

# Appendix B6: Flood Management Sub- Plan

CABRAMATTA LOOP PROJECT

# ACKNOWLEDGEMENT TO COUNTRY

Fulton Hogan acknowledges the Cabrogal of the Darug Nation People as the Traditional Owners of the land we are working on, and pay our respect to their Elders past, present and emerging.

We recognise their deep connection to Country and value the contribution to caring for, and managing the land and water.

We are committed to pursuing genuine and lasting partnerships with Traditional Owners to understand their culture and connections to Country in the way we plan for and carry out the delivery of the Works.



## Document control

This is an e-copy of the Plan and it interfaces with the other associated plans, which together describe the proposed overall project management system for the project.

The latest revision of this plan is available on the Fulton Hogan server. If any unsigned hard copies of this document are printed, they are valid only on the day of printing.

The revision number is included at the bottom of each page. When revisions occur, the entire document will be issued with the revision number updated accordingly for each owner of a controlled copy.

Attachments/Appendices to this plan are revised independently of this plan.

## Revision History

REV	DATE	AUTHOR / REVISED BY	ENDORSED BY	BRIEF DESCRIPTION OF CHANGE
0	15/07/2021	████████	████████	Initial issue for ARTC review
1	04/08/2021	████████	████████	Revised in response to comments from ARTC and initial issue for ER review.
2	01/09/2021	████████	████████	Revised in response to comments from ARTC, the ER, Alternate ER and Fairfield City Council.
3	27/09/2021	████████	████████	Revised in response to outstanding comments from Alternate ER.

## Table of Contents

<b>1. Introduction</b>	<b>1</b>
1.1. Purpose	1
1.2. Background	1
1.3. Structure of FMP	1
1.4. Consultation for Preparation of the FMP	1
<b>2. Objectives, Targets and Environmental Performance Outcomes</b>	<b>4</b>
2.1. Objectives	4
2.2. Targets	4
2.3. Environmental Performance Outcomes	4
<b>3. Legal and Other Requirements</b>	<b>5</b>
3.1. Legislation	5
3.2. Guidelines and Standards	5
3.3. Conditions of Approval	6
3.4. Revised Mitigation Measures	8
<b>4. Existing Environment</b>	<b>10</b>
4.1. Catchments and Watercourses	10
4.2. Existing Flooding and Drainage Conditions	13
4.3. Surface Hydrology and Identified Project-Specific Flooding Conditions	13
4.4. Existing Flood Hazard	13
<b>5. Environmental Aspects and Impacts</b>	<b>17</b>
5.1. Impacts on Flood Behaviour and Overland Flows During Construction	17
5.2. Impacts of Flooding on Construction	17
5.3. Consistency with Council Floodplain Risk Management Plans	18
5.4. Impacts on Existing Emergency Management Arrangements	18
<b>6. Environmental Mitigation Measures</b>	<b>18</b>
<b>7. Compliance Management</b>	<b>19</b>
7.1. Roles and Responsibilities	19
7.2. Training	19
7.3. Complaints	19
7.4. Inspections and Monitoring	19
7.5. Auditing	19
7.6. Reporting	19
7.7. Non-conformances	20
<b>8. Review and Improvement of FMP</b>	<b>20</b>

## List of Tables

Table 1: Environmental Performance Outcomes Relevant to Flooding Management .....	4
Table 2: Conditions of Approval Relevant to FMP .....	6
Table 3: Revised Mitigation Measures Relevant to FMP .....	8
Table 4: Flooding Mitigation Measures .....	18
Table 5: Flood Monitoring and Inspections .....	22
Table 6: Emergency Management Roles and Responsibilities .....	24

## List of Figures

Figure 1: Catchment Area and Watercourse Locations (EIS Volume 1, p13.5) .....	12
Figure 2: Existing Flood Depth and Extent – One Per Cent (1%) AEP (EIS Volume 3 Technical Report 5, p20) .....	14
Figure 3: Existing Flood Depth and Extent – Five Per Cent (5%) AEP (EIS Volume 3 Technical Report 5 Appendix A) .....	15
Figure 4: Existing Provisional Flood Hazard Category – Five Per Cent (5%) AEP Event (EIS Volume 3 Technical Report 5 Appendix A) .....	16
Figure 5: Fulton Hogan Incident and Emergency Response Plan Flowchart – Storms and Flooding .....	25

## Appendices

Appendix A: Flood Warning and Evacuation Procedure

## Glossary/ Abbreviations

Term/ abbreviation	Definition
AEP	Has the same meaning as the definition of the term in the Project approval: Annual Exceedance Probability