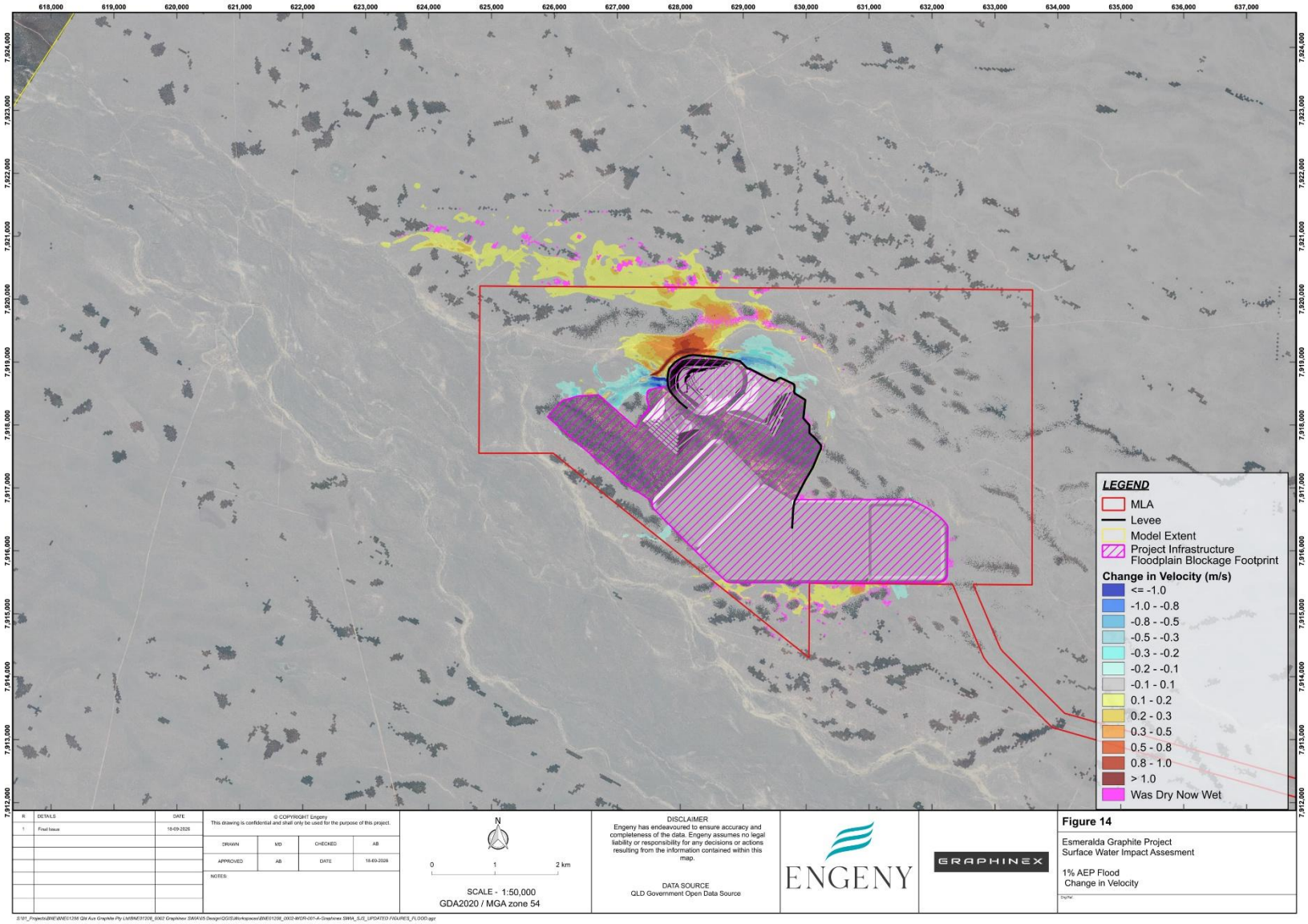



**Figure 7.16: Change in 1% AEP Peak Flood Velocity for the Operational Phase**

## 7.9 Flood Risks for Project Infrastructure

The developed case flood results were used to analyse flood risks for the Project infrastructure. The levee provides flood protection to the operational mining and processing areas for the Project however the western and southern section of the MLA are inundated in very rare flood events (0.1% AEP). The flood results show potential flooding interactions with the following:

- Sedimentation pond 3
- Sedimentation pond 4
- Topsoil stockpile areas
- The southern and western TSF embankments.

### 7.9.1 Sedimentation Pond 3 Flood Interactions

Sedimentation pond 3 is located just outside the flood protection levee to allow the dam to overflow to the stream order 3 tributary. The flood model results show flooding against the dam location in the 20% AEP flood event. Peak flood levels against the dam are summarised in Table 7.7. Sedimentation pond 3 will include an embankment around the northern and western extents which ties into the flood protection levee to the east. The dam will contain a by-wash spillway around the western extent. The spillway level is expected to be RL 120.5 m AHD with a dam crest level of 121 m AHD or greater. Peak flood levels against the dam show the 1% AEP flood event will result in inundation of the dam. In large rainfall events the dam is expected to be full and flood flows entering the dam will be controlled by the dam water levels. Detailed design of the dam will need to consider erosion protection of the upstream and downstream sides of the spillway.

Sedimentation pond 3 is located outside of the conveyance area of the stream order 3 Tributary resulting in low peak flood velocities against the dam embankment. Peak flood velocities against the dam embankment in the 0.1% AEP flood event are below 0.55 m/s which poses a very low erosion risk. Despite the low erosion risk identified in this assessment, detailed design of the dam embankment will consider erosion risk from flows in stream order 3 tributary.

**TABLE 7.7: SEDIMENTATION POND 3 FLOODING INTERACTIONS**

| Flood Event | Peak Flood Level (m AHD) | Peak Velocity (m/s) |
|---|---|---|
| 20% AEP | 119.69 | 0.04 |
| 10% AEP | 119.91 | 0.09 |
| 5% AEP | 120.17 | 0.16 |
| 2% AEP | 120.49 | 0.27 |
| 1% AEP | 120.66 | 0.33 |
| 0.1% AEP | 121.16 | 0.54 |

### 7.9.2 Sedimentation Pond 4 Flood Interactions

Sedimentation pond 4 is located outside the flood protection levee to the west of the pit near the topsoil stockpile area behind an access road. The flood model results show flooding against the dam location in the 20% AEP flood event. Peak flood levels against the dam are summarised in Table 7.7. Sedimentation pond 4 will include a small embankment around the northern extents with a by-wash spillway around the western side. The spillway is expected to be RL 119.3 m AHD with a dam crest level of 119.8 m AHD. Peak flood levels against the dam show the 2% AEP flood event will result in inundation of the dam. In large rainfall events the dam is expected to be full and flood flows entering the dam will be controlled by the dam water levels. Detailed design of the dam will need to consider erosion protection of the upstream and downstream sides of the spillway.

Sedimentation pond 4 is located outside of the conveyance area of the stream order 3 Tributary resulting in low peak flood velocities against the dam embankment. Peak flood velocities against the dam embankment in the 0.1% AEP flood event below 0.8 m/s which poses a low erosion risk. Despite the low erosion risk identified in this assessment, detailed design of the dam embankment will consider erosion risk from flows in stream order 3 tributary.

**TABLE 7.8: SEDIMENTATION POND 4 FLOODING INTERACTIONS**

| Flood Event | Peak Flood Level (m AHD) | Peak Velocity (m/s) |
|---|---|---|
| 20% AEP | 118.82 | 0.41 |
| 10% AEP | 118.98 | 0.58 |
| 5% AEP | 119.16 | 0.68 |
| 2% AEP | 119.43 | 0.72 |
| 1% AEP | 119.58 | 0.74 |
| 0.1% AEP | 120.10 | 0.79 |

### 7.9.3 Topsoil Stockpile Flood Interactions

Topsoil stockpiles are proposed to be placed in the northwest of the Project area which is outside the pit flood protection levee. The flood model results show this area is affected by flooding from the northeast of the stockpile area from flow in the stream order 3 tributary and from the west from flow in Warrigal Creel/Borer River.

Flooding in the stream order 3 tributary will result in inundation against the topsoil stockpiles in the 20% AEP flood event with flood depths in the 0.1% AEP flood event reaching 1.8m. The area is located on the fringe of the floodplain where velocities are expected to be very low. Flood model results show peak velocities in the 10% AEP flood event are 0.1 m/s against the stockpile and remain below 0.6 m/s in the 0.1% AEP flood event. This shows the area will have a low risk of erosion.

Flooding in Warrigal Creek/Borer River start to interact with the 10% AEP flood event with flood depths against the stockpile areas reaching 0.75m. Flood velocities in the inundation area are very low with 0.1% AEP peak flood velocities remaining below 0.2 m/s. This shows the area has a very low risk to erosion and the flooding interactions are expected to have negligible impacts to the stockpile emplacements.

### 7.9.4 TSF Flood Interactions

There are minor flooding interactions at the base of the TSF embankments in more frequent flood events from upstream catchment flows. The TSF embankments will incorporate toe drains for the diversion of clean water catchments. More extensive inundation of the TSF embankment toe occurs in the 1% AEP and 0.1% AEP flood events. The deepest inundation occurs against the southern embankment of TSF 4 with 0.1% AEP peak flood depths reaching 1.9m. Despite the deep extents peak flood velocities against the embankment remain low with 0.1% peak flood velocity generally remaining below 0.5 m/s and reaching 0.8 m/s in isolated locations. The flood model results indicate a low risk of erosion to the TSF embankments however detailed design of the TSFs will consider erosion risk of the embankment toes from flooding.

## 7.10 Closure Flood Impacts

The Existing Case flood model was updated to represent the Closure phase of the mine including the proposed backfill of the mine and removal of mine infrastructure and TSF 1, TSF 2 and TSF 3. Topography was modified to include the final landforms as well as the inclusion of the diversion drain to the north of the rehabilitated mine pit. The Closure Case flood model was then simulated for the 1% and 0.1% AEP design flood events under two climate change emission pathways. It is noted the western out of pit waste rock dump is proposed to be rehabilitated and remain post closure however was not represented in the model bathymetry due to changes to the Projects rehabilitation staging during the EIS process. The location of the waste rock dump is shown on the closure phase flood maps in Appendix D. Flooding impacts associated with the western waste rock dump are expected to be isolated to the immediate areas around the WRD due to being located outside of the floodplain conveyance area.

The Closure Case flood results were compared with the Existing Case results to produce change in flood height (afflux) and velocity result grids to determine the potential flooding impacts associated with the Project during closure. The change in the 1% AEP peak flood depth and velocity are shown in Figures 7.17 to 7.20 for the closure phase with the SSP2-4.5 and SSP3-7.0 climate change scenarios. The flood impact assessment results show the following:

- The closure of the Project will continue to have minor impacts to Warrigal Creek and Borer River flooding due to the diversion of the unnamed waterway (stream order 3). However, the impact is less than during the operation phase of the project.
  - This impact is expected to include isolated increases in peak flood levels at the location of the diversion drain and south of the rehabilitated TSF4.

- Breakout north from the diverted unnamed waterway (stream order 3) has not been modelled in the closure scenario, reinstating the flow path to existing conditions.

- Peak flood depth in Warrigal Creek decreases by a maximum of 0.03 m in the 1% AEP event.
- The changes in flood depth are minor and not expected result in any adverse impacts to the waterway, surrounding properties or flood immunity of any third-party infrastructure.
- Increases to peak flood velocity are confined to the diversion drain and to the south of the rehabilitated TSF4. Decreases in peak flood velocity have been modelled downstream of the rehabilitated TSF4.

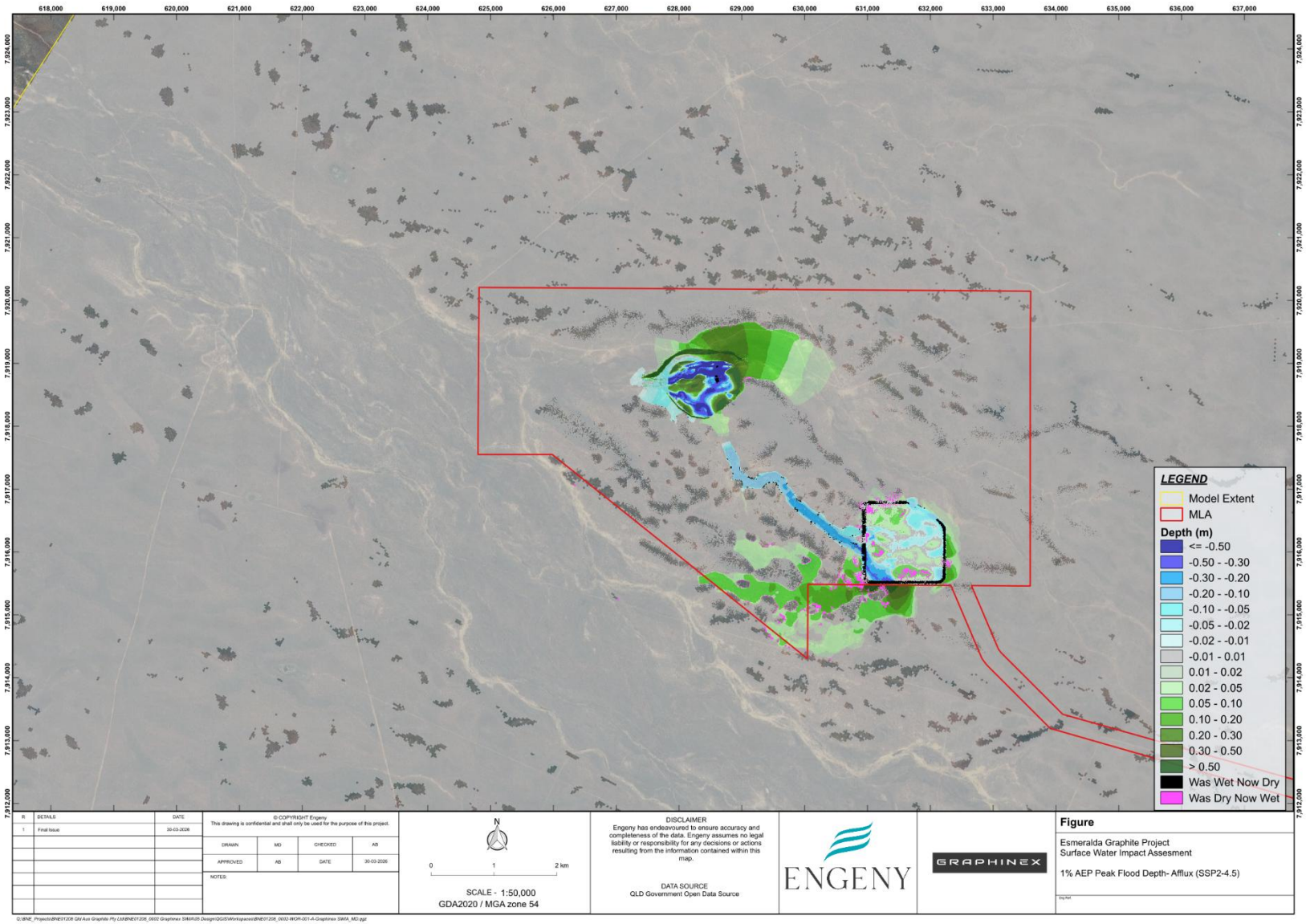



**Figure 7.17: 1% AEP Flood Afflux for the Closure Phase (SSP2-4.5 2090)**

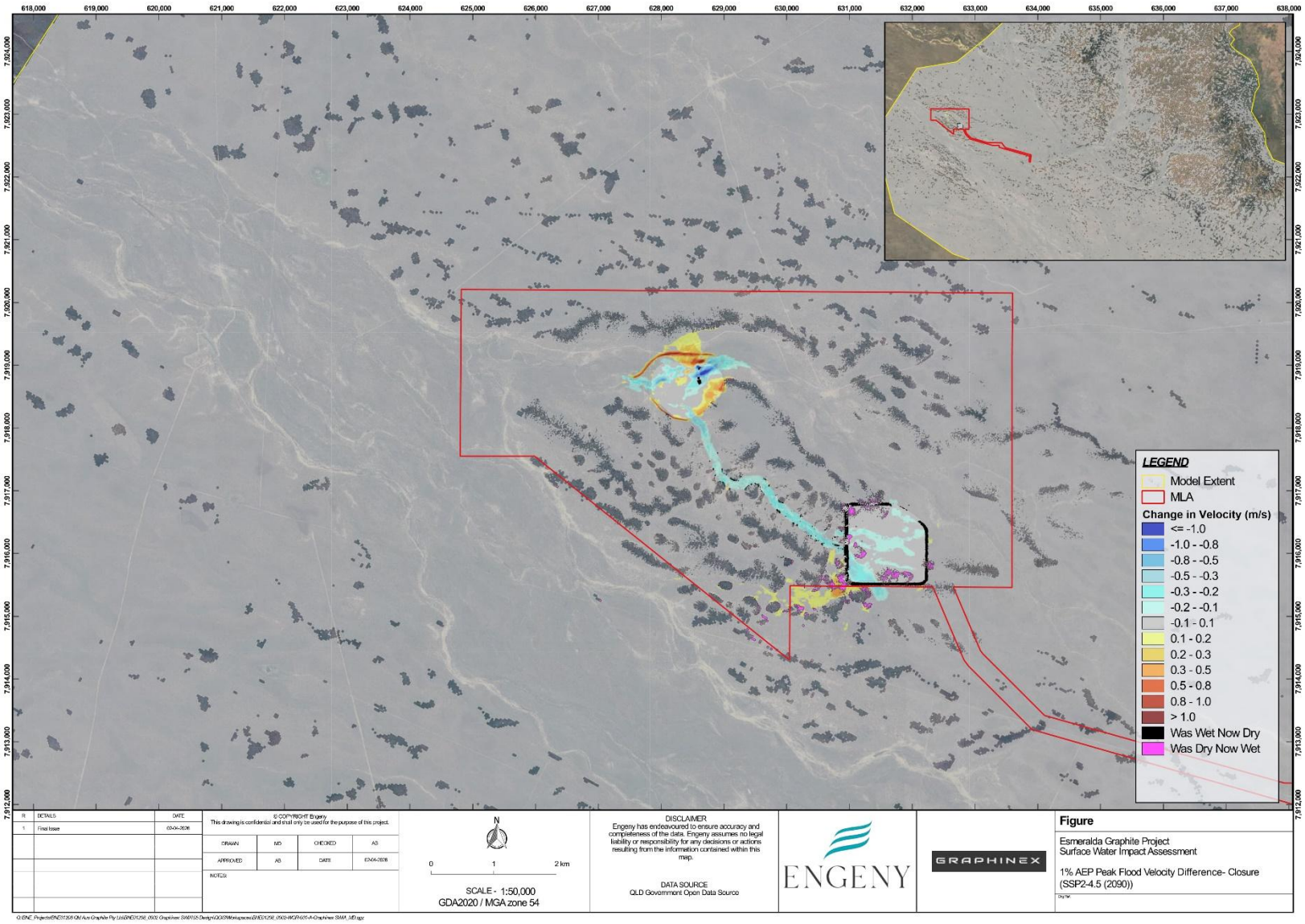



**Figure 7.18: Change in 1% AEP Peak Flood Velocity for the Closure Phase (SSP2-4.5 2090)**

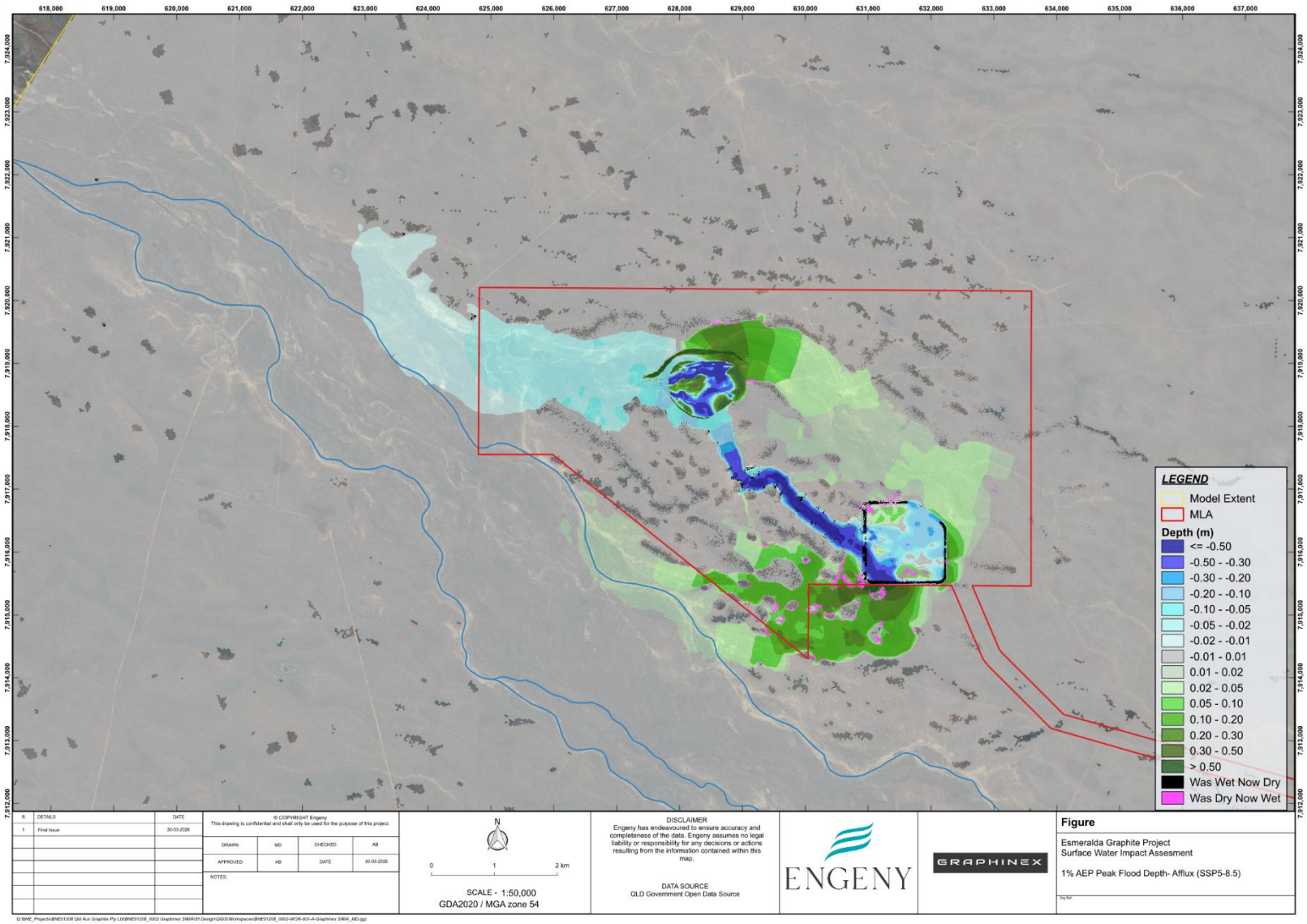



**Figure 7.19: 1% AEP Flood Afflux for the Closure Phase (SSP5-8.5 2090)**

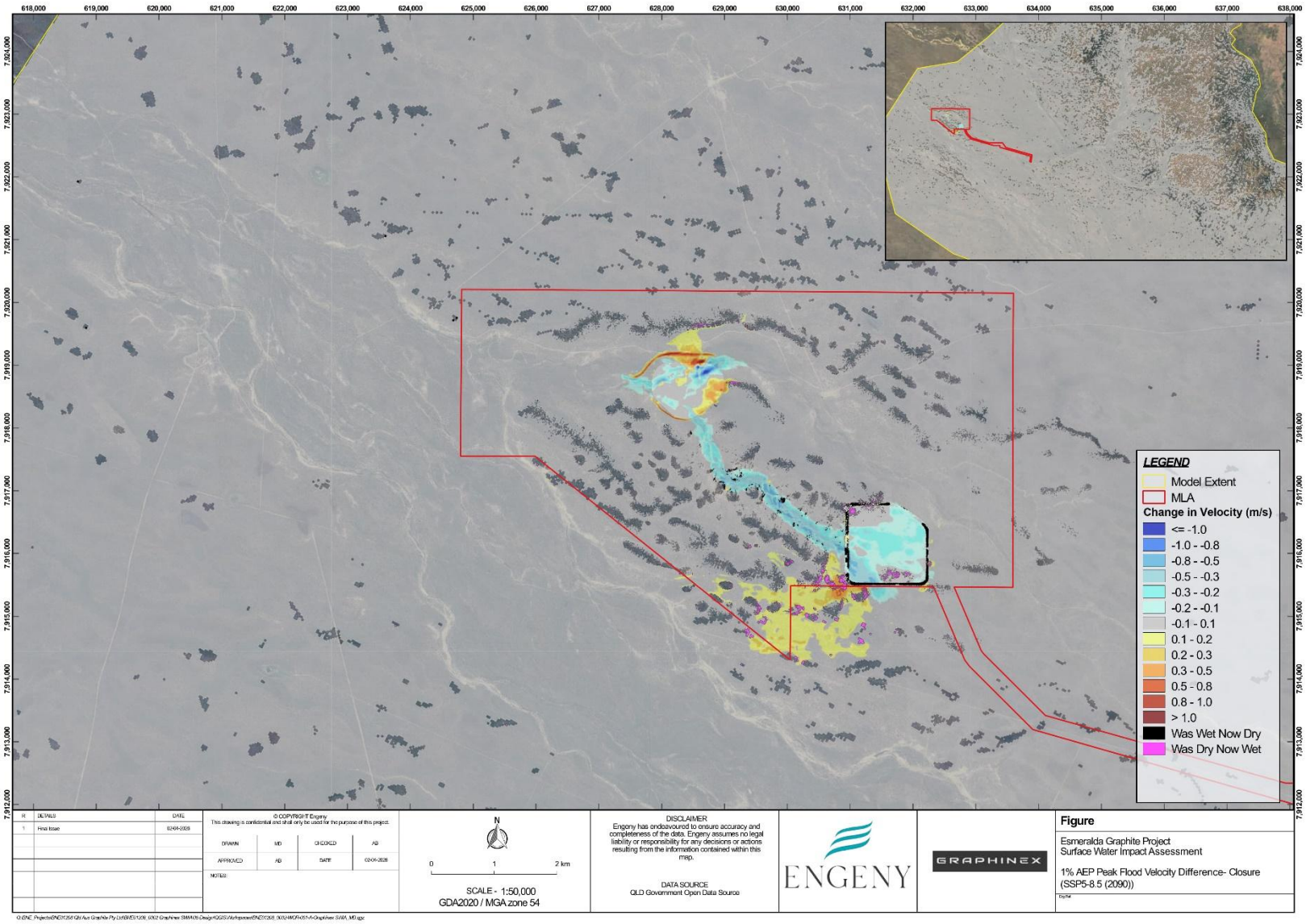



**Figure 7.20: Change in 1% AEP Peak Flood Velocity for the Closure Phase (SSP5-8.5 2090)**

## 7.11 Climate Change Sensitivity

The Existing Case flood was simulated for two future climate change scenarios to assess change in flooding (afflux and velocity) and determine the potential flooding impacts from different SSP emission pathways.

- Median Emission Pathway Projection (SSP2-4.5 2090).
- High Emission Pathway Projection (SSP5-8.5 2090).

Flood modelling results for the median and high emission paths for 2090 have been compared to the current day scenario (2030) model results to calculate resulting afflux. These results show the incremental change in existing flooding conditions due to potential future climate scenarios. It is noted the current day modelling was used to assess the operational phase flooding impacts and the high emission pathway projection was used to assess the closure phase flooding impacts for the Project.

Climate change and uplift factors have been applied in accordance with the site-specific duration dependant estimates for rates of change (%/C), and loss scaling ratios (ARR Data Hub, 2026).

The flood impact mapping for the design AEP events is provided in Appendix C, and the change in the 1% AEP peak flood depth and velocity are also shown Figures 7.21 to 7.24. The flood impact assessment results show the following:

- Increases in flood levels from climate change was most pronounced in the upstream major waterways where flooding is more contained to the main river channels, and decreases downstream where there is significant breakout flooding.
- The SSP2-4.5 pathway for 2090 results in an increase in depth across the floodplain. Breakout flooding towards the MLA has increased by up to 0.33 m, in the 0.1% AEP event and 0.37 m in the 1% AEP event. Flooding at the MLA increases by 0.18 m in both the 0.1% and 1% AEP events. Minimal changes to flood velocity were modelled for this scenario.
- The SSP5-8.5 pathway for 2090 results in an increase in depth across the floodplain. Breakout flooding towards the MLA has a modelled afflux of up to 0.75 m in the 0.1% AEP event and 0.82 m in the 1% AEP event. Flooding at the MLA increases by 0.45 m in both the 0.1% and 1% AEP events.
- Flood velocity changes in the SSP5-8.5 pathway was minor, modelled at 0.15 – 0.35 m/s for the 0.1% and 1% AEP events.

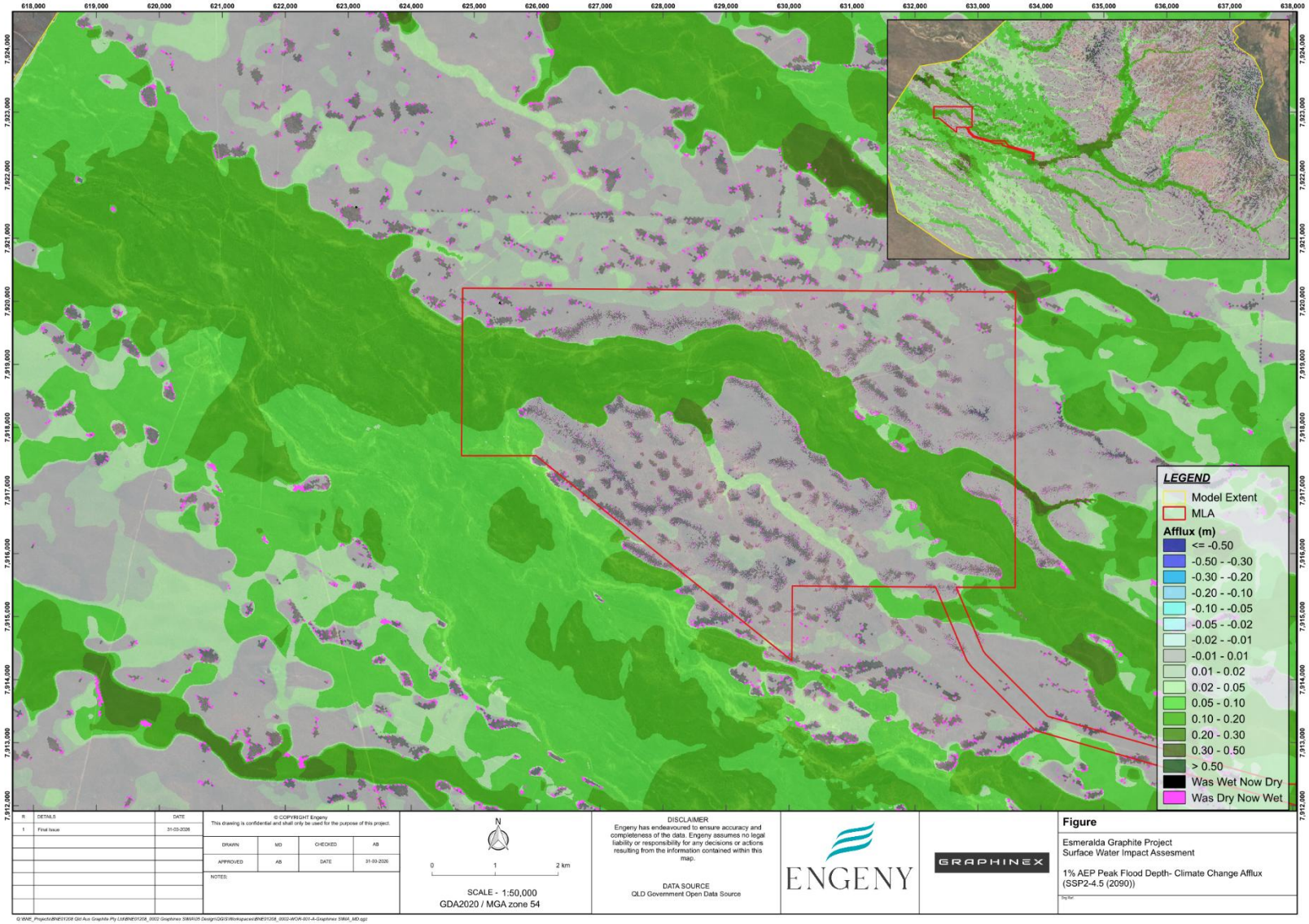



**Figure 7.21: 1% AEP Flood Afflux - Climate Change Sensitivity (SSP2-4.5 2090)**

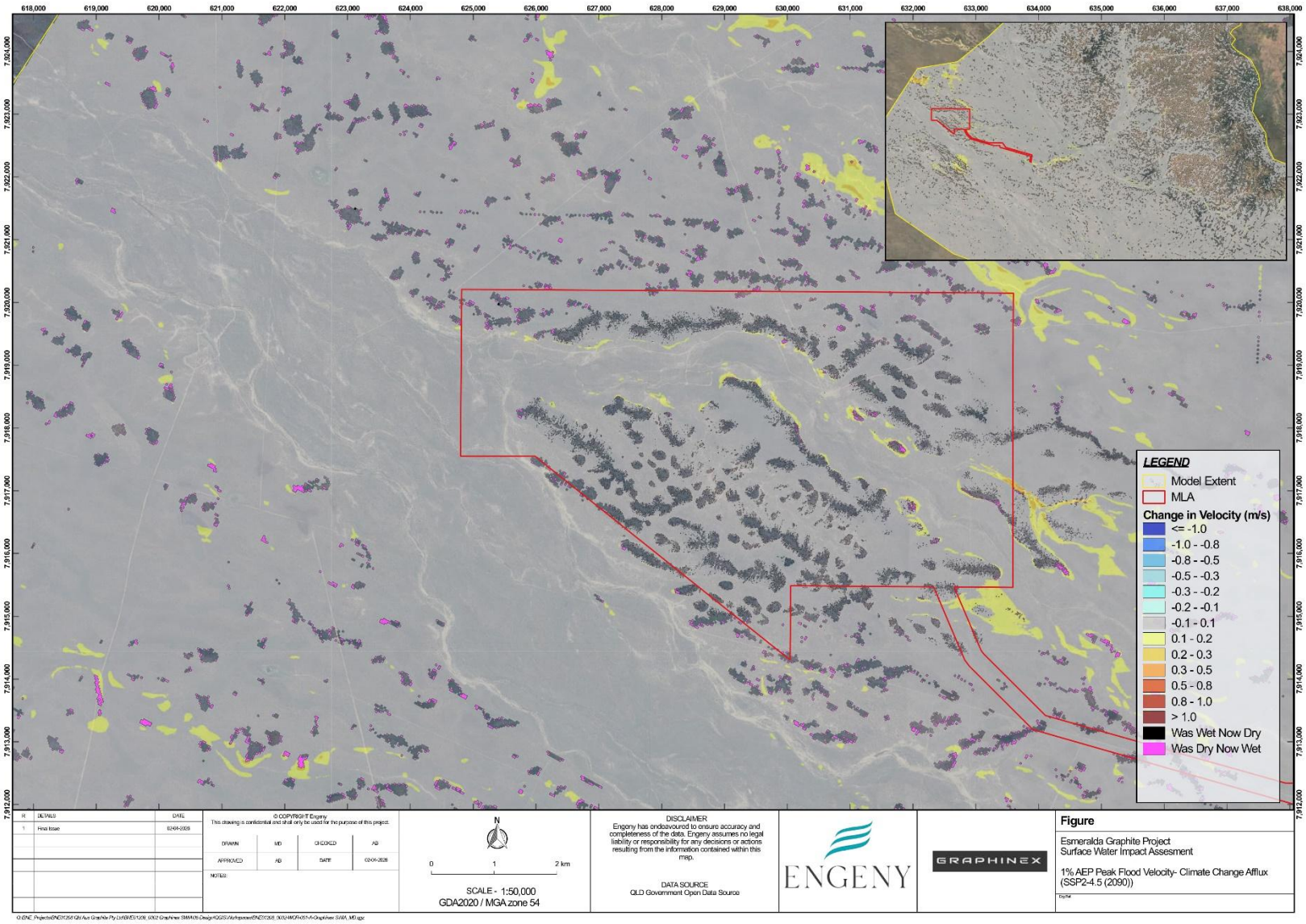



**Figure 7.22: Change in 1% AEP Peak Flood Velocity - Climate Change Sensitivity (SSP2-4.5 2090)**

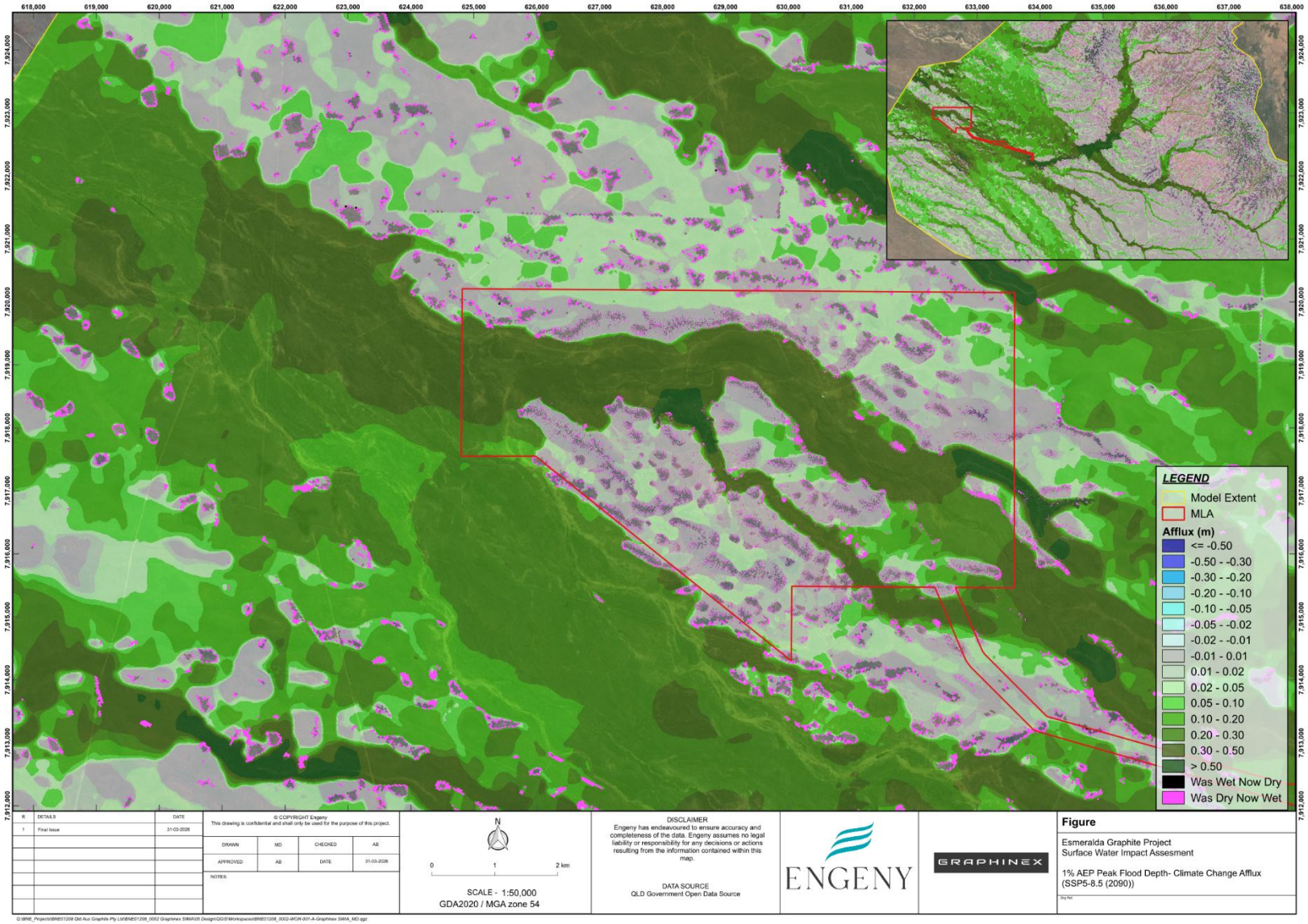



**Figure 7.23: 1% AEP Flood Afflux - Climate Change Sensitivity (SSP5-8.5 2090)**

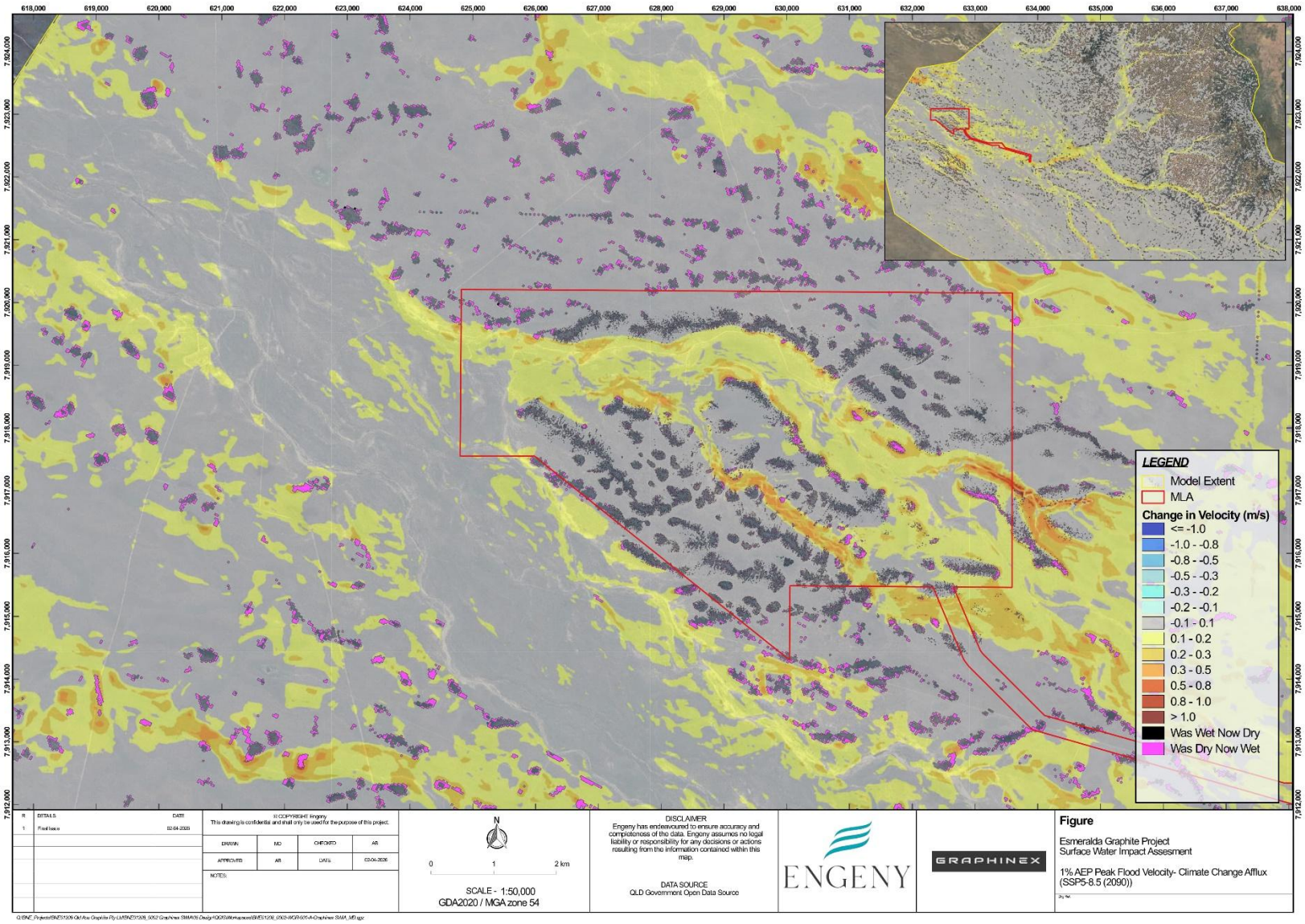



**Figure 7.24: Change in 1% AEP Peak Flood Velocity - Climate Change Sensitivity (SSP5-8.5 2090)**

## 7.12 Detailed Operational Flooding Interactions

Flood modelling undertaken for the Project focused on assessing the worst-case flooding impacts associated with the Project disturbance. This involved blocking the entire disturbance area from the model topography to provide a conservative estimate of potential flood impacts. Flooding interactions and risks to Project infrastructure for this scenario are assessed in Section 7.9.

This section presents flood modelling results for the operational phase of the Project with representation of the project infrastructure based on the project layout to show more detailed flooding interactions. The topography was updated to represent the following:

- The proposed waste rock dumps and stockpile locations
- The tailings storage facilities (1 to 4)
- The flood protection levee and diversion drains
- Sediment Dams 3 and 4 based on the proposed spillway and embankment elevations discussed in Section 7.9.

The flood model was simulated for the 0.1% AEP scenario to show flooding interactions with the operational mine infrastructure and landforms. The flood model results are presented in Figure 7.25 and Figure 7.26 for peak flood depth and velocity respectively. These model results show the same flooding interactions with Project infrastructure as determined in Section 7.9. this includes flooding interactions with:

- Sedimentation pond 3
- Sedimentation pond 4
- Topsoil stockpile areas
- The southern and western TSF embankments.

As determined in Section 7.9 the peak 0.1% AEP peak flood velocities against the landforms all remain low and show a very low risk of erosion.

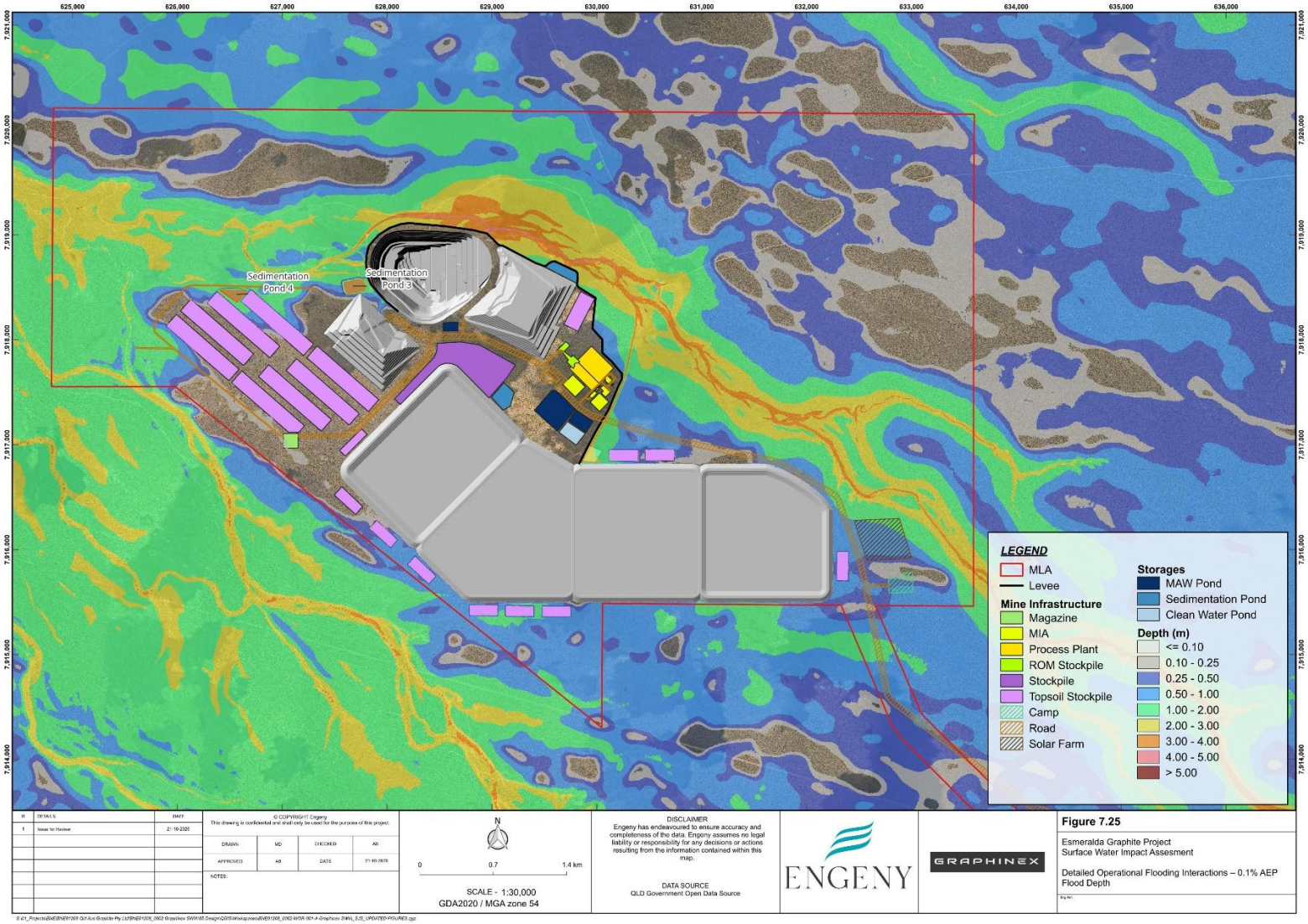



**Figure 7.25: Detailed Operational Flooding Interactions – 0.1% AEP Depth**

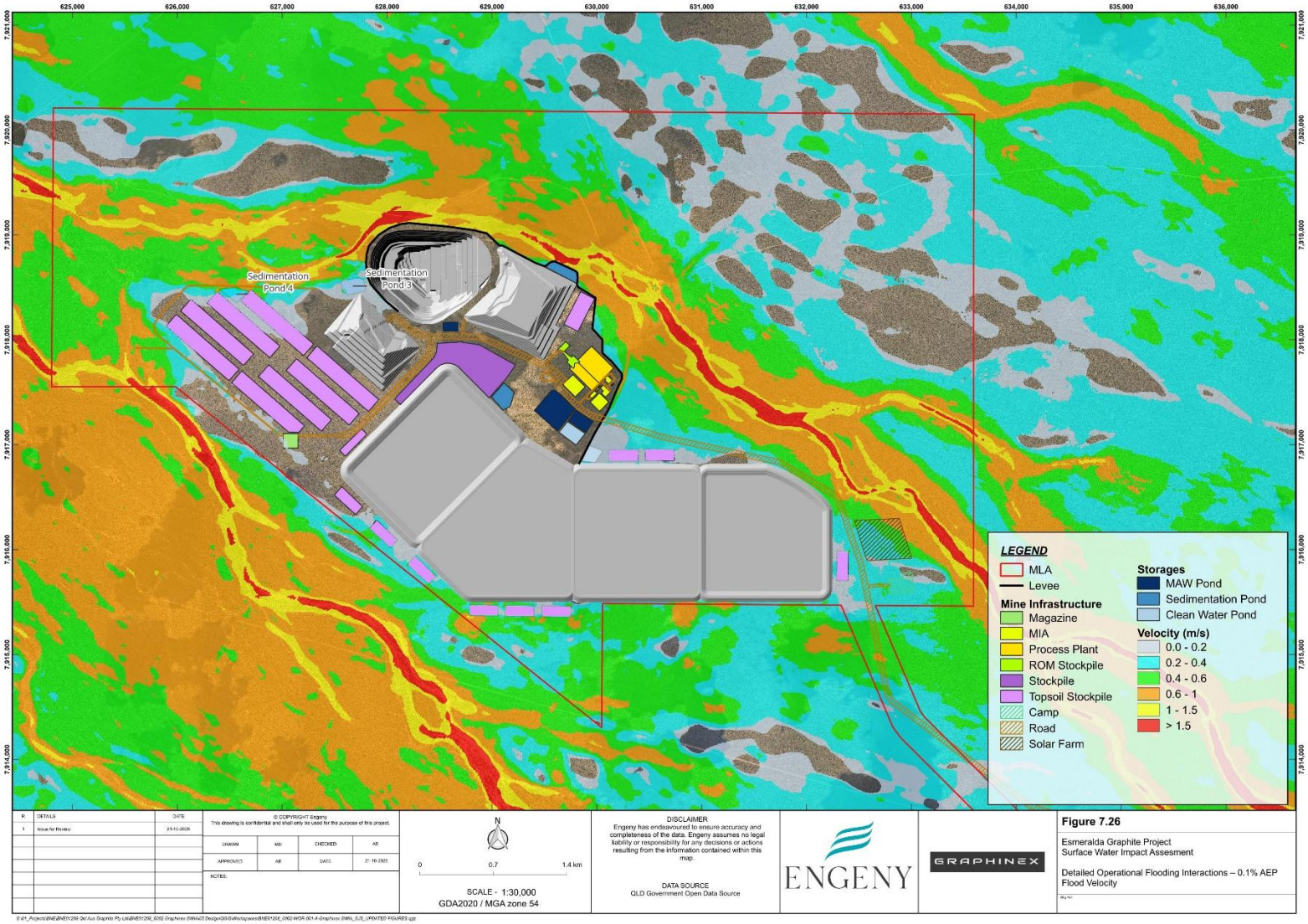


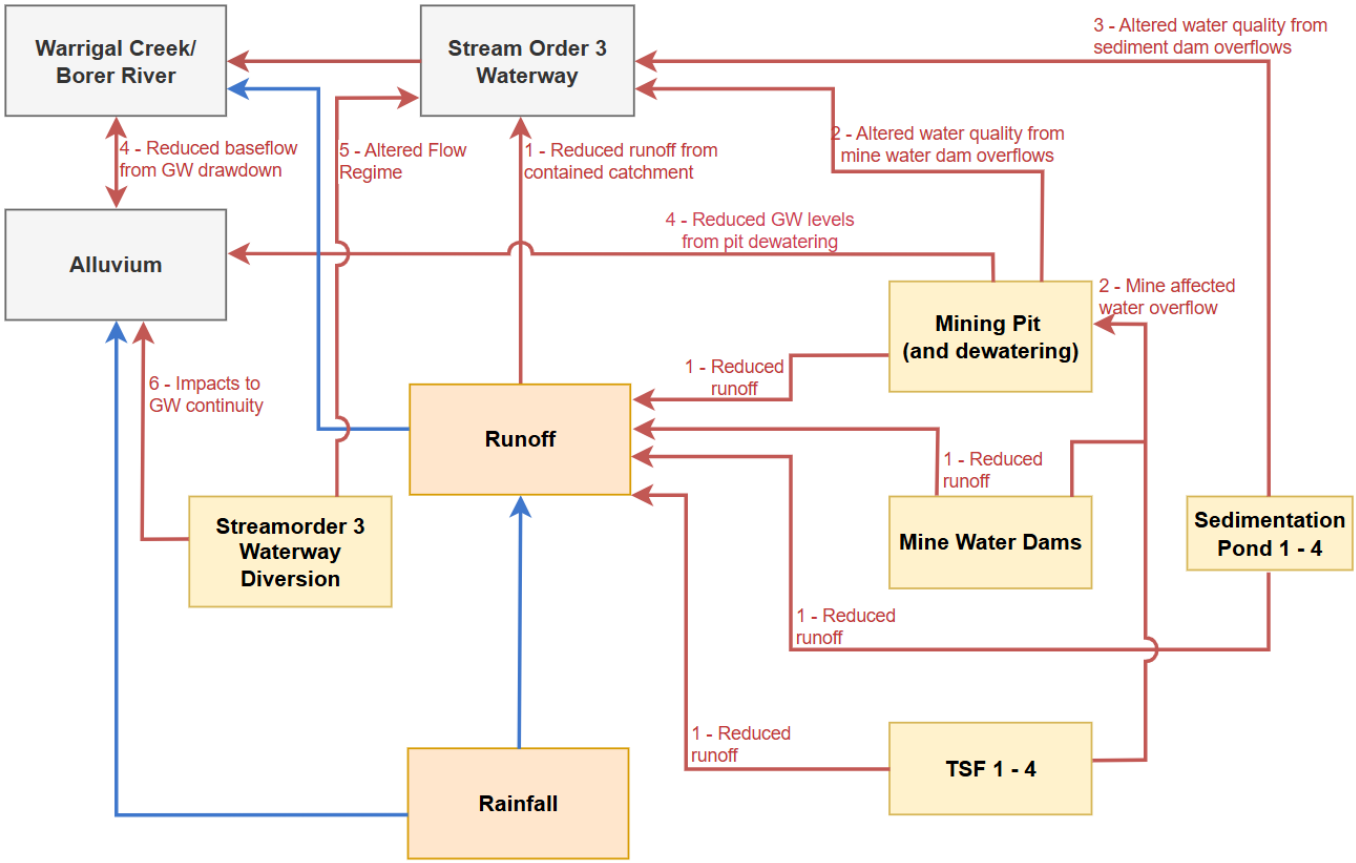

**Figure 7.26: Detailed Operational Flooding Interactions – 0.1% AEP Velocity**

# 8. SURFACE WATER IMPACT ASSESSMENT

The potential impacts of the Project on surface water resources include:

- Impacts on streamflow volumes and duration due to the catchment area contained by the Project's water management system.
- Impacts on environmental values in downstream waterways from uncontrolled releases from mine water storages.
- Impacts on environmental values of receiving waterways from uncontrolled overflows from sediment dams.
- Impacts to streamflow regime from the proposed watercourse diversion of the stream order 3 waterway.
- Impacts on flood flows and behaviour in the surrounding waterways.
- Cumulative surface water impacts of Projects in the region on the environmental values of the receiving waters.

An Impact Pathway Diagram (IPD) for the Project has been developed to conceptualise potential surface water impacts using the summary guide from the IESC (IESC, 2024). The IPD for surface water is shown in Figure 8.1 and Table 8.1 provides details of the conceptualised impacts. The potential impacts are assessed in the following sections and elsewhere in this report.




*Red arrows show impacts; blue arrows represent unimpacted hydrological pathways. Impact sources are shaded in yellow, receptors (water resources) are shaded in grey, and processes are superimposed on or near the arrows. GW = groundwater. Accompanying impact pathway diagrams for the groundwater system and groundwater dependent ecosystems are provided in relevant EIS assessment reports.*

**Figure 8.1: Conceptualised Surface Water Impact Pathway Diagram**

**TABLE 8.1: IMPACT PATHWAY DIAGRAM DESCRIPTIONS**

| ID | Description of Hypothesized Pathway | Details and assessment description |
|---|---|---|
| 1 | Altered flow in downstream waterways | Impacts on streamflow volumes and duration in minor drainage paths and regional waterways downstream of the Project from catchment area contained by the Project's water management system. The potential impacts to streamflow in downstream waterways are provided in Section 8.1. |
| 2 | Water quality impacts from mine water dam overflows | Impacts on environmental values in downstream waterways from uncontrolled releases from mine water storages. All mine affected water reports to mine water storages which ultimately overtop to the mining pit. The mining pit has excess storage capacity preventing the risk of overflowing to the receiving environment. The potential impacts from mine water dam overflows is provided in Section 8.2. |
| 3 | Water quality impacts from sediment dam overflows | Impacts on environmental values of receiving waterways from uncontrolled overflows from sediment dams. The potential impacts from sediment dam overflows are provided in Section 8.3. |
| 4 | Streamflow impacts to regional waterways from groundwater drawdown | Significant groundwater drawdown from the mining pit during operations could reduce baseflows in the immediate and reginal waterways. The impact of groundwater drawdown on the surrounding waterways is assessed as part of the Groundwater Assessment Report for the Project (Hydrogeologist.com.au, 2026). |
| 5 | Altered flow regime from the watercourse diversion | The proposed watercourse diversion of the unnamed stream order 3 waterway may impact the flow regime of the downstream waterway. The diversion design ensures flow in the stream order 3 tributary is maintained and follows the natural regime as described in Section 8.1 and the Watercourse Diversion Functional Design Report (Engeny, 2026). |
| 6 | Watercourse diversion impacts to groundwater continuity in the alluvium. | The proposed watercourse diversion of the unnamed stream order 3 waterway may impact continuity of the alluvium if the channel intercepts the surrounding groundwater system or significantly restructures the alluvium. Details of the diversion design are provided in the Watercourse Diversion Functional Design Report (Engeny, 2026) and potential impacts of the diversion on groundwater are provided in in the Groundwater Assessment Report for the Project (Hydrogeologist.com.au, 2026).. |

# 8.1 Streamflow Impacts to Local and Regional Waterways

The Project area is expected to intercept a maximum catchment area of 13.4 km$^2$ during the operational life of the Project (refer Section 6.1.3). This catchment area will be temporarily removed from the stream order 3 tributary flowing around the northern extent of the mine as well as Warrigal Creek and further downstream waterways. The stream order 3 tributary has an existing catchment area of 115 km$^2$ which means the project will remove approximately 12% of this area during the project life (refer Section 2.3.3). At closure the catchment area will be reinstated from the pit backfill and rehabilitation of the remaining landforms.

The Warrigal Creek catchment area is 1,127 km$^2$ (refer Section 2.3.1) which means the total area will be reduced by 1.2% during the project life however will be reinstated at closure similar to the stream order 3 tributary. The reduction in catchment area is expected to reduce streamflow volumes by a similar proportion as the catchment area reduction. The reduction in catchment area is expected to have negligible impact on the streamflow characteristics of the stream order 3 tributary, in terms of streamflow volume and the frequency and duration of low flows, which are typically required to maintain aquatic ecosystems. This is because of the ephemeral flow characteristics of the creeks and the reduction in area is expected to result in a proportional reduction in streamflow volumes for high and low flows and have no material change in the frequency or duration of flow events.

The reduction in catchment during the operational phase of the Project is not expected to impact water availability to existing licence holders as the closest licence is located on the Norman River at Glenore Weir. This location is approximately 170 km downstream of the Project area with a total catchment area of 39,360 km$^2$.

The Project involves the diversion of the stream order 3 tributary around the northern extent of the mining area (Engeny, 2026). The diversion has been designed in accordance with the DNRME guidelines for permanent watercourse diversions to maintain the existing hydrology, hydraulic, geomorphic and ecological features of the existing waterway (DNRME, 2019).

## 8.2 Mine Water Dam Overflows

Mine water storages associated with the Project do not have potential to discharge offsite. All mine water dams overflow to the mining pit which has excess capacity to contain all overflow volumes. this ensures that there would be minimal actual or potential discharge of contaminants to waters that may or have the potential to cause an adverse effect on identified environmental values.

### 8.2.1 Mine Affected Water Quality

Mine affected water quality is expected to be impacted by the following sources:

- Geochemistry of the processed ore
- Reagents used in the processing system (diesel, MIBC and flocculant)
- Groundwater inflows to the mining pit
- Seepage from ROM stockpile areas
- Potential oxidation of tailings materials within the TSFs
- Runoff from the processing area.

The contaminants of concern associated with the above sources are provided in Table 4.2. MAW will be used to supply Project water demands and will be recycled through the processing plant and the TSFs. Contaminants will accumulate in the MAW storages and ultimately be entrained with tailings material in the TSFs. MAW quality is expected to be poor with elevated salinity and metal concentrations and potentially acidification from PAF materials. MAW is not proposed to be released as part of the project with all overflows from MAW storages directed to the mining pit for containment.

## 8.3 Sediment Dam Overflows

Sediment dams have been designed to contain the 10% AEP 24-hour design storm event with allowance for sediment storage. It is proposed to supply truck fill demands from the sediment dams and dewater the sediment dams to the mine water system to improve containment and maintain supply to water demands. Sedimentation pond 1 and 2 overflow to the mining pit and pose no risk to the receiving environment. Sedimentation pond 3 and 4 overflow to the stream order 3 tributary, downstream of the proposed watercourse diversion. The sediment dam overflow pathways are shown in Figure 8.2.

The water balance modelling shows overflows from sedimentation pond 3 occurs in between 6% and 12% of years before year 53 (Table 6.6) which exceeds the design containment standards. Overflow volumes from sedimentation pond 3 in the 95$^{th}$ percentile year (1 in 20 years) are on average 30ML which is less than half of the dams storage volume (80 ML). Overflows to the stream order 3 Tributary are expected to be very infrequent (less than 10% of years) and not be significant in volumes in larger wet years ( e.g. 95$^{th}$ percentile).

sedimentation pond 4 is designed to capture runoff from topsoil stockpile areas with a much lower erosion and contamination risk and therefore has a reduced containment standard. sedimentation pond 4 is expected to overflow more frequently than sedimentation pond 3 with overflows occurring in approximately 60% of years on average.

The sediment dams have been designed to provide sufficient storage for settlement of suspended solids so that water quality during overtopping events has negligible impact on the water quality in the receiving waterway. Sediment dams will also include overflow control structures with scour protection (rock chutes, rock aprons or level spreaders) to ensure non-erosive discharges. Monitoring of overtopping events will be undertaken to assess the performance of the sediment dams and ensure downstream environmental values are maintained and validate the design assumptions. Sediment dam overflows and associated water quality are not expected to have adverse impacts on water quality and environmental values in receiving waterways downstream of the Project.

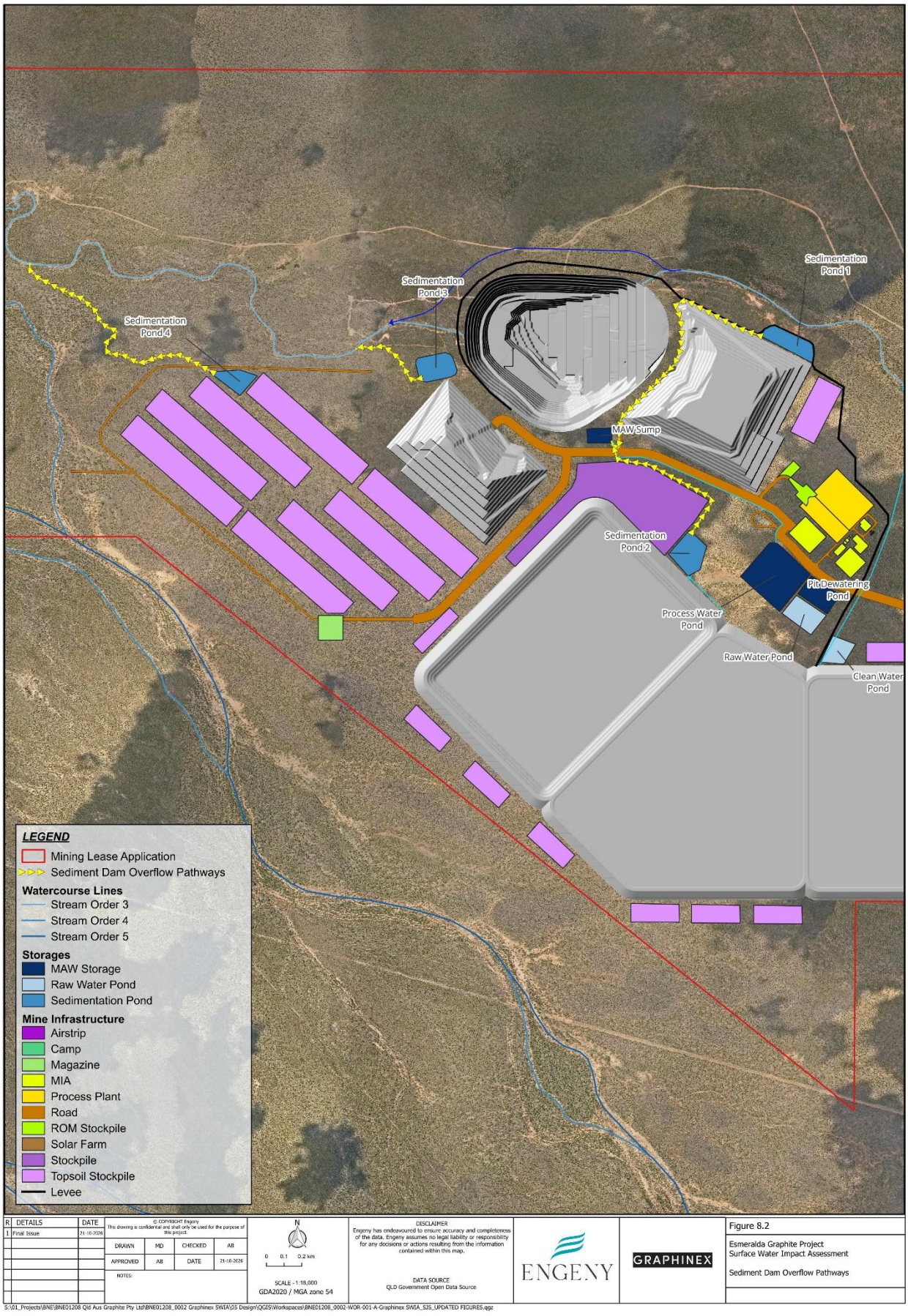



**Figure 8.2: Sediment Dam Overflow Pathway**

### 8.3.1 Sediment Dam Overflow Water Quality

Sedimentation ponds 3 and 4 are proposed to overflow to the stream order 3 tributary and sedimentation ponds 1 and 2 are proposed to overflow to the mining pit. Because of this the expected water quality in sedimentation pond 3 and 4 has been investigated in more detail to determine potential risks to the receiving environment. It is noted that sedimentation pond 1 and 2 are expected to have similar water quality characterisation as sedimentation pond 3 because of the similar catchment land uses.

#### 8.3.1.1 Sedimentation Pond 3

Sedimentation pond 3 is used to contain runoff from the western waste rock dump and surrounding roads which are expected to produce high sediment loads. The dam also has potential to intercept seepage from rainfall infiltration to the waste rock dump which may follow the natural ground elevations. Seepage volumes are expected to be small compared to surface water runoff volumes, indicating a lesser influence on the quality of water. The contribution of seepage to sediment dam inventory is expected to be even less in large rainfall events due to the delayed response of infiltration flow paths.

Potential seepage from the waste rock dumps may contain slightly elevated concentrations of aluminium, arsenic and zinc based on the geochemical testing of spoil materials (refer Section 4.1.5). Geochemical testing showed concentrations of these dissolved metals in waste materials were slightly above the draft WQOs. Geochemical data for aluminium shows an average concentration of 0.22 mg/L which is equivalent to the average background surface water quality data and is not considered a high risk. Average Zinc concentrations (0.007 mg/L) are only slightly above the draft WQO of 0.005 mg/L, however, is lower than the zinc concentration in soils (0.026 mg/L). The average arsenic concentrations in the waste rock material (0.047 mg/L) is 3.6 times the draft WQO of 0.013 mg/L. Based on the geochemical data and comparison to the WQOs and receiving water quality data, the main contaminant that may be produced from the waste rock dumps besides sediment, is Arsenic which has an average concentration of 0.047 m/L. The metal concentrations within the waste rock material are relatively low despite exceeding the draft WQO.

Sedimentation pond 3 catchment is 62.4 ha for the majority of operations with 39.8 ha being the waste rock dump (64%) and the remainder being the surrounding roads and dam footprint (36%). Seepage rates from WRD are reported to be highly variable and dependant on the dumped material, thickness and compaction as well as the local climatic conditions (Williams, 2008). Waste dump seepage is likely to be less than 15% of incident rainfall while during larger storm events, catchment runoff can exceed 50% of incident rainfall. This indicates that water quality in the dam will be highly diluted with surface runoff. It is also noted seepage produced from rainfall infiltration has a delayed response compared to surface runoff.

Considering the dam capacity, relatively low metal concentrations and volume contributions from seepage compared to runoff during larger rainfall events, any contaminants produced from seepage are expected to be diluted by surface runoff and remain below the draft WQOs.

Sedimentation pond 3 water quality is expected to be influenced by the WRD seepage however is expected to produce a low risk of exceeding the draft WQOs in overflows. The risk is further mitigated by the expected dilution in the receiving waterway (stream order 3 tributary) with a contributing catchment of 115 $km^2$ (160 times greater than the sedimentation pond 3 catchment).

#### 8.3.1.1 Sedimentation Pond 4

Sedimentation pond 4 is located to the northwest of the Project area and captures runoff from the topsoil stockpiles and surrounding roads. Runoff and seepage flows from the topsoil stockpiles is not expected to contain elevated contaminants compared to the receiving environment. Inflows to the sediment dam are expected to have elevated sediment loads which require treatment through detention before discharging. The risk of sedimentation pond 4 overflows impacting the receiving environment water quality is considered low.

## 8.4 Flooding

### 8.4.1 Project Impacts on Flooding

Flooding impacts for the operation and closure phases of the mine have been assessed using the regional flood model as described in Section 7.6. The operational phase of the mine includes the maximum mining disturbance footprint and accounts for levees for flood protection of the pit and operational areas. The closure phase of the mine represents the backfilled final void and removal of mine infrastructure and TSF1, TSF2 and TSF3. The flooding impact results show:

- The operational phase of the project will have minor impacts to Warrigal Creek and Borer River flooding due to the diversion of the unnamed waterway (stream order 3).
  - This impact is expected to include localised increases in peak flood levels at the location of the diversion drain and south of the TSFs, as well as a minor decrease in flood levels in Warrigal Creek downstream of the Project site.

  - increases in flood depth in the tributaries north of the mine is expected to occur in events greater than the 2% AEP where floodwater breakout of the diversion drain occurs, with impacts expected to extend less than 2 km downstream of the MLA in the 1% AEP flood event.
  - The breakout flooding from the diversion drain in events greater than the 2% AEP is expected to decrease peak flood depth in Warrigal Creek, with impacts greater than 20 mm expected to extend less than 4 km downstream of the MLA.
- Increases to peak flood velocity in the operational phase are confined to the northern breakout flooding location from the watercourse diversion, by a maximum of 0.5 m/s in the 1% AEP flood event (localised to the north of the diversion drain) however the existing case shows no breakout flow at this location. The absolute velocity remains relatively low (<0.6 m/s) showing negligible increased risk of erosion or scour.
- The closure phase of the project will continue to have minor impacts to Warrigal Creek and Borer River but are expected to be less than the operational phase due to backfill of the mining void, removal of infrastructure and operational flood levees.
  - Flooding impacts during the closure phase compared to the existing case are expected to include isolated increases in peak flood levels at the location of the diversion drain and south of the rehabilitated TSF4.
  - Significant impacts to the northern breakout from the diverted unnamed waterway (stream order 3) has not been modelled in the closure scenario due to the pit backfill and removal of the flood protection levee reinstating the floodplain close to existing conditions.
- During the closure phase, peak flood depth in Warrigal Creek decreases by a maximum of 0.03 m in the 1% AEP event, with decreases greater than 10mm extending approximately 2 km downstream of the MLA.
- Increases to peak flood velocity during the closure phase are isolated to the diversion drain and to the south of the rehabilitated TSF4 and generally confined within the MLA.

The changes in flooding conditions during the operational phase of the Project are minor and not expected result in any adverse impacts to the waterway, surrounding properties or flood immunity of any third-party infrastructure. Flooding impacts are expected to reduce when the Project enters the closure phase and are generally confined to the MLA.

### 8.4.2 Flood Risks to Project Infrastructure

The developed case flood results were used to analyse flood risks for the Project infrastructure (refer Section 7.8). The levee provides flood protection to the operational mining and processing areas for the Project however the western and southern areas of the Project have flooding interactions in large flood events (0.1% AEP). The flood results show potential flooding interactions with the following:

- Sedimentation pond 3
- Sedimentation pond 4
- Topsoil stockpile areas
- The southern and western TSF embankments.

Sedimentation ponds 3 and 4 become inundated in 1% AEP and 2% AEP flood events in the stream order 3 tributary respectively. In large rainfall events, the dams are expected to be full and flood flows entering the dams will be controlled by water levels in the dams. The flood model results also show peak flood velocities against the dam embankments are expected to be low with the 0.1% AEP peak flood velocity remaining below 0.55 m/s and 0.8 m/s for sedimentation pond 3 and 4 respectively. This indicates the dams have a low risk of erosion during very rare flood events however detailed design of the dams will need to consider any erosion risks from flooding in the stream order 3 tributary.

Topsoil stockpiles are proposed to be placed in the north-west of the Project area which is outside the pit flood protection levee. The flood model results show this area is affected by flooding from the north-east of the stockpile area from flow in the stream order 3 tributary and from the west from flow in Warrigal Creel/Borer River. The topsoil stockpile area is on the upper fringes of the floodplain and flood model results show 0.1% AEP peak velocities remain below 0.6 m/s from flooding in the stream order 3 tributary and below 0.2 m/s from flooding in Warrigal Creek/Borer River. The model results show the topsoil stockpile area has a very low risk to erosion, and the flooding interactions are expected to have negligible impacts to the topsoil stockpile emplacements.

The TSFs (1-4) are located around the southern and western extents of the Project area. There are minor flooding interactions against the embankments in more frequent flood events however more extensive inundation is expected in the 1% AEP and 0.1% AEP flood events. Peak flood depths against the embankments reach 1.9m in the 0.1% AEP flood event however peak velocities remain low. The flood model results indicate a low risk of erosion to the TSF embankments however detailed design of the TSFs will consider erosion risk of the embankment toes from flooding.

### 8.4.3 Risk of Levee Overtopping or Failure

The flood protection levee is located around the processing area and mining pits and is designed to provide 0.1% AEP flood protection with consideration of climate change impacts to hydrology and suitable freeboard. The levee will be classified as a regulated structure and will be designed in accordance with requirements of the Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (DETSI, 2025). Although extremely unlikely, extreme flooding can occur that exceeds the regulated structure design requirements that may result in overtopping of the levee embankment and resulting in flooding ingress to operations.

The Probable Maximum Flood (PMF) was assessed for the Project as part of the flooding impact assessment. The PMF peak flood levels around the Project were 2m higher than the 0.1% AEP event near the process plant and 1.5m higher near the mining pit. With a flood protection levee designed in accordance with the regulated requirements and 0.5m of freeboard, the PMF could exceed the levee crest by between 1.0 m and 1.5 m. This would result in extensive flooding ingress to the process plant and/or mining pit. The depth of overtopping may also result in failure of the levee embankment from scour, increasing the volume of ingress. The volume of ingress will result in significant inundation of the mining pit and impact mine operations. A PMF event is extremely rare and far exceeds the design requirements of a flood protection levee.

The risk of levee overtopping or failure is managed by the levee being classified as a regulated structure and needing to meet the requirements of the Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (DETSI, 2025).

## 8.5 Seepage

### 8.5.1 Waste Rock Dump Seepage

Mine waste materials from the excavation of the pit will be placed in out of pit dumps adjacent to the mining void. Rainfall runoff and infiltration will be collected via drains and report to sedimentation ponds. Two out of pit dumps are proposed to the south east and south west of the mining pit with a maximum total area of 104 ha and will be mostly constructed in the first 18 years of the project. The out of pit dump will be constructed with soils, overburden materials and waste rock from the ore body as part of the excavation of the mining pit. At closure, the western dump will be used for the pit backfill and the eastern dump will be partially removed before being reshaped, topsoiled and vegetated to aim to return the land to a grazing PMLU where possible.

Testing of potential waste rock materials captured as part of the geochemical assessment (RGS, 2024) has been reviewed to characterise the quality of potential seepage from the spoil dump and the risk on sediment dam water quality and downstream water quality. The geochemical assessment of the Project area included analysis of material samples for soils, overburden and orebody and underlying geology. The assessment concluded the WRD materials typically are non-acid forming with low total sulfur content, slightly alkaline, low salinity and only contain slightly elevated concentrations of Aluminium (Al), Arsenic (As), and Zinc (Zn).

Any runoff and seepage produced by the waste rock dumps will be collected in Sedimentation ponds 1 and 3 and managed by the water management system. The sediment dams are designed to contain a 10% AEP, 24 hour storm event. Sedimentation pond 1 overtops to the mining pit and sedimentation pond 3 overtops to the stream order 3 waterway which has a catchment area of 115 $km^2$. In very large rainfall events sedimentation pond 3 can overtop where waters will mix with streamflow in the stream order 3 waterway. The risk of sedimentation pond 3 overflows is assessed in Section 8.3.1.1.

This shows seepage produced during small to medium rainfall events will be contained and managed by the sediment dams. Any seepage produced during large rainfall events that result in overtopping of the sediment dams would receive significant dilution immediately in the receiving waterway. The geochemical data for the WRD materials shows:

- Dissolved aluminium concentrations are on average 0.22 mg/L which is 3.3 times the Aquatic Ecosystems WQO of 0.055 m/L. It is noted background monitoring data for the Project shows equivalent average dissolved aluminium concentration in the existing waterways.
- Dissolved arsenic concentrations are on average 0.047 mg/L which is 3.6 times the Aquatic Ecosystems WQO of 0.013 m/L.
- Dissolved zinc concentrations are on average 0.007 mg/L which is 1.4 times the Aquatic Ecosystems WQO of 0.005 m/L.

The metal concentrations in the waste rock material are generally low and the sediment dams are expected to effectively capture and manage any seepage from the waste rock dumps. Based on this seepage is not expected to have a material impact on the environmental value of receiving waters.

### 8.5.2 Seepage from Storages

The risk of seepage from storages has been assessed as part of the consequence category assessment for each storage (refer Section 9). The raw water and sediment storages will have low contaminant concentrations and be typically operated with low inventories and pose a very low risk on groundwater resources due from seepage outflows. Any seepage from these dams is not expected to cause adverse impacts to humans, third party infrastructure or the environment.

The mine water dams water quality (PWD, PDD and MAW Sump) will be impacted by mining and processing activities. These storages will contain contaminants present in the ore body, reagents used in the process plant, and groundwater (refer Section 4.2). The water quality of these storages may also be impacted by chemical reactions (oxidation) due to the PAF nature of the ore materials.

Considering the Process Water Dam and Pit Dewatering Dam will likely store significant quantities of poor-quality water for extended periods of time they potentially could have a significant impact from seepage on environmental values. Soils testing information for the Project show the deeper soils (>55cm deep) have a hydraulic conductivity less than 0.01 mm/hour or 0.24 mm/day (AARC Environmental Solutions , 2026). Based on the footprint of the Process Water Dam (8.1 ha) and Pit Dewatering Dam (2.5 ha) daily seepage volumes could reach 6 kL/day and 19 kL/day respectively. The Process Water Dam and Pit Dewatering Dam CCA classified the dams as having a significant risk for failure to contain seepage, and therefore require a liner to prevent seepage in accordance with the hydraulic performance criteria (Refer Section 9.4). The dams will be constructed with a HDPE liner to minimisel seepage, to reduce the risk to receiving groundwater or surface water environment.

The MAW Sump will only store small quantities of water for short durations and is located immediately within the pit's groundwater drawdown extent. Any seepage from the MAW sump will report directly to the pit and therefore is not expected to have a significant impact on groundwater.

## 8.6 Cumulative Impacts

The Project is the only known planned mining operation or future project in the Borer River catchment and the second project in the Norman River catchment. The Croydon Gold Mine is located 70km north of the Project in the Bellmore Creek catchment which joins the Norman River 150 kms downstream of the Project. Based on the small scale of the mining operations currently present within the Normal River catchment and no known future mining operations, the cumulative impacts are expected to be negligible.

## 8.7 Climate Change Impacts

Future global temperature increases due to climate change will impact rainfall and evaporation conditions which has the potential to change the flooding and water balance assessments for the Project. Climate change is expected to increase the magnitude of extreme rainfall and flooding events while also reducing long-term average annual rainfall depths. Climate change impacts for the Project has been assessed for the operational water balance and flood assessment for the Project as described in Sections 6.2 and 7.3.3.1.

### 8.7.1 Operational Water Balance and Containment

The operational water balance model was updated to reflect expected changes to average annual rainfall and evaporation for the SSP2-4.5 and SSP3-7.0 climate pathways over a long-term projection period (year 2070). Decreases in the long-term annual precipitation and increasing evaporation rates is expected for both SSP pathways in 2070. The changes in rainfall and evaporation are expected to reduce long-term rainfall runoff volumes resulting in lower site inventories and reduced frequency and volume of overflows from water storages. The climate change sensitivity model results show:

- Average decreases of 26% and 21% in total inventory for the SSP2-4.5 and SSP3-7.0 pathways respectively for the operating phase of the Project.
- Predicted annual overflow frequency reduces for the climate change scenarios with:
  - Sedimentation pond 3 average overflow frequency reducing from 9%, to 4% and 6% for the SSP2-4.5 and SSP3-7.0 pathways respectively.
  - Sedimentation pond 4 overflow frequency reducing from 63%, to 49% and 51% for the SSP2-4.5 and SSP3-7.0 pathways respectively.

This shows potential future climate change impacts are expected to reduce water inventories and reduce the frequency of potential overflows and impacts on the receiving environment.

### 8.7.2 Flooding

Current and future climate change impacts on flooding have been assessed for the operational and closure phases of the project. Flood modelling for the Project has been assessed for the following climate scenarios:

- Current day climate (2030) adjusted hydrology for the operational phase of the project.
- Future projected climate for year 2090 for the SSP2-4.5 (median) and SSP5-8.5 (very high) emission pathways.

Flood modelling for the closure phase of the project has been assessed for the two future climate change pathways to understand how the assessed impacts could change under varying future climate conditions. Flood modelling and the assessed closure phase impacts for the different future climate scenarios show:

- Existing case current day flood levels within the MLA are expected to increase by 0.37 m and 0.82 m for the SSP2-4.5 and SSP5-8.5 future climate change scenarios.
- Closure phase flooding impacts have a larger extent for the very high emissions pathway (SSP5-8.5, year 2090) compared to the median emissions pathway (SSP2-4.5).
- For both the median and very high future climate change scenarios, the closure phase flooding impacts are not significant outside of the MLA and indicating no significant impact on existing third parties, waterways or other receptors.

# 9. REGULATED STRUCTURES

A preliminary consequence category assessment of water and waste containment structures proposed for the Project has been undertaken in accordance with the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures* – version 5.05 (the Manual) (DETSI, 2025). The Manual specifies the procedure for consequence category assessment of structures, constructed as part of environmental relevant activities under the Environmental Protection Act 1994.

Water retaining structures are assessed using the Manual to determine if their consequence category is low, significant, or high. Structures deemed to be of significant or high consequence category are referred to as regulated structures. The manual requires the assessment of the consequences of the following failure event scenarios:

- 'Failure to contain – seepage' – spills or releases to ground and/or groundwater via seepage from the floor and/or sides of the structure.
- 'Failure to contain – overtopping' – spills or releases from the structure that result from loss of containment due to overtopping of the structure.
- 'Dam break' – collapse of the structure due to any possible cause.

For each failure event scenario, the Manual requires the consequences to be assessed for each of the following categories of harm.

- Harm to humans.
- General environmental harm.
- General economic loss or property damage.

The consequence category of each type of harm is assigned, based on the severity of harm as specified in Table 1 of the Manual (refer to Table 9.1). Regulated structures are required to meet hydraulic performance criteria based on the assessed consequences for each of the failure events. The hydraulic performance criteria required by the Manual are designed to reduce the likelihood of each failure event occurring.

**TABLE 9.1: CONSEQUENCE CATEGORY ASSESSMENT CRITERIA (TABLE 1 OF MANUAL) (DETSI, 2025)**

| Environmental Harm | Consequence Category | | |
|---|---|---|---|
| | High | Significant | Low |
| Harm to Humans | Location such that people are routinely present in the failure path and if present loss of life to greater than 10 people is expected[1].<br>Note: The requirement to consider the location of people in the failure path is only relevant to the 'dam break' scenario.<br>Location such that contamination of waters (surface and/or groundwater[2]) used for human consumption could result in the health of 20 or more people being affected[3]. | Location such that people are routinely present in the failure path and if present loss of life to 1 person or greater, but less than 10 people is expected[1].<br>Note: The requirement to consider the location of people in the failure path is only relevant to the 'dam break' scenario.<br>Location such that contamination of waters (surface and/or groundwater[2]) used for human consumption could result in the health of 10 or more people but less than 20 people being affected. | Location such that people are not routinely present in the failure path and loss of life is not expected[1].<br>Note: The requirement to consider the location of people in the failure path is only relevant to the 'dam break' scenario.<br>Location such that contamination of waters (surface and/or groundwater[2]) used for human consumption could result in the health of less than 10 people being affected. |
| General Environmental Harm | Location such that:<br>a) Contaminants may be released to areas of MNES, MSES or HEV waters that are not already authorised to be disturbed to at least the same extent under other conditions of this authority subject to any applicable offset commitment (Significant Values); and<br>b) Adverse effects[4] on Significant Values are likely; and<br>c) The adverse effects are likely to cause at least one of the following:<br>i) Loss or damage or remedial costs greater than $50,000,000; or | Location such that contaminants may be released so that adverse effects (that are not already authorised to be disturbed to at least the same extent under other conditions of this authority subject to any applicable offset commitment) either:<br>a) Would be likely to be caused to Significant Values but those adverse effects would not be likely to meet the thresholds for the High consequence category and instead would be likely to cause at least one of the following:<br>i) Loss or damage or remedial costs greater than $10,000,000 but less than $50,000,000; or<br>ii) Remediation of damage is likely to take more than 6 months but less than 3 years; or<br>iii) Significant alteration to existing ecosystems; or | Location such that either:<br>a) Contaminants are unlikely to be released to areas of Significant Values or Moderate Values; or<br>b) Contaminants are likely to be released to those areas but would be unlikely to meet any of the minimum thresholds specified for the Significant Consequence Category for adverse effects. |

| Environmental Harm | Consequence Category | | |
|---|---|---|---|
| | High | Significant | Low |
| | ii) Remediation of damage is likely to take 3 years or more; or<br>iii) permanent alteration to existing ecosystems; or<br>iv) The area of damage (including downstream effects) is likely to be at least 5 km$^2$. | iv) The area of damage (including downstream effects) is likely to be at least 1 km$^2$ but less than 5 km$^2$. or<br>b) Would be likely to be caused to environmental values classed as slightly or moderately disturbed waters[5], wetland of general ecological significance[6], riverine areas, springs or lakes and associated flora and fauna (Moderate Values), and the adverse effects are likely to cause at least one of the following:<br>i) Loss or damage or remedial costs greater than $20,000,000; or<br>ii) Remediation of damage is likely to take more than 1 year; or<br>iii) Significant alteration to existing ecosystems; or<br>iv) The area of damage (including downstream effects) is likely to be at least 2 km$^2$. | |
| General economic loss or property damage | Location such that harm (other than a different category of harm as specified above) to third party assets in the failure path would be expected to require $10 million or greater in rehabilitation, compensation, repair or rectification costs[7]. | Location such that harm (other than a different category of harm as specified above) to third party assets in the failure path would be expected to require $1 million and greater but less than $10 million in rehabilitation, compensation, repair or rectification costs[7]. | Location such that harm (other than a different category of harm as specified above) to third party assets in the failure path would be expected to require less than $1 million in rehabilitation, compensation, repair or rectification costs[7]. |

*1. 'People routinely present in the failure path' could be considered to be people who occupy buildings or other places of occupation that lie within the failure impact zone. For the purposes of this Manual, this should refer to people other than site personnel engaged by the resource operation and located on the tenements and tenure associated with the resource operation; for other ERAs, it would be the 'premises referred to in the authority'. It should be noted that while this is appropriate for the assessment of consequence categories in accordance with this Manual, adherence to the requirements of this Manual does not limit, amend or change in any way, any other requirements to be complied with under relevant health and safety acts or legislation that requires the safety of site personnel to be considered.*

*2. When considering potential impacts on groundwater, it is not envisaged that a full hydrogeological assessment will be required in all cases. Any consideration of potential impacts on groundwater systems should consider the water quality of the potential receiving aquifer as well as the quality of fluid stored in the regulated dam. Existing groundwater drawdown in areas surrounding resource operations (e.g. drawdown as a result of mine pit or underground mine dewatering) can also be considered when assessing the consequence of dam seepage on groundwater systems.*

*3. 'An adverse effect on human health means a physiological effect on human health and does not include an impact on the quality of downstream water that merely negatively affects taste and which is unlikely to cause persons to become physically ill.*

*4. Adverse effects includes chronic and acute effects where an acute effect is on living organism/s which results in severe symptoms that develop rapidly, and a chronic effect is an adverse effect on a living organism/s which develops slowly. In some instances, it may be necessary to carry out or reference existing ecological/toxicological studies to assess the impacts of contaminants on living organisms.*

*5. See Water EPP for definitions.*

*6. Wetland of general ecological significance' means a wetland shown on a map of referable wetland as a 'general ecologically significant wetland' or 'wetland of other environmental value'.*

*7. This does not include the holder's own mine or gas production, on-site industrial or commercial assets, the holder's workers' accommodation, agricultural facilities on the holder's land such as a farm shed or farm dam or infrastructure solely for servicing the holder.*

# 9.1 Preliminary assessment of failure modes

## 9.1.1 Dam Break

The mine water storages are all located upstream of the mining pit and any dam break flows are expected to be contained within the pit void. Sedimentation ponds 1, 3 and 4 will contain small embankments (3m or less) and can feasibly fail towards the stream order 3 tributary. There are no third part infrastructure or population at risk in the areas downstream of the Project that could be impacted from dam break. The sedimentation ponds are expected to have relatively good water quality and not expected to result in significant environmental harm in a dam break event.

## 9.1.2 Failure to Contain Overtopping

Water stored in the mine water dams (PWD, PDD and the MAW Sump) is expected to be poor quality due to contact with material stockpiles and processing, the open cut pit and groundwater inflows. Water in the mine water storages will possibly contain elevated concentrations of Copper (Cu) Molybdenum (Mo), Rhenium (Re), Sulphur (S) and Tellurium (Te) (refer Section 4.1.2). The mine water dams (PWD, PDD and the MAW Sump) all spill to the open cut mining pit which has excess storage capacity with negligible risk of overflow.

Water stored in the sedimentation ponds is expected to contain only elevated concentrations of suspended solids relative to background concentrations. The structures are designed to allow for stormwater detention to remove the majority of suspended solids before overflowing to the receiving environment (Sedimentation Pond 1 and 2 overflow to the pit). Sedimentation Ponds 1 and 3 will potentially receive seepage from the WRDs however the water quality in theses storages is not expected to exceed the WQOs in the receiving environment. An overtopping failure of these structures is not expected to have significant impacts to the receiving waters.

The Raw Water Dam will contain raw water and water transferred from the Clean Water Diversion Sump which collects clean catchment runoff. Water quality in theses dams is expected to be similar to the receiving environment (low contaminant concentrations). Overflows from the Raw Water Dam and Clean Water Diversion Sump are not expected to cause any adverse impacts to humans, third party infrastructure or the environment.

### 9.1.3 Failure to Contain Seepage

The project is located within the Carpentaria groundwater basin, a sedimentary basin that was deposited between the Cretaceous and Jurassic time periods. The Carpentaria Basin is a significant groundwater basin in regional Queensland and is a water source for local landholders and farming industries (Hydrogeologist.com.au, 2026).

The mine water dams water quality (PWD, PDD and MAW Sump) will be impacted by mining and processing activities. The water quality in these storages will contain similar contaminants present in the ore body, reagents used in the process plant and groundwater. The water quality of these storages may also be impacted by chemical reactions (oxidation) due to the PAF nature of the ore materials.

Considering the Process Water Dam and Pit Dewatering Dam will likely store larger quantities of poor-quality water for extended periods of time they potentially could have a significant impact from seepage on environmental values. Soils testing information for the Project show the deeper soils (>55cm deep) have a hydraulic conductivity less than 0.01 mm/hour or 0.24 mm/day (AARC Environmental Solutions , 2026). Based on the footprint of the Process Water Dam (2.5 ha) and Pit Dewatering Dam (8.1 ha) daily seepage volumes could reach 6 kL/day and 19 kL/day respectively.

The MAW Sump will only store small quantities of water for short duration and is located immediately within the pits groundwater drawdown extent and therefore is not expected to have a significant impact on groundwater from seepage.

Water stored in the sediment dams is expected to contain only elevated concentrations of suspended solids following rainfall events. Seepage from these structures is not expected to contain dissolved concentrations of contaminants that could have a significant impact to the receiving groundwater or surface water environment.

The Raw Water Dam and Clean Water Diversion Sump will contain clean catchment runoff water. Seepage discharges from these dams are not expected to cause any adverse impacts to humans, third party infrastructure or the environment.

## 9.2 Preliminary Consequence Category Assessment

Table 9.2 outlines the preliminary Consequence Category Assessment (CCA) outcomes for the relevant Project water infrastructure, including the likely Regulated status and the determination for this classification. The CCA results are based on the concept design, intended operational strategy, and expected contaminant concentrations of stored contents for each structure.

The adopted purpose, conceptual location, and key infrastructure details for each structure are outlined in Sections 5.3.

Whilst the preliminary CCAs have been completed for the purpose of the EIS, during detailed design of the Project water infrastructure a detailed CCA will be completed and certified as part of the design process required by the Manual.

**TABLE 9.2: PRELIMINARY CONSEQUENCE CATEGORY ASSESSMENT OUTCOMES AND DETERMINATION**

| Structure | Scenario | Consequence Category | Determination |
|---|---|---|---|
| Process Water Dam | Failure to Contain - Seepage | Significant | The structure receives process return flows from the processing plant which is likely to contain higher concentrations of contaminants associated with the ore body geochemistry. The storage however ultimately overtops to the mining pit and therefore is not likely to have significant impacts on the receiving environment water quality from failure to contain overtopping.<br><br>The Process Water Dam will likely store large quantities of poor quality water for extended periods of time which potentially could result in seepage and have a significant impact on environmental values. |
| | Failure to Contain - Overtopping | Low | |
| | Dam Break | Low | The structure has a mostly excavated impoundment with low potential for a dam break scenario. Dam break flows will however flow into the mining pit which has sufficient capacity to contain the dam break volume and prevent water entering the receiving environment. Therefore it is unlikely to have an impact on the receiving environment. |
| Pit Dewatering Dam | Failure to Contain - Seepage | Significant | The structure receives return flows from the tailings dams and pit dewatering which is likely to contain higher concentrations of contaminants associated with the ore body geochemistry and groundwater. The storage however ultimately overtops to the mining pit and therefore is not likely to have significant impacts on the receiving environment water quality from failure to contain overtopping.<br><br>The Pit Dewatering Dam will likely store large quantities of poor quality water for extended periods of time which potentially could result in seepage and have a significant impact on environmental values. |
| | Failure to Contain - Overtopping | Low | |
| | Dam Break | Low | The structure has a mostly excavated impoundment with low potential for a dam break scenario. Dam break flows will however flow into the mining pit which has sufficient capacity to contain the dam break volume and prevent water entering the receiving environment and is unlikely to have an impact on the receiving environment |
| MAW Sump | Failure to Contain - Seepage | Low | The structure receives drainage from the ore stockpile area which is likely to contain higher concentrations of contaminants associated with the ore body geochemistry. The storage however ultimately overtops to the mining pit and therefore is not likely to have significant impacts on the receiving environment water quality from failure to contain overtopping.<br><br>The MAW Sump will only store small quantities of water for short duration and is located immediately within the pits groundwater drawdown extent and therefore is not expected to have a significant impact on groundwater from seepage. |
| | Failure to Contain - Overtopping | Low | |
| | Dam Break | Low | The structure has a mostly excavated impoundment with a small storage volume with low potential for a dam break scenario. Dam break flows will however flow into the mining pit which has sufficient capacity to contain the dam break volume and prevent water entering the receiving environment and is unlikely to have an impact on the receiving environment |
| Sedimentation Pond 1 | Failure to Contain - Seepage | Low | Water stored in the sediment dams is expected to contain only elevated concentrations of suspended solids following rainfall events. Sedimentation Pond 1 will potentially receive seepage from the WRDs however the water quality is not expected to exceed the WQOs in the receiving environment. Seepage or overflows from these structures is not expected to contain dissolved concentrations of contaminants that could have a significant impact to the receiving groundwater or surface water environment.<br><br>Sedimentation Pond 1 is expected to store up to 3m of water above natural ground level and under a dam failure event would drain report to the stream order 3 tributary upstream of the proposed diversion. There is no population at risk or third-party infrastructure that could by impacted by dam break flows and the expected water quality of the sediment dams is unlikely to have a significant impact on the reviewing waterway environmental value. |
| | Failure to Contain - Overtopping | Low | |
| | Dam Break | Low | |
| Sedimentation Pond 2 | Failure to Contain - Seepage | Low | Water stored in the sediment dams is expected to contain only elevated concentrations of suspended solids following rainfall events. Seepage or overflows from these structures is not expected to contain dissolved concentrations of contaminants that could have a significant impact to the receiving groundwater or surface water environment.<br><br>Sedimentation Pond 2 has an entirely excavated impoundment with no risk of a dam break. |
| | Failure to Contain - Overtopping | Low | |
| | Dam Break | Low | |

| Structure | Scenario | Consequence Category | Determination |
|---|---|---|---|
| Sedimentation Pond 3 | Failure to Contain - Seepage | Low | Water stored in the sediment dams is expected to contain only elevated concentrations of suspended solids following rainfall events. Sedimentation Pond 3 will potentially receive seepage from the WRDs however the water quality is not expected to exceed the WQOs in the receiving environment Seepage or overflows from these structures is not expected to contain dissolved concentrations of contaminants that could have a significant impact to the receiving groundwater or surface water environment.<br><br>Sedimentation Pond 3 is expected to store up to 1.2m of water above natural ground level and under a dam failure event would drain report to the stream order 3 tributary downstream of the proposed diversion. There is no population at risk or third-party infrastructure that could by impacted by dam break flows and the expected water quality of the sediment dams is unlikely to have a significant impact on the reviewing waterway environmental value. |
| | Failure to Contain - Overtopping | Low | |
| | Dam Break | Low | |
| Sedimentation Pond 4 | Failure to Contain - Seepage | Low | Water stored in the sediment dams is expected to contain only elevated concentrations of suspended solids following rainfall events. Seepage or overflows from these structures is not expected to contain dissolved concentrations of contaminants that could have a significant impact to the receiving groundwater or surface water environment.<br><br>Sedimentation Pond 2 is expected to store up to 1m of water above natural ground level and under a dam failure event would drain report to the stream order 3 tributary downstream of the proposed diversion. There is no population at risk or third-party infrastructure that could by impacted by dam break flows and the expected water quality of the sediment dams is unlikely to have a significant impact on the reviewing waterway environmental value. |
| | Failure to Contain - Overtopping | Low | |
| | Dam Break | Low | |
| Raw Water Dam | Failure to Contain - Seepage | Low | Water stored in the Raw Water is expected to be good quality and Seepage or overflows from this structure is not expected to have a significant impact to the receiving groundwater or surface water environment.<br><br>The structure has a mostly excavated impoundment with a small storage volume with low potential for a dam break scenario. Dam break flows will however flow into the mining pit which has sufficient capacity to contain the dam break volume and prevent water entering the receiving environment and is unlikely to have an impact on the receiving environment |
| | Failure to Contain - Overtopping | Low | |
| | Dam Break | Low | |
| Clean Water Diversion Dam | Failure to Contain - Seepage | Low | Water stored in the Raw Water is expected to be good quality and Seepage or overflows from this structure is not expected to have a significant impact to the receiving groundwater or surface water environment.<br><br>The Clean Water Diversion Dam had an entirely excavated impoundment with no risk of a dam break. |
| | Failure to Contain - Overtopping | Low | |
| | Dam Break | **Low** | |

## 9.3 Tailings Storage Facilities

Design of the Projects Tailings Storage Facilities has been completed by Soil & Rock Engineering Pty Ltd (SRE) including a consequence category assessment using the same methodology from this report (Soil & Rock Engineering Pty Ltd, 2026). The design report determined the four TSF cells have a “significant” consequence category for failure to contain seepage, failure to contain overtopping and dam break. Based on this determination the TSFs were designed with the following to achieve the hydraulic performance criteria of the Manual (Soil & Rock Engineering Pty Ltd, 2026).

- High-Density Polyethylene (HDPE) Liner Dam Liner to reduce the risk of seepage.
- Design Storage Allowance (DSA) of 1.62 GL to 1.70 GL to achieve 1:100 AEP wet season containment to reduce the risk of overflow.
- Emergency Storm Storage (ESS) of 0.75m in each dam to provide containment of the 1:100 72 hour storm event.
- Spillway width of 25 m to convey a storm event rarer than the 0.1% AEP event with suitable freeboard for wave run up.

## 9.4 Flood Protection Levee

The flood protection levee that follows the proposed watercourse diversion will protect operational areas from flood ingress. The Manual determines levees or bunds that are required to provide flood immunity to operational areas in events up to and including the 0.1% AEP event are considered regulated structures (DETSI, 2025). Based on this the flood protection levee is determined to be a regulated structure

and must comply with the hydraulic design criteria for levees in the Manual. The hydraulic performance criteria for levees is to provide 0.1% AEP flood protection with additional suitable freeboard (0.5 m) which has been incorporated into its concept design.

## 9.5 Preliminary Consequence Category Assessment Summary

Table 9.3 below summarises the preliminary consequence category assessment of the structures associated with the Project. The Process Water Dam, Pit Dewatering Dam were determined to be a regulated structure due to the significant potential consequences of seepage discharges from the structures. The tailings cells were assessed as having a "significant" consequence category for the failure to contain seepage, failure to contain overtopping and dam break scenarios. The other structures were all assessed as having a preliminary consequence category of Low and are not expected to be classified as regulated structures.

A certified consequence category assessment will be completed for all structures in accordance with the Manual during detailed design. If the assessed consequence category of any structure increases to 'Significant' or 'High' during detailed design, hydraulic performance design criteria will need to be adopted in accordance with the Manual. This would include:

- Failure to Contain - Seepage: Installation of a dam liner to prevent seepage from the structure and a leak detection system.
- Failure to Contain - Overtopping: Adoption of a Design Storage Allowance (DSA) and Maximum Reporting Level (MRL).
- Dam Break: Spillway capacity upgrade for the nominated design flood event.

The PWD and PDD were classified as significant potential consequence for failure to contain seepage and therefore likely require liners to reduce the risk of seepage in accordance with the hydraulic performance criteria in the Manual. The need for a liner for the other storages will be determined during detailed design when additional information on water quality is available for the processing plant recycled water and residue bleed water. The TSF cells were assessed as having a significant consequence category for all failure modes by SRE and have incorporated the appropriate hydraulic performance criteria into the designs as discussed in Section 9.3.

**TABLE 9.3: PRELIMINARY CONSEQUENCE CATEGORY ASSESSMENT SUMMARY**

| Structure | Failure to Contain - Seepage | Failure to Contain - Overtopping | Dam Break | Regulated |
|---|---|---|---|---|
| Process Water Dam (PWD) | Significant | Low | Low | Yes |
| Pit Dewatering Dam (PDD) | Significant | Low | Low | Yes |
| MAW Sump | Low | Low | Low | No |
| Sedimentation Pond 1 | Low | Low | Low | No |
| Sedimentation Pond 2 | Low | Low | Low | No |
| Sedimentation Pond 3 | Low | Low | Low | No |
| Sedimentation Pond 4 | Low | Low | Low | No |
| Raw Water Dam | Low | Low | Low | No |
| Clean Water Sump | Low | Low | Low | No |
| TSF Cells 1 to 4 | Significant | Significant | Significant | Yes |
| Flood Protection Levee | - | - | - | Yes |

# 10. MITIGATION AND MANAGEMENT MEASURES

Surface water mitigation strategies have been discussed throughout the development of the water management system and water balance model (Sections 5 to 6) and the risk of regional flooding to the Project (Section 7). The water management system has been specifically designed to minimise impacts to the surrounding environment and water resources in the region.

This section summarises how the mitigation strategies address the impacts outlined in Section 7.4. The water management system infrastructure has been developed to achieve the water resource and water quality objectives of:

- Equitable, sustainable, and efficient use of water resources.
- Maintenance of environmental flows, water quality, in-stream habitat diversity and naturally occurring inputs from riparian zones (including groundwater dependent ecosystems) support the long-term maintenance of the ecology of aquatic biotic communities.
- The condition and natural function of water bodies are maintained including the stability of beds and banks of watercourses.
- Protecting the environmental values of waters.
- Protecting the environmental values of wetlands and groundwater dependent ecosystems (GDEs), and
- Protecting the environmental values of groundwater and any associated surface ecological systems.

A range of management strategies has been proposed to mitigate any negative environmental impacts on water resources and water quality, and to assist in meeting the water quality objectives and protection of identified environmental values. The proposed management strategies and contingency measures are summarised in Table 10.1 against the management hierarchy and intent of the EPP (Water).

**TABLE 10.1: MANAGEMENT AND MITIGATION STRATEGIES**

| Mitigation/Monitoring Measure | Function |
|---|---|
| Diversion of clean catchments around disturbed areas | Diverting clean catchment around the Project reduces the risk of overwhelming the mine water storage inventory and the risk of an uncontrolled overflow as well as reduces impact to streamflow in the receiving waterways. The proposed implementation of clean catchment diversions over the Project life is expected to mitigate the risk of an uncontrolled mine water overflow and minimise streamflow impacts downstream of the Project. |
| Diversion of stream order 3 Tributary | The diversion is used to redirect the stream order 3 waterway that will be intercepted by the mining pit, around the operations. The stream order 3 Tributary diversion is designed in accordance with the DNRME guidelines for permanent watercourse diversions to maintain the existing hydrology, hydraulic, geomorphic and ecological features of the existing waterway. The diversion will remain at closure and be monitored over the Project life and into closure in accordance with the standard EA conditions for watercourse diversions. |
| Erosion and sediment controls for treatment of sediment runoff | The erosion and sediment control strategy has been developed to prevent erosion through minimising disturbance and drainage control structures. Where minimising disturbance is not possible, sediment basins have been designed to contain sediment runoff from disturbed areas including rehabilitated areas until they are suitably established.<br><br>Sediment and erosion control structures are designed in accordance with relevant guidelines to ensure adequate catchment and treatment of suspended solids in disturbed catchment runoff and minimise impacts from excessive sediment loads on the receiving waterways. |
| Design containment standard of mine affected water | Mine affected water storages have been designed such that the standard of containment for all water infrastructure containing mine water meets the environmental objectives for regulated structures containing contaminants from the DEHP Guideline for Structures which are Dams or Levees Constructed as part of Environmentally Relevant Activities<br><br>The dams have been positioned up slope of the mining pit with all potential overflows from mine water storages and tailings cells reporting to the pit sump. The mining pit has excess |

| Mitigation/Monitoring Measure | Function |
|---|---|
| | storage capacity to contain any overflow volumes. The site water balance model shows that there is no mine water accumulation in repeat wet years. |
| Treatment and release of waters to facilities, land or waters. | Sediment dam water quality will be monitored regularly to validate expected water quality of runoff from disturbed areas and confirm that the proposed operating strategy achieves the desired water quality outcomes.<br><br>Monitoring of the receiving environment will be undertaken during operations as well as during and after all uncontrolled releases from sediment dams. Outcomes of the monitoring data will be used to identify any potential for environmental harm and provide recommendations for improvements to erosion and sediment control measures. |
| | Review of the water quality data for water storages will occur as part of updates to the Water Management Plan, while surface water quality data for the receiving waterways will be reviewed as part of the Receiving Environment Monitoring Program (REMP) (see Section 10.2).<br><br>The reviews will identify any deviations from assumed or predicted water quality and whether the current management controls are appropriate to meet water quality objectives for environment values within the receiving environment.<br><br>In an unlikely event of a non-compliant water release from the mine water management system, a review of the system operation and performance will be conducted by a suitably qualified and experienced person including recommendations for any corrective action and changes to management controls if required. |
| Flooding | Flooding risks and potential impacts for the project have been assessed using detailed combined hydrologic and hydraulic model with modelled design flows validated to regional flood estimation techniques. The flooding assessment identified there are localised flood impacts in rare flood events however there is limited receptors associated with the flooding changes. The flood impacts also show there is negligible change in flood velocity in the affected waterways and not cause further erosion that would occur without the Project.<br><br>Review of the flood model and flooding risks associated with the Project can be re-assessed following capture of streamflow monitoring data captured of significant flood events in the Borer River, Warrigal Creek and the stream order 3 tributary. |
| Spill response and containment | Appropriate procedures, containment and spill control measures will be implemented at appropriate locations where the transportation and loading, as well as storage of materials occurs onsite. The design and management of all required fuels and hydrocarbons will ensure there are effective means of secondary containment to prevent or minimise releases to the environment from any fuel and oil storage onsite. |
| Recycle, re-use or treat waste waters or contaminants.<br><br>Reduction in stored inventory through preferential process use | Water dewatered from the pit and recovered from the tailings cells will be used preferentially for supply to Project water demands to reduce mine water inventories and accumulation of contaminated water in the water management system. |
| | Water contained within sediment dams on site will be used wherever possible for dust suppression and other operational demands when mine water inventories are low. |
| Final landform design | The mine plan and final landform have been developed to allow complete backfill of the mining pit with a final elevation that replicates the existing topography level and drainage. This allows the entire Project area to be freely draining with no ongoing water management risks or potential impacts post closure. |
| Water management system design | Water management systems have been designed using water balance models to determine the containment measures to satisfy the requirements for water quality and overflow risks as per Section 5. The mine water containment has been conservatively designed so overflows are contained in the mining pit and result in no mine water discharges to the receiving environment. |

| Mitigation/Monitoring Measure | Function |
|---|---|
| Water Monitoring Plan with reporting and corrective actions | A water monitoring plan will be developed for the Project which will include corrective actions for overflows and managing water quality as per Section 10.2 below. The monitoring plan will be developed using the surface monitoring locations presented in Section 10.2.1.1 and sampling of all WQOs for the project identified by the surface water assessment (this report), geochemical assessment (RGS, 2026) and groundwater assessments (Hydrogeologist.com.au, 2026). The monitoring plan will cover monitoring requirements for surface water, groundwater, sediment and fish passage and include procedures for routine monitoring and event-based monitoring as required by the future Environmental Authority conditions for the Project. |
| Hazardous material storage plans | Where hazardous materials are required, storage of these materials will be conducted as per Item 2 in the performance outcomes in Table 3.2. This includes but is not limited to secondary containment to prevent releases to the environment and secure containers to prevent removal of containers from the site by a flood event. |
| Water management plan | A water management plan will be developed prior to commencement of the project as per Section 10.3 below. This will examine and address all issues relevant to the importation, generation, use, and management of water for the Project in order to minimise the quantity of water that is contaminated and the risk of environmental harm from the Project.<br>The water management plan will be updated annually and include a review of the water management system performance and validation of models used to assess the system performance (refer Section 10.1). Annual updates will also include revaluation of risks over a short and long-term outlook using relevant models and identify any mitigation measures to ensure the ongoing risk of environmental harm is minimised. |
| Erosion and sediment control plan | An erosion and sediment control plan will be prepared in accordance with EA requirements to manage erosion and sediment control measures implemented in association with the Project. This will be as detailed in Section 10.4 below. |

## 10.1 Water Balance Model Update and Review Program

The operational water balance model developed for the Project will receive continual updates and validation throughout the Project life as more data and information become available. The updated model will then be used to review the water management system performance against what was determined for the surface water impact assessment.

The following data and information will be collected for the duration of the Project to inform the regular updating and validation of the operational water balance model:

- Water inventory of the mine water dams and sediment dams (dam water level).
- Metered water movements to and from the processing plant.
- Decant water volumes from the tailings cells.
- Water quality in the mine water storages and sediment dams.
- Pumped flow meter data for major transfer and truck fill points.
- Aerial survey of the mine topography to review catchment area and land use development.
- Daily rainfall.

The model will be validated (or calibrated) to recorded dam water inventories captured from the monitoring activities described above. The update and review of the model will be used to assess validity of the following model parameters, inputs, and assumptions:

- Surface water runoff parameters for the various site land uses.
- Pumpable groundwater volumes reporting to the mining pit (using pit dewatering information).
- Project water demands.
- Water losses and recovery through the tailings cells.
- The classification of storages using water quality information (sediment or mine affected storages).

## 10.2 Water Quality Management and Monitoring

A water monitoring program is one of the key controls for the ongoing performance assessment of the site and identification of potential impacts. The aim of the water monitoring program is to identify and quantify potential impacts on the receiving waters during operations and assess the adequacy of or improvements to the mitigation measures. The purpose of the water monitoring program is to:

- Assess background water quality to develop a baseline for assessing impacts.
- Track changes in water quality over time.
- Guide management actions and controls for mitigating impacts.
- Demonstrate effectiveness of controls.
- Support regulatory compliance.

The water monitoring program will be developed based on the receiving waters environmental values and the potential impacts of the Project determined from the EIS surface water assessment (this report) and the groundwater assessment (Hydrogeologist.com.au, 2026). The WMP will provide the following:

- Identification of environmental values (EVs) for receiving waters that could be potentially affected by water releases from the Project.
- Measurable indicators and associated water quality objectives (WQOs) to maintain or enhance the identified EVs.
- Suitable test sites within the receiving waters that could be potentially impacted by water releases (downstream monitoring locations).
- Suitable upstream control sites to establish background conditions for assessment of potential impacts at the downstream monitoring locations.
- Methods for assessing impacts at the downstream sites against the WQOs and upstream monitoring locations (control sites).

The monitoring strategy for surface water is outlined in the following sections, and the groundwater monitoring is outlined in the groundwater assessment (Hydrogeologist.com.au, 2026). The monitoring plan will be updated based on the collection and analysis of data captured under this plan, in conjunction with ongoing surface water and groundwater monitoring as the Project progresses towards operations. It is also expected the WMP will form the initial basis for the Project's Receiving Environment Monitoring Program (REMP) and therefore has been developed in accordance with the REMP development guidelines (DESI, 2024).

### 10.2.1 Surface Water Monitoring

Surface water monitoring will be undertaken at locations upstream and downstream of the Project as well as water storages. The monitoring data will be used to:

- Continue to collect local water quality and streamflow data.
- Detect and identify any causes in changes from baseline conditions.
- Develop a statistically sufficient dataset of baseline local water quality data to produce site-specific WQOs.
- Identify any impacts and corrective actions required; and,
- Assess the performance of the water management system and the effectiveness of any mitigation and management measures.

Water monitoring for the Project has to date been constrained by the remote location of the Project area and the highly ephemeral nature of the waterways. Currently, two (2) rounds of water quality sampling have been collected which is not sufficient to define site specific water quality objectives. Six (6) rising stage samplers have recently been installed across the Project area to assist with capturing water quality during high flow events when access is constrained. Sampling will continue during the EIS process for the Project to define site specific water quality objectives.

Monitoring will then continue for the construction, operation and decommissioning stages of the Project to identify potential water quality impacts. The water quality indicators (as listed in Section 10.2), will be measured against the WQOs for the receiving waterway throughout the construction, operation and decommissioning stages of the Project.

Any required changes or updates to the ongoing water quality and streamflow monitoring for the Project site will be assessed and documented through the development and ongoing updates to the monitoring plan. The plan will also outline the routine assessment, reporting mechanisms and auditing of water quality data and WQO, as well as mitigation measures and triggers for any corrective actions.

### 10.2.1.1 Surface Water Monitoring Locations and Frequency

Proposed surface water monitoring locations are summarised in Table 10.2 and shown in Figure 10.1. Monitoring locations have been located such that there are sampling locations both upstream (reference or control) and downstream of the site and its potential impacts. Upstream locations are proposed on the local stream order 3 tributary and Warrigal Creek. Monitoring locations upstream of the site have been selected such that they can transition into a Receiving Environment Monitoring Program (REMP) during the operational phase of the Project.

The downstream monitoring stations have been located on the local stream order 3 tributary and Warrigal Creek/Borer River at locations downstream of the overflow pathways from the site storages. The downstream waterways are highly braided and therefore two (2) monitoring locations have been selected to allow assessment of potential impacts in the anabranch and main channel of Warrigal Creek/Borer River. Additional or alternative monitoring locations (e.g., other water storages on site and/or surrounding environmental features) will be developed as part of site-specific plans as required. This will include dedicated sites to monitor channel and floodplain geomorphology throughout the life of the mine (e.g., sediment dam discharge locations).

It is proposed to continue monitoring during the EIS process for the Project using the six (6) rising stage samplers and grab samples during flow events when possible. Once the Project is operational it is proposed to undertake monthly sampling of the surface water locations.

**TABLE 10.2: PROPOSED SURFACE WATER MONITORING LOCATIONS**

| Monitoring Location (ID) | Easting (GDA2020) | Northing (GDA2020) | Proposed Sampling | Purpose |
|---|---|---|---|---|
| **Upstream Locations** | | | | |
| W1 (Stream Order 3 Tributary) | 639620 | 7912130 | Water Quality and Sediment | Monitor water quality of flows upstream of the Project to assess changes in quality and potential impacts to downstream waterways and sediment.<br><br>Monitor river flow rate to determine mixing potential and identify changes in water quality with flow conditions. |
| W6 (Warrigal Creek) | 625796 | 7917437 | Streamflow, Water Quality and Sediment | |
| W7 (Stream Order 3 Tributary) | 632395 | 7916667 | Water Quality and Sediment | |
| W8 (Stream Order 3 Tributary) | 630425 | 7918381 | Streamflow, Water Quality and Sediment | |
| **Downstream Locations** | | | | |
| W3 (Stream Order 3 Tributary) | 626637 | 7919048 | Water Quality and Sediment | Monitoring of the water quality in the stream order 3 waterway to determine potential impacts to water quality in the local waterways without influence of dilution with the major waterway streamflow (Warrigal Creek/Borer River). |
| W4 (Warrigal Creek) | 624366 | 7919486 | Water Quality and Sediment | To allow assessment of potential water quality impacts downstream of the confluence with the local tributary and an anabranch of Warrigal Creek/Borer River which has more dilution potential with the major waterway streamflow (Warrigal Creek/Borer River). |
| W5 (Warrigal Creek) | 621982 | 7920554 | Water Quality and Sediment | To allow assessment of potential water quality impacts downstream of the confluence of the local tributary with the major waterway main channel (Warrigal Creek/Borer River). |

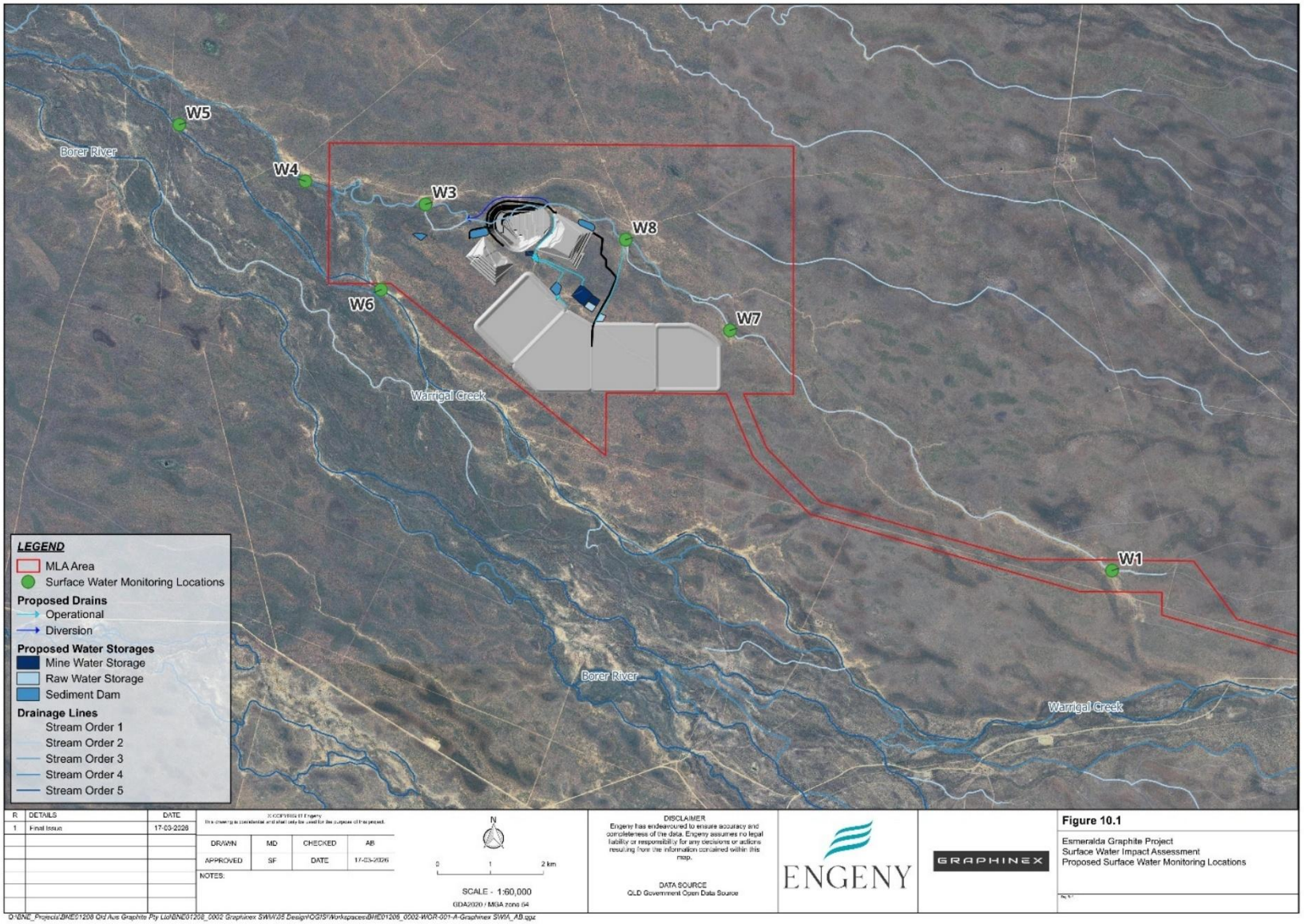



**Figure 10.1: Proposed Surface Water Monitoring Locations**

### 10.2.1.2 Streamflow Monitoring

Streamflow gauging will be required during the operational phase of the Project to assess impacts and to allow for ongoing refinement of surface water models. It is proposed to monitor streamflow in the local stream order 3 tributary as well as Warrigal Creek/Borer River. Continuous streamflow monitoring is not required as the Project does not propose controlled releases.

### 10.2.1.3 Water Storage Monitoring

Routine sampling of the site water storages will be conducted monthly to track water quality trends in the storages and allow review of risks to environmental values. Sampling of water storages will also be completed during overflow events to determine the concentration and quantity of contaminants to allow investigation into the potential for environmental harm. Water storages will be sampled for the water quality parameters presented in the following section. Water levels in the storages will be monitored routinely (monthly) using a water level gauge board as part of other sampling or maintenance activities.

### 10.2.1.4 Sampling Methods and Parameters

Water quality monitoring parameters are proposed for the baseline surface water monitoring program in Table 10.3. These parameters form the basis for ongoing operational monitoring of physio-chemical parameters and contaminants (e.g. metals). Water quality monitoring should be undertaken using a combination of laboratory and in situ sampling and in accordance with the Queensland Monitoring and Sampling Manual (DES, 2018).

During the operational phase of the Project, the surface water sampling frequency will be dictated and outlined within environmental approvals and/or site-specific plans. To best meet the Queensland Monitoring and Sampling Manual minimum sample quantity requirements, it is recommended the ongoing monitoring program sample frequency is monthly for discrete water quality parameters. Parameters such as streamflow, pH and electrical conductivity are generally monitored continuously (i.e., real time/in situ). It is recommended that monitoring be conducted for a period of at least one year prior to any statistical analysis being undertaken.

Water quality parameters will be measured against the WQOs and where they are not met, investigations will be undertaken to determine the cause and any required corrective actions.

WQOs associated with the water quality monitoring parameters will be able to be reviewed for the site once a statistically sufficient dataset of baseline local water quality data has been obtained in accordance with QWQG requirements. This review of local water quality data and any potential variation of WQOs will allow for local background correction if required, which will assist the Project develop adaptive and suitable management measures and responses.

**TABLE 10.3: PROPOSED SURFACE WATER MONITORING PARAMETERS**

| Monitoring Category | Indicator |
|---|---|
| Surface Water - Physio-chemical | pH |
| | Salinity (Electrical Conductivity (EC)) |
| | Dissolved Oxygen (DO) |
| | Temperature |
| | Turbidity |
| | Sulfate |
| | Total Suspended Solids |
| | Total Dissolved Solids |
| | Nitrogen (Total N, Oxidised N, Kjeldahl Nitrogen, Ammonium) |
| | Phosphorus (Total P, Filterable Reactive Phosphorus) |
| | Dissolved Organic Carbon |
| Surface Water - Toxicants | Metals and Metalloids (As, Al, Ag, B, Ba, Be, Cd, Co, Cr, Cu, Fe, Hg, Mn, Mo, Pb, Ni, Se, U, V, Zn) |
| | Calcium, Magnesium, Potassium, Sodium, Chloride, Fluoride |

| Monitoring Category | Indicator |
|---|---|
| | Total Recoverable Hydrocarbons and Total Petroleum Hydrocarbons |
| Surface Water - Biological Indicators | Microalgal (Chlorophyll-a) |
| Sediment and Soil | Particle Size Distribution and soil classification |
| | EC |
| | pH |
| | Moisture Content |
| | Metals and Metalloids (As, Al, Ag, B, Ba, Be, Cd, Co, Cr, Cu, Fe, Hg, Mn, Mo, Pb, Ni, Se, U, V, Zn) |
| | Chloride, Fluoride, Calcium, Sodium |
| | Nitrogen (Total N, Oxidised N, Kjeldahl Nitrogen, Ammonium) |
| | Phosphorus (Total P, Filterable Reactive Phosphorus) |
| | Total Recoverable Hydrocarbons and Total Petroleum Hydrocarbons |

## 10.3 Water Management Plan

The primary purpose of a mining project water management plan is to examine and address all issues relevant to the importation, generation, use, and management of water on a mining project in order to minimise the quantity of water that is contaminated and released by and from the project (DEHP, 2012). A water management plan detailing site water management infrastructure, maintenance requirements and containment performance standards will be prepared in accordance with EA conditions. This document will provide a structure for achieving the adequate protection of EVs by achieving WQOs (as identified in Section 3.2 and 3.3). The water management plan will document the likelihood and consequence of impacts to EVs within and around the Project as well as the management controls in place to reduce risks to an acceptable level.

The water management plan is expected to address the following aspects of site water management:

- Background information and description of site activities relevant to water management including:
  - Identified environmental values and water quality objectives of the receiving waterways.
  - Description of receiving waterways.
  - Description of the local and regional groundwater aquifers.
  - Water quality monitoring of the receiving waterways and groundwater aquifers used to establish baseline conditions.
  - Description of current and historical mining and associated activities.
  - Site climate conditions.
- Description of contaminant sources for the different water sources and uses associated with the project.
- Water management system including:
  - Objectives of water management system.
  - Site storages details and locations.
  - Transfer infrastructure.
  - Identification of water storages.
  - Proposed actions to maintain water infrastructure.
  - Actions required to maintain required freeboard in containment structures.
- Site water balance details including:
  - Details of major water inflow and outflow mechanisms.
  - Water balance model development including:
    - Details of calibration of runoff parameters.
    - Key input assumptions.

  - Water balance forecast results.

- Details of water quality monitoring plan and monitoring outcomes.
- Emergency and contingency planning.
- Assignment of responsibility for water management plan actions.

The water management plan will be reviewed annually and updated as required by EA conditions, typically prior to the wet season (November). Substantive updates will be undertaken when material changes occur to mine layout, water balance, or receiving environment conditions. This will enable identification of changes to the water management system and the site water balance and allow implementation of mitigation measures to prevent impacts to Environmental Values of the receiving environment. The update process will identify risks associated with the water management system and feedback to infrastructure and operational management improvements.

## 10.4 Erosion and Sediment Control Plan

An erosion and sediment control plan (ESCP) detailing design and maintenance requirements will be prepared in accordance with EA requirements, to manage erosion and sediment control measures implemented in association with the Project.

Management of erosion and sediment control will be undertaken in accordance with the Best Practice Erosion and Sediment Control (BPESC) guideline (IECA, 2018), which provides guidance on sediment basin sizing and operation. Further details on the sizing of sediment basins for the Project are provided in Section 5.3.2.1. The ESCP will define the following aspects of the erosion and sediment control requirements for the Project:

- Limiting disturbance to prevent sediment runoff generation.
- Erosion control measures such as revegetation and rehabilitation, aimed to prevent soil erosion from disturbed areas.
- Documenting soil types and disturbed catchment areas on the site and their potential for sediment generation.
- Design and management of drainage control measures to prevent erosion from concentrated flows and manage the flow of both clean water and sediment runoff.
- Erosion and sediment control requirements associated with temporary disturbance and construction activities.
- Design and management of sediment dams including dewatering and desilting requirements and the use of suitable construction materials.
- Water quality testing of sediment dams to assess their performance and inform continual improvements of the erosion and sediment control system.

## 10.5 Receiving Environment Monitoring Program

A receiving environment monitoring program (REMP) will be developed to monitor, identify, and assess any impacts to the EVs, water quality and flows within the receiving environment over the Project life. The REMP will require annual monitoring and reporting and analysis of long-term trends and potential impacts. Outcomes of the monitoring programs will inform further mitigation measures and remediation of existing mitigation measures as required.

The REMP will be developed to include the following:

- Background information and descriptions of:
  - Site location and history.
  - Catchment and watercourses.
  - Regional and local land use.
  - Local climate conditions.
  - Receiving environment EVs and WQOs.
- Monitoring aspects which are expected to include stream flow, surface water and sediment quality, ecology, and habitat.
- Monitoring methodology will be developed in accordance with the Queensland Monitoring and Sampling Manual (DES, 2018).
- Monitoring locations and selection of sites including consideration of temporal variation.

# 11. QUALIFICATIONS

a) In preparing this document, including all relevant calculation and modelling, Engeny Water Management (Engeny) has exercised the degree of skill, care and diligence normally exercised by members of the engineering profession and has acted in accordance with accepted practices of engineering principles.

b) Engeny has used reasonable endeavours to inform itself of the parameters and requirements of the project and has taken reasonable steps to ensure that the works and document is as accurate and comprehensive as possible given the information upon which it has been based including information that may have been provided or obtained by any third party or external sources which has not been independently verified.

c) Engeny reserves the right to review and amend any aspect of the works performed including any opinions and recommendations from the works included or referred to in the works if:

   i) Additional sources of information not presently available (for whatever reason) are provided or become known to Engeny; or

   ii) Engeny considers it prudent to revise any aspect of the works in light of any information which becomes known to it after the date of submission.

d) Engeny does not give any warranty nor accept any liability in relation to the completeness or accuracy of the works, which may be inherently reliant upon the completeness and accuracy of the input data and the agreed scope of works. All limitations of liability shall apply for the benefit of the employees, agents and representatives of Engeny to the same extent that they apply for the benefit of Engeny.

e) This document is for the use of the party to whom it is addressed and for no other persons. No responsibility is accepted to any third party for the whole or part of the contents of this Report.

f) If any claim or demand is made by any person against Engeny on the basis of detriment sustained or alleged to have been sustained as a result of reliance upon the Report or information therein, Engeny will rely upon this provision as a defence to any such claim or demand.

g) This Report does not provide legal advice.

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# APPENDIX A: EXISTING FLOOD RESULTS

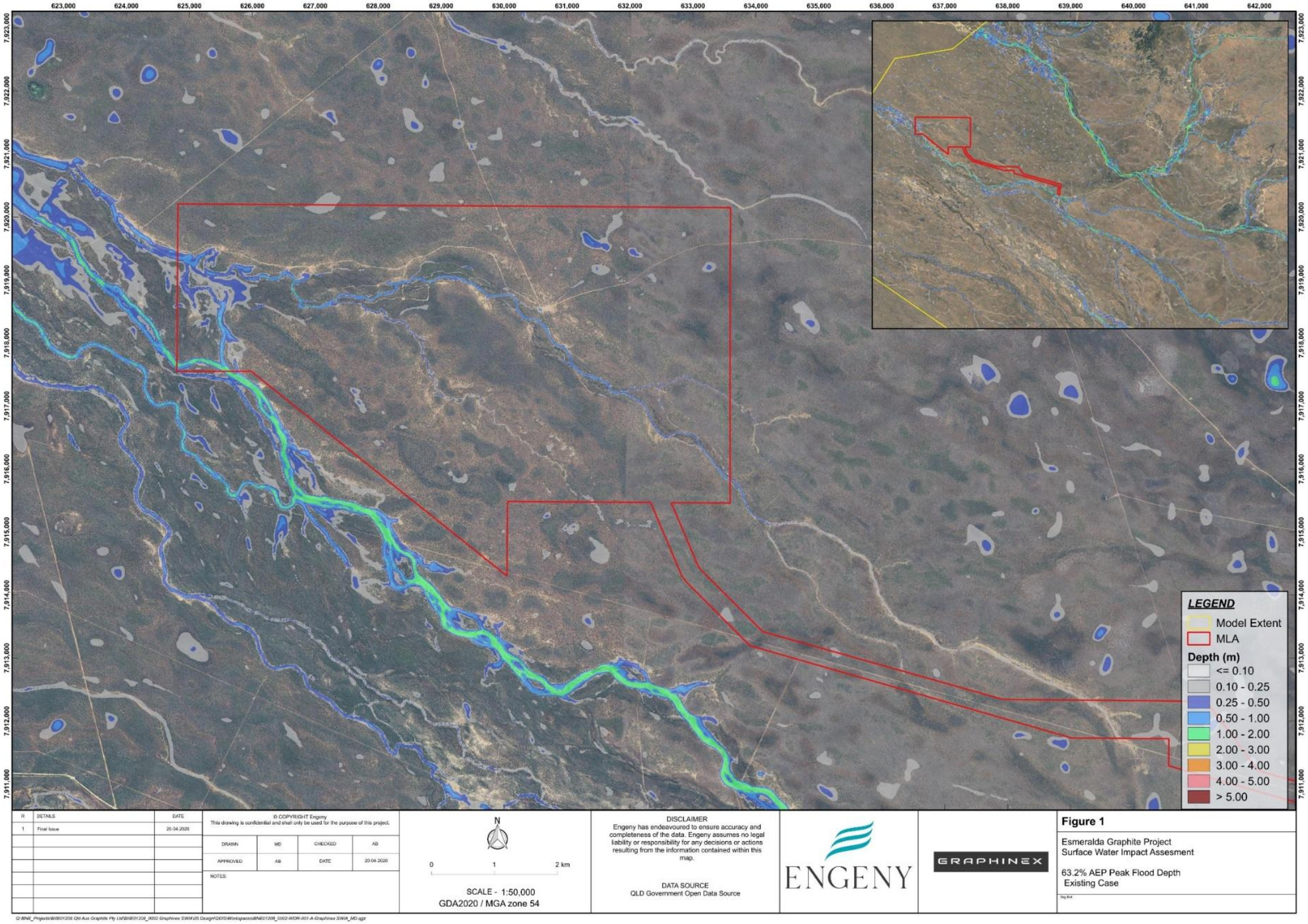



**FIGURE A.1: EXISTING CASE 63.27% AEP PEAK FLOOD DEPTH MAP**

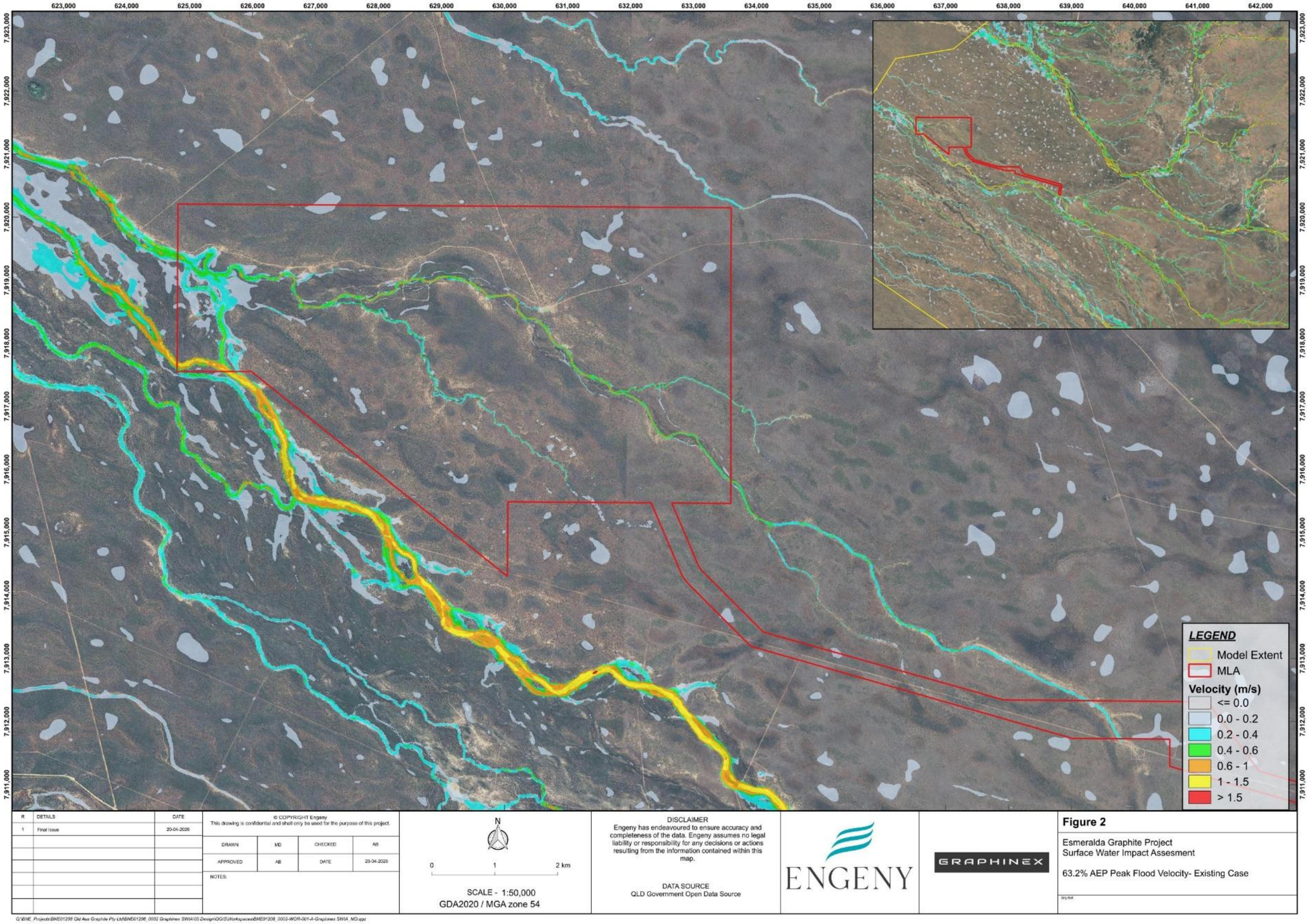



**FIGURE A.2: EXISTING CASE 63.27% AEP PEAK FLOOD VELOCITY MAP**

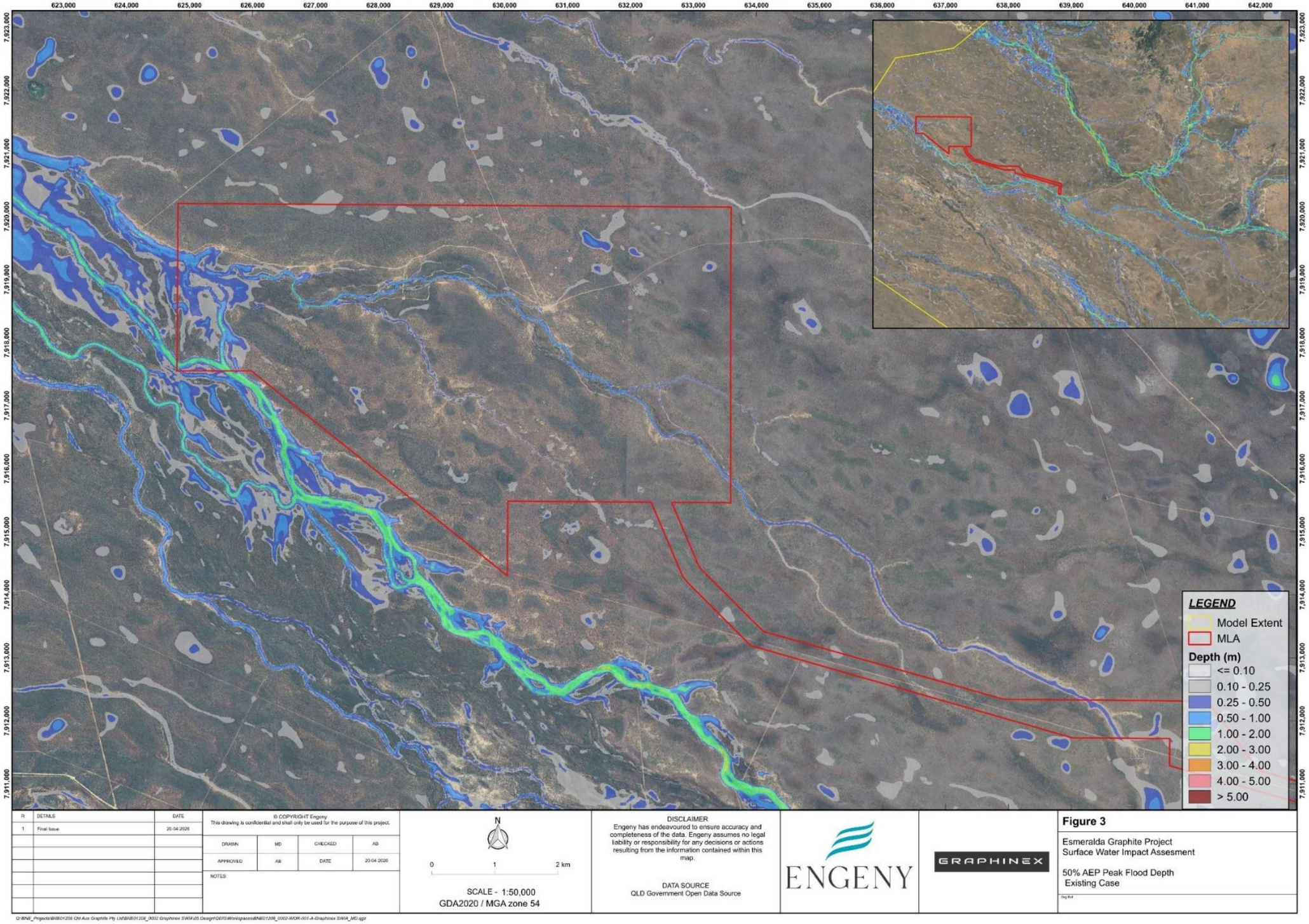



**FIGURE A.3: EXISTING CASE 50% AEP PEAK FLOOD DEPTH MAP**

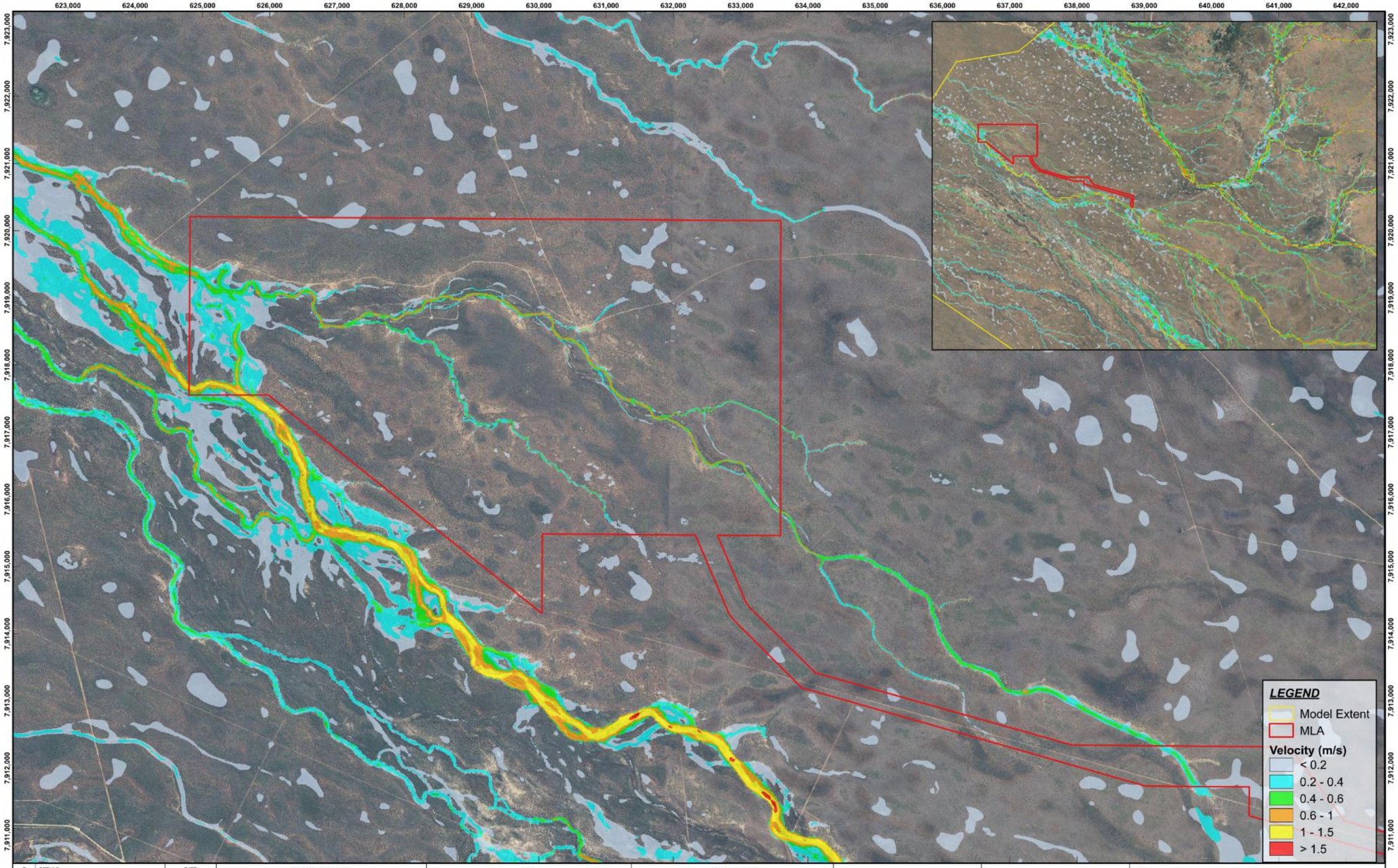



**FIGURE A.4: EXISTING CASE 50% AEP PEAK FLOOD VELOCITY MAP**

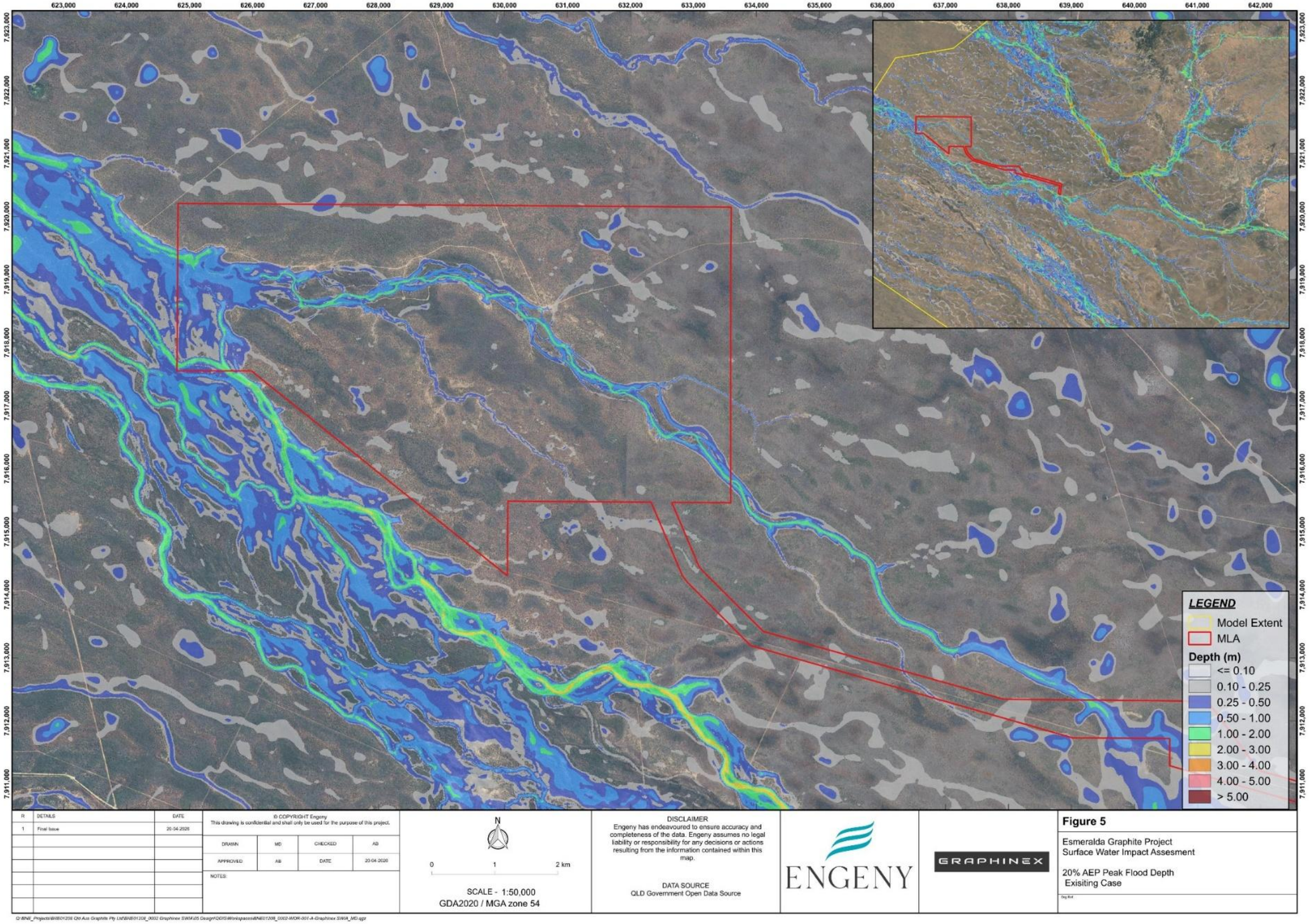



**FIGURE A.5: EXISTING CASE 20% AEP PEAK FLOOD DEPTH MAP**

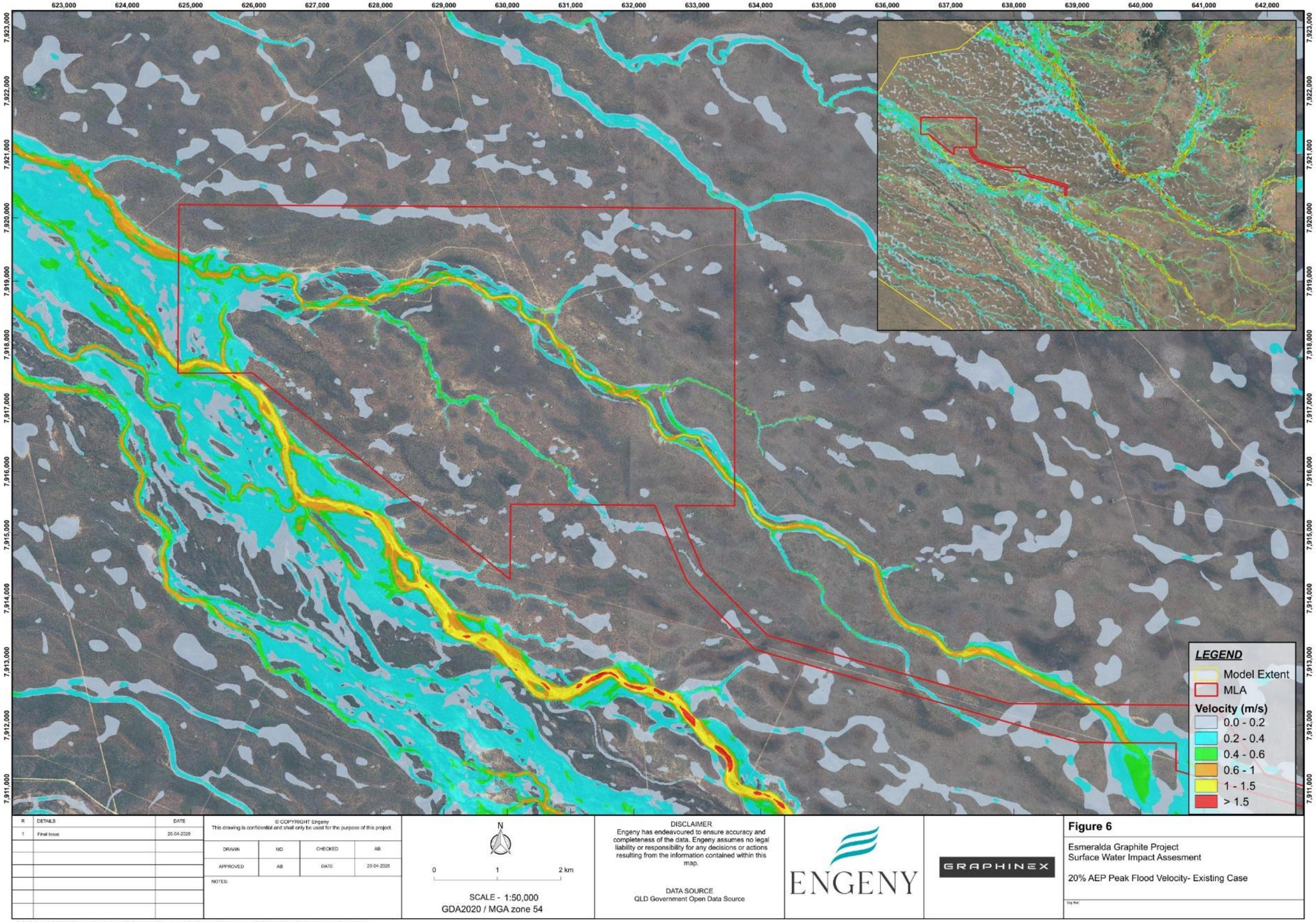



**FIGURE A.6: EXISTING CASE 20% AEP PEAK FLOOD VELOCITY MAP**

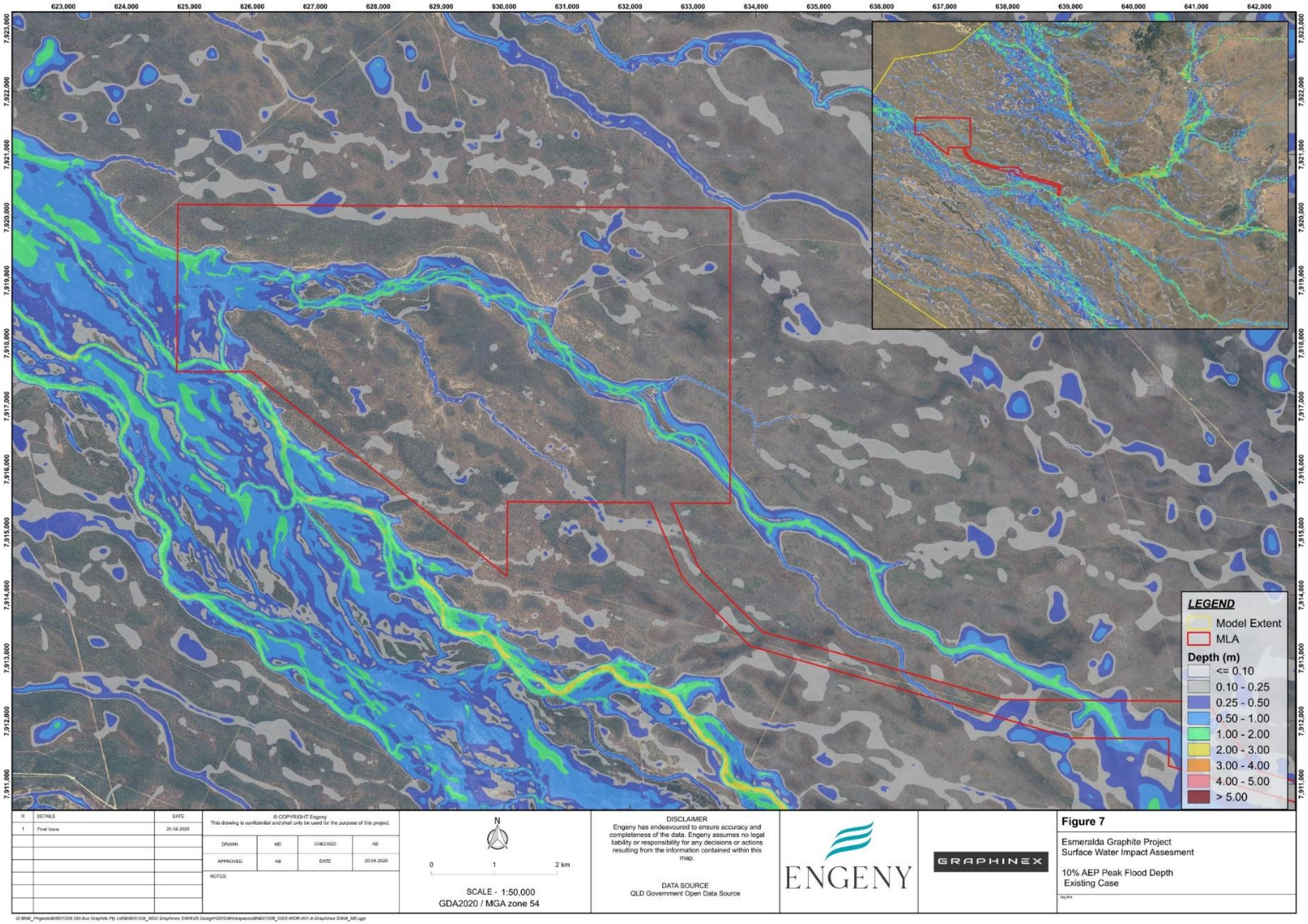



**FIGURE A.7: EXISTING CASE 10% AEP PEAK FLOOD DEPTH MAP**

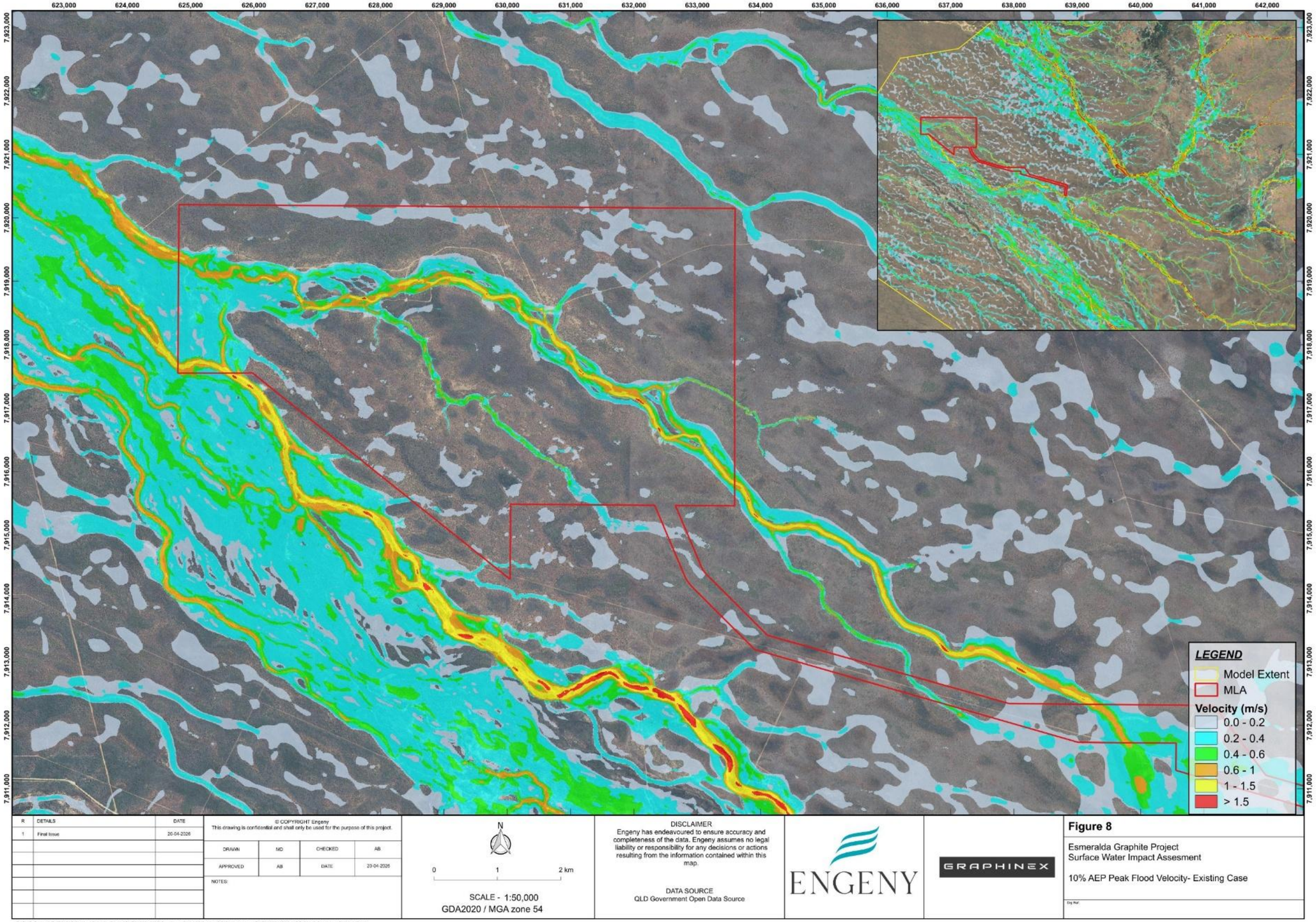



**FIGURE A.8: EXISTING CASE 10% AEP PEAK FLOOD VELOCITY MAP**

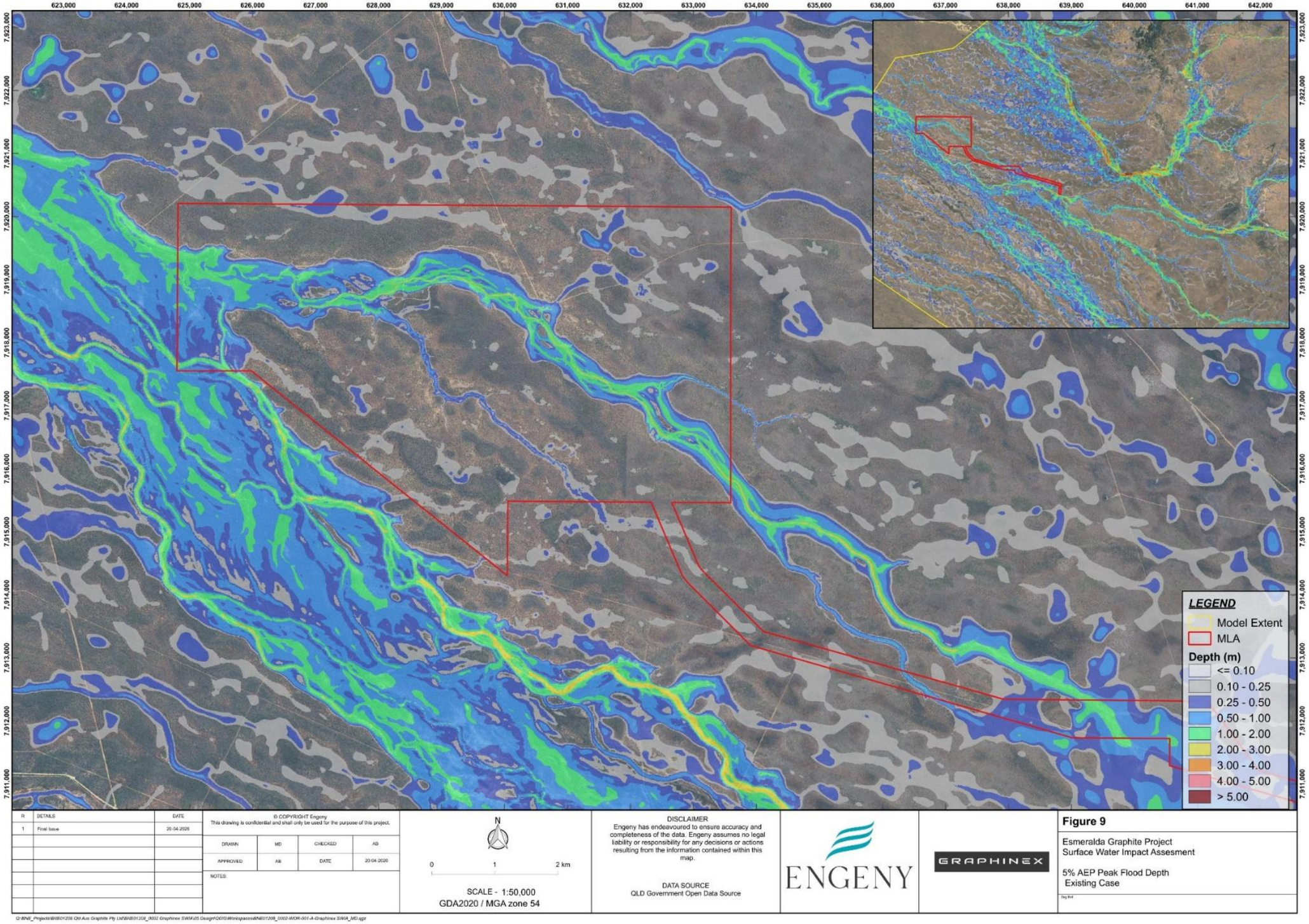



**FIGURE A.9: EXISTING CASE 5% AEP PEAK FLOOD DEPTH MAP**

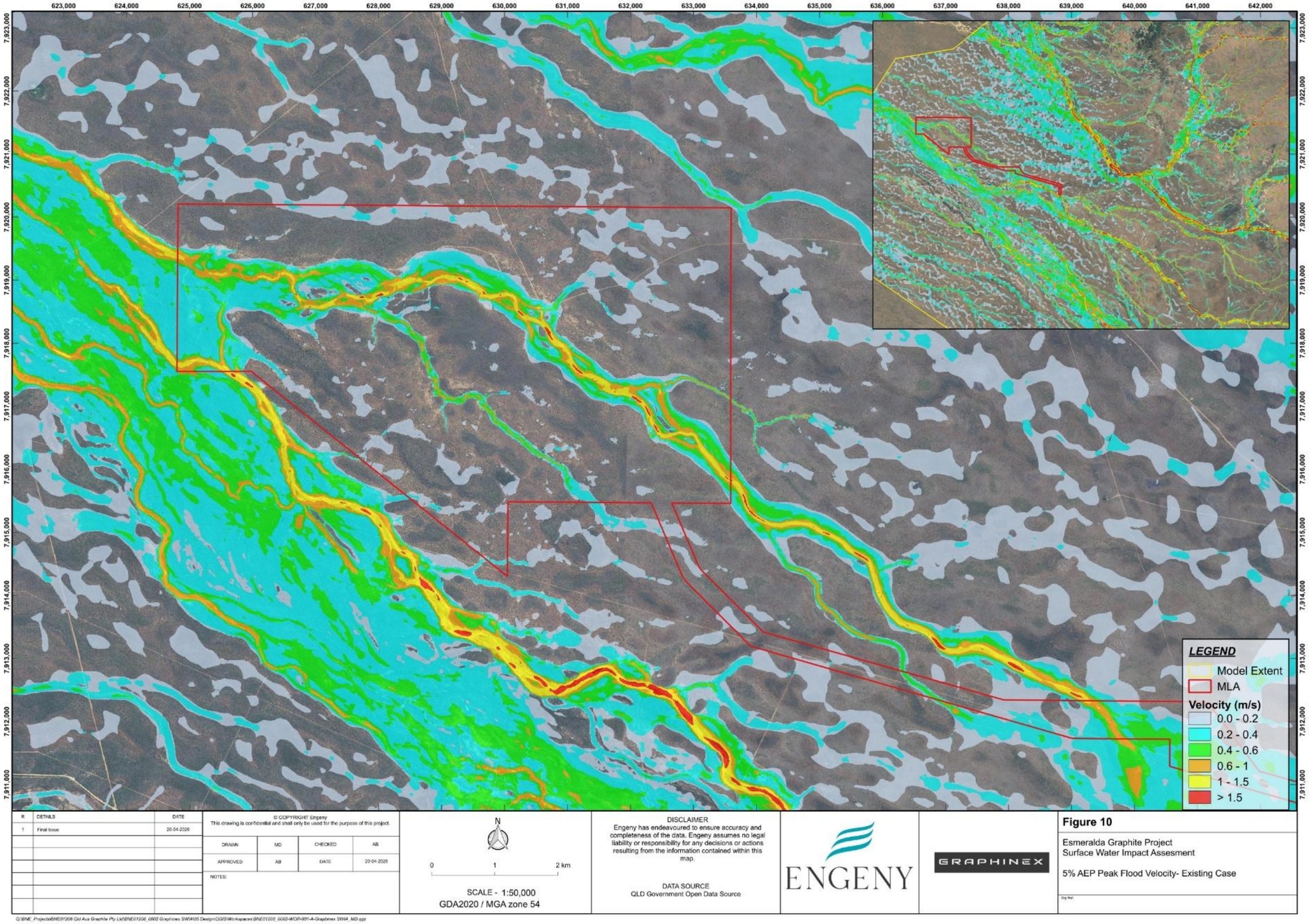



**FIGURE A.10: EXISTING CASE 5% AEP PEAK FLOOD VELOCITY MAP**

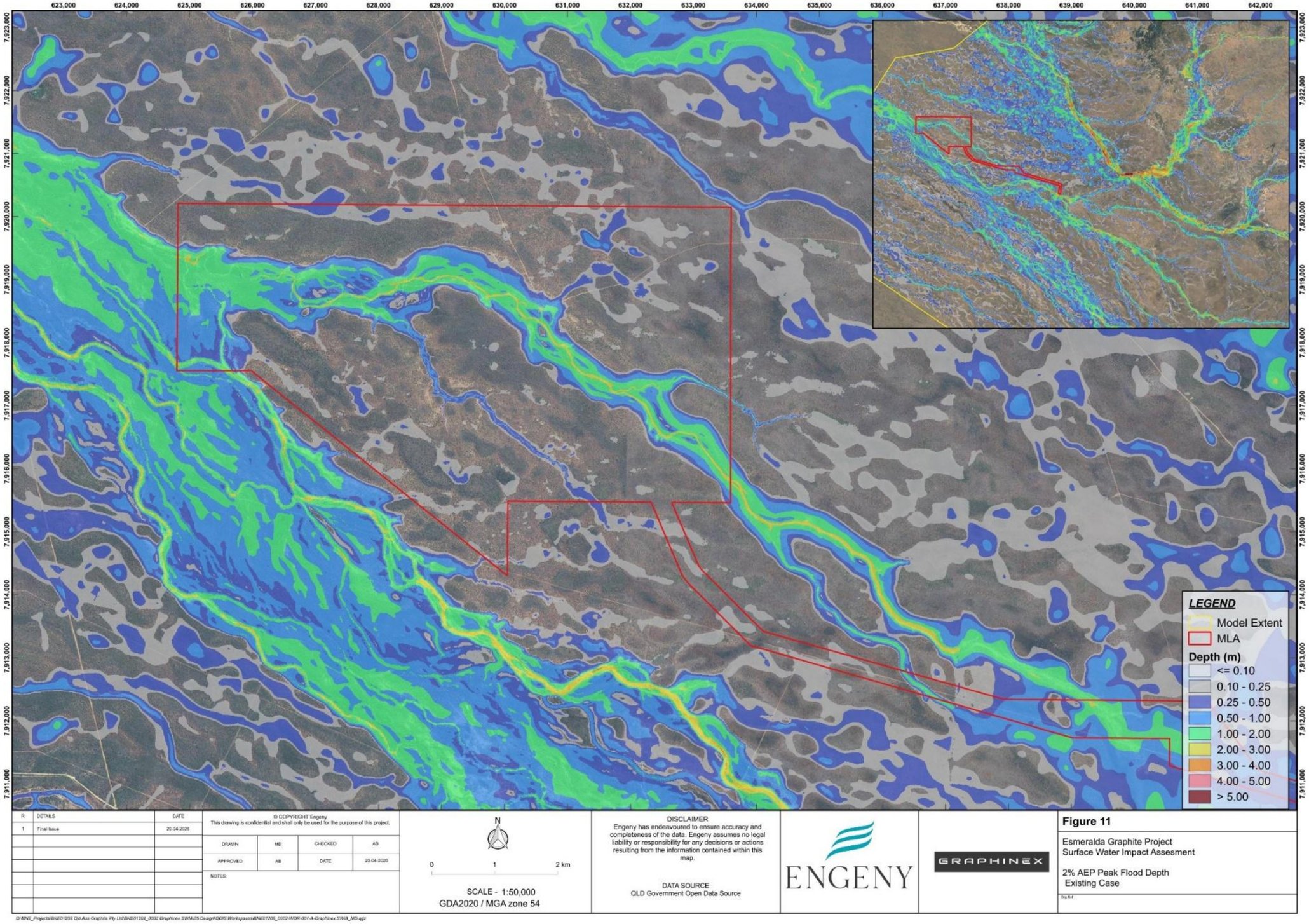



**FIGURE A.11: EXISTING CASE 2% AEP PEAK FLOOD DEPTH MAP**

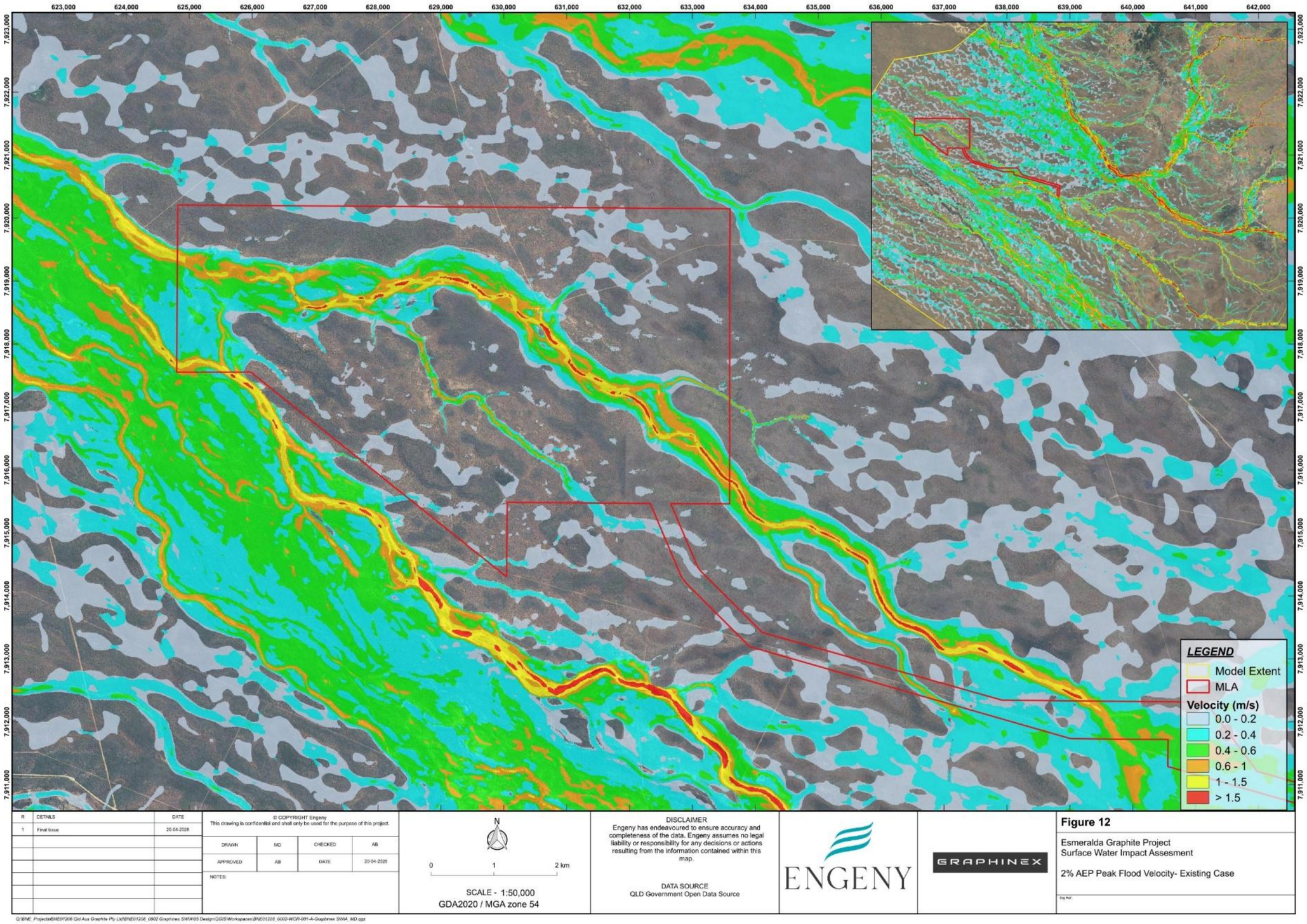



**FIGURE A.12: EXISTING CASE 2% AEP PEAK FLOOD VELOCITY MAP**

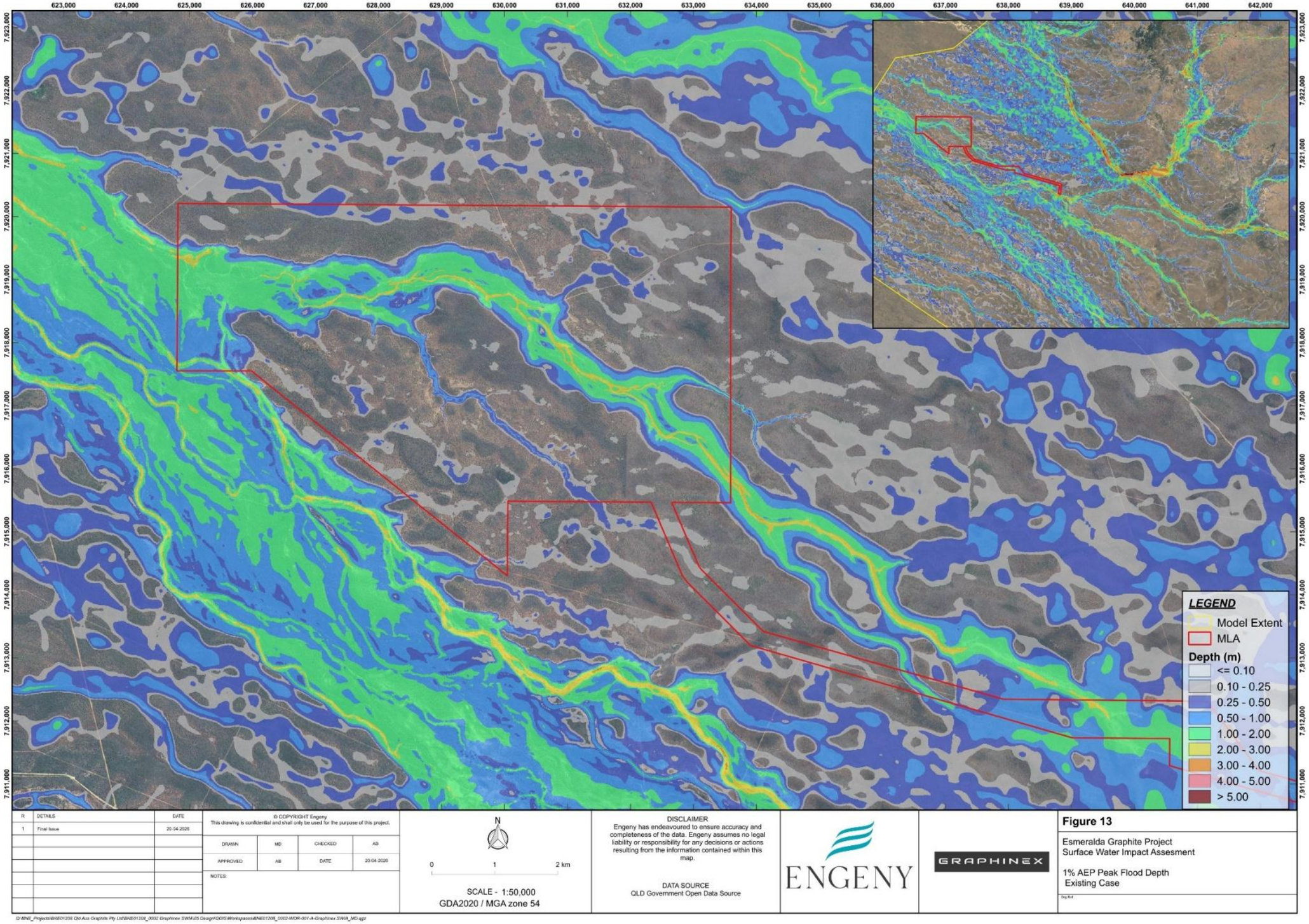



**FIGURE A.13: EXISTING CASE 1% AEP PEAK FLOOD DEPTH MAP**

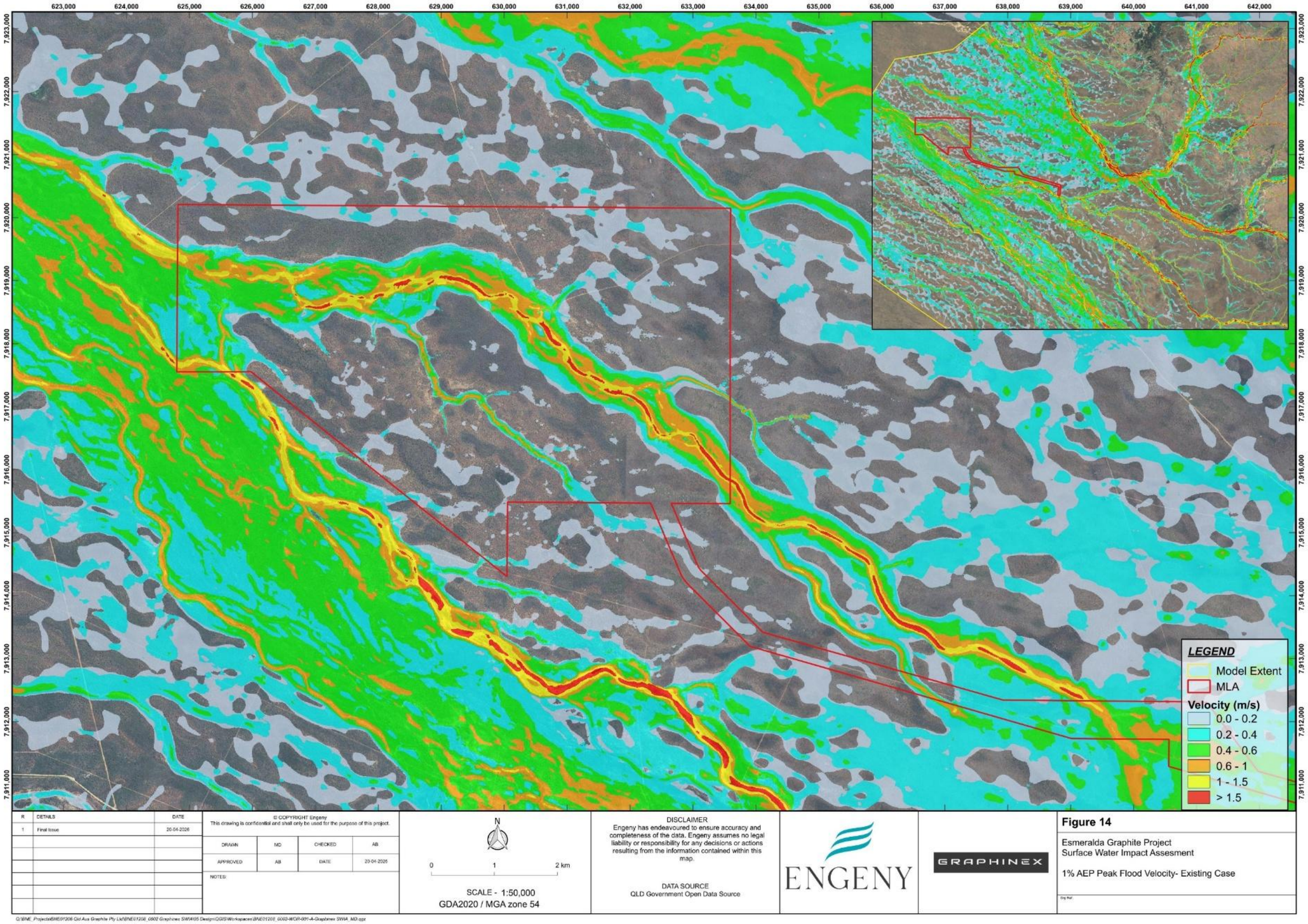



**FIGURE A.14: EXISTING CASE 1% AEP PEAK FLOOD VELOCITY MAP**

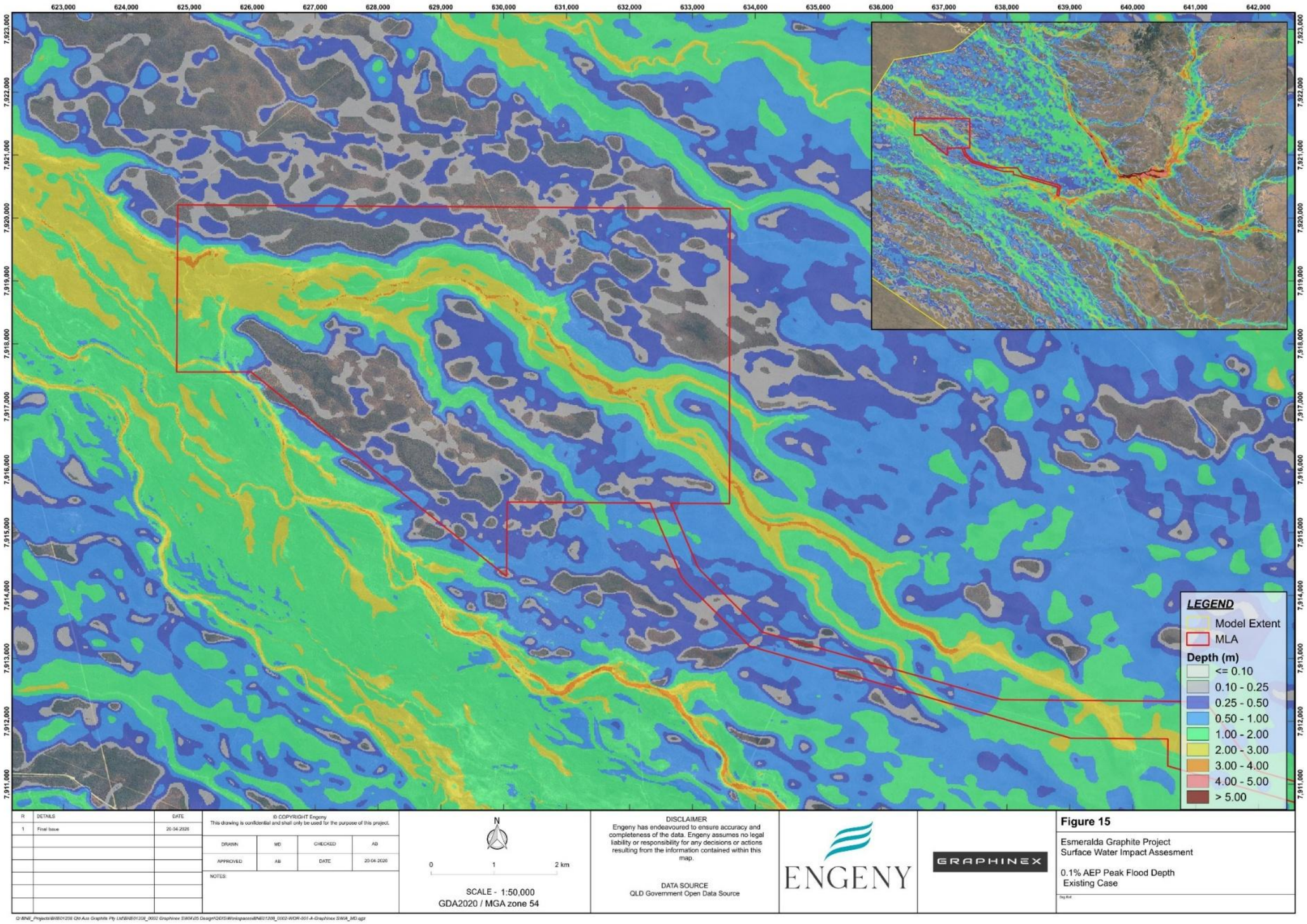



**FIGURE A.15: EXISTING CASE 0.1% AEP PEAK FLOOD DEPTH MAP**

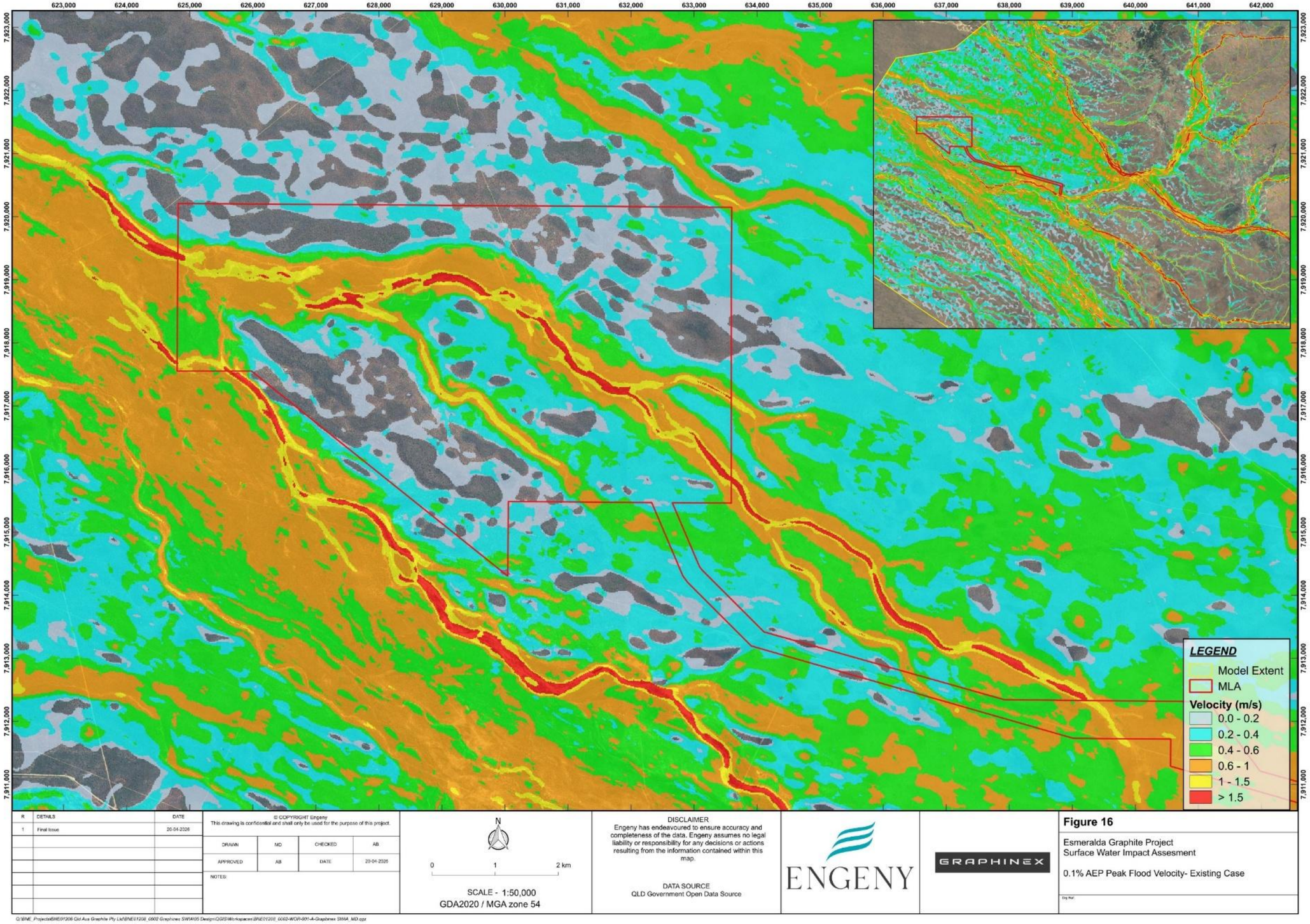



**FIGURE A.16: EXISTING CASE 0.1% AEP PEAK FLOOD VELOCITY MAP**

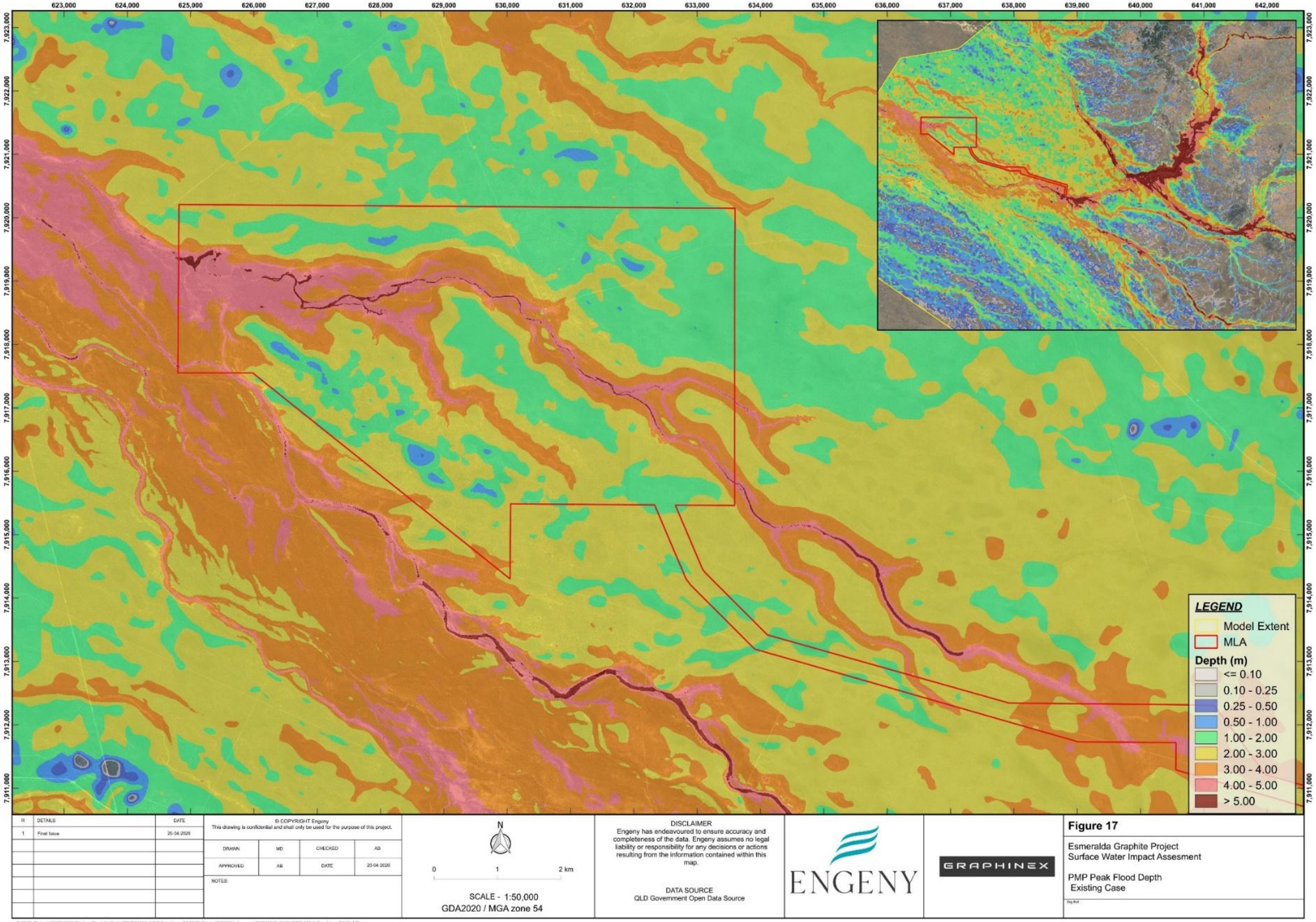



**FIGURE A.17: EXISTING CASE PMF PEAK FLOOD DEPTH MAP**

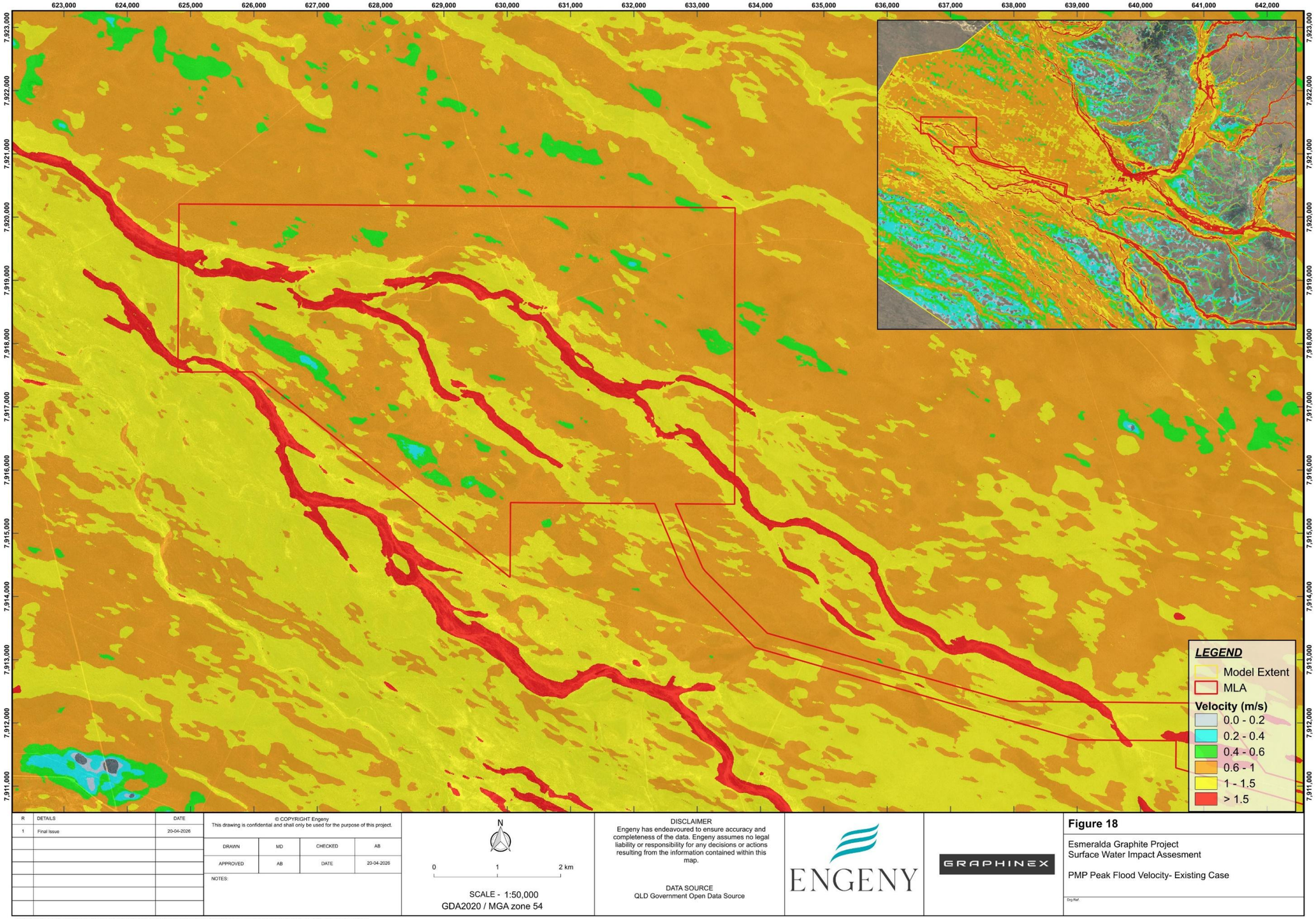
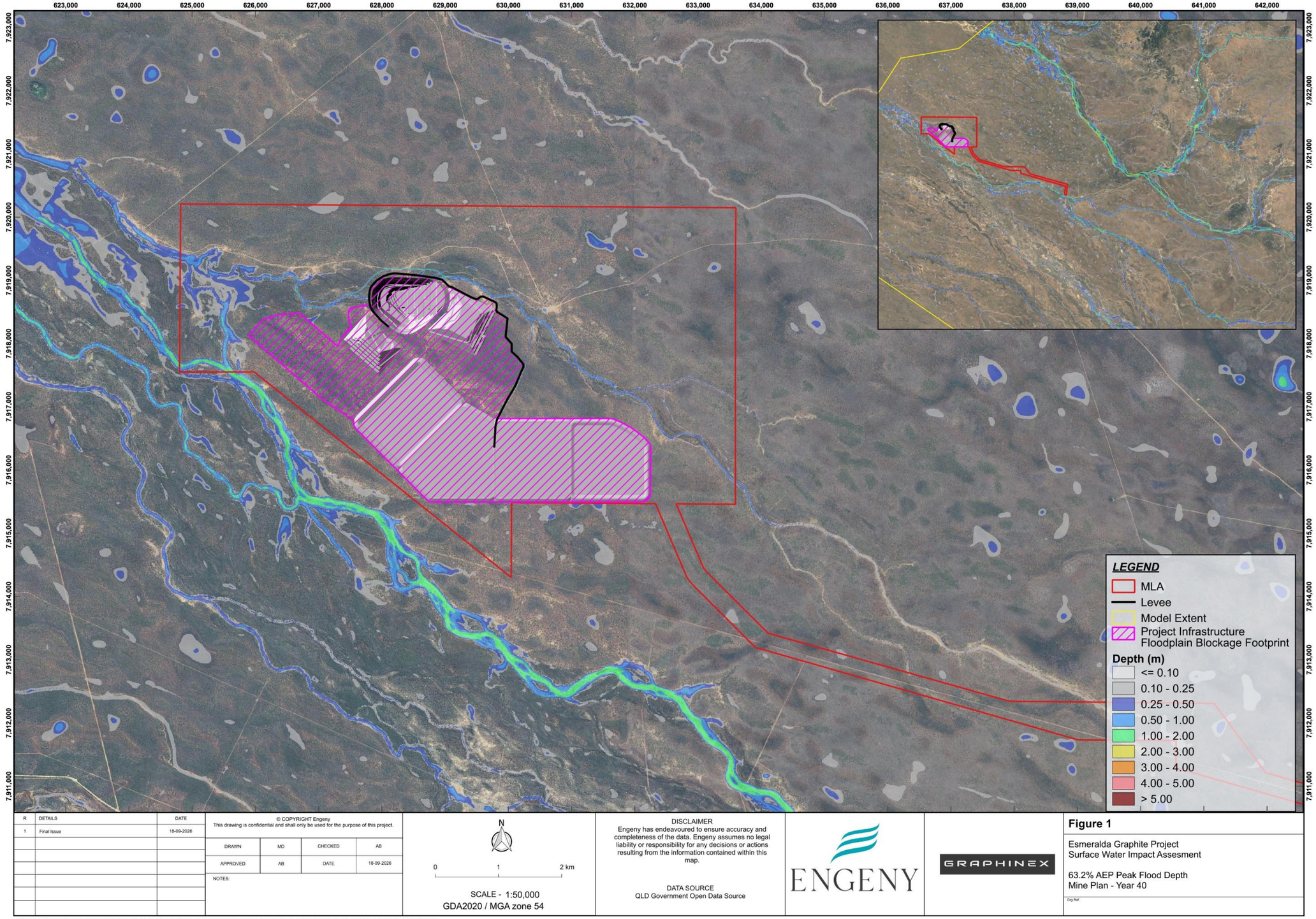



**FIGURE A.18: EXISTING CASE PMF PEAK FLOOD VELOCITY MAP**

# APPENDIX B: OPERATIONAL PHASE FLOOD RESULTS




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0 1 2 km

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**Figure 1**

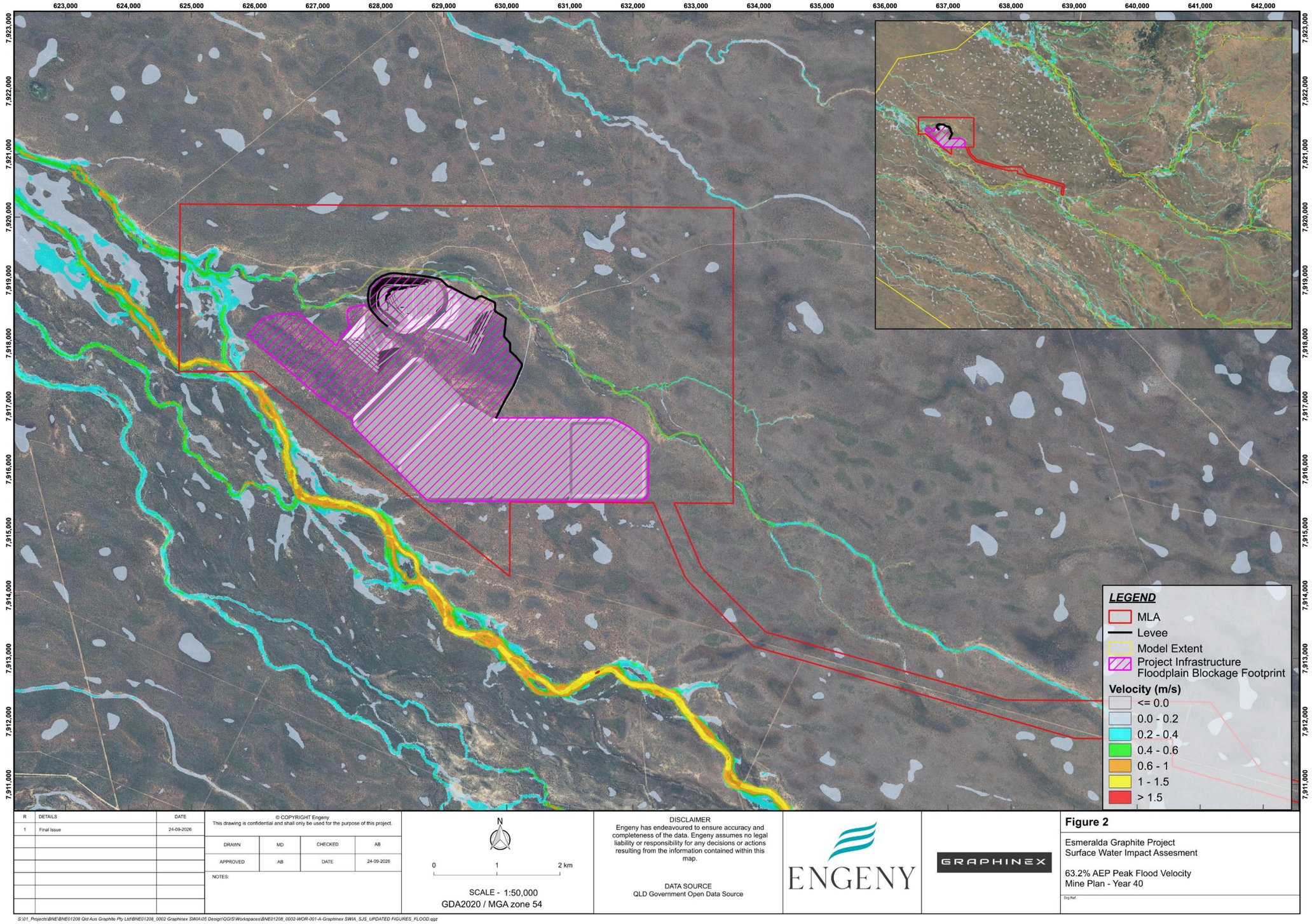
Esmeralda Graphite Project
Surface Water Impact Assesment

63.2% AEP Peak Flood Depth
Mine Plan - Year 40

Drg Ref:

S:\01_Projects\BNE\BNE01208 Qld Aus Graphite Pty Ltd\BNE01208_0002 Graphinex SWIA\05 Design\QGIS\Workspaces\BNE01208_0002-WOR-001-A-Graphinex SWIA_SJS_UPDATED FIGURES_FLOOD.qgz

**FIGURE B.1: OPERATIONAL PHASE 63.2% AEP FLOOD DEPTH MAP**




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0 1 2 km

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**Figure 2**

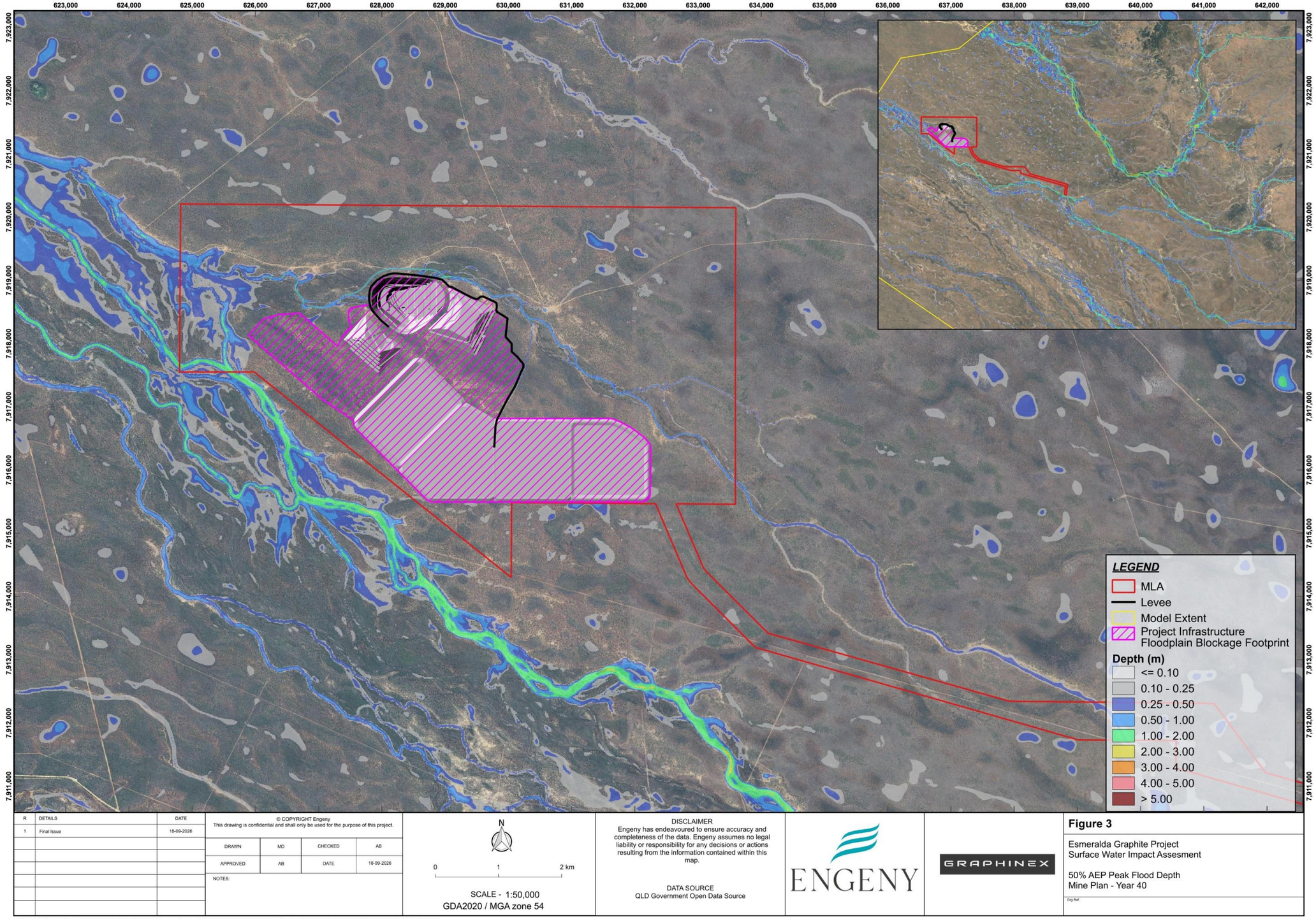
Esmeralda Graphite Project
Surface Water Impact Assesment

63.2% AEP Peak Flood Velocity
Mine Plan - Year 40

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**FIGURE B.2: OPERATIONAL PHASE 63.2% AEP FLOOD VELOCITY MAP**




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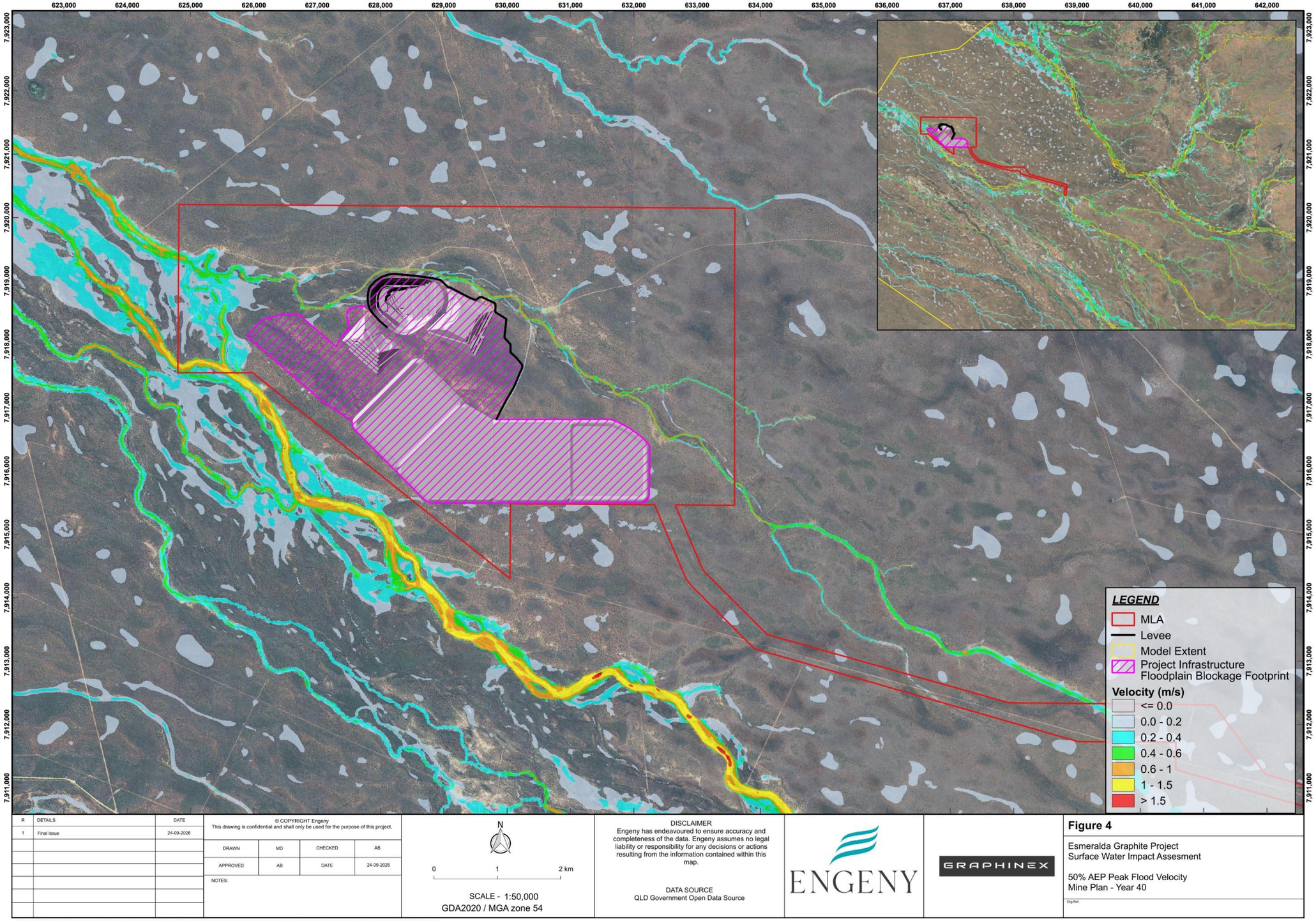
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**FIGURE B.3: OPERATIONAL PHASE 50% AEP FLOOD DEPTH MAP**




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0 1 2 km

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**Figure 4**

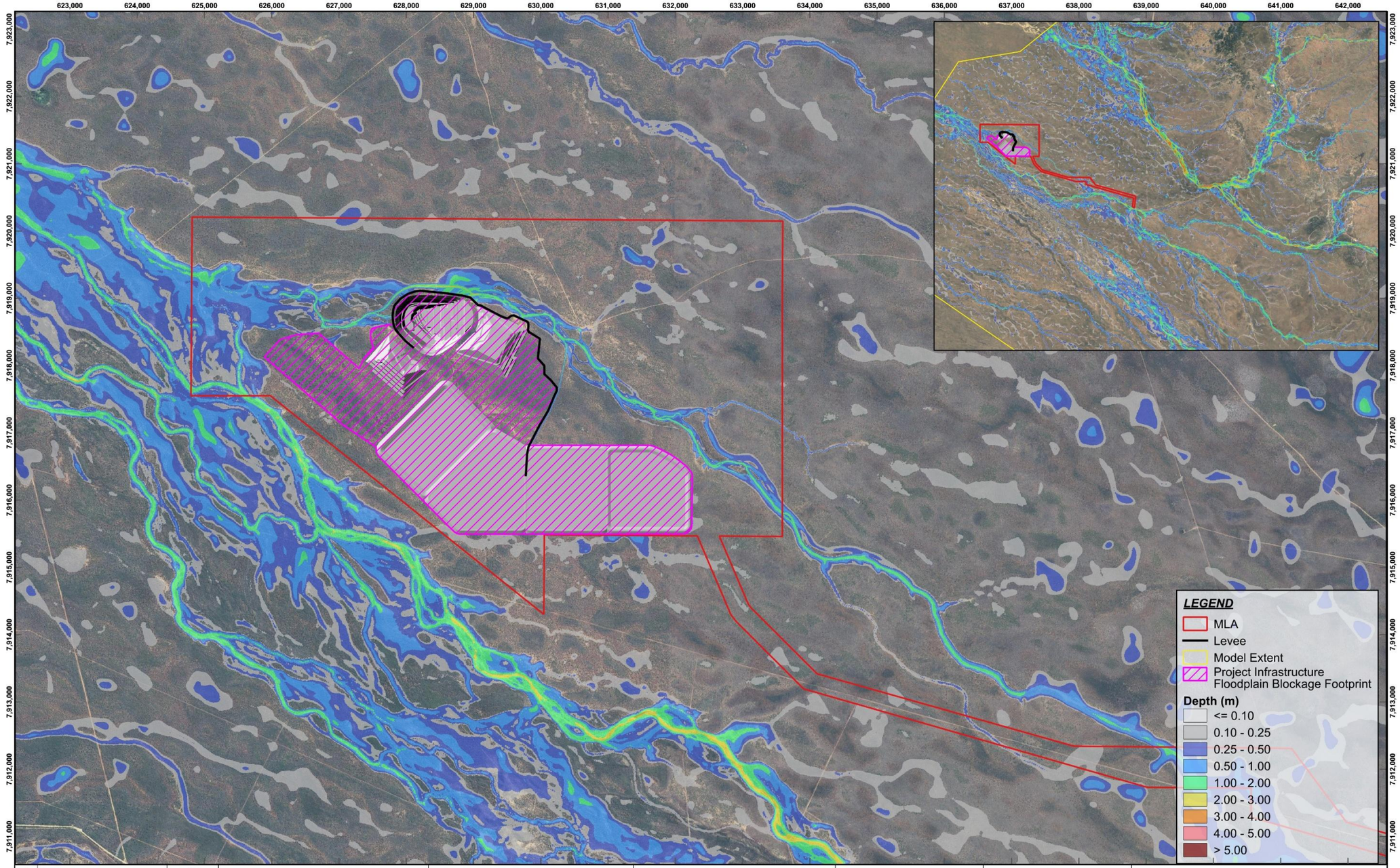
Esmeralda Graphite Project
Surface Water Impact Assesment

50% AEP Peak Flood Velocity
Mine Plan - Year 40

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**FIGURE B.4: OPERATIONAL PHASE 50% AEP FLOOD VELOCITY MAP**




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0 1 2 km

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**Figure 5**

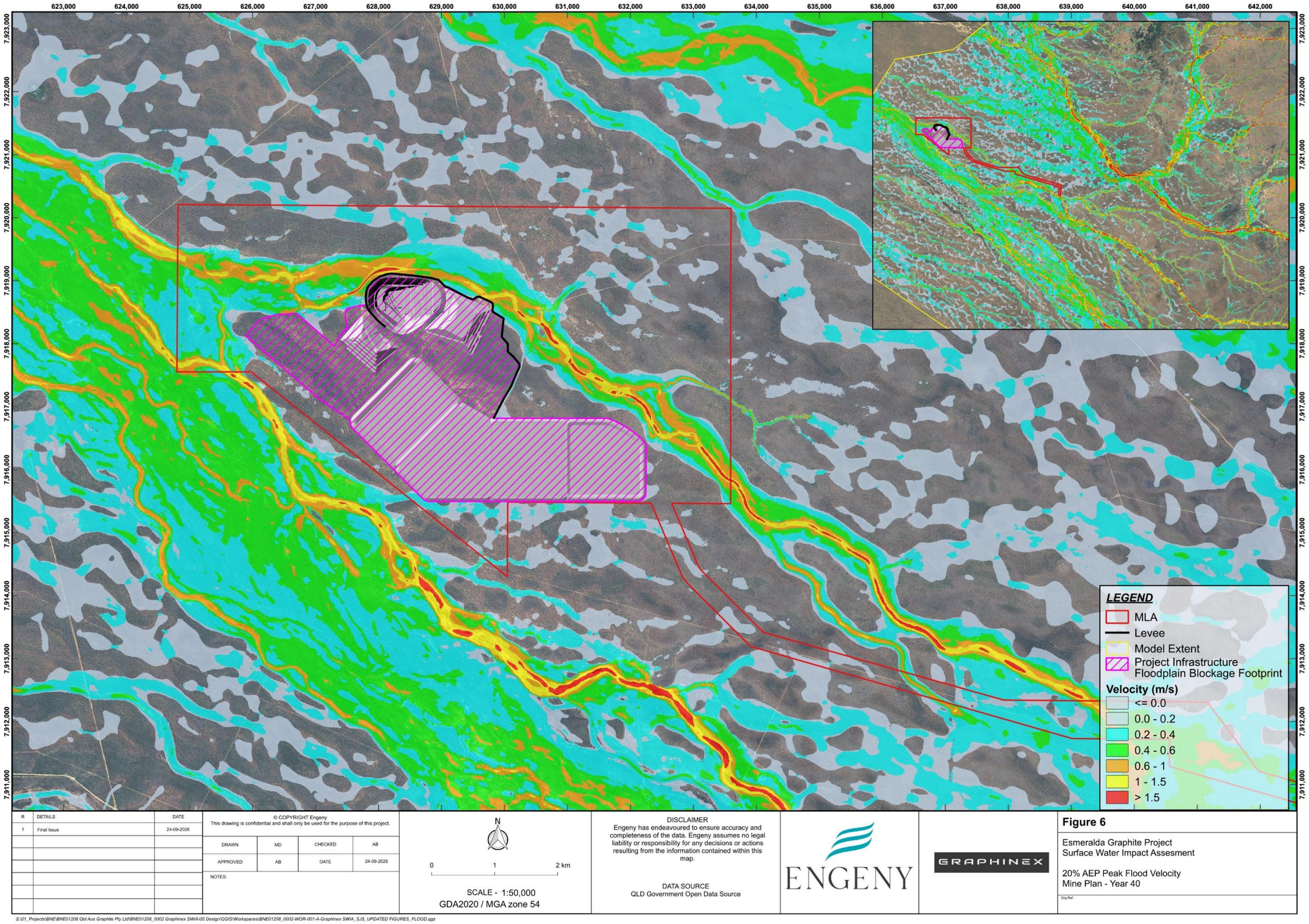
Esmeralda Graphite Project
Surface Water Impact Assesment

20% AEP Peak Flood Depth
Mine Plan - Year 40

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**FIGURE B.5: OPERATIONAL PHASE 20% AEP FLOOD DEPTH MAP**




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0 1 2 km

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**Figure 6**

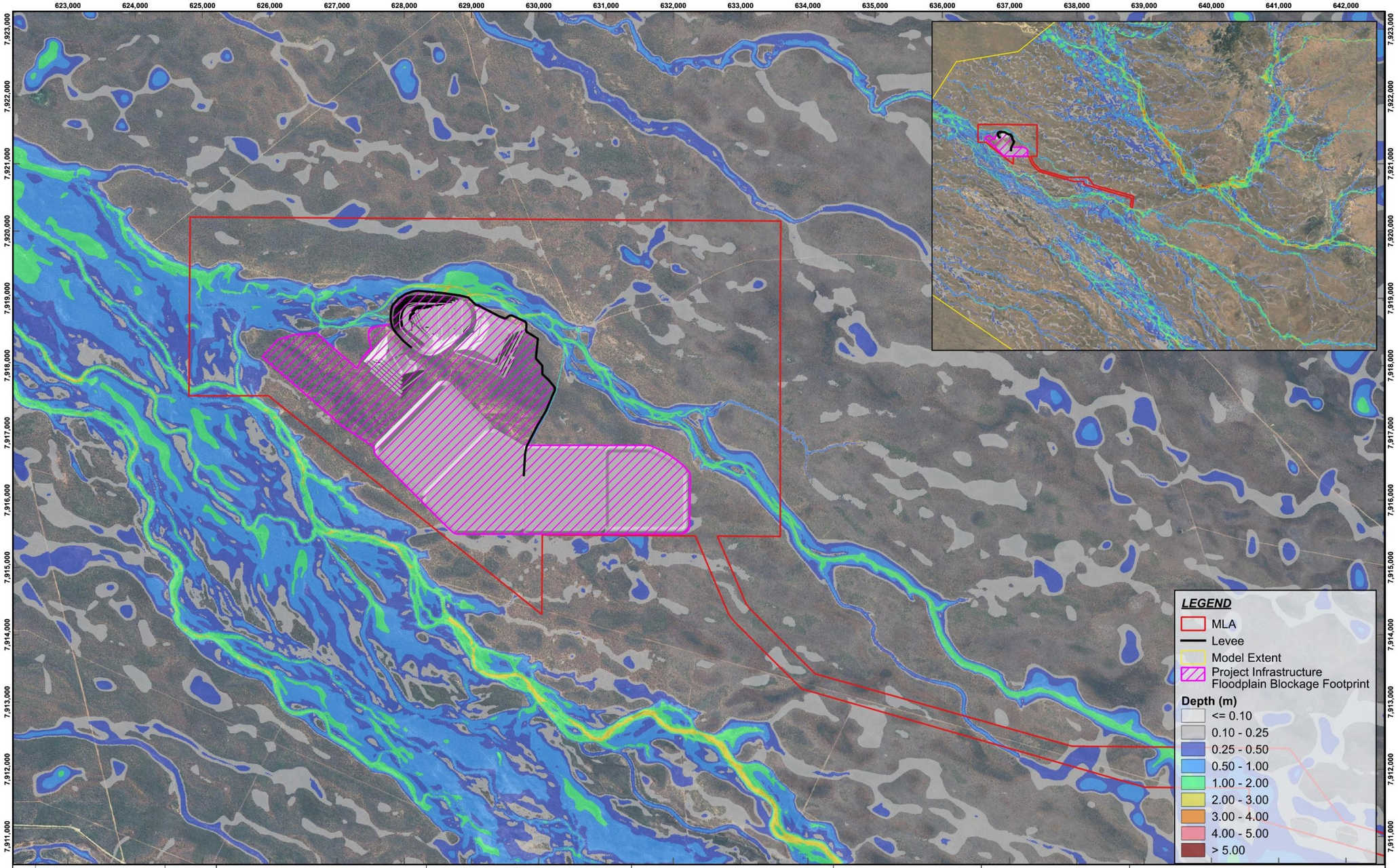
Esmeralda Graphite Project
Surface Water Impact Assesment

20% AEP Peak Flood Velocity
Mine Plan - Year 40

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**FIGURE B.6: OPERATIONAL PHASE 20% AEP FLOOD VELOCITY MAP**




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0 1 2 km

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**Figure 7**

Esmeralda Graphite Project
Surface Water Impact Assesment

10% AEP Peak Flood Depth
Mine Plan - Year 40

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**FIGURE B.7: OPERATIONAL PHASE 10% AEP FLOOD DEPTH MAP**

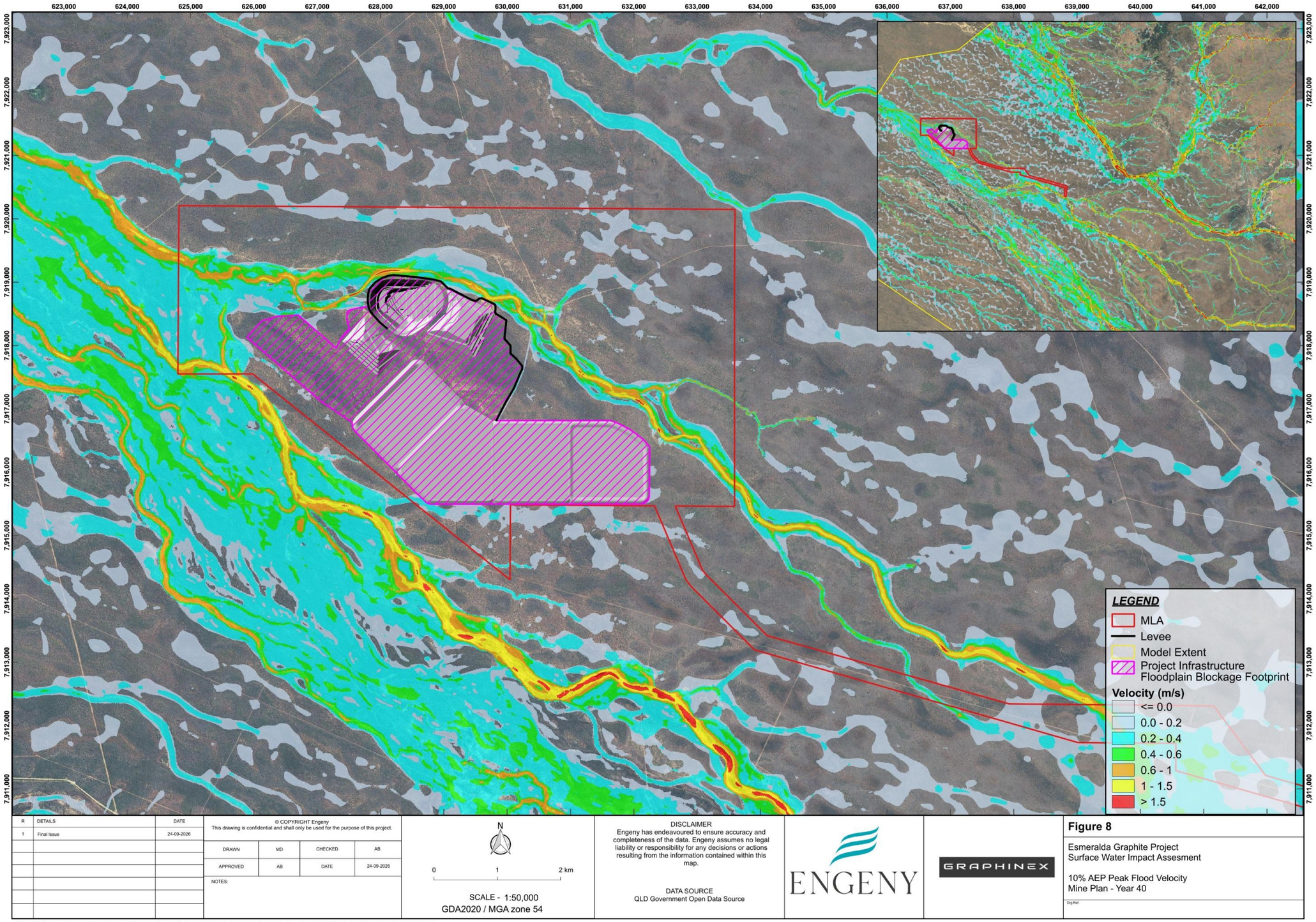



**FIGURE B.8: OPERATIONAL PHASE 10% AEP FLOOD VELOCITY MAP**

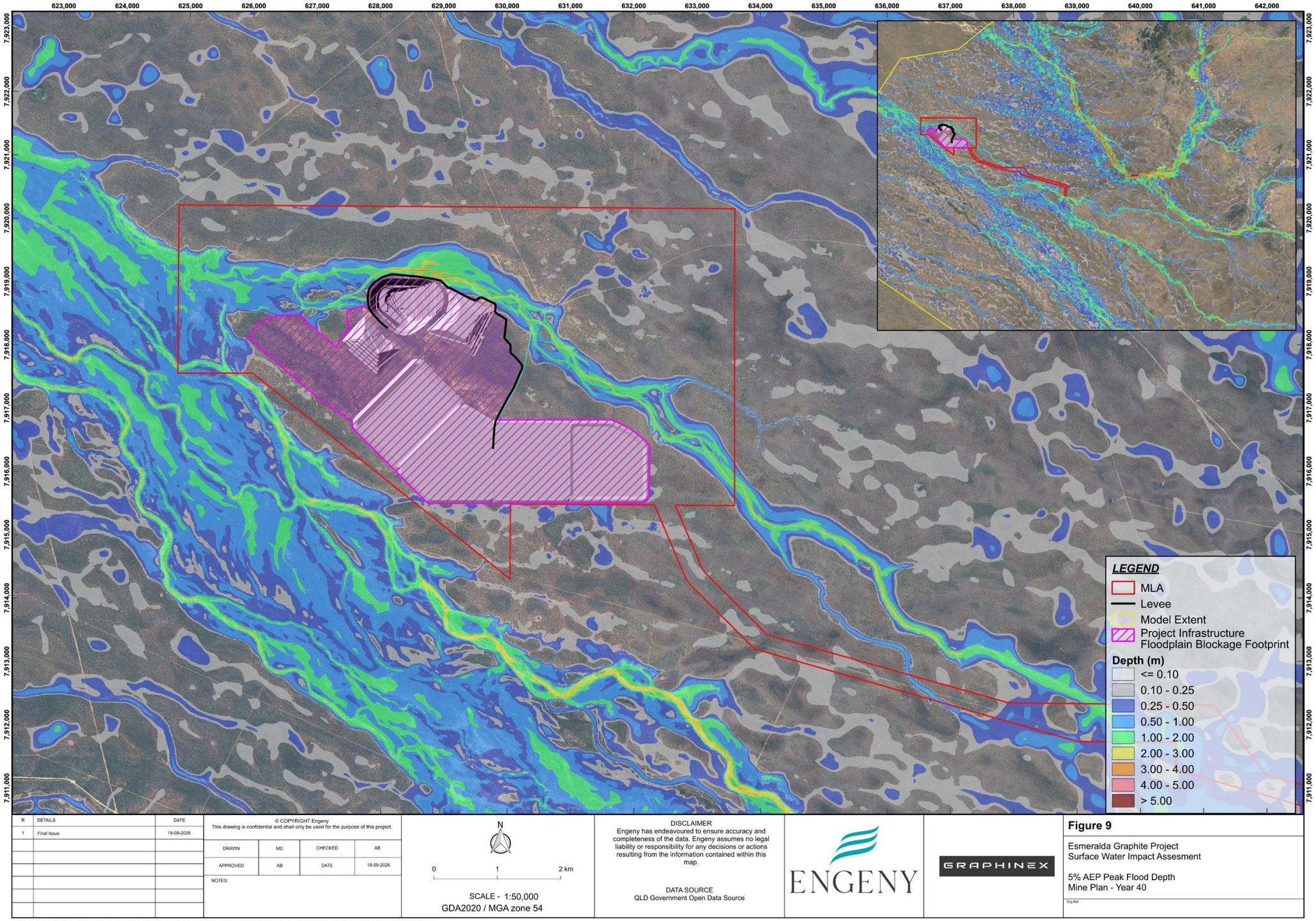
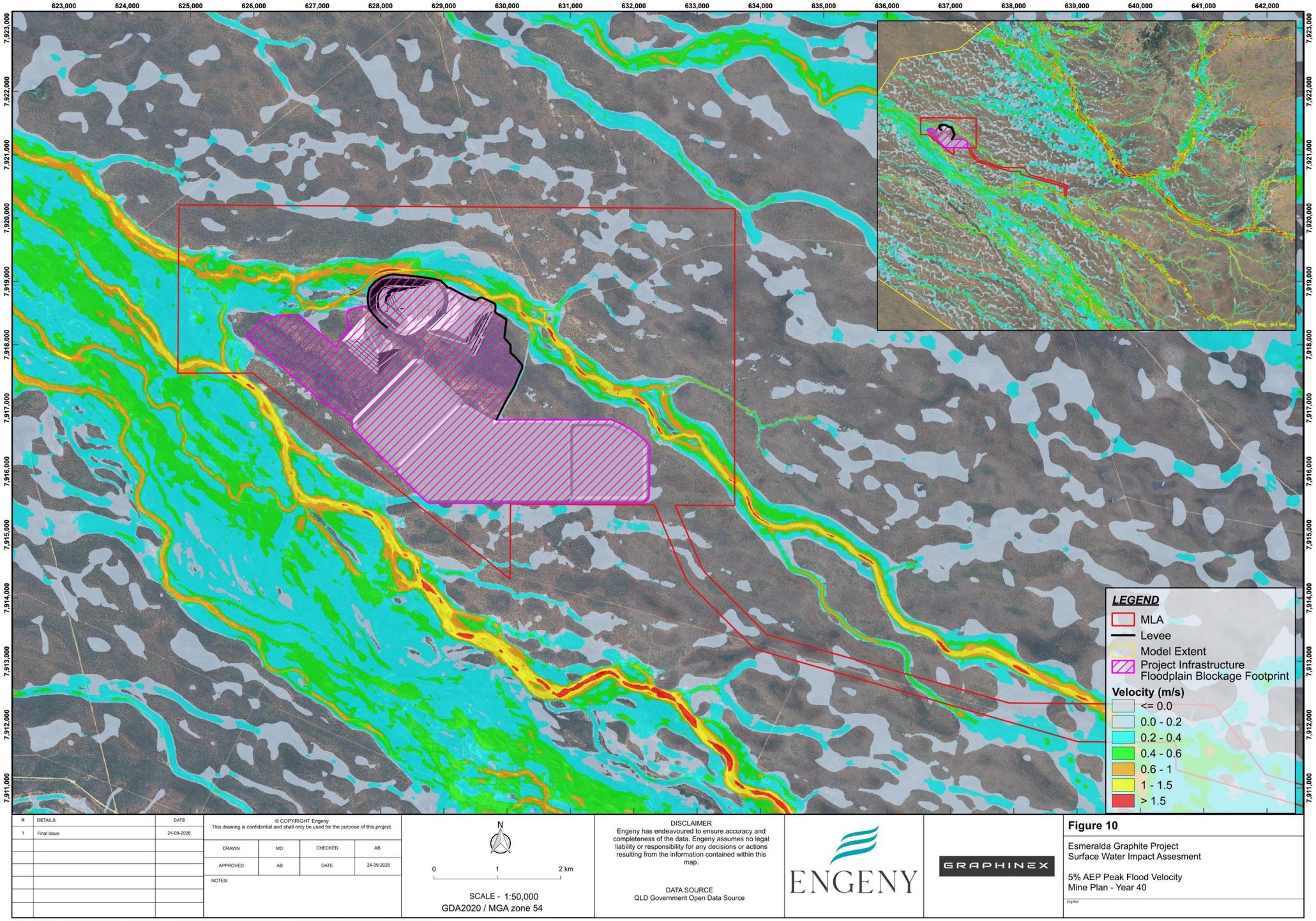



**FIGURE B.9: OPERATIONAL PHASE 5% AEP FLOOD DEPTH MAP**




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0 1 2 km

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**Figure 10**

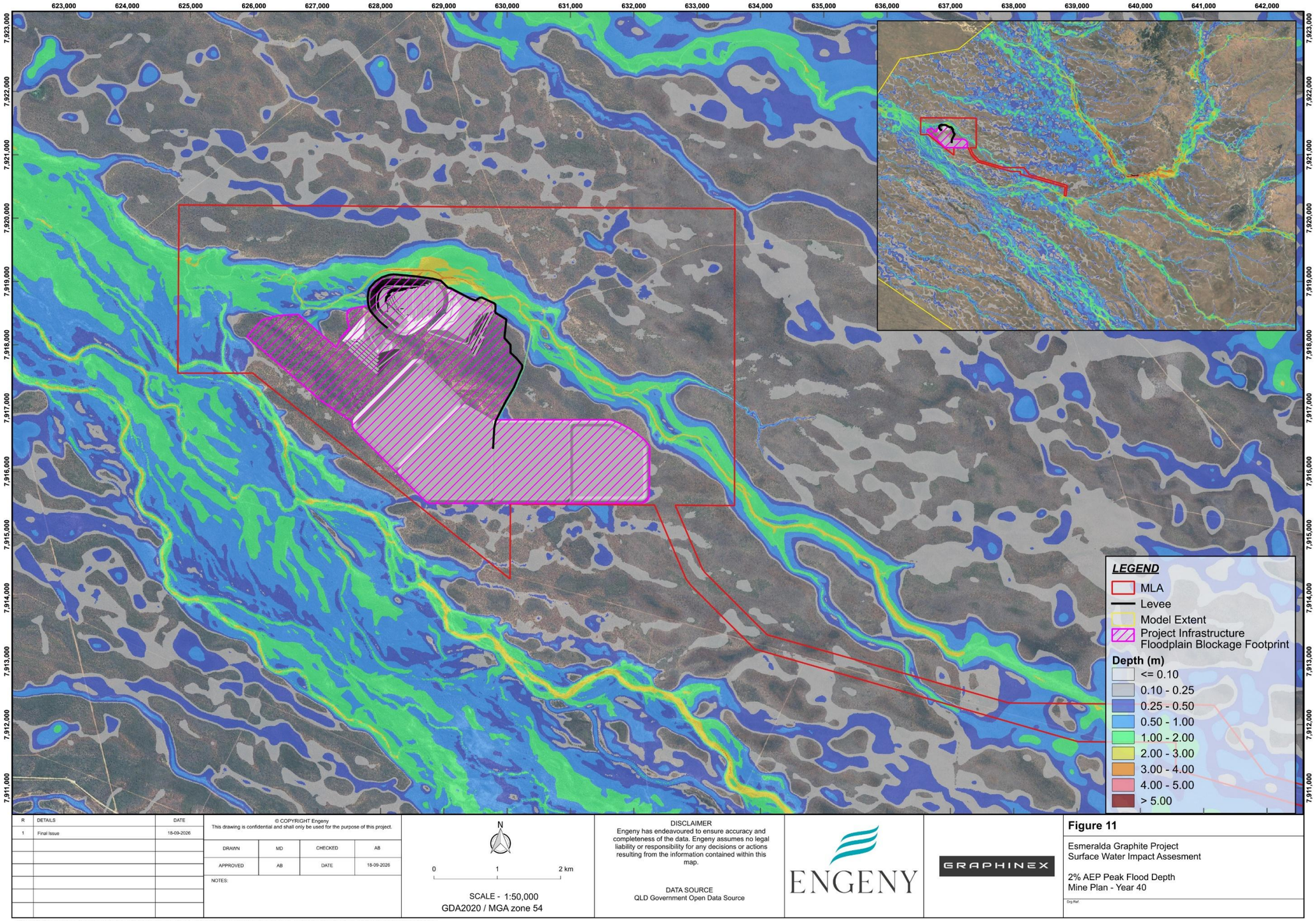
Esmeralda Graphite Project
Surface Water Impact Assesment

5% AEP Peak Flood Velocity
Mine Plan - Year 40

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**FIGURE B.10: OPERATIONAL PHASE 5% AEP FLOOD VELOCITY MAP**




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N

0 1 2 km

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**Figure 11**

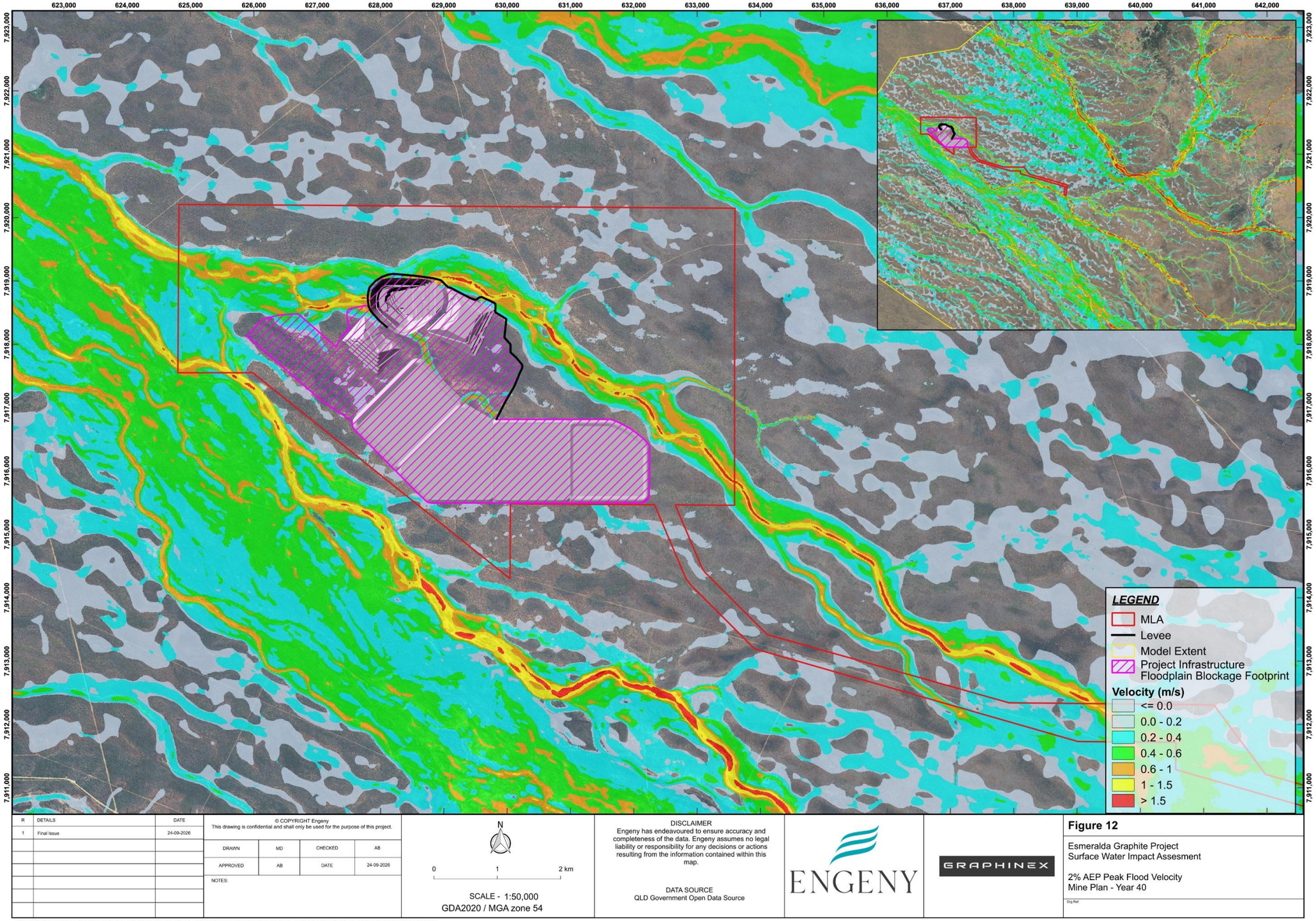
Esmeralda Graphite Project
Surface Water Impact Assesment

2% AEP Peak Flood Depth
Mine Plan - Year 40

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**FIGURE B.11: OPERATIONAL PHASE 2% AEP FLOOD DEPTH MAP**




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N

0 1 2 km

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**Figure 12**

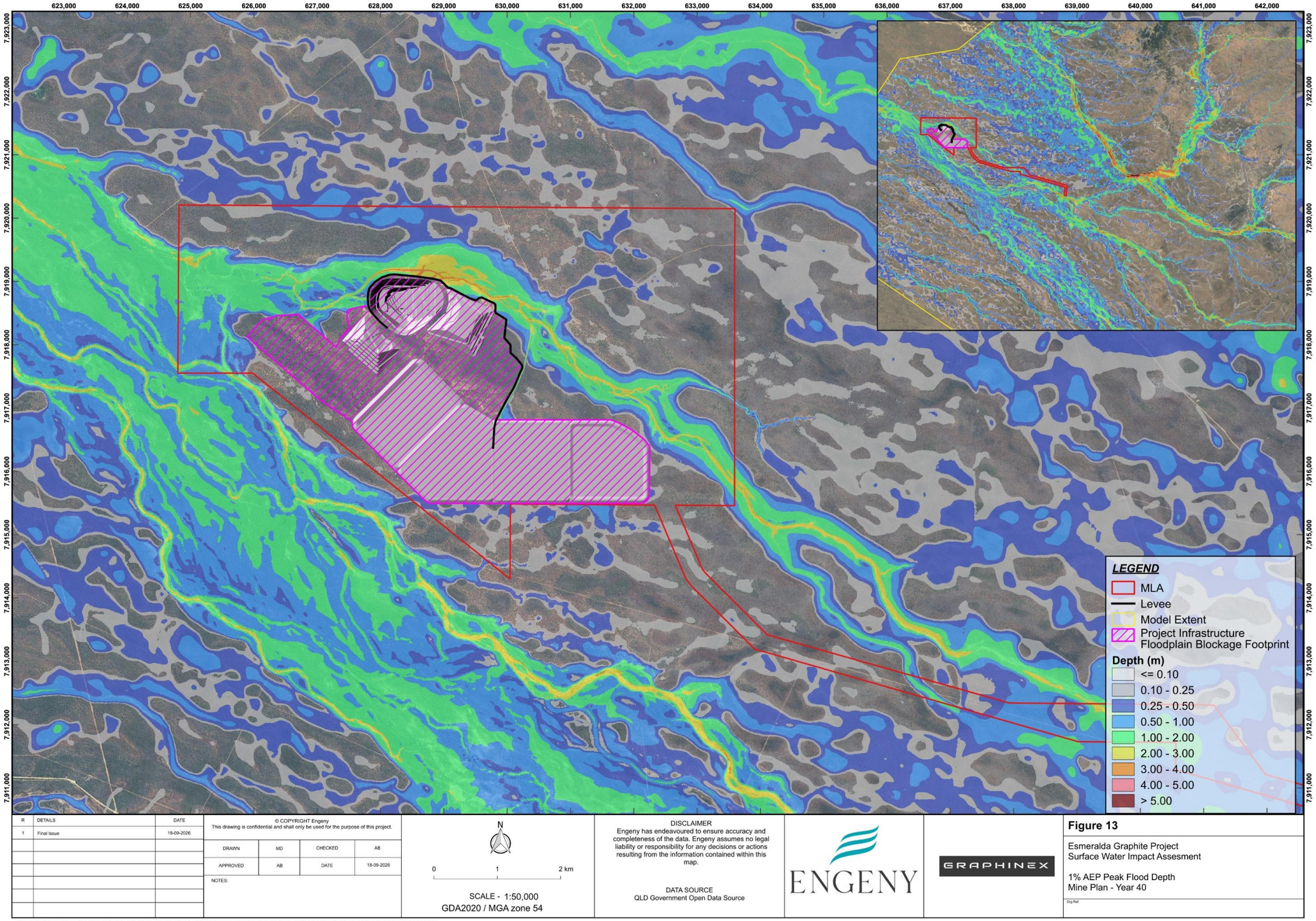
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Surface Water Impact Assesment

2% AEP Peak Flood Velocity
Mine Plan - Year 40

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**FIGURE B.12: OPERATIONAL PHASE 2% AEP FLOOD VELOCITY MAP**




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0 1 2 km

SCALE - 1:50,000
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**Figure 13**

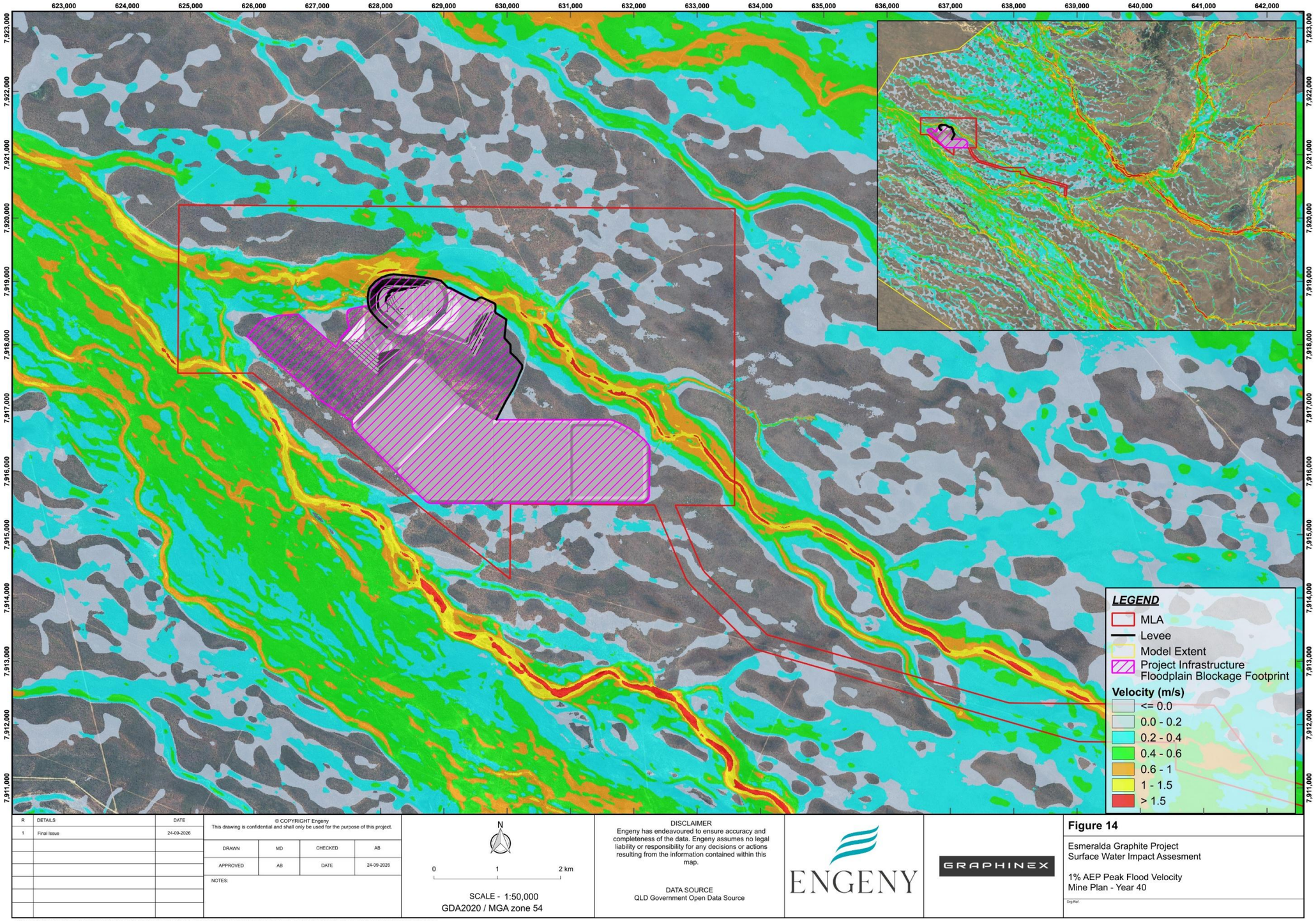
Esmeralda Graphite Project
Surface Water Impact Assesment

1% AEP Peak Flood Depth
Mine Plan - Year 40

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**FIGURE B.13: OPERATIONAL PHASE 1% AEP FLOOD DEPTH MAP**




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N

0 1 2 km

SCALE - 1:50,000
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**Figure 14**

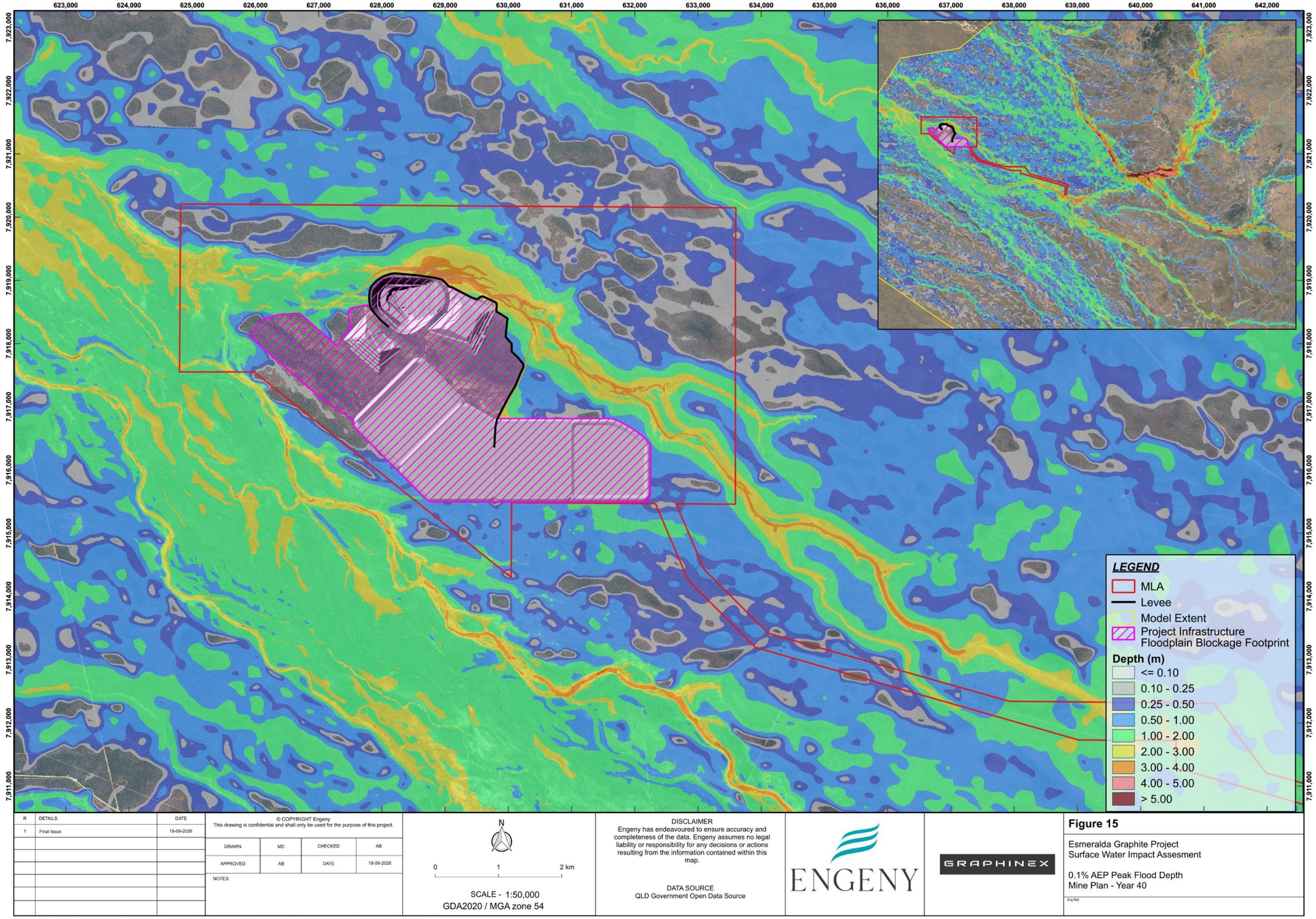
Esmeralda Graphite Project
Surface Water Impact Assesment

1% AEP Peak Flood Velocity
Mine Plan - Year 40

Drg Ref:

S:\01_Projects\BNE\BNE01208 Qld Aus Graphite Pty Ltd\BNE01208_0002 Graphinex SWIA\05 Design\QGIS\Workspaces\BNE01208_0002-WOR-001-A-Graphinex SWIA_SJS_UPDATED FIGURES_FLOOD.qgz

**FIGURE B.14: OPERATIONAL PHASE 1% AEP FLOOD VELOCITY MAP**




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| 1 | Final Issue | 18-09-2026 |

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DATA SOURCE
QLD Government Open Data Source

ENGENY

GRAPHINEX

**Figure 15**

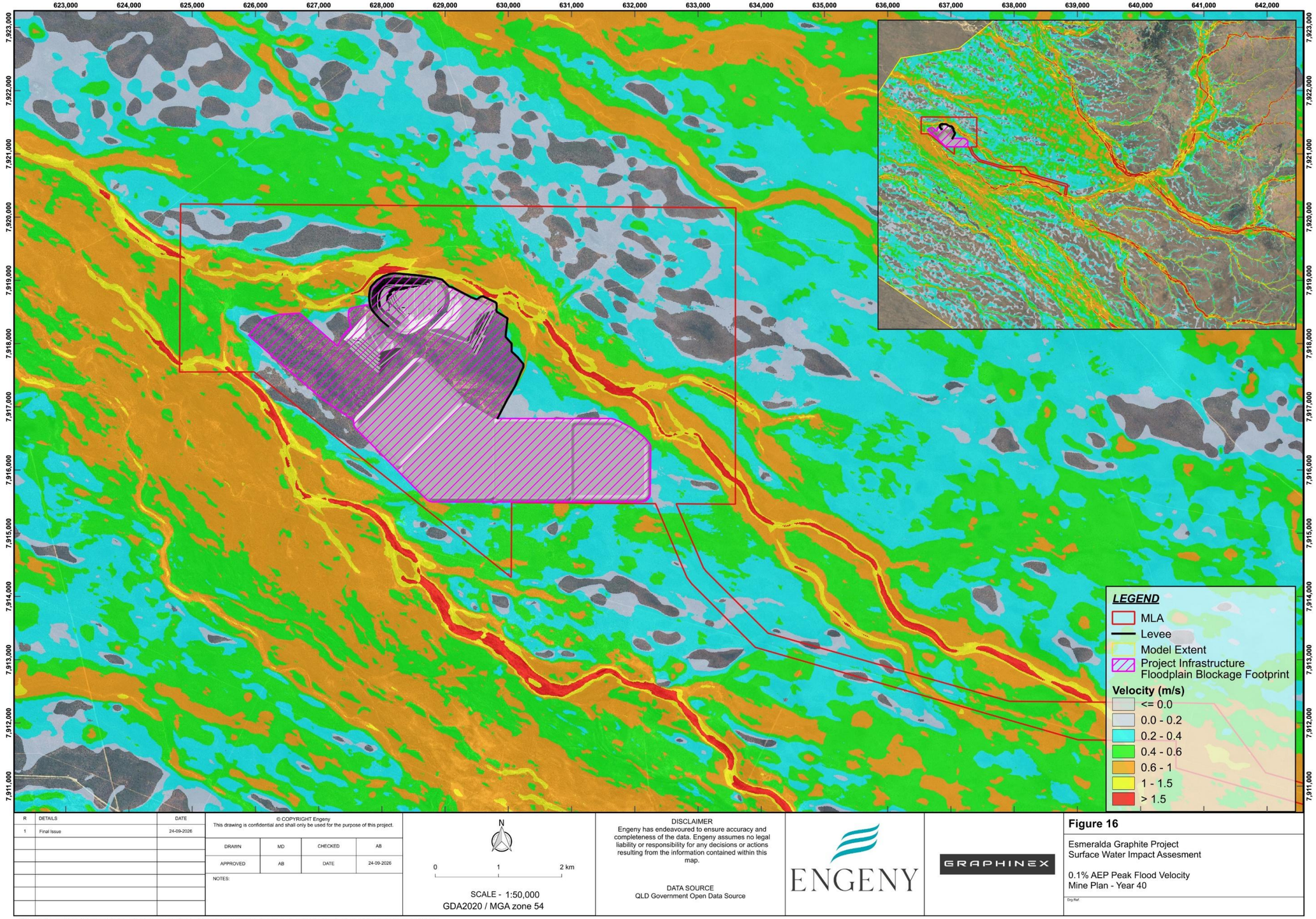
Esmeralda Graphite Project
Surface Water Impact Assesment

0.1% AEP Peak Flood Depth
Mine Plan - Year 40

Drg Ref:

S:\01_Projects\BNE\BNE01208 Qld Aus Graphite Pty Ltd\BNE01208_0002 Graphinex SWIA\05 Design\QGIS\Workspaces\BNE01208_0002-WOR-001-A-Graphinex SWIA_SJS_UPDATED FIGURES_FLOOD.qgz

**FIGURE B.15: OPERATIONAL PHASE 0.1% AEP FLOOD DEPTH MAP**




| R | DETAILS | DATE |
|---|---|---|
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NOTES:

N

0 1 2 km

SCALE - 1:50,000
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GRAPHINEX

**Figure 16**

Esmeralda Graphite Project
Surface Water Impact Assesment

0.1% AEP Peak Flood Velocity
Mine Plan - Year 40

Eng Ref:

S:\01_Projects\BNE\BNE01208 Qld Aus Graphite Pty Ltd\BNE01208_0002 Graphinex SWIA\05 Design\GIS\Workspaces\BNE01208_0002-WOR-001-A-Graphinex SWIA_SJS_UPDATED FIGURES_FLOOD.qgz

**FIGURE B.16: OPERATIONAL PHASE 0.1% AEP FLOOD VELOCITY MAP**

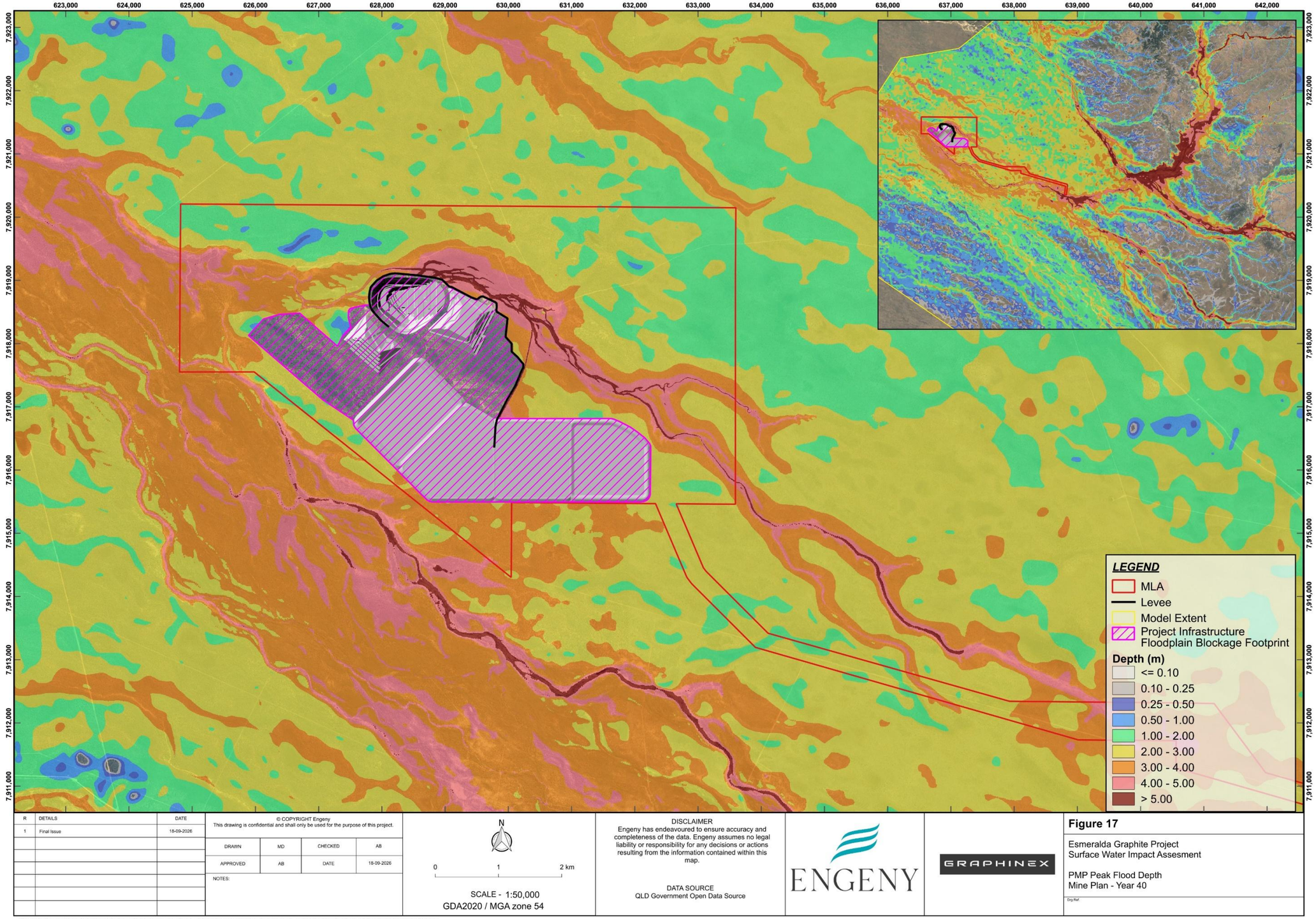



**FIGURE B.17: OPERATIONAL PHASE PMP FLOOD DEPTH MAP**

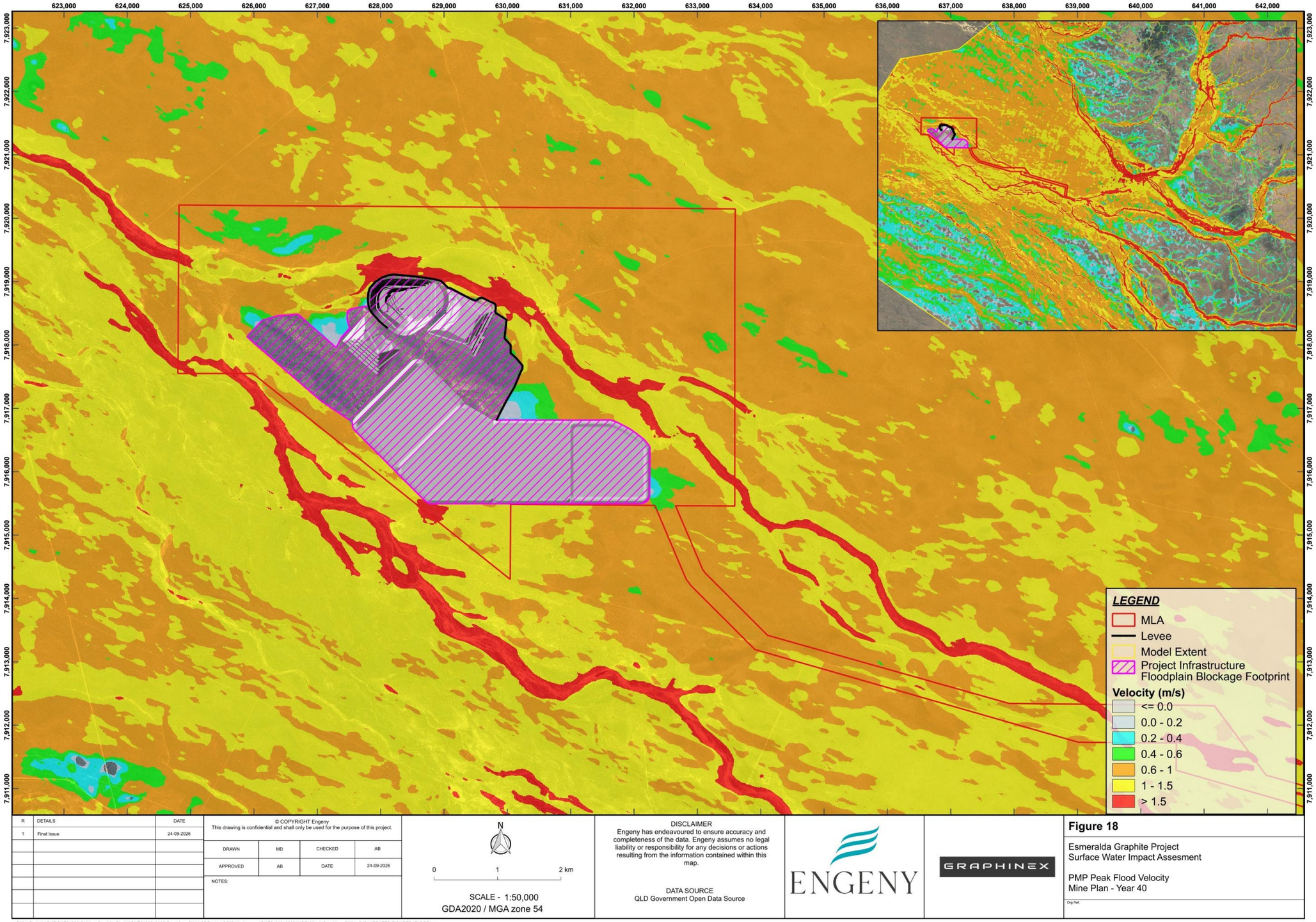



**FIGURE B.18: OPERATIONAL PHASE PMP FLOOD VELOCITY MAP**

# APPENDIX C: OPERATIONAL PHASE FLOOD IMPACT RESULTS

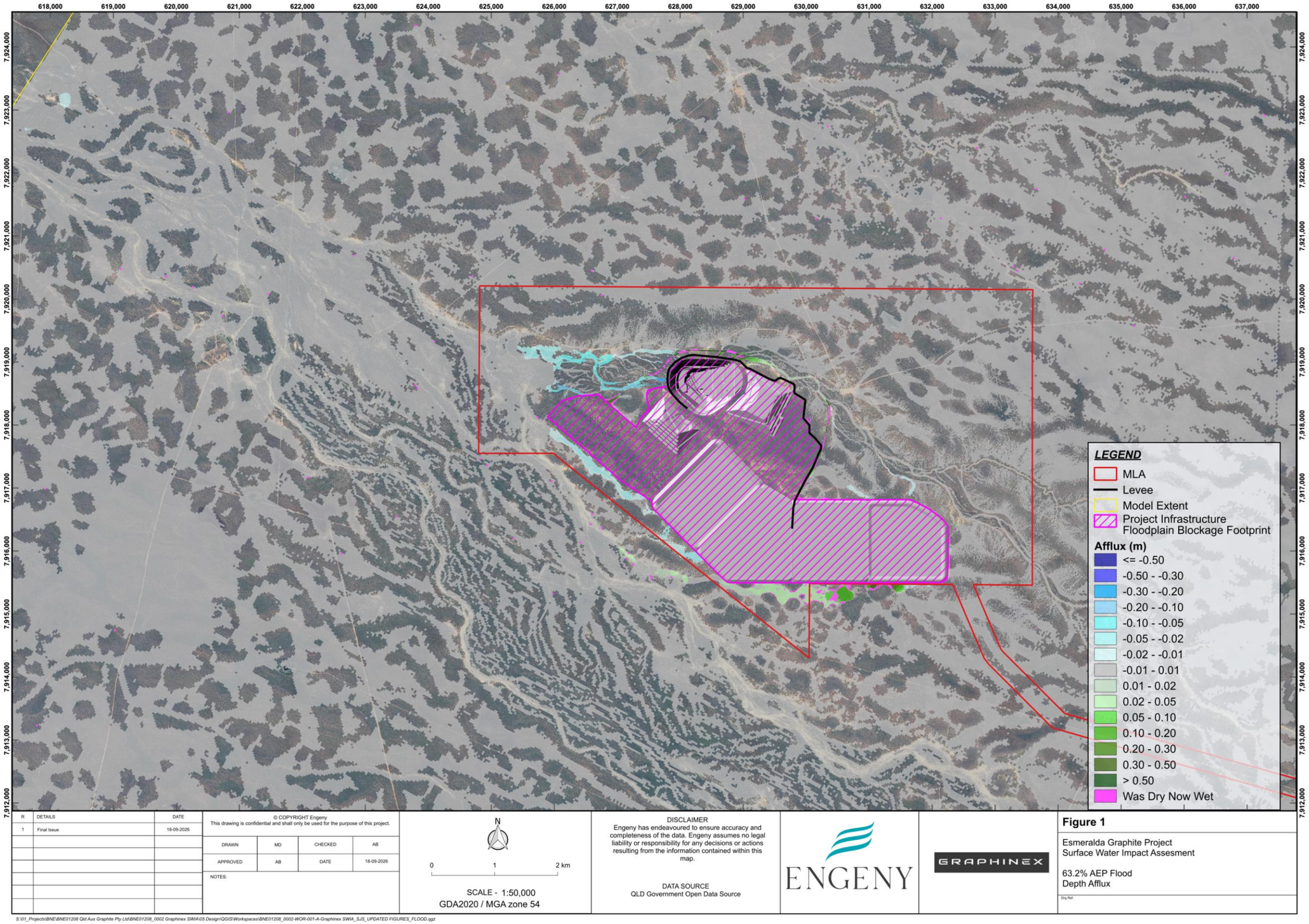



**FIGURE C.1: OPERATIONAL PHASE 63.2% AEP DEPTH AFFLUX MAP**

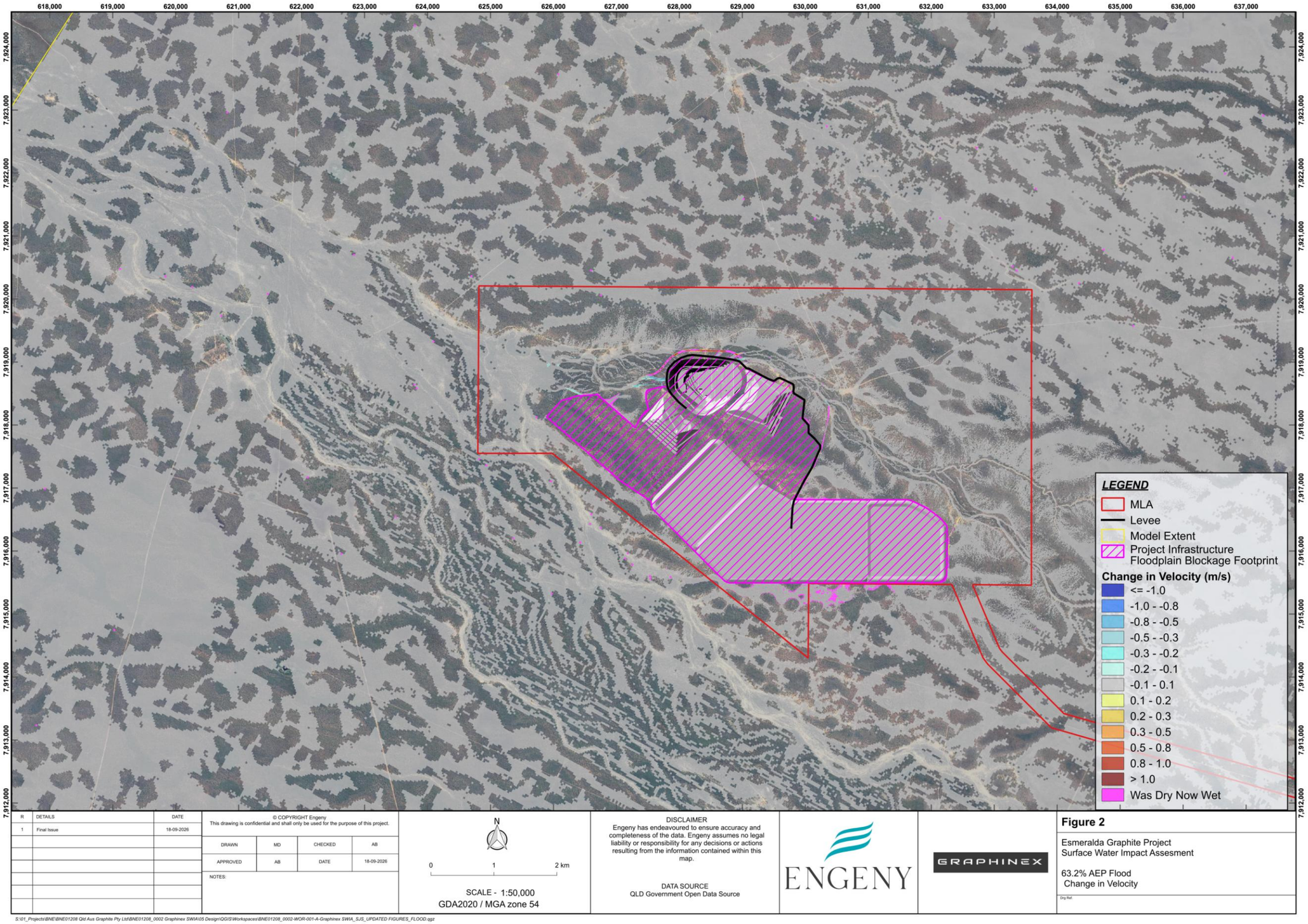



**FIGURE C.2: OPERATIONAL PHASE 63.2% AEP CHANGE IN VELOCITY MAP**

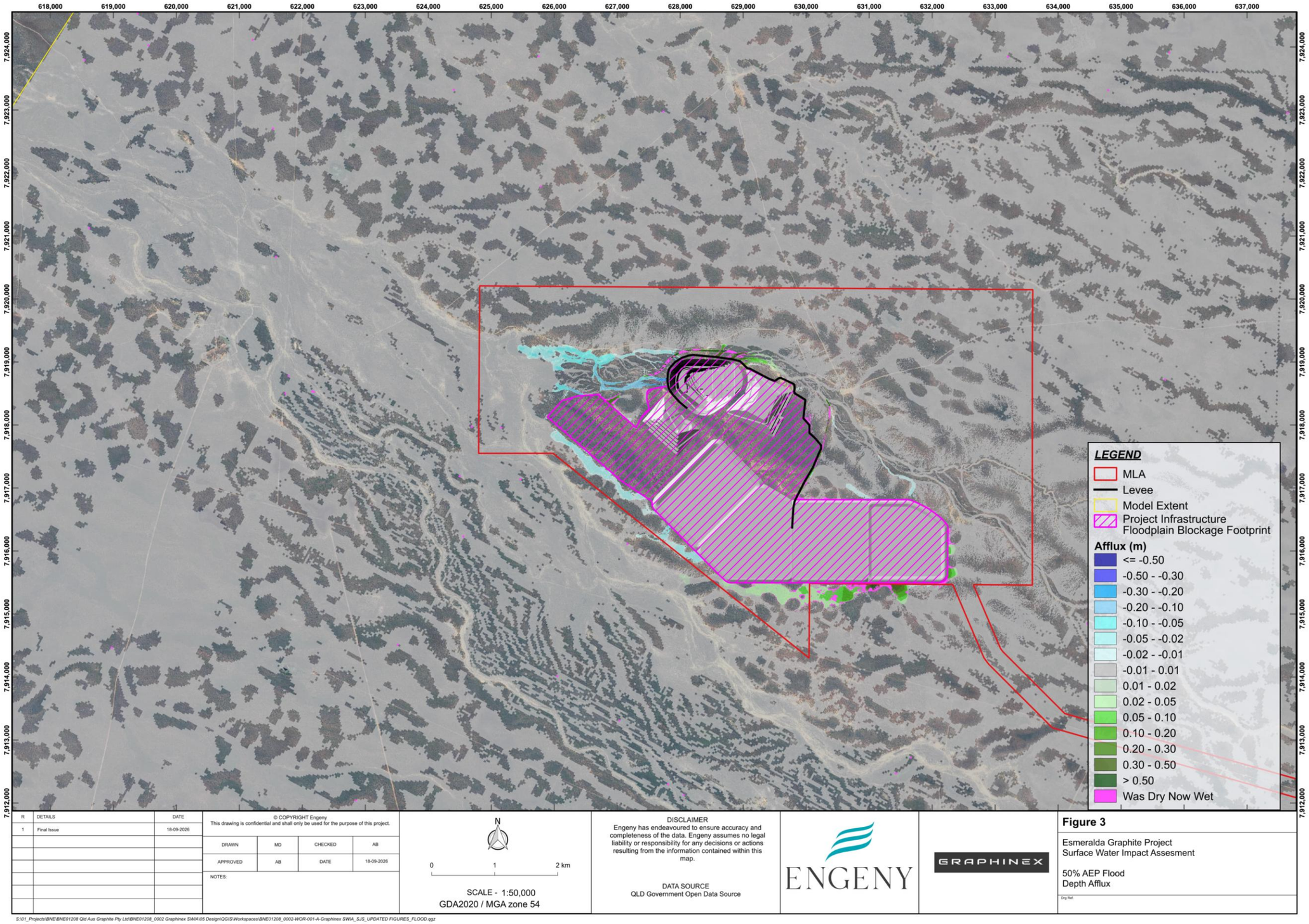



**FIGURE C.3: OPERATIONAL PHASE 50% AEP DEPTH AFFLUX MAP**

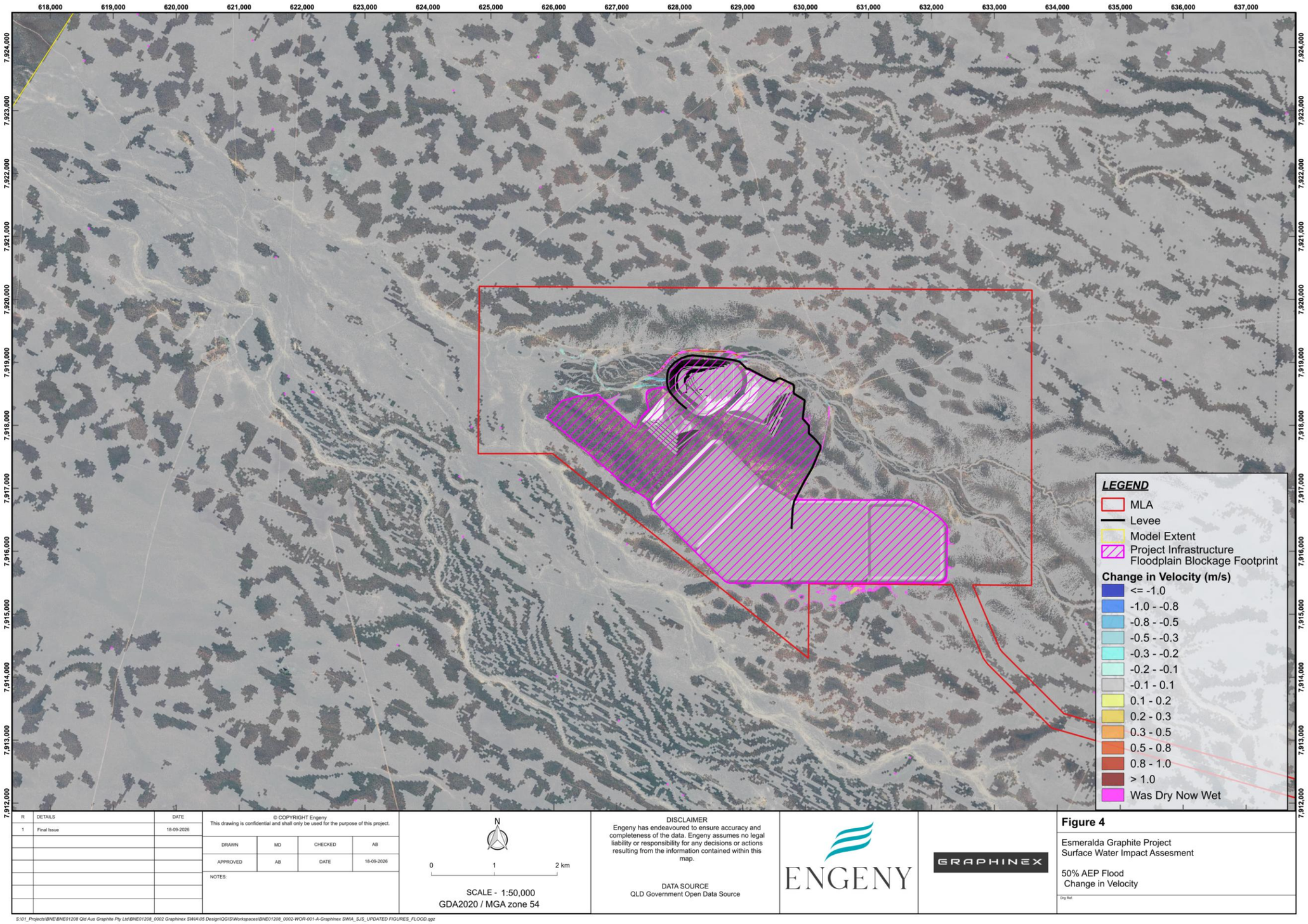



**FIGURE C.4: OPERATIONAL PHASE 50 % AEP CHANGE IN VELOCITY MAP**

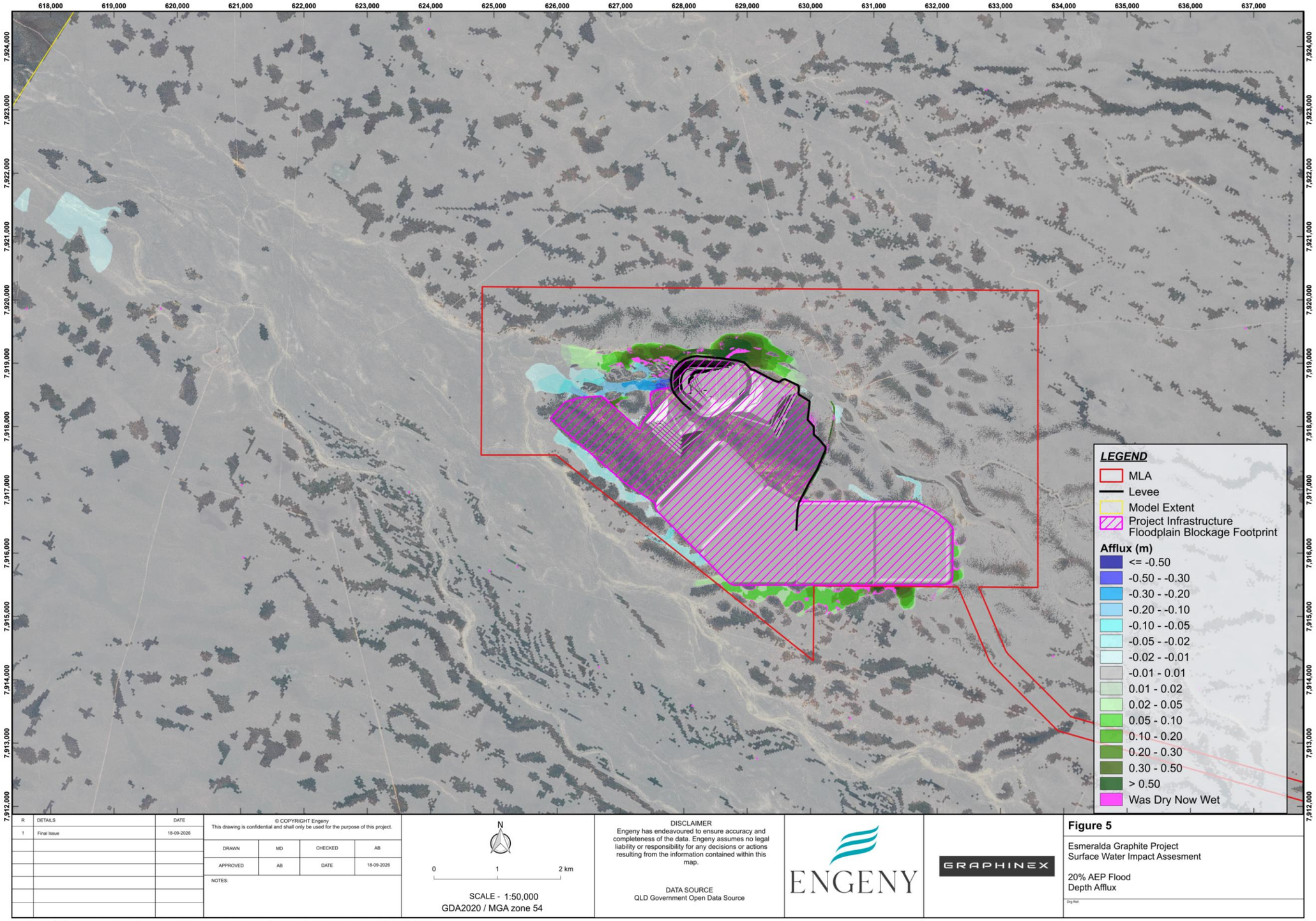



**FIGURE C.5: OPERATIONAL PHASE 20% AEP DEPTH AFFLUX MAP**

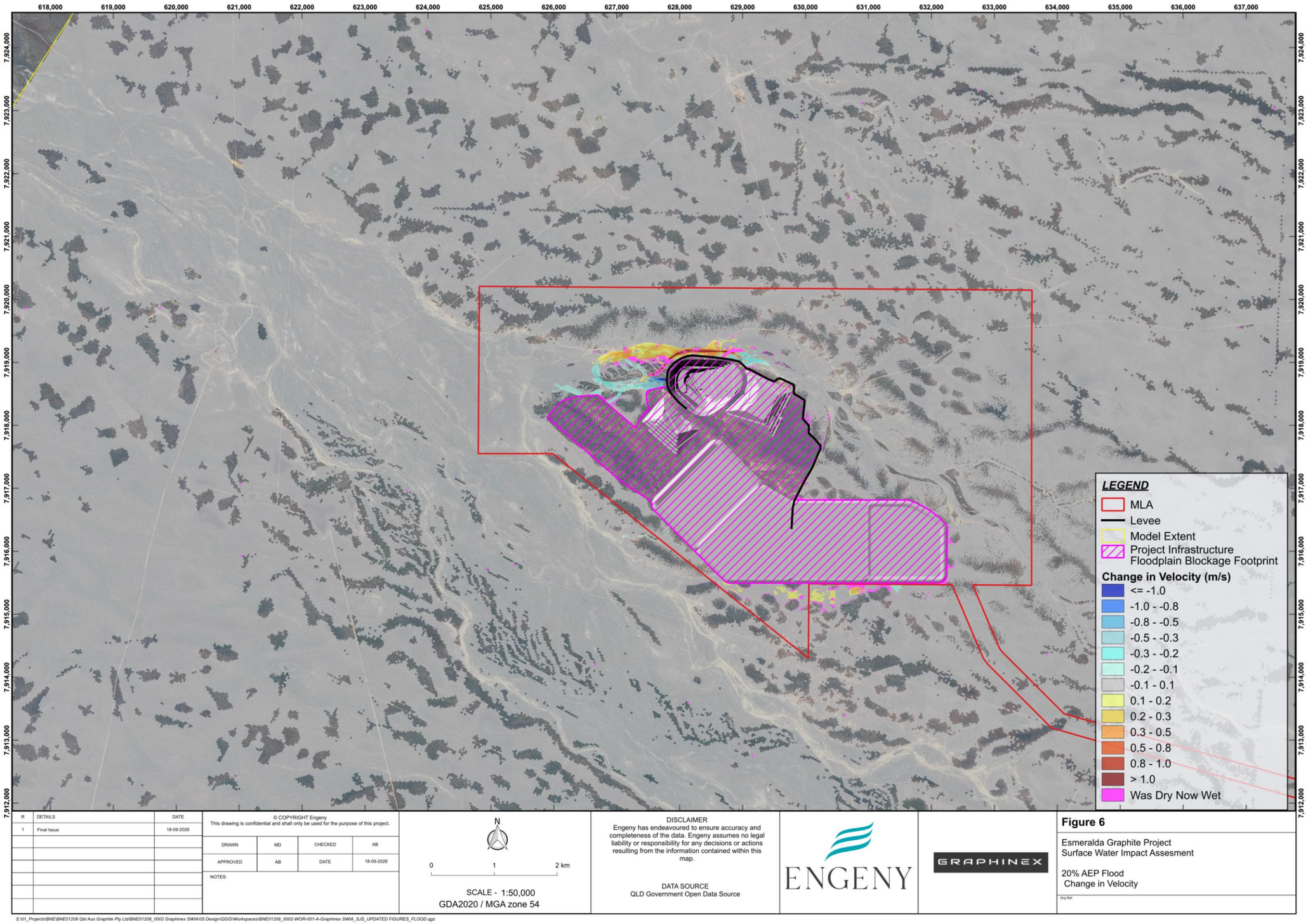
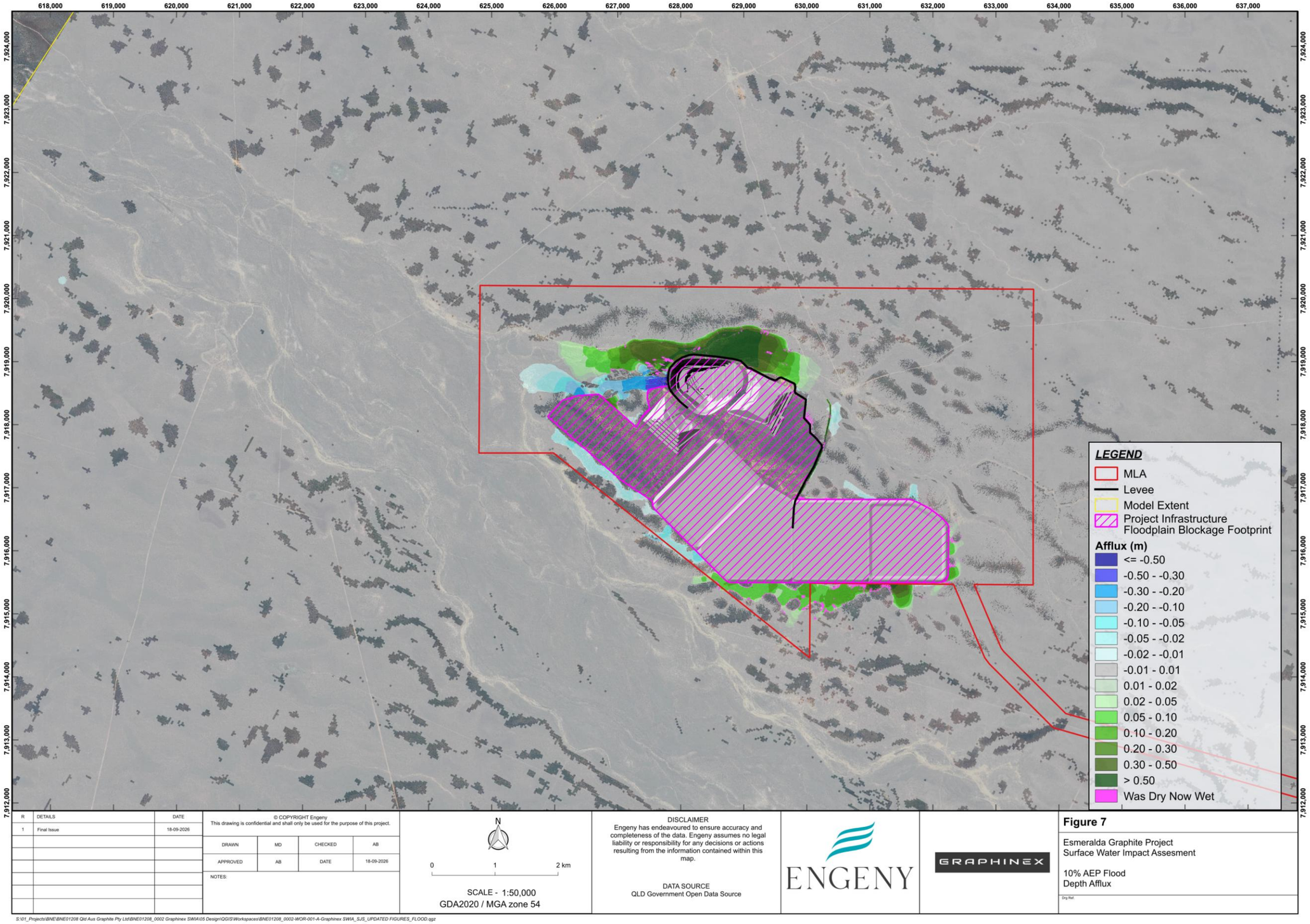



**FIGURE C.6: OPERATIONAL PHASE 20 % AEP CHANGE IN VELOCITY MAP**




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NOTES:

N

0 1 2 km

SCALE - 1:50,000
GDA2020 / MGA zone 54

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DATA SOURCE
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GRAPHINEX

**Figure 7**

Esmeralda Graphite Project
Surface Water Impact Assesment

10% AEP Flood
Depth Afflux

Drg Ref:

S:\01_Projects\BNE\BNE01208 Qld Aus Graphite Pty Ltd\BNE01208_0002 Graphinex SWIA\05 Design\QGIS\Workspaces\BNE01208_0002-WOR-001-A-Graphinex SWIA_SJS_UPDATED FIGURES_FLOOD.qgz

**FIGURE C.7: OPERATIONAL PHASE 10 % AEP DEPTH AFFLUX MAP**

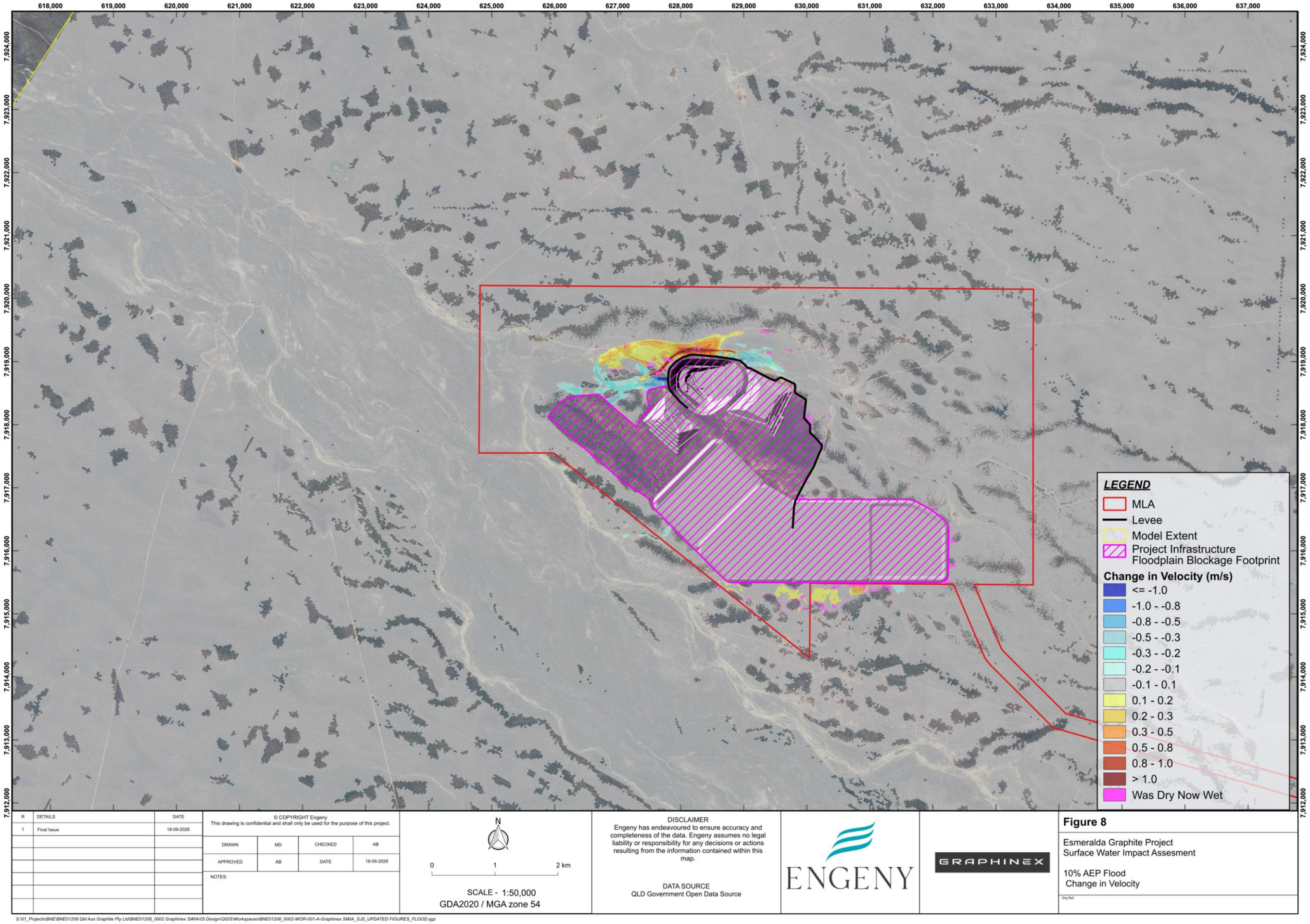



**FIGURE C.8: OPERATIONAL PHASE 10% AEP CHANGE IN VELOCITY MAP**

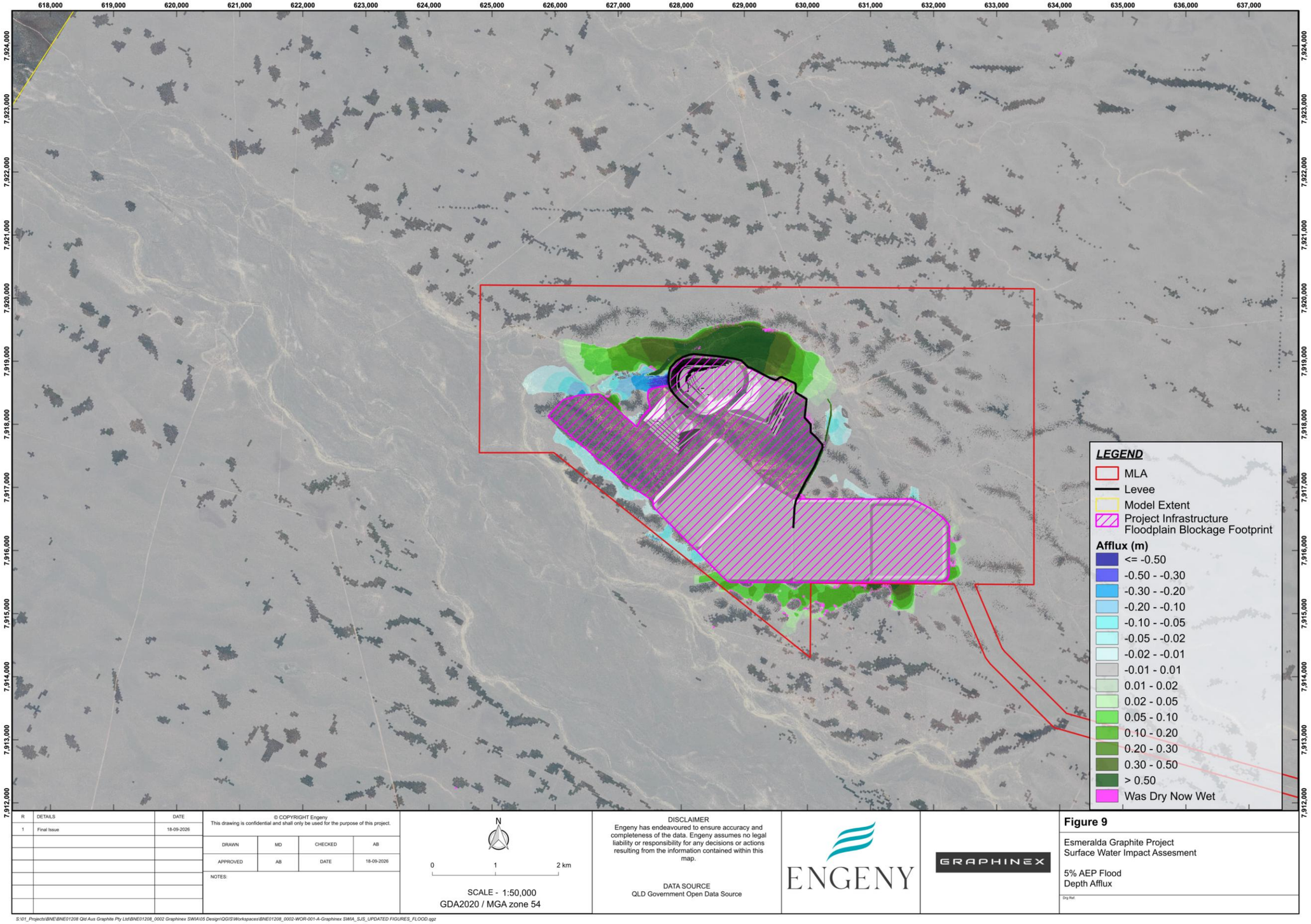



**FIGURE C.9: OPERATIONAL PHASE 5% AEP DEPTH AFFLUX MAP**

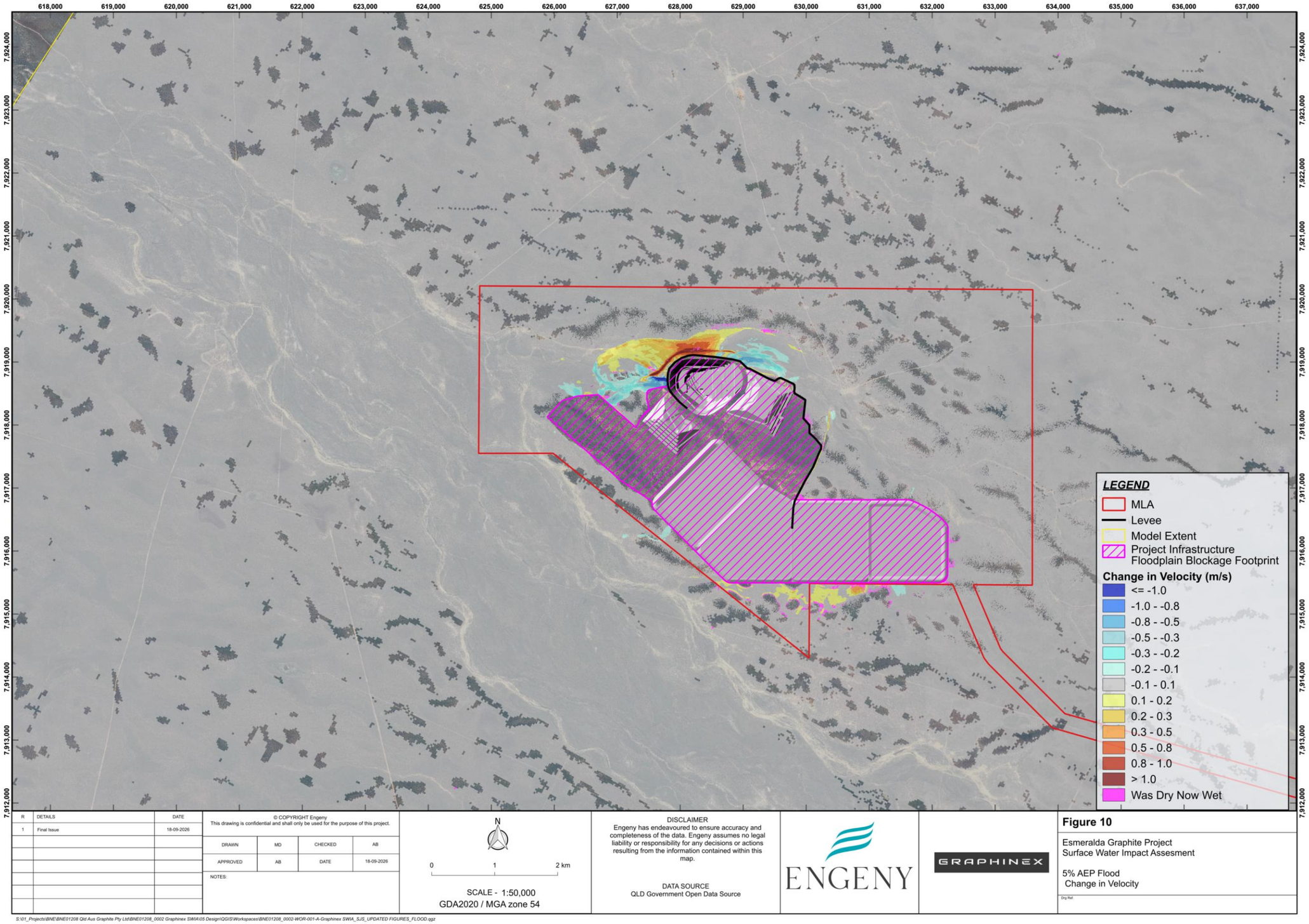



**FIGURE C.10: OPERATIONAL PHASE 5% AEP CHANGE IN VELOCITY MAP**

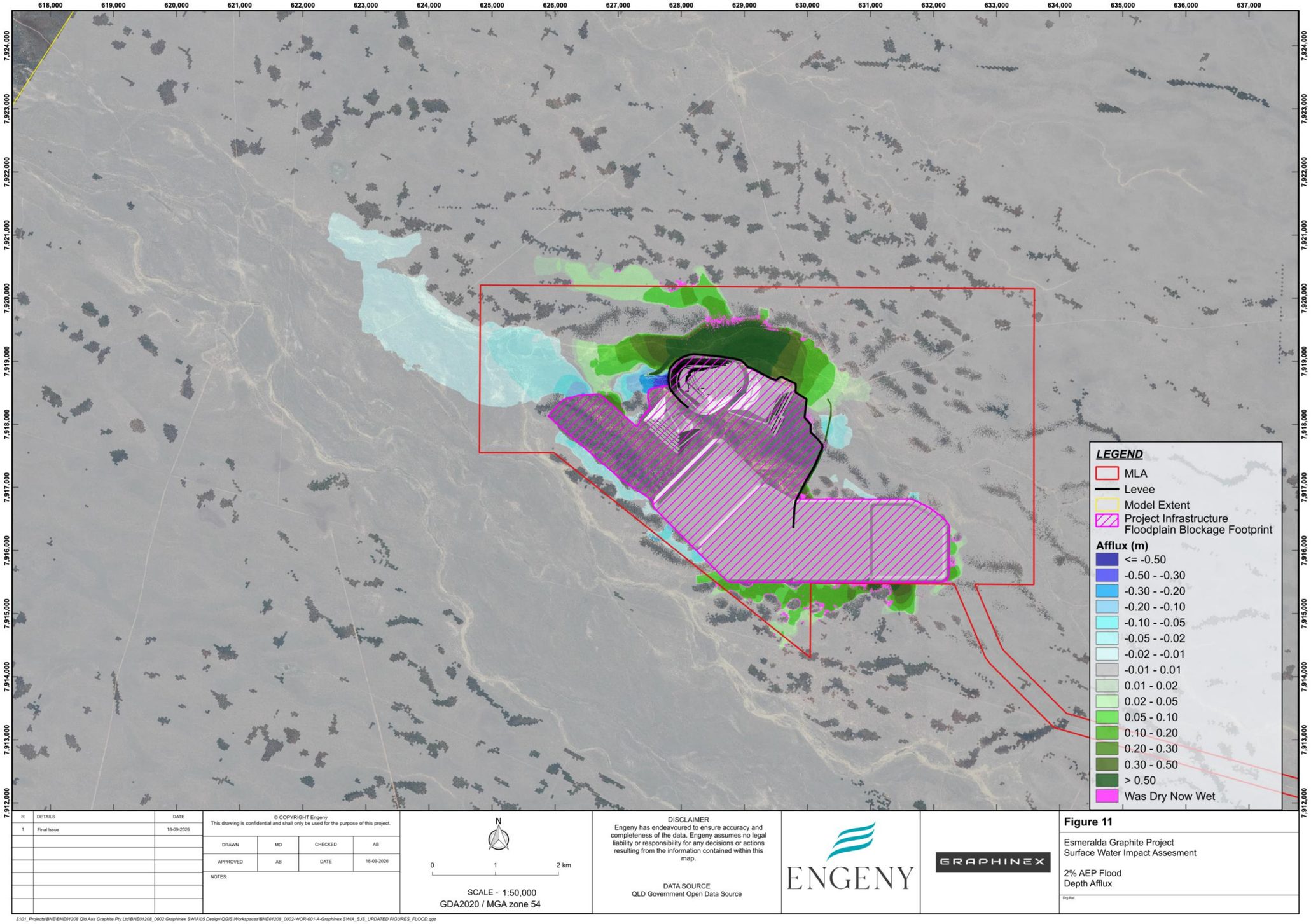



**FIGURE C.11: OPERATIONAL PHASE 2% AEP DEPTH AFFLUX MAP**

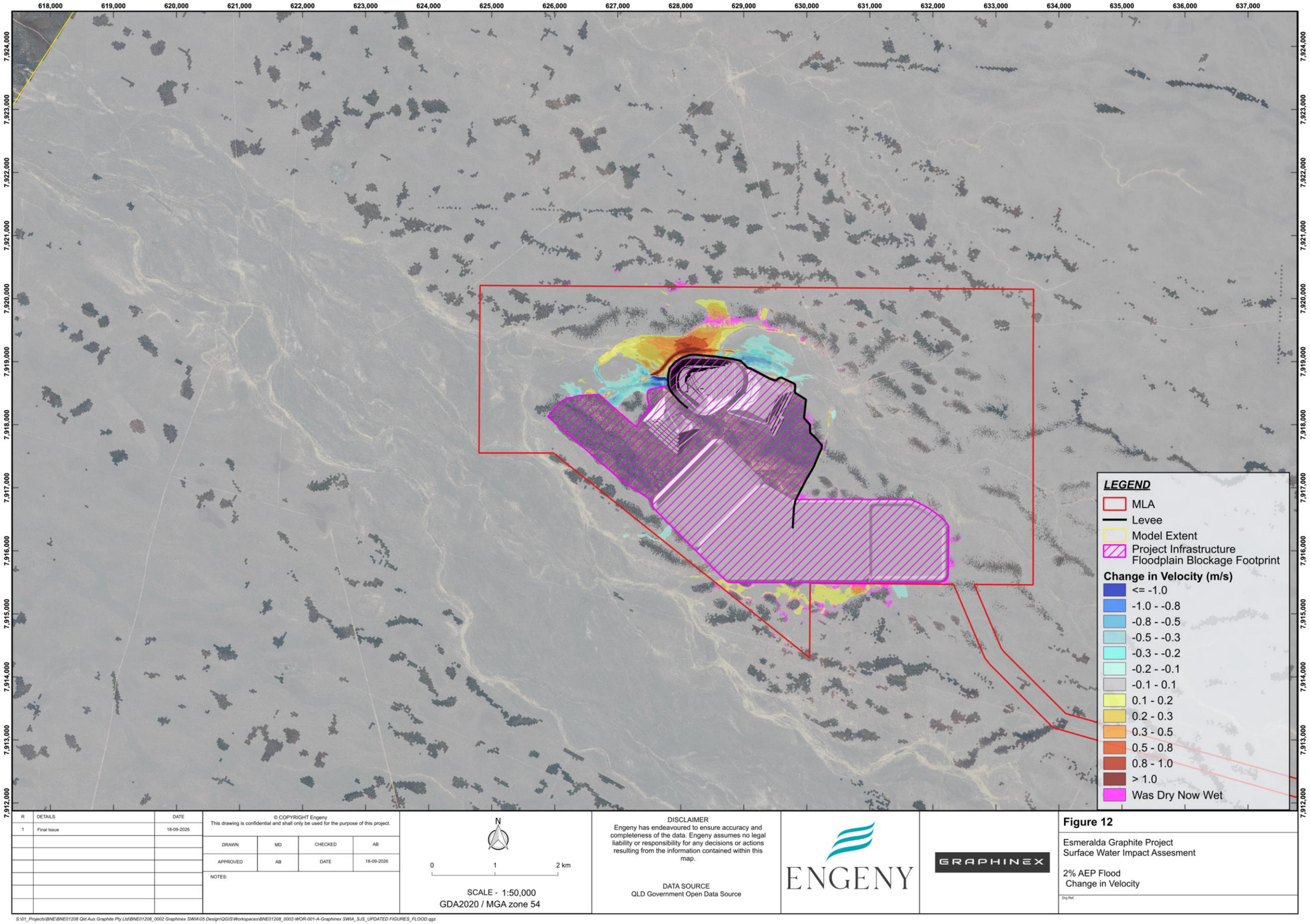



**FIGURE C.12: OPERATIONAL PHASE 2% AEP CHANGE IN VELOCITY MAP**

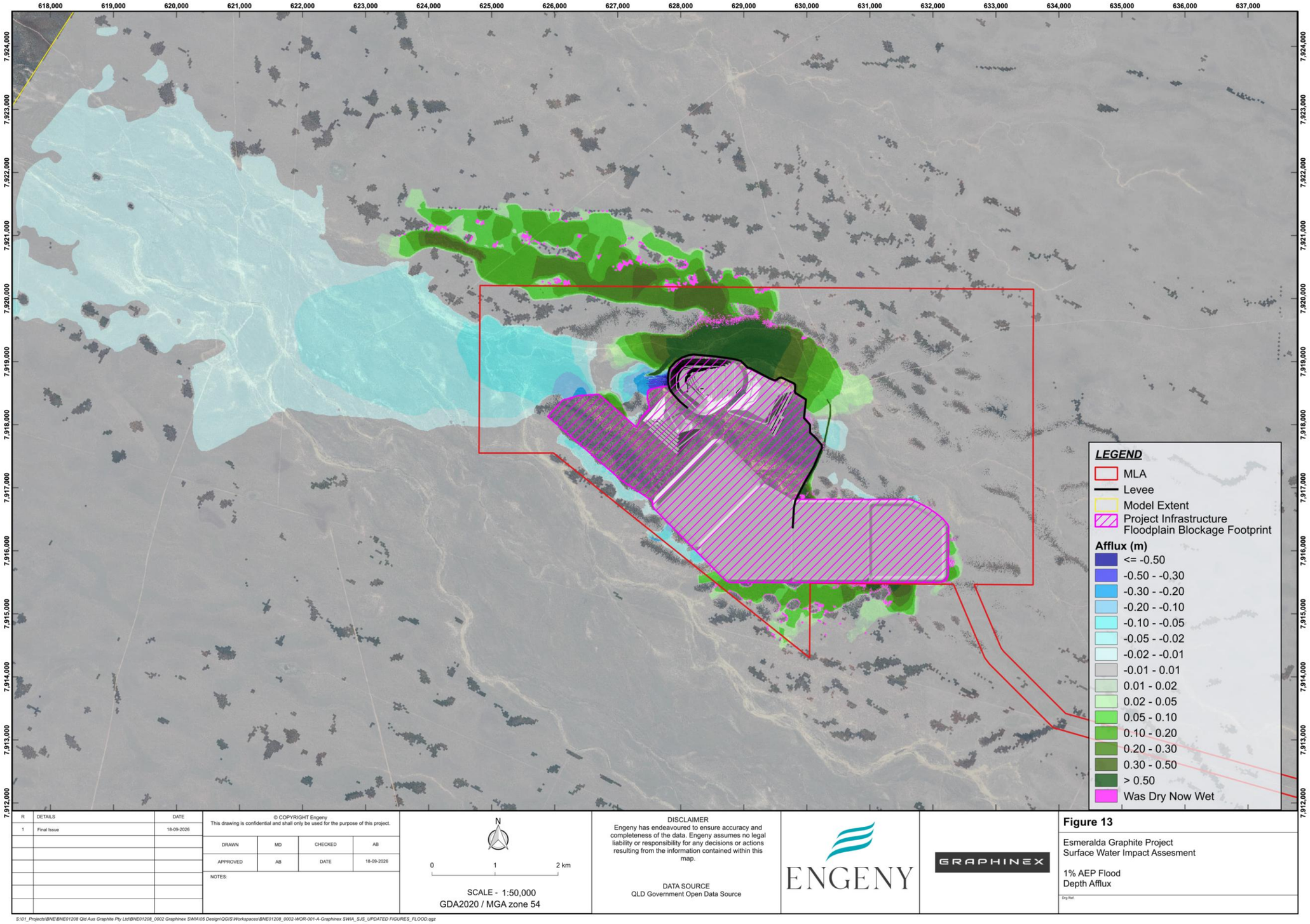



**FIGURE C.13: OPERATIONAL PHASE 1% AEP DEPTH AFFLUX MAP**

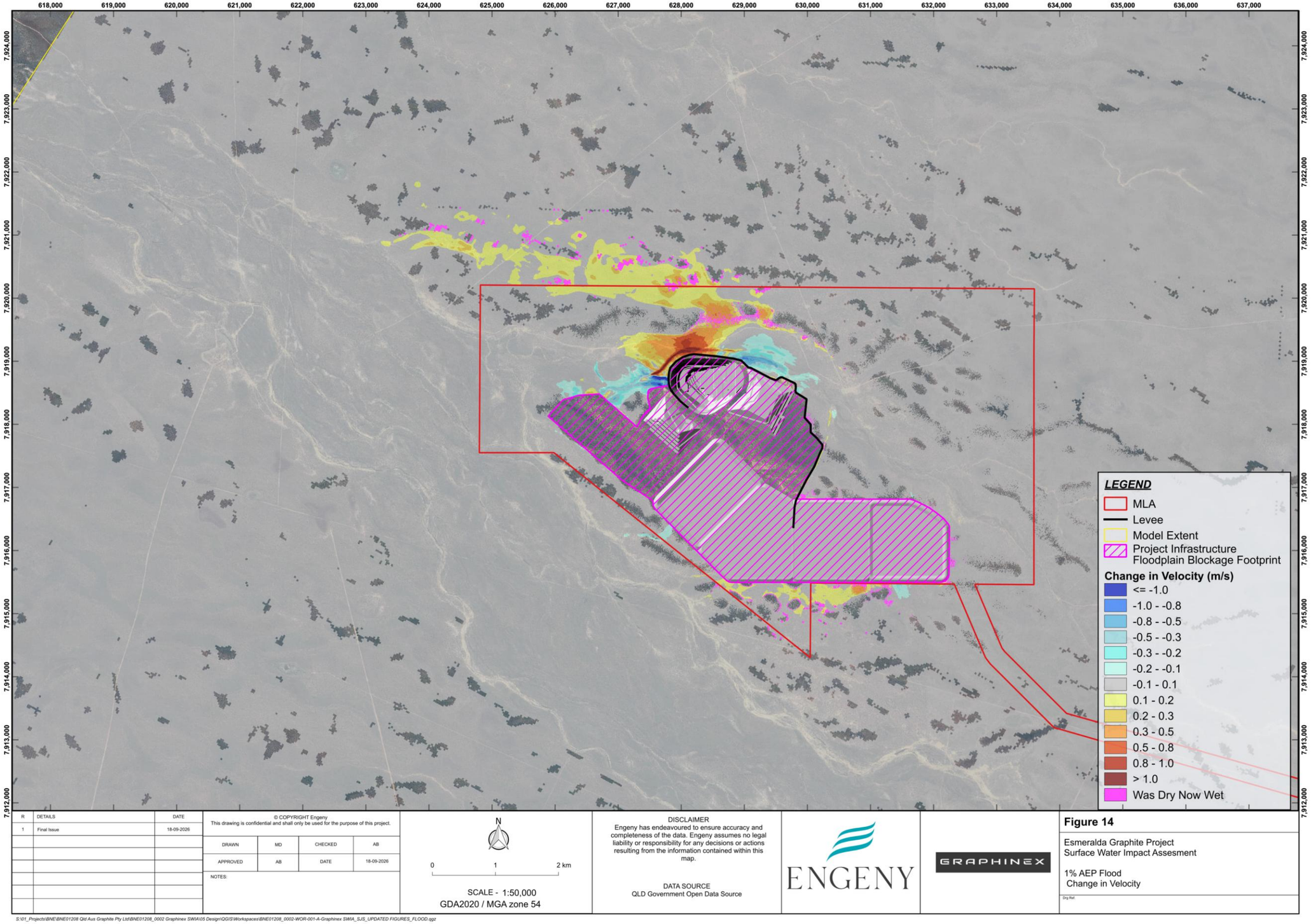



**FIGURE C.14: OPERATIONAL PHASE 1% AEP CHANGE IN VELOCITY MAP**

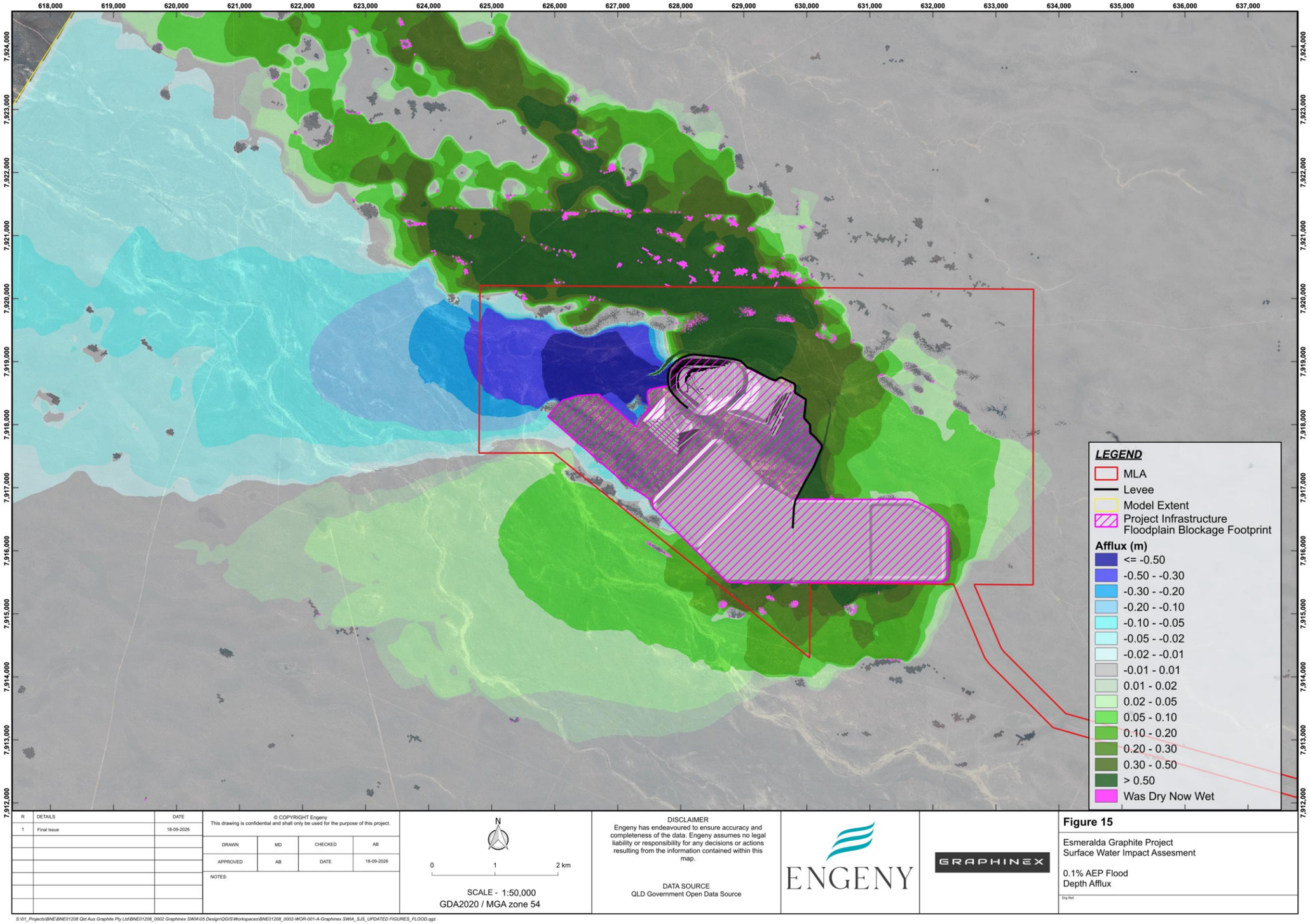



**FIGURE C.15: OPERATIONAL PHASE 0.1% AEP DEPTH AFFLUX MAP**

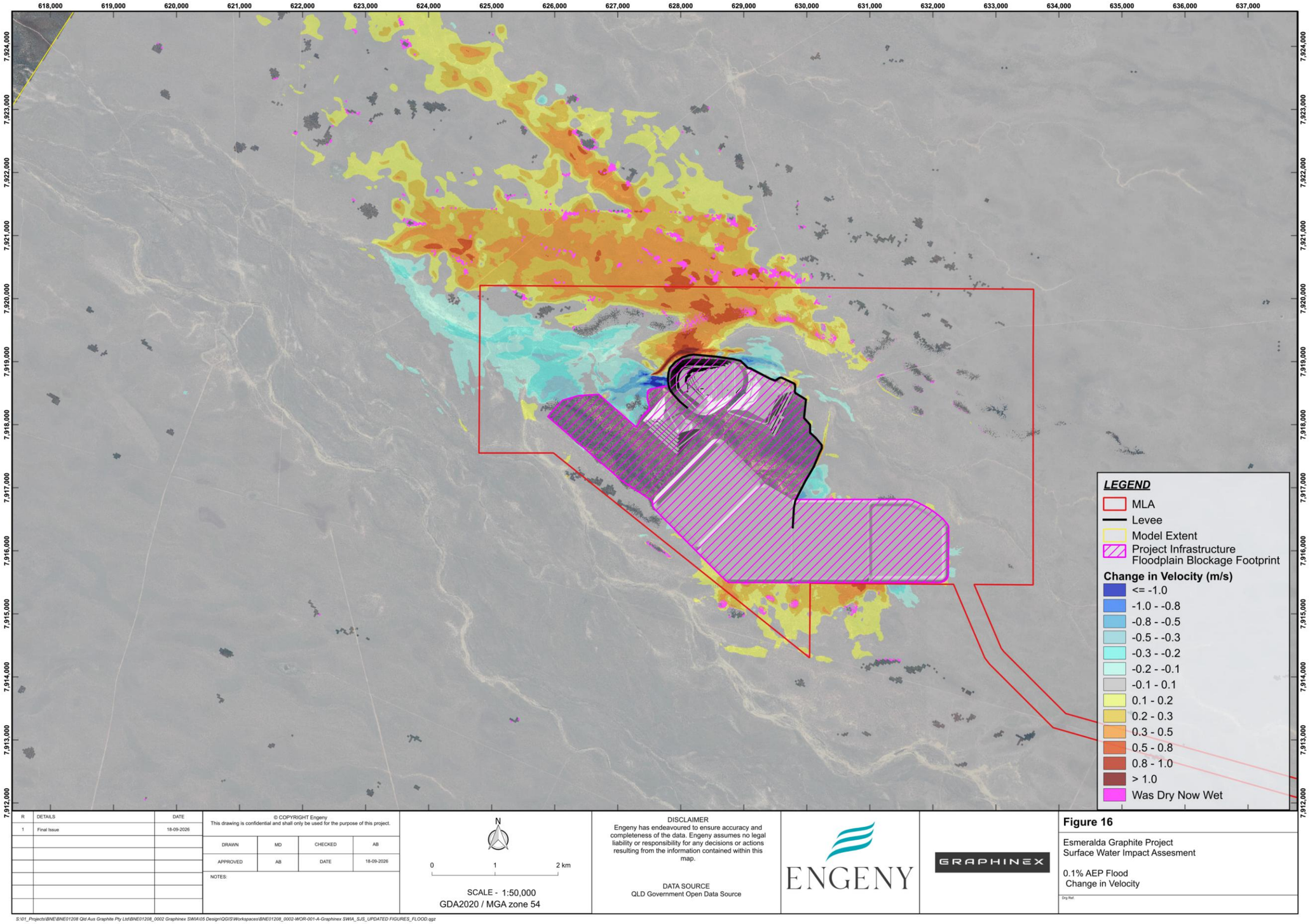



**FIGURE C.16: OPERATIONAL PHASE 0.1% AEP CHANGE IN VELOCITY MAP**

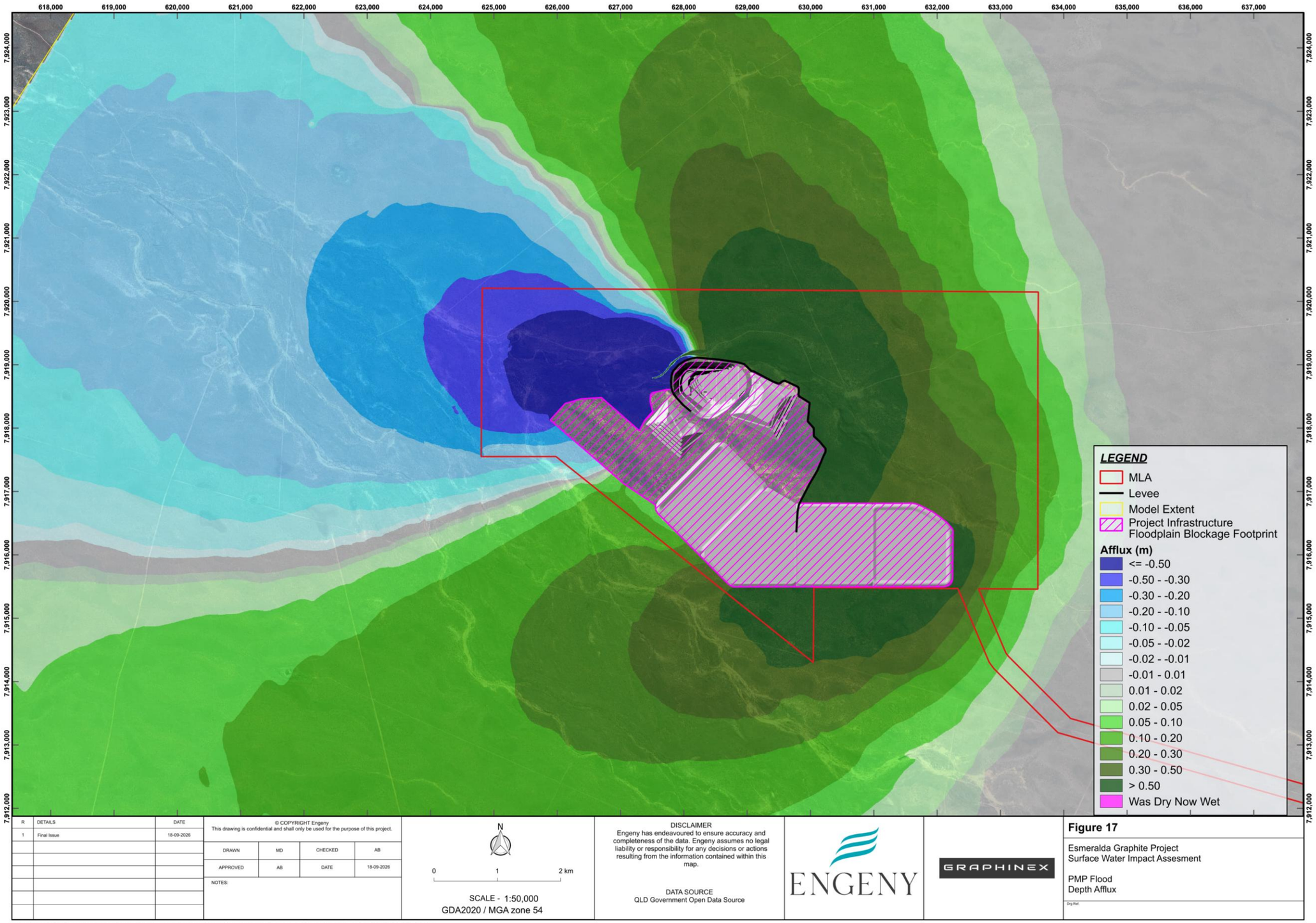



**FIGURE C.17: OPERATIONAL PHASE PMP DEPTH AFFLUX MAP**

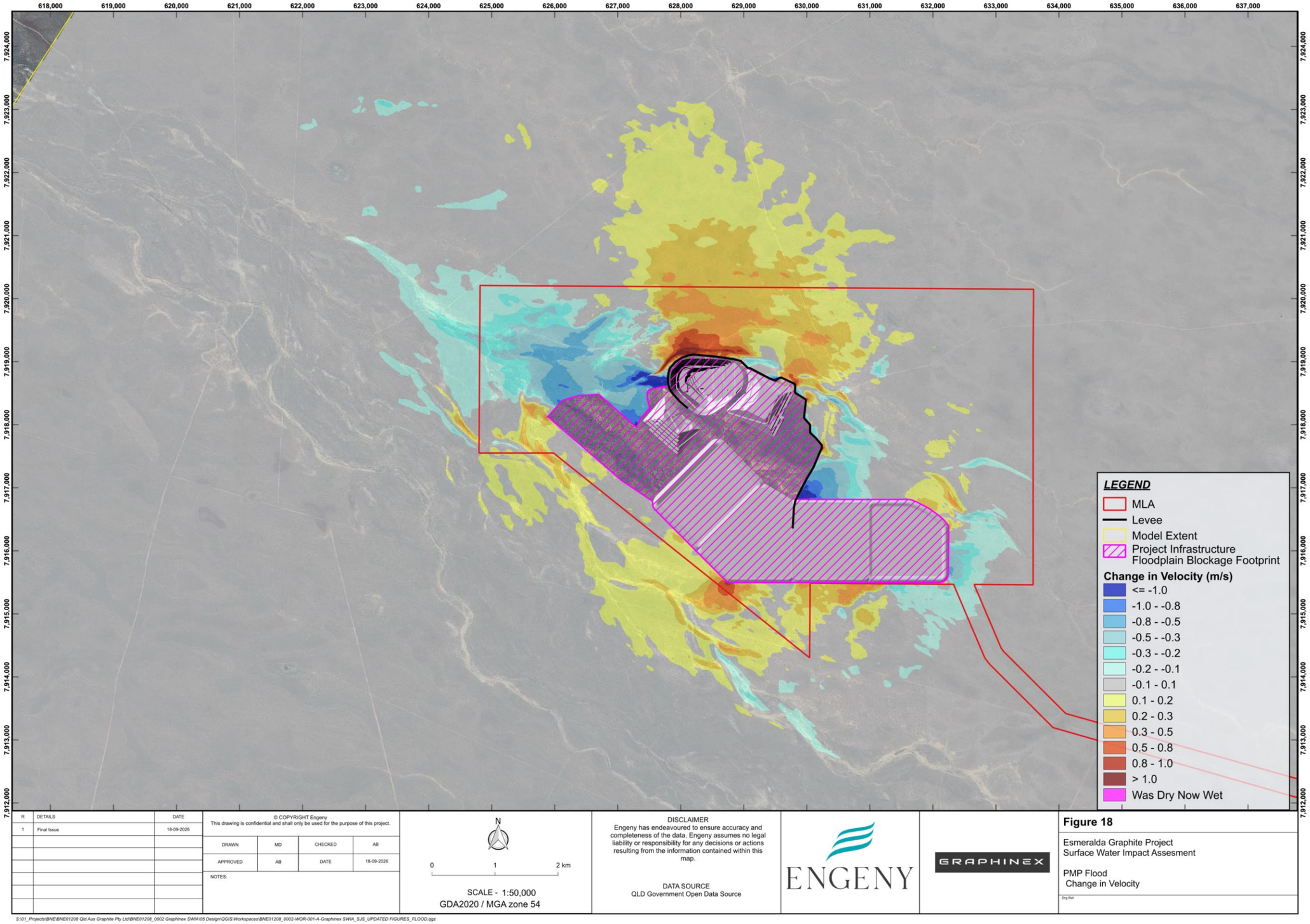



**FIGURE C.18: OPERATIONAL PHASE PMP CHANGE IN VELOCITY**

# APPENDIX D: EXISTING CASE AND CLOSURE PHASE CLIMATE CHANGE FLOOD RESULTS

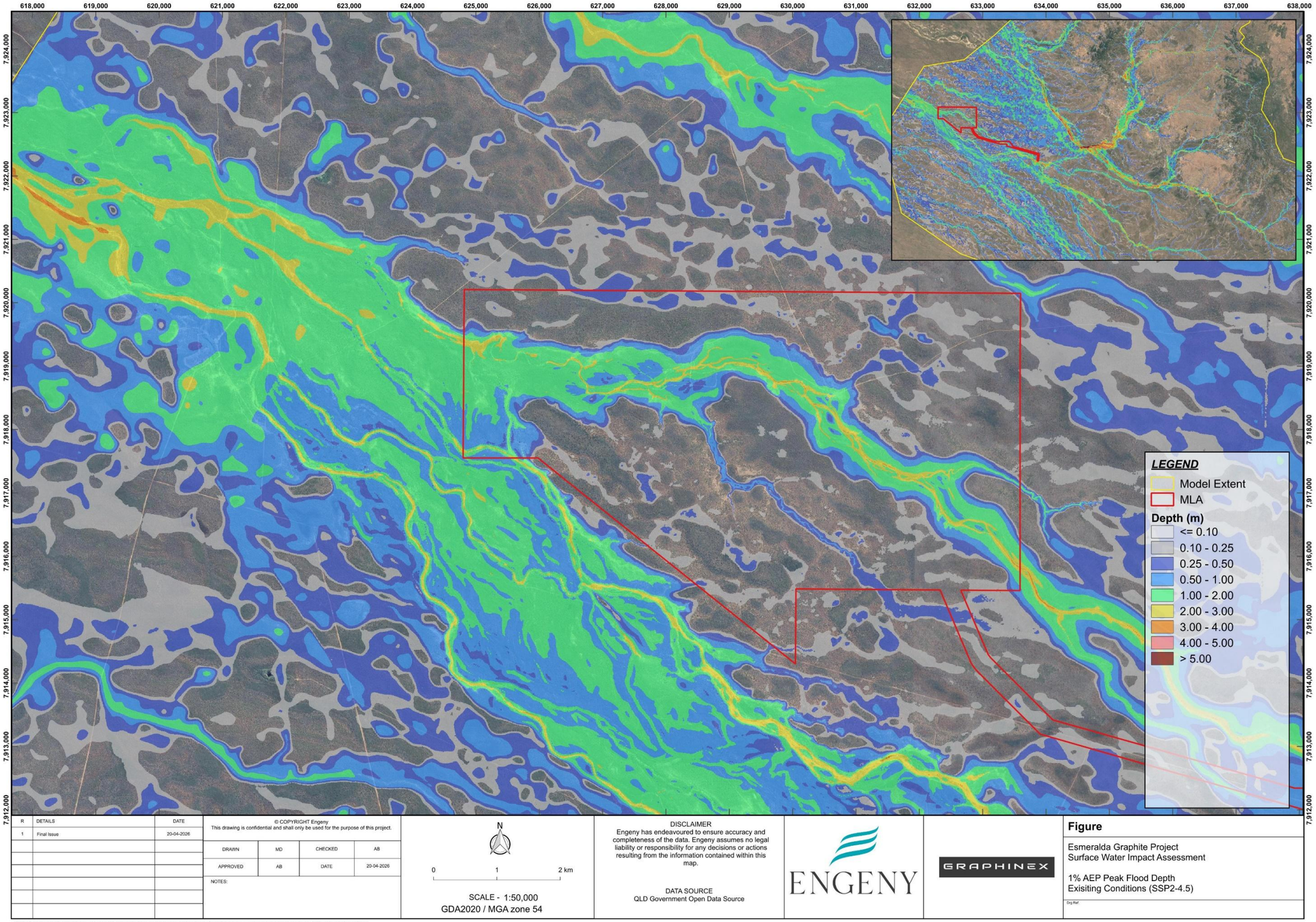



**FIGURE D.1: EXISTING CASE CLIMATE CHANGE SCENARIO (SSP2-4.5 YEAR 2090) 1% AEP DEPTH MAP**

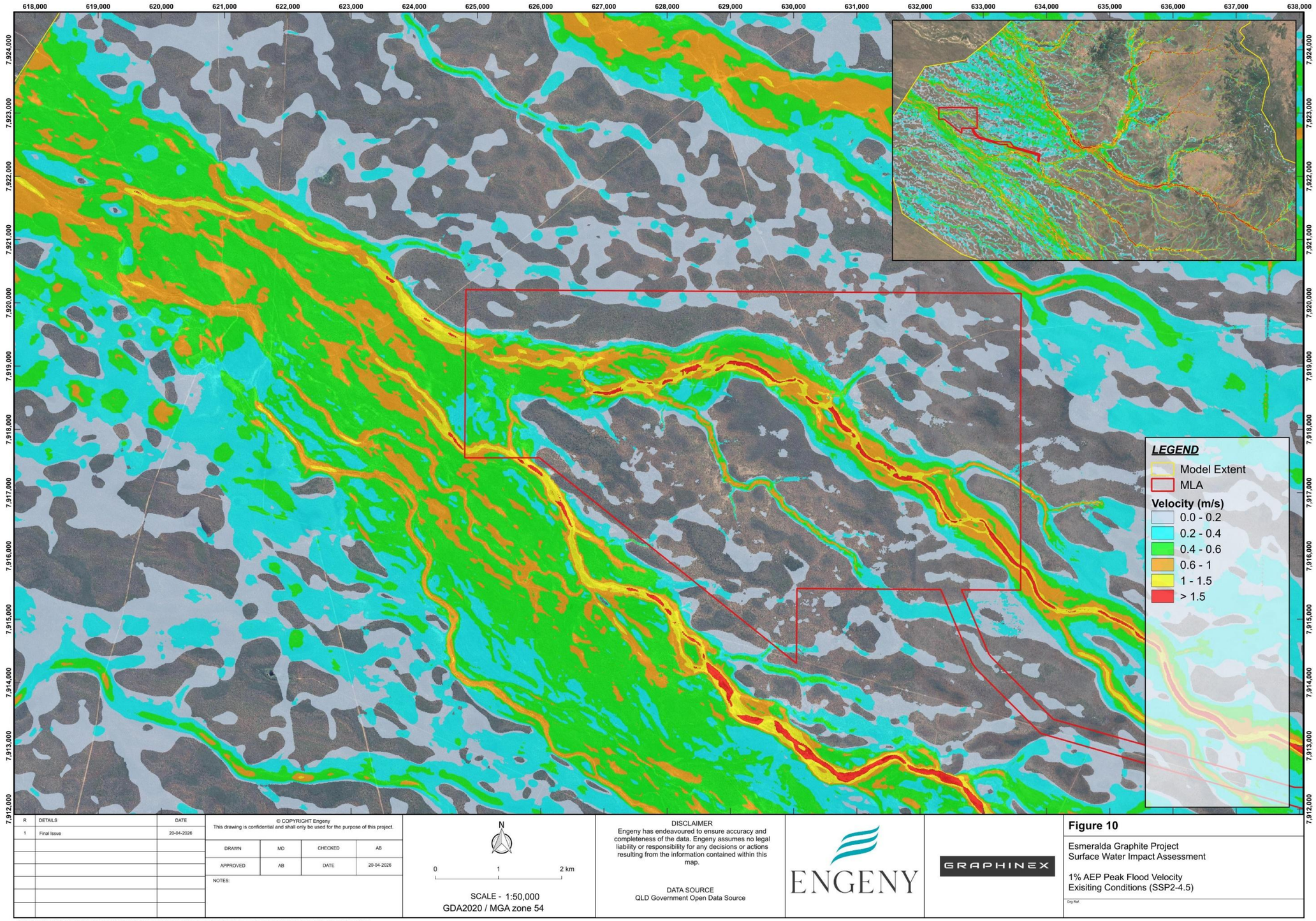
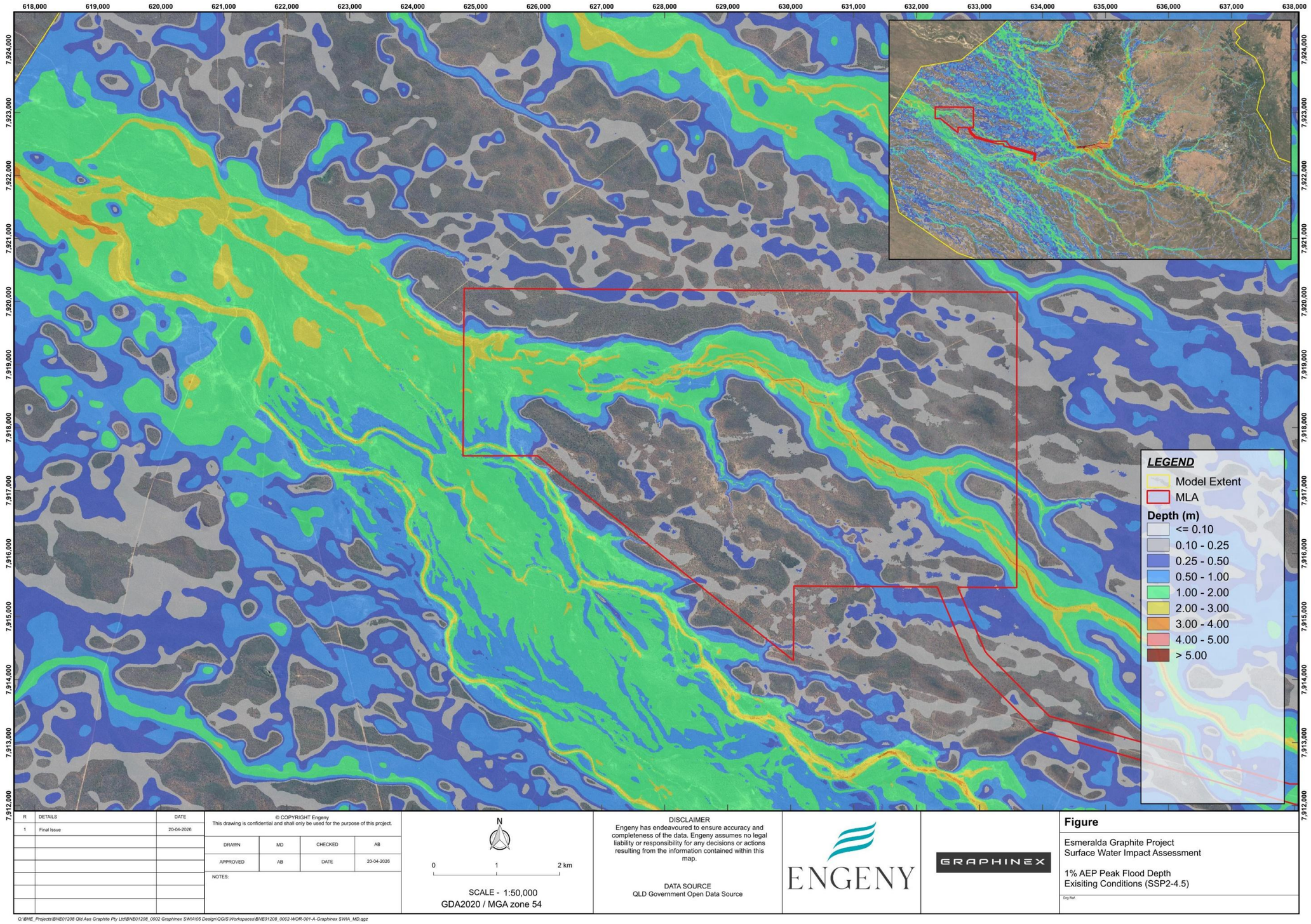



**FIGURE D.2: EXISTING CASE CLIMATE CHANGE SCENARIO (SSP2-4.5 YEAR 2090) 1% AEP VELOCITY MAP**




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|---|---|---|
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NOTES:

N

0 1 2 km

SCALE - 1:50,000
GDA2020 / MGA zone 54

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DATA SOURCE
QLD Government Open Data Source

ENGENY

GRAPHINEX

**Figure**

Esmeralda Graphite Project
Surface Water Impact Assessment

1% AEP Peak Flood Depth
Exisiting Conditions (SSP2-4.5)

Drg Ref

Q:\BNE_Projects\BNE01208 Old Aus Graphite Pty Ltd\BNE01208_0002 Graphinex SWIA\05 Design\QGIS\Workspaces\BNE01208_0002-WOR-001-A-Graphinex SWIA_MD.qgz

**FIGURE D.3: EXISTING CASE CLIMATE CHANGE SCENARIO (SSP5-8.5 YEAR 2090) 1% AEP DEPTH MAP**

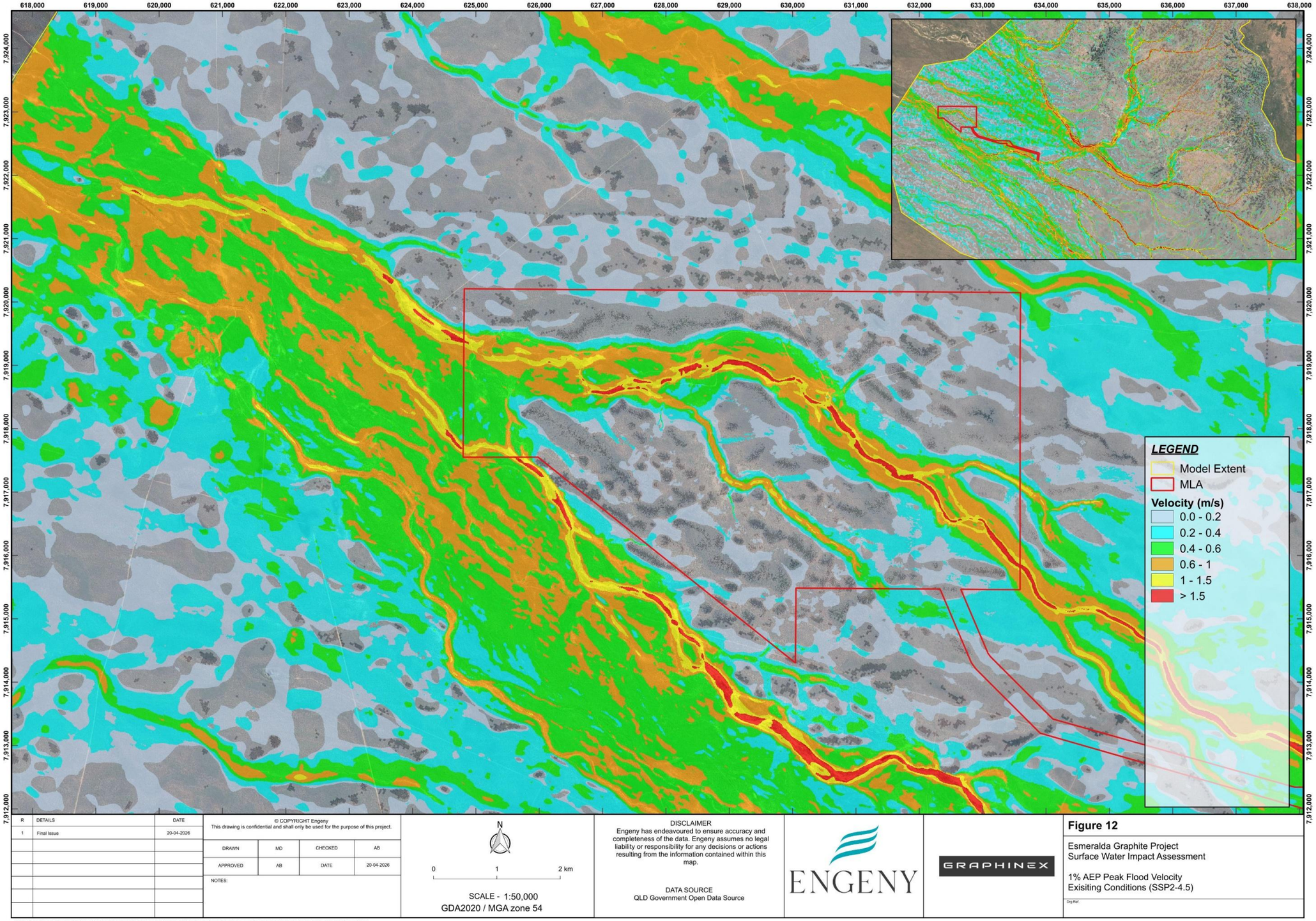



**FIGURE D.4: EXISTING CASE CLIMATE CHANGE SCENARIO (SSP5-8.5 YEAR 2090) 1% AEP VELOCITY MAP**

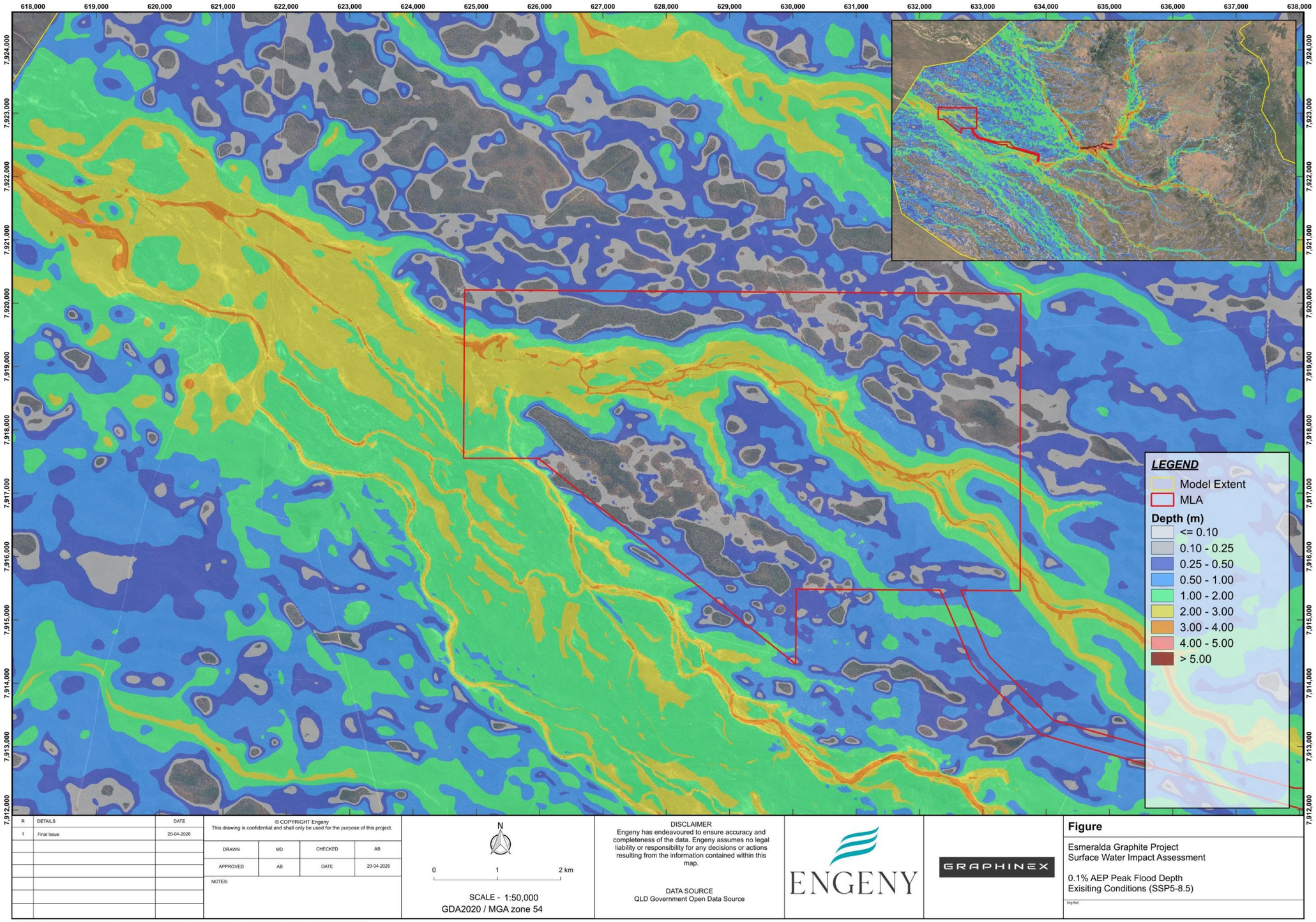



**FIGURE D.5: EXISTING CASE CLIMATE CHANGE SCENARIO (SSP2-4.5 YEAR 2090) 0.1% AEP DEPTH MAP**

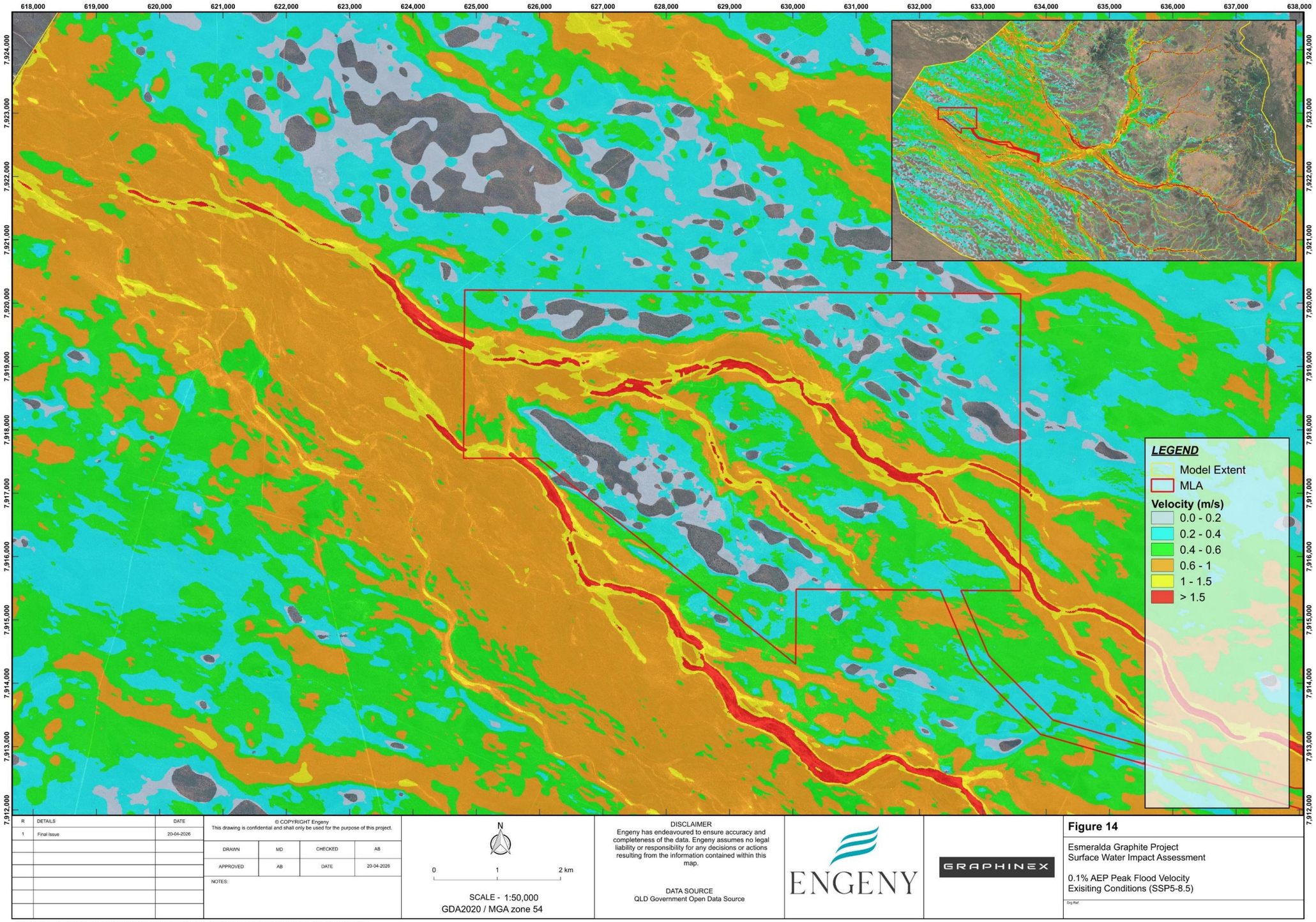



**FIGURE D.6: EXISTING CASE CLIMATE CHANGE SCENARIO (SSP2-4.5 YEAR 2090) 0.1% AEP VELOCITY MAP**

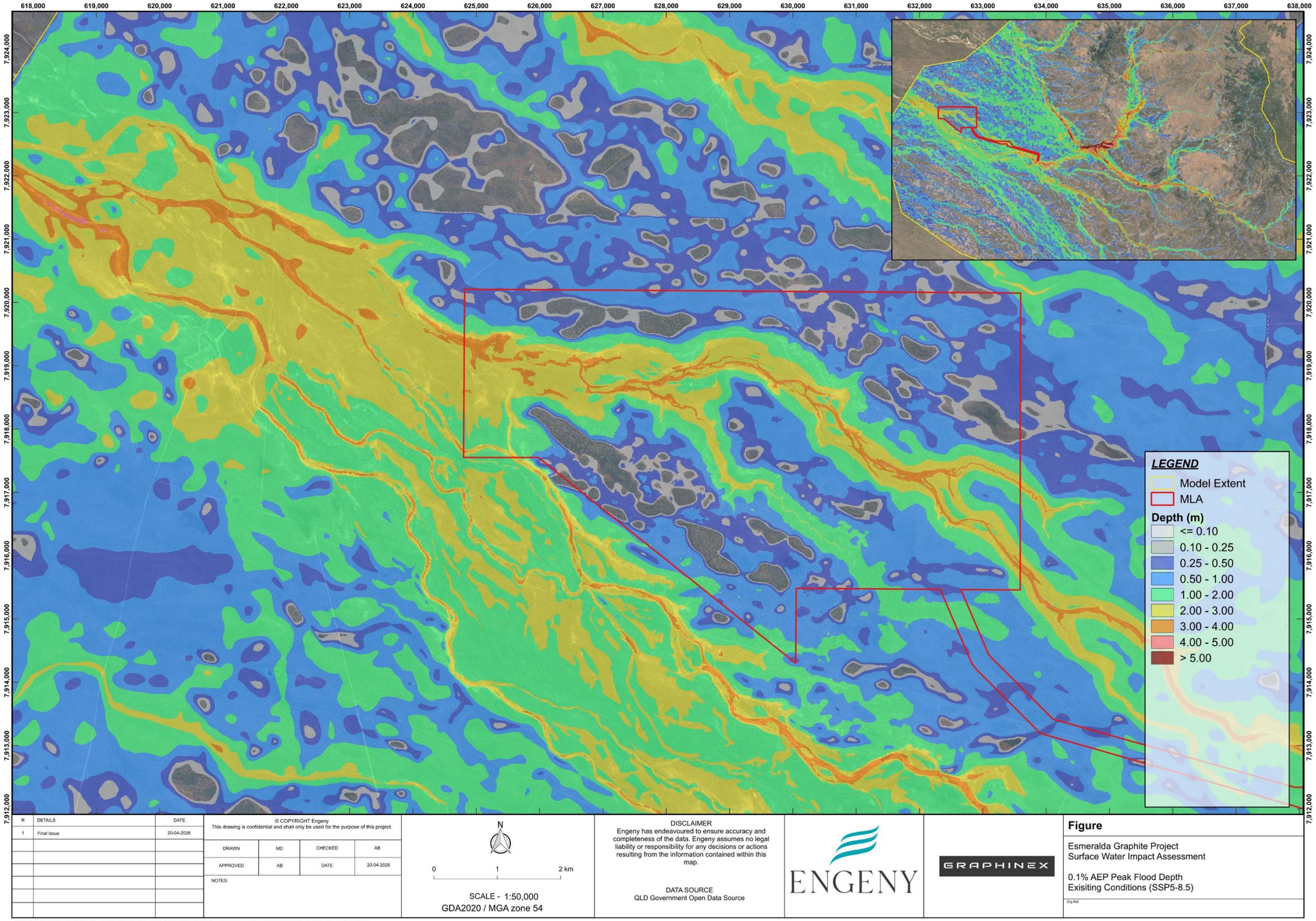
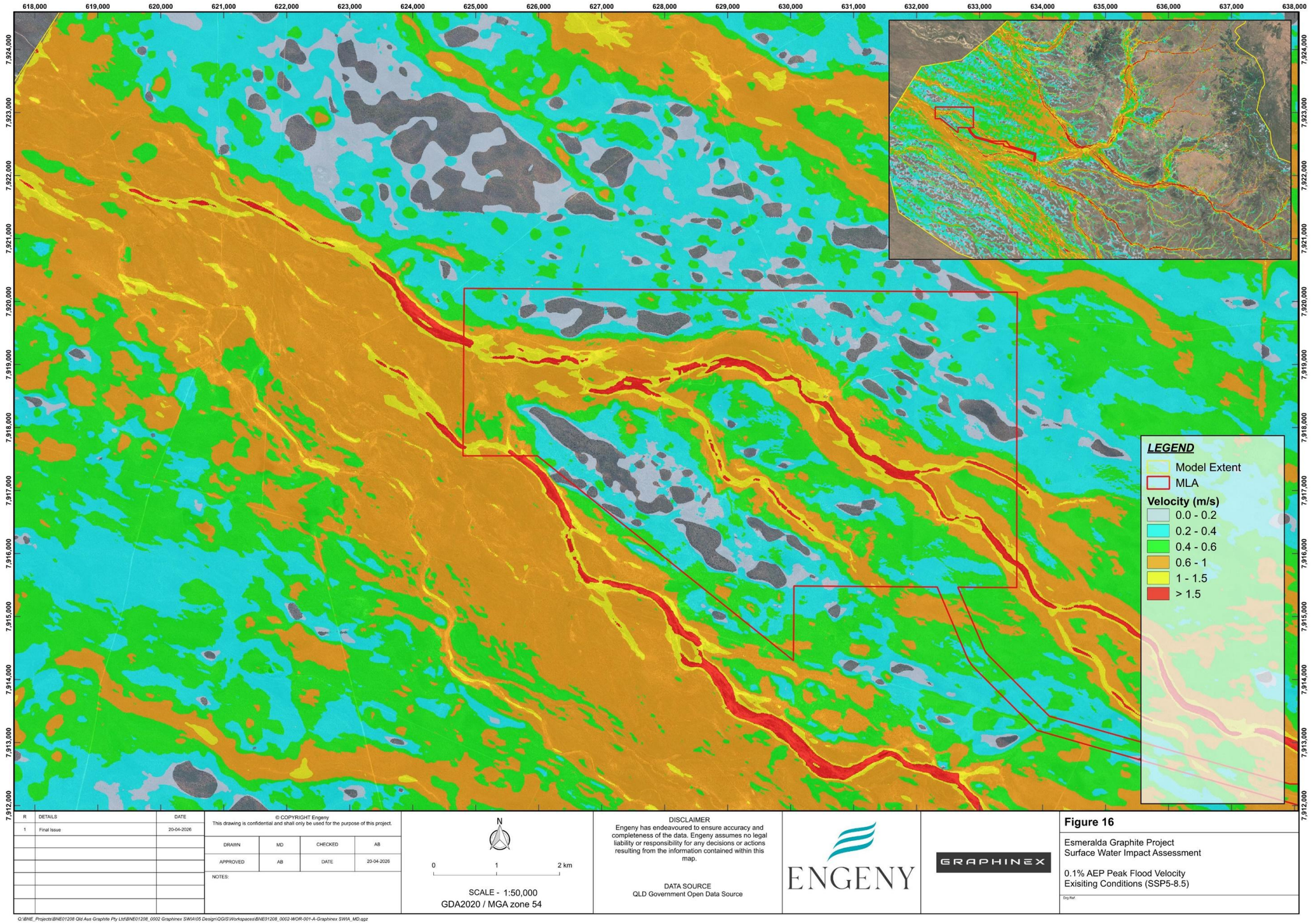



**FIGURE D.7: EXISTING CASE CLIMATE CHANGE SCENARIO (SSP5-8.5 YEAR 2090) 0.1% AEP DEPTH MAP**




| R | DETAILS | DATE |
|---|---|---|
| 1 | Final Issue | 20-04-2026 |

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|---|---|---|---|
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NOTES:

N

0 1 2 km

SCALE - 1:50,000
GDA2020 / MGA zone 54

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DATA SOURCE
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GRAPHINEX

**Figure 16**

Esmeralda Graphite Project
Surface Water Impact Assessment

0.1% AEP Peak Flood Velocity
Exisiting Conditions (SSP5-8.5)

Drg Ref:

Q:\BNE_Projects\BNE01208 Qld Aus Graphite Pty Ltd\BNE01208_0002 Graphinex SWIA\05 Design\QGIS\Workspaces\BNE01208_0002-WOR-001-A-Graphinex SWIA_MD.qgz

**FIGURE D.8: EXISTING CASE CLIMATE CHANGE SCENARIO (SSP5-8.5 YEAR 2090) 0.1% AEP VELOCITY MAP**

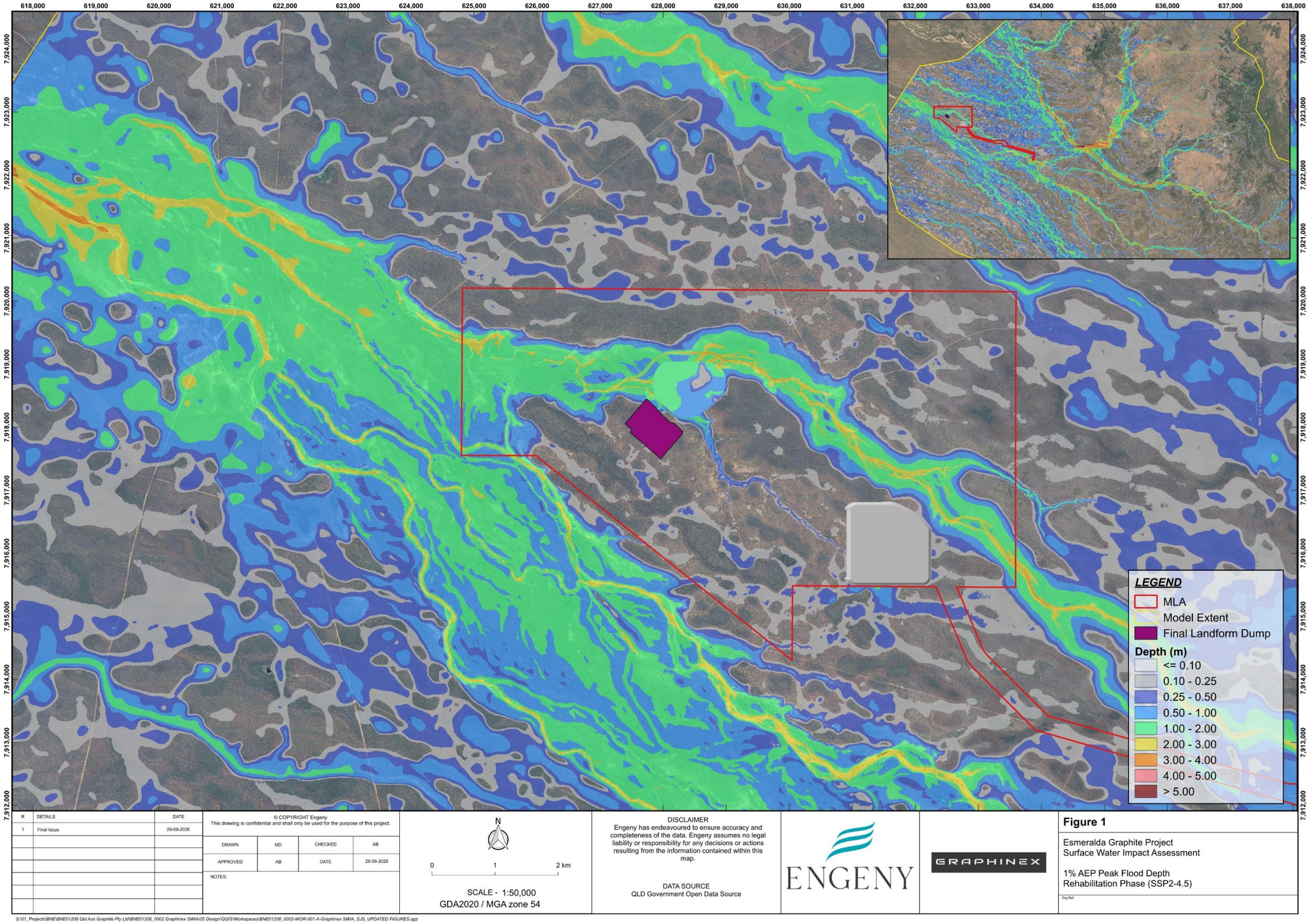



**FIGURE D.9: CLOSURE PHASE WITH CLIMATE CHANGE (SSP2-4.5 YEAR 2090) 1% AEP DEPTH MAP**

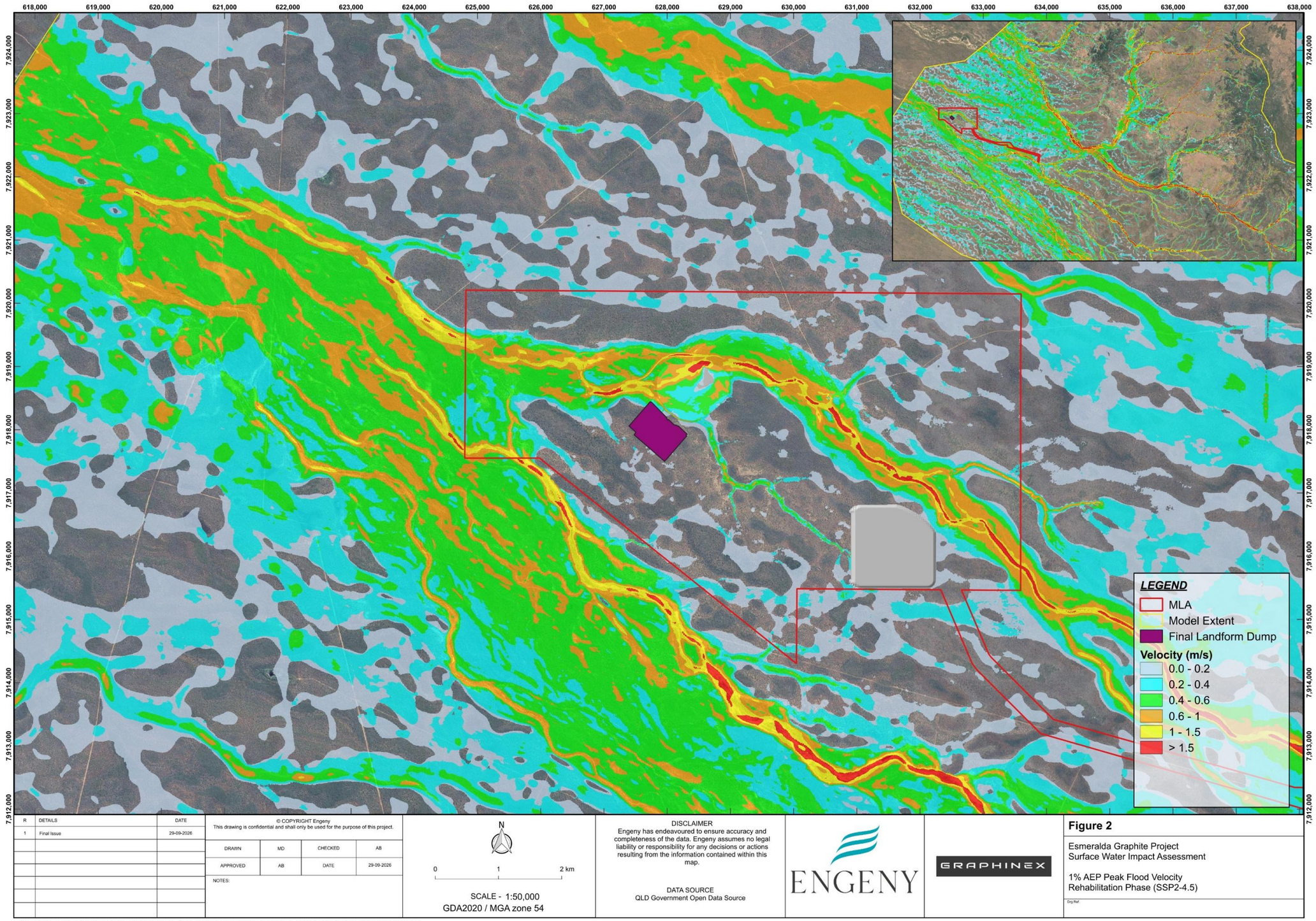



**FIGURE D.10: CLOSURE PHASE WITH CLIMATE CHANGE (SSP2-4.5 YEAR 2090) 1% AEP VELOCITY MAP**

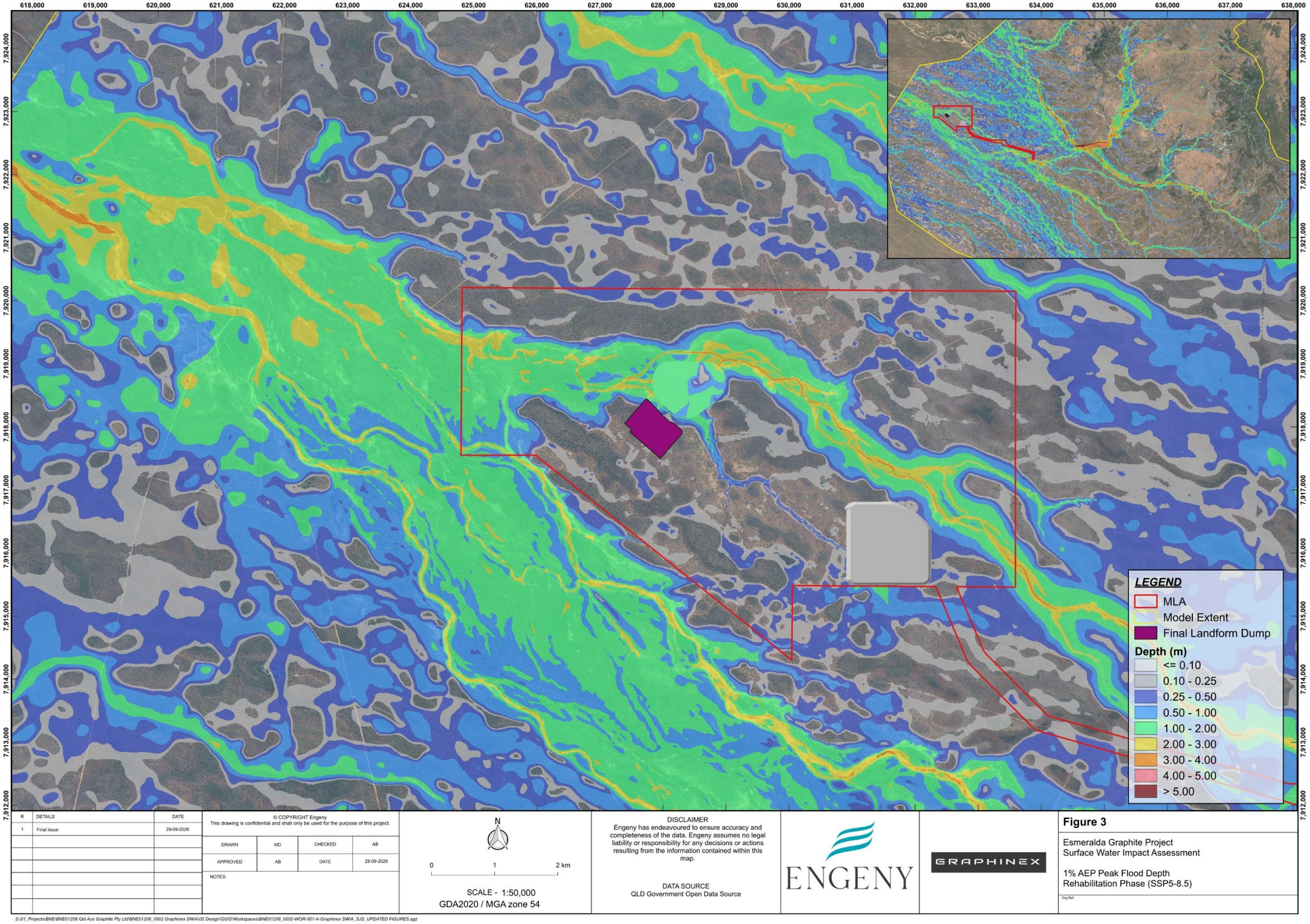



**FIGURE D.11: CLOSURE PHASE WITH CLIMATE CHANGE (SSP5-8.5 YEAR 2090) 1% AEP DEPTH MAP**

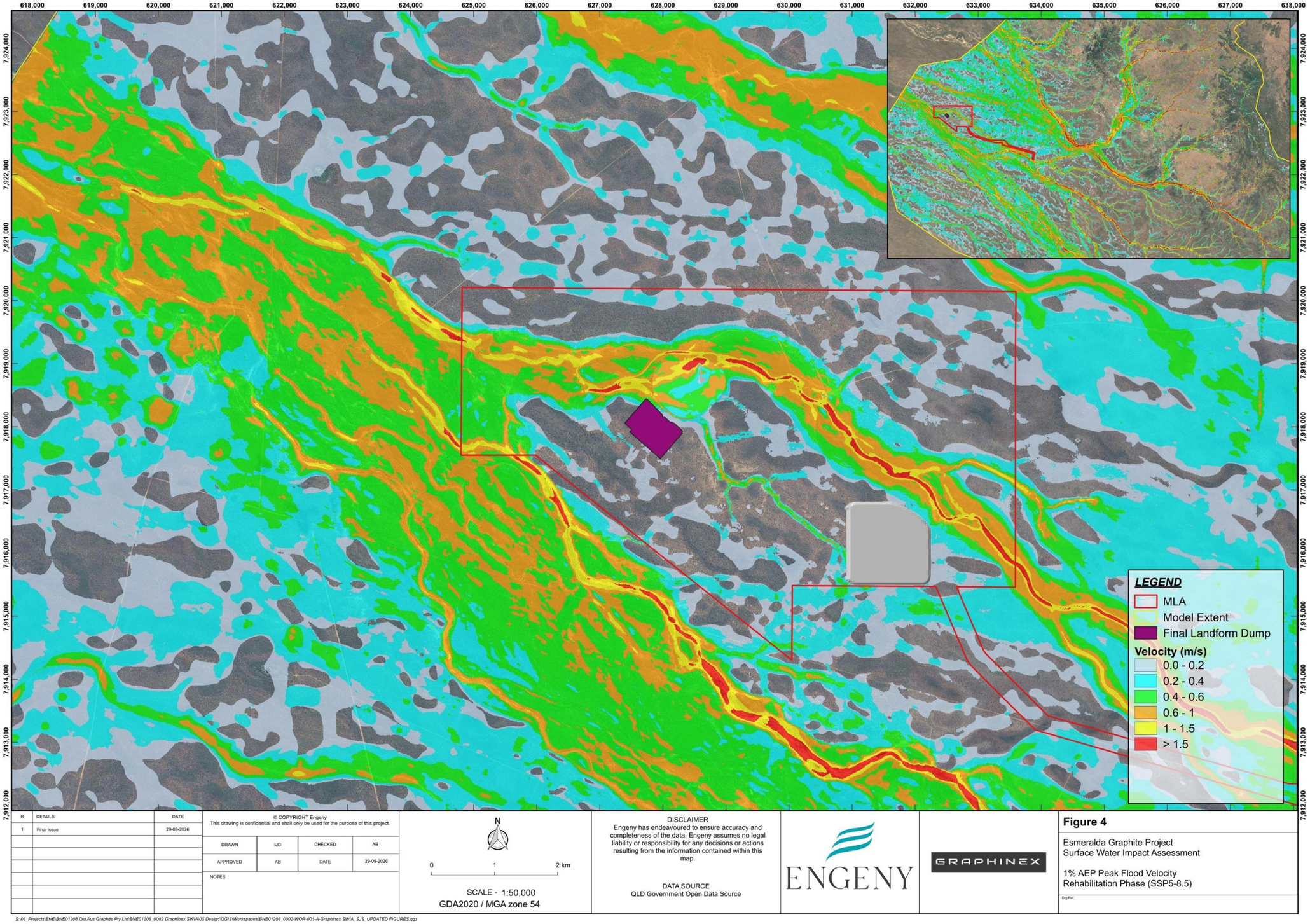



**FIGURE D.12: CLOSURE PHASE WITH CLIMATE CHANGE (SSP5-8.5 YEAR 2090) 1% AEP VELOCITY MAP**

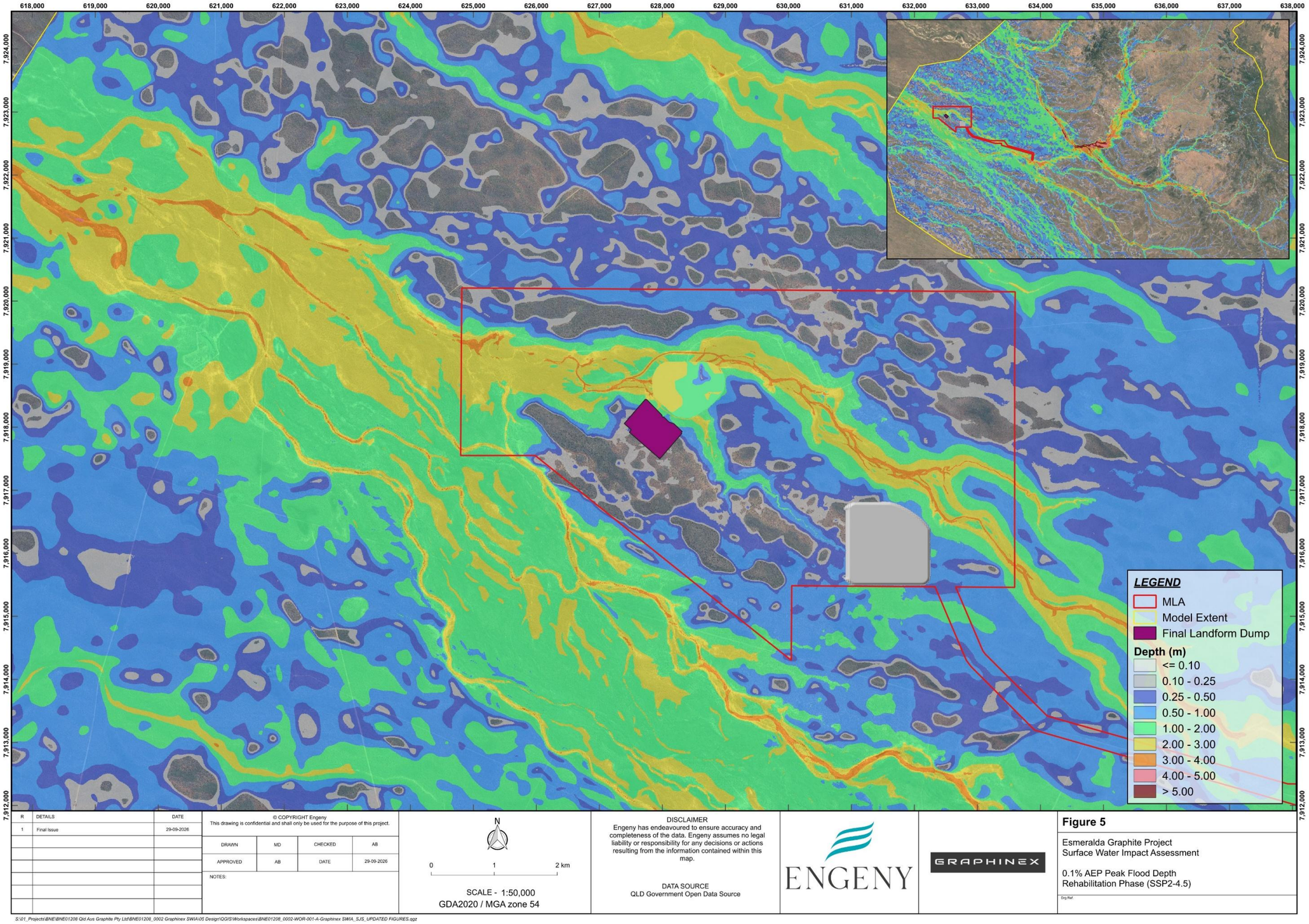



**FIGURE D.13: CLOSURE PHASE WITH CLIMATE CHANGE (SSP2-4.5 YEAR 2090) 0.1% AEP DEPTH MAP**

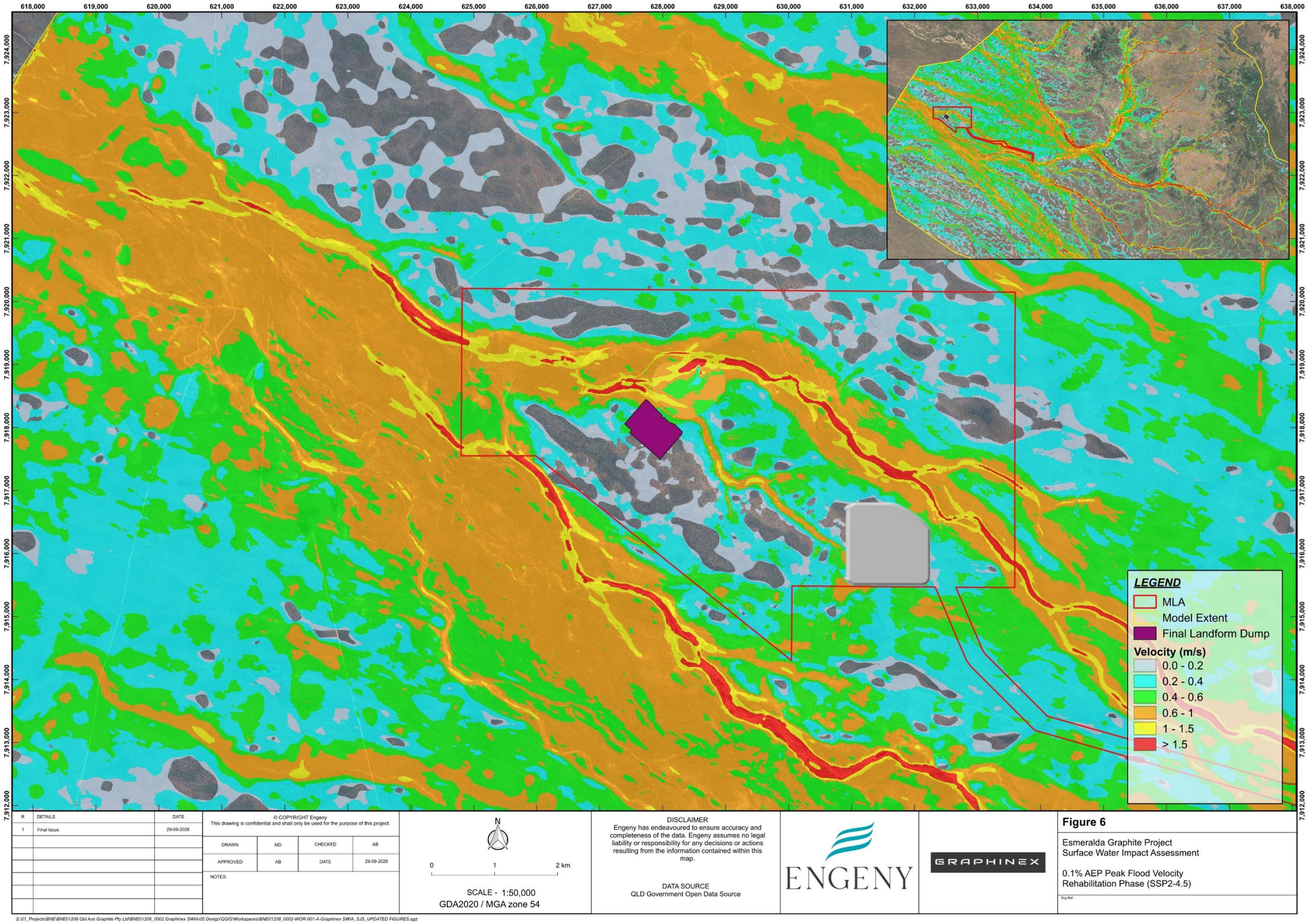



**FIGURE D.14: CLOSURE PHASE WITH CLIMATE CHANGE (SSP2-4.5 YEAR 2090) 0.1% AEP VELOCITY MAP**

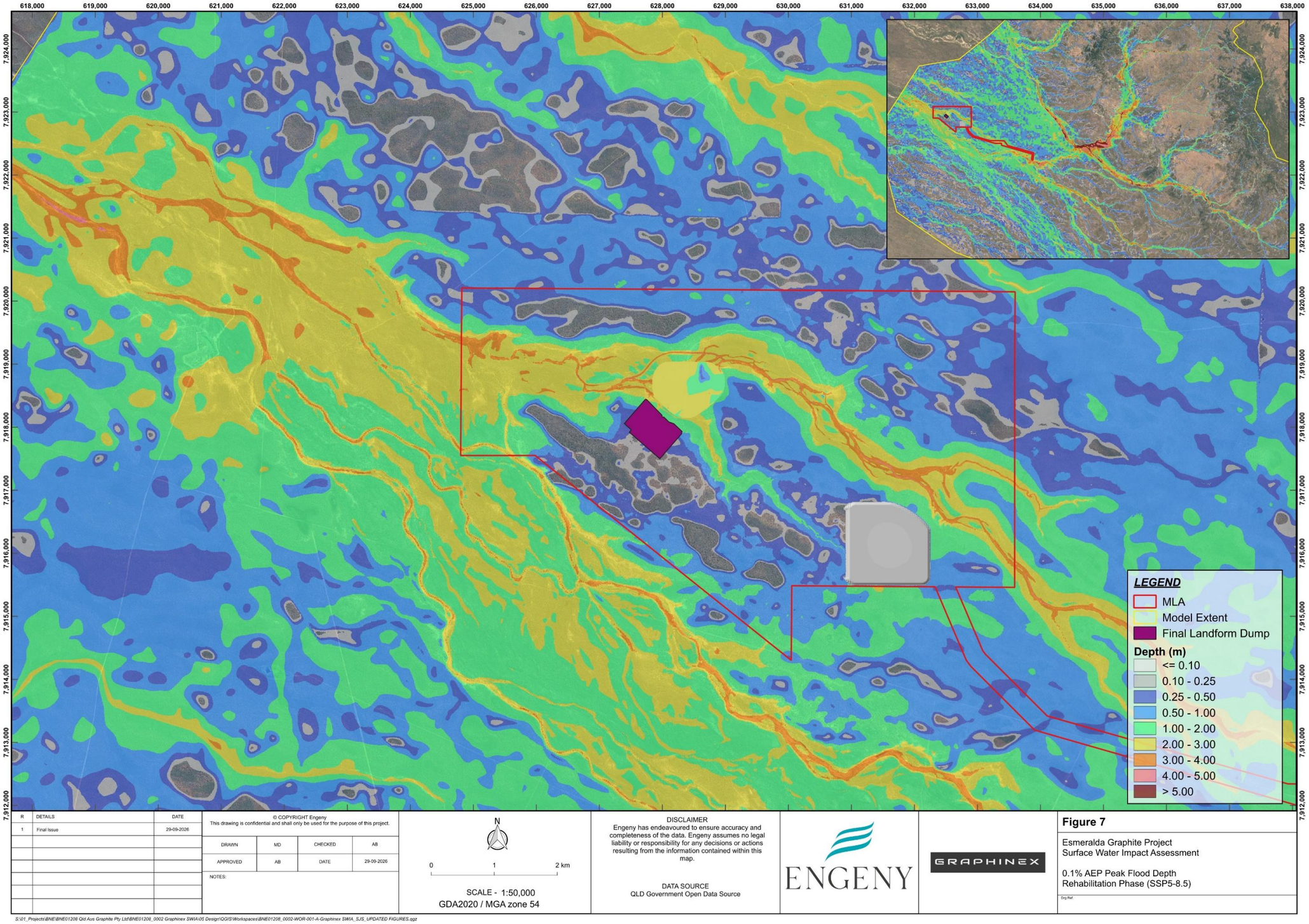



**FIGURE D.15: CLOSURE PHASE WITH CLIMATE CHANGE (SSP5-8.5 YEAR 2090) 0.1% AEP DEPTH MAP**

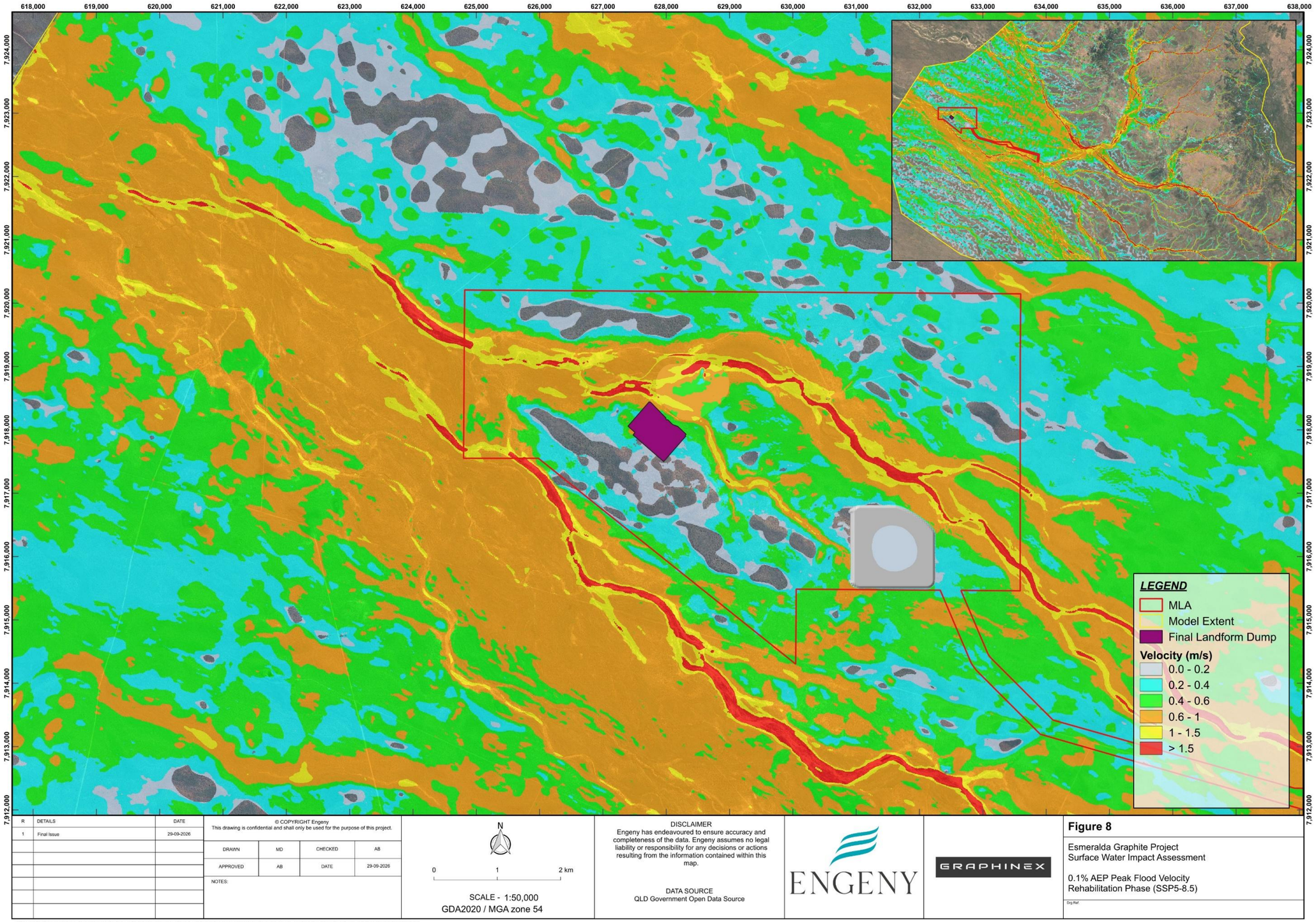



**FIGURE D.16: CLOSURE PHASE WITH CLIMATE CHANGE (SSP5-8.5 YEAR 2090) 0.1% AEP VELOCITY MAP**

# APPENDIX E: CLIMATE CHANGE SENSITIVITY FLOOD MAPS

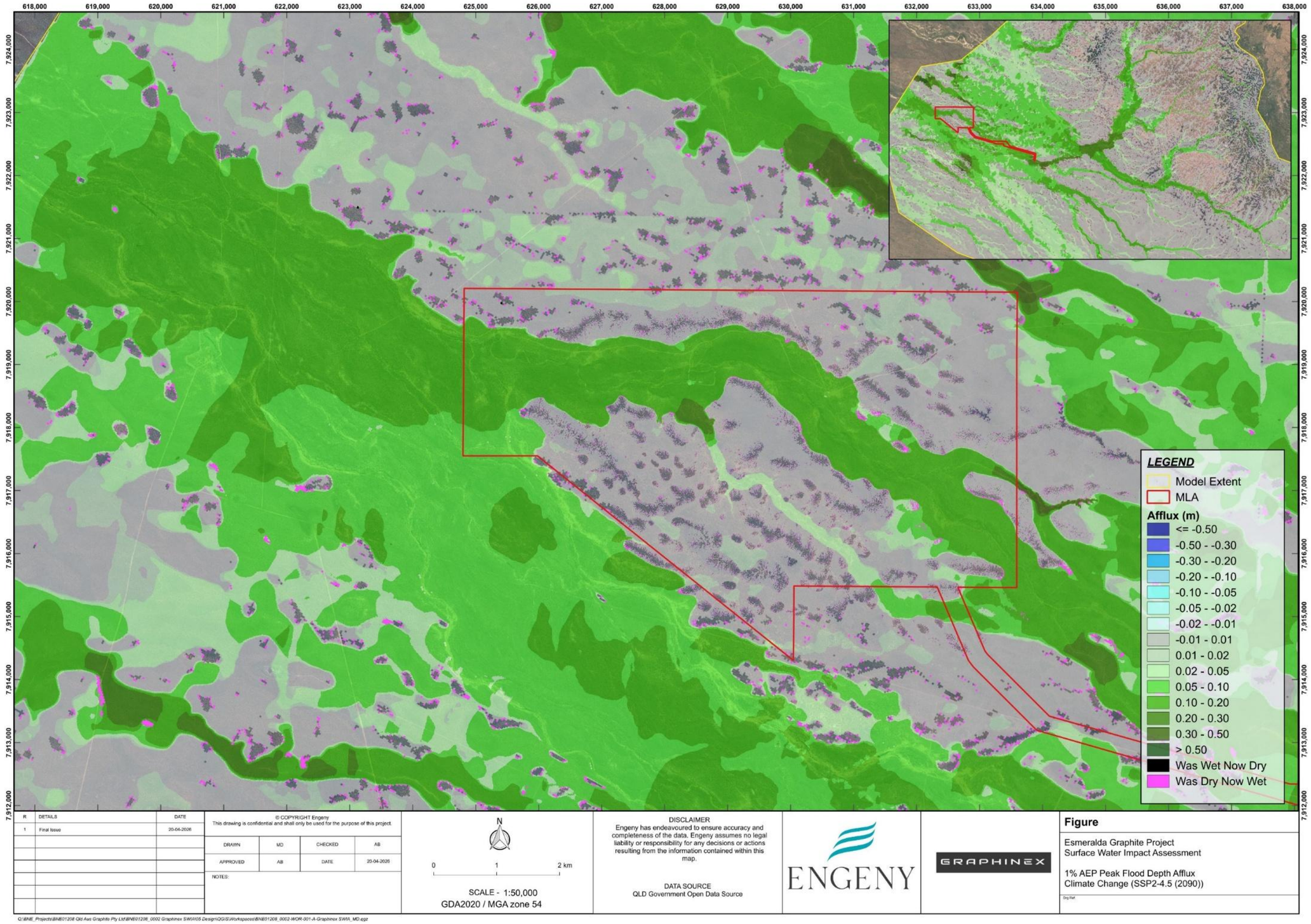



**FIGURE E.1: CLOSURE PHASE WITH CLIMATE CHANGE (SSP2-4.5 YEAR 2090) 1% AEP DEPTH AFFLUX MAP**

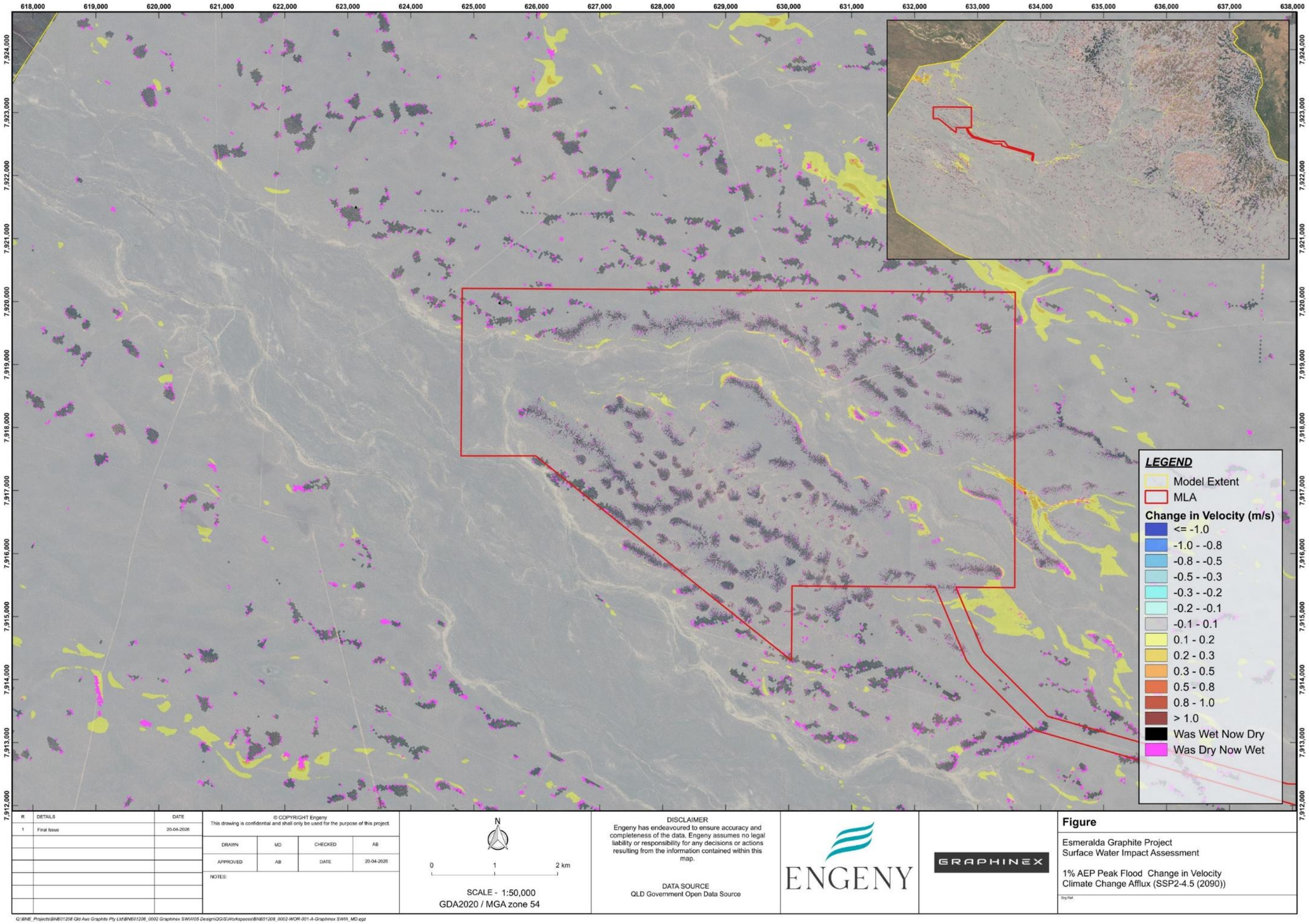



**FIGURE E.2: CLOSURE PHASE WITH CLIMATE CHANGE (SSP2-4.5 YEAR 2090) 1% AEP CHANGE IN VELOCITY MAP**

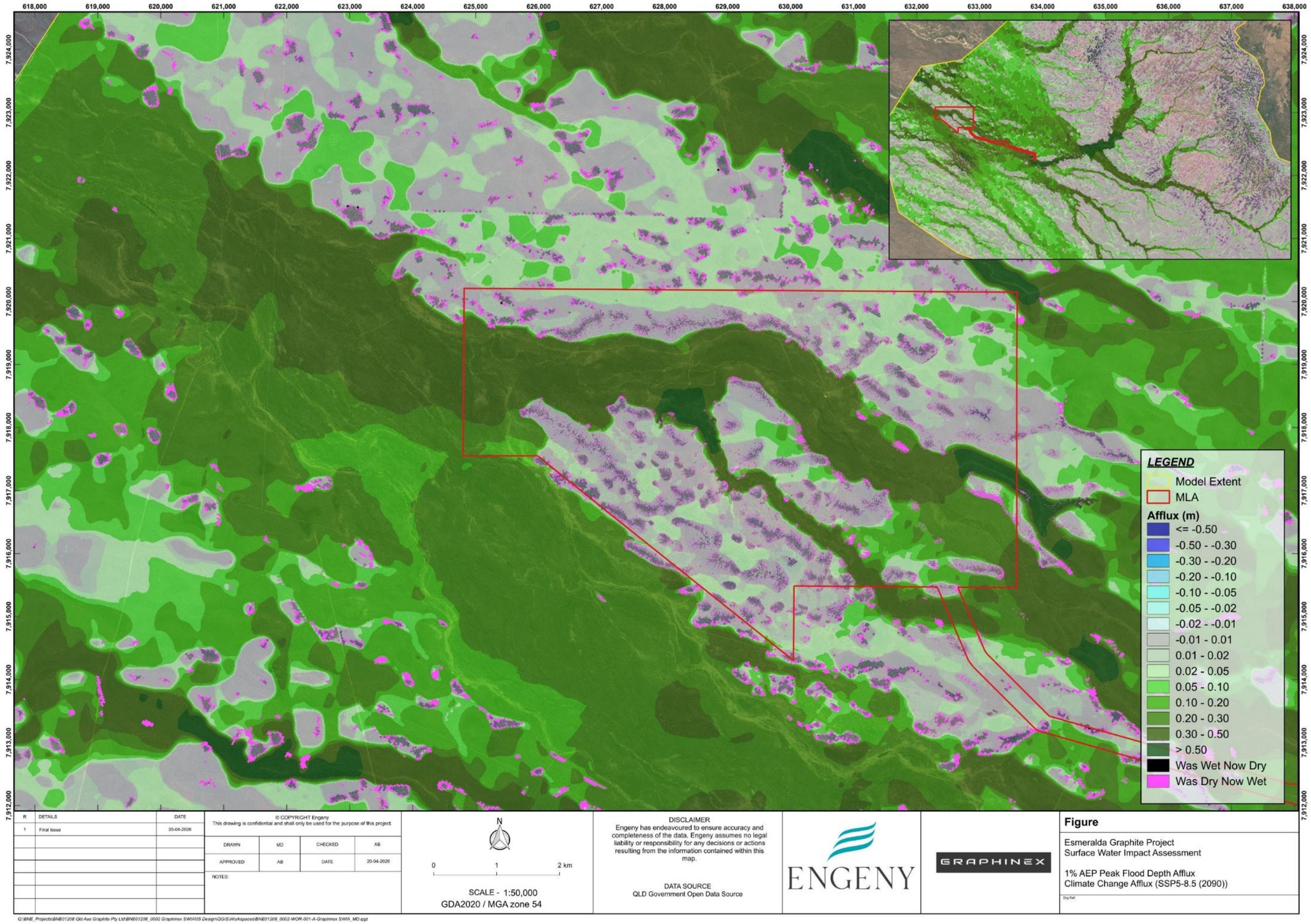



**FIGURE E.3: CLOSURE PHASE WITH CLIMATE CHANGE (SSP5-8.5 YEAR 2090) 1% AEP DEPTH AFFLUX MAP**

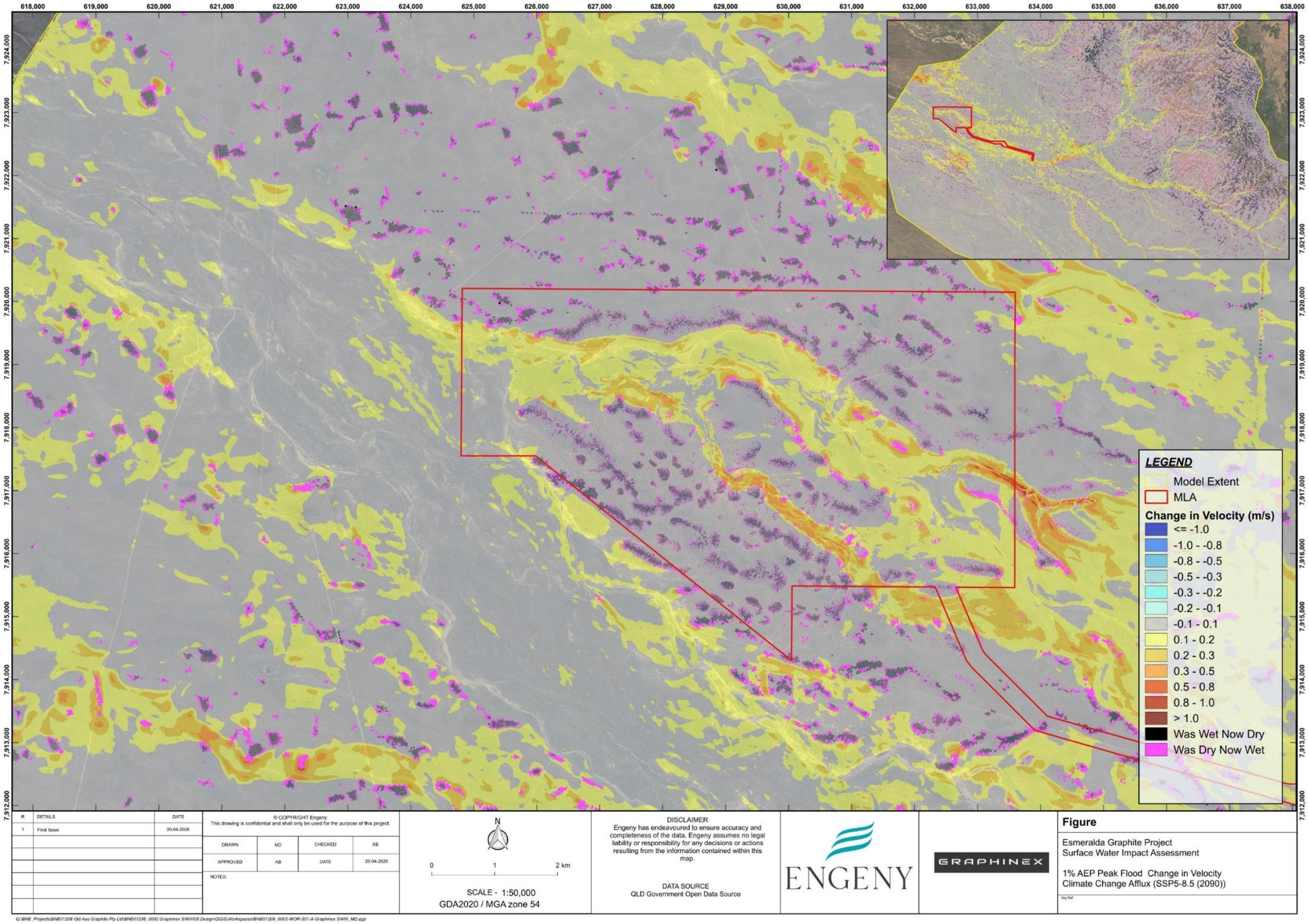



**FIGURE E.4: CLOSURE PHASE WITH CLIMATE CHANGE (SSP5-8.5 YEAR 2090) 1% AEP CHANGE IN VELOCITY MAP**

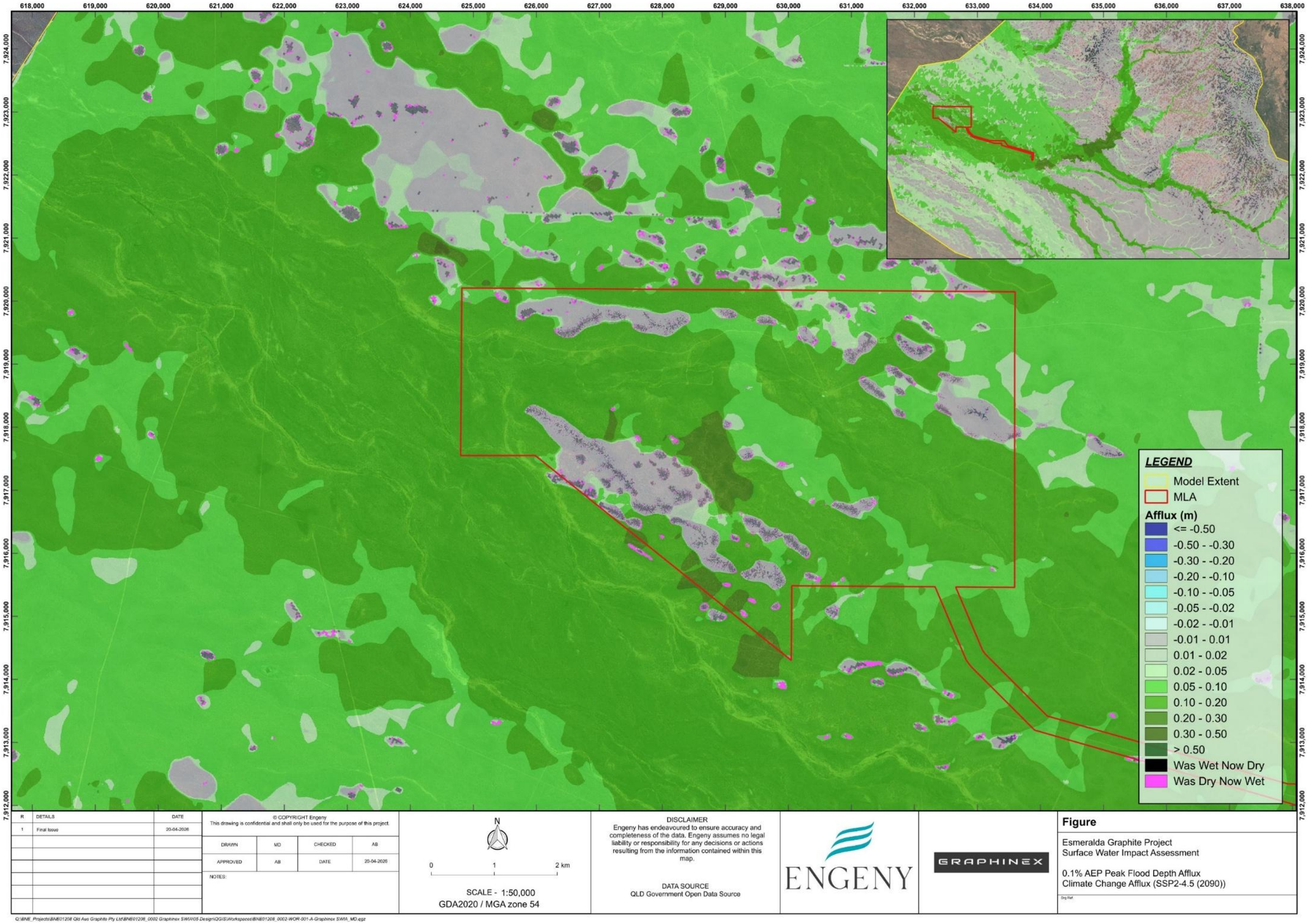



**FIGURE E.5: CLOSURE PHASE WITH CLIMATE CHANGE (SSP2-4.5 YEAR 2090) 0.1% AEP DEPTH AFFLUX MAP**

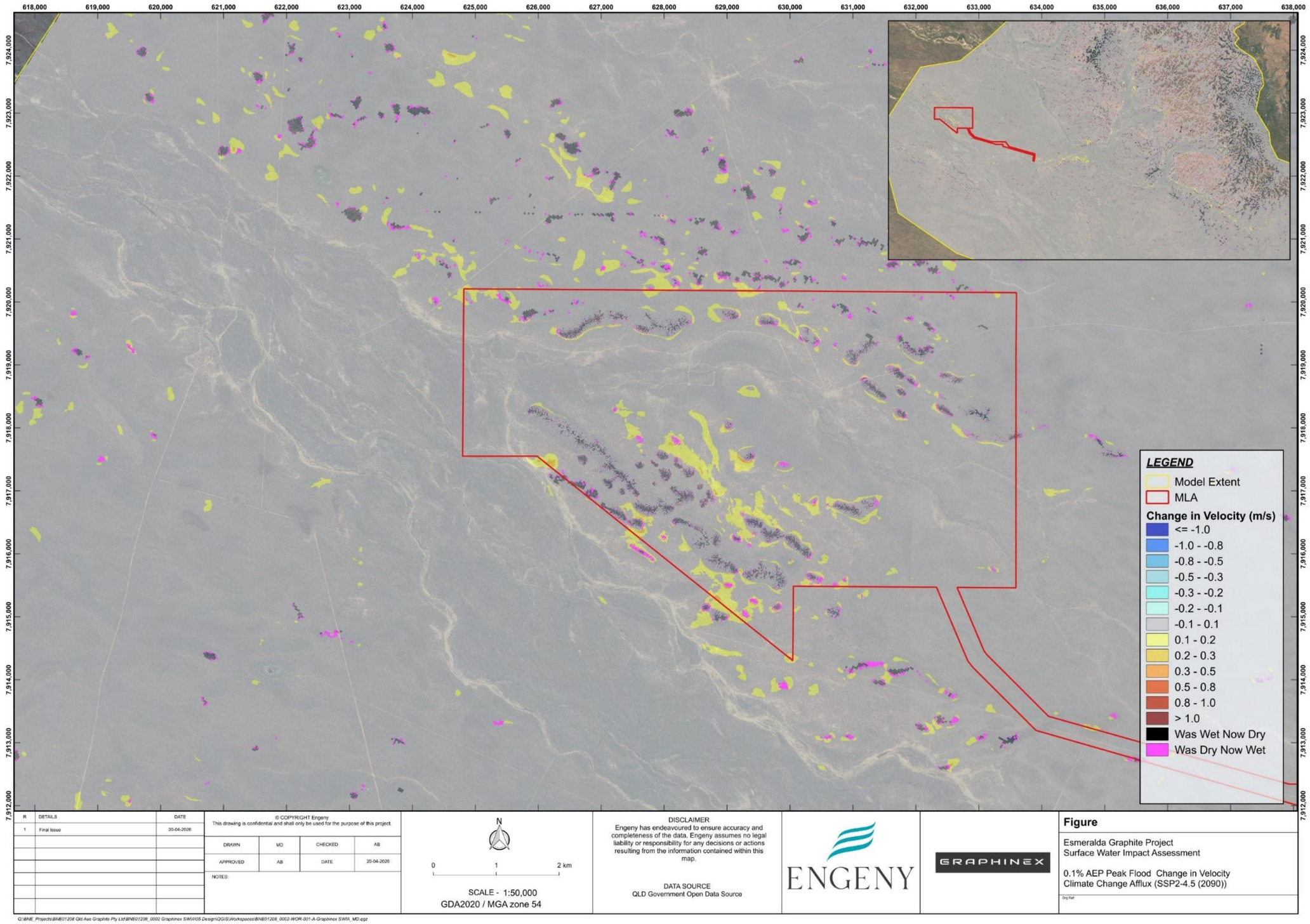



**FIGURE E.6: CLOSURE PHASE WITH CLIMATE CHANGE (SSP2-4.5 YEAR 2090) 0.1% AEP CHANGE IN VELOCITY MAP**

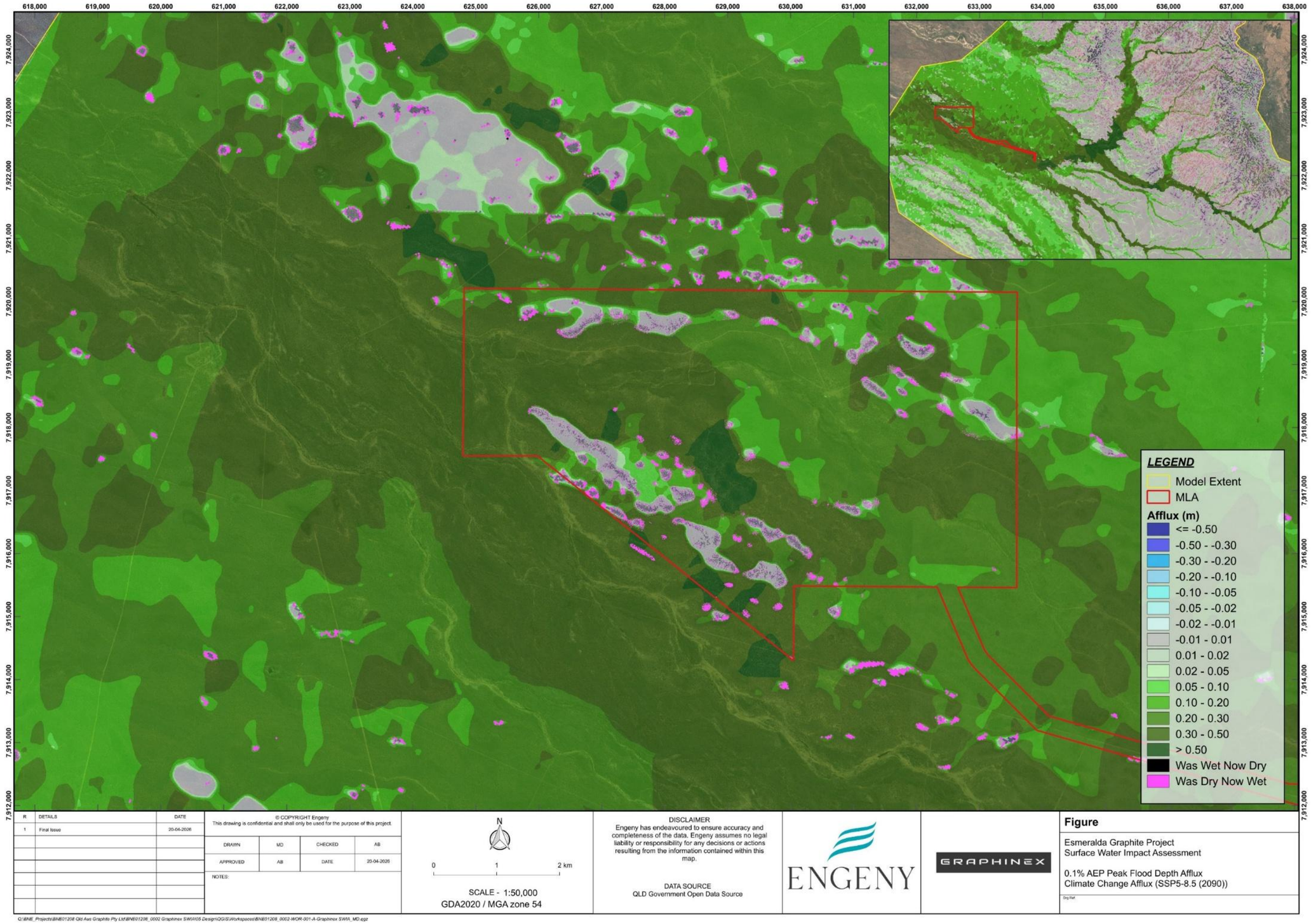



**FIGURE E.7: CLOSURE PHASE WITH CLIMATE CHANGE (SSP5-8.5 YEAR 2090) 0.1% AEP DEPTH AFFLUX MAP**

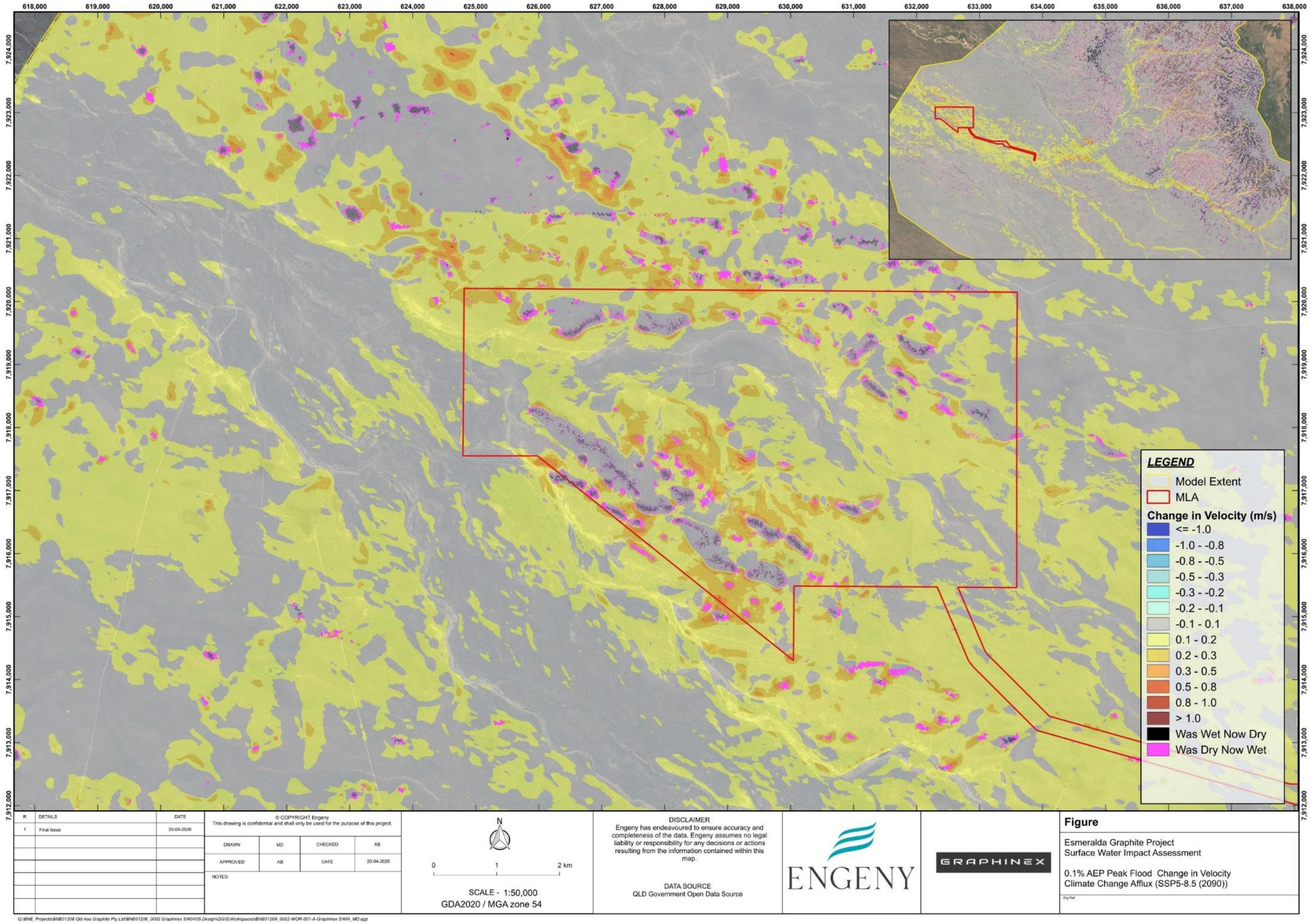



**FIGURE E.8: CLOSURE PHASE WITH CLIMATE CHANGE (SSP5-8.5 YEAR 2090) 0.1% AEP CHANGE IN VELOCITY MAP**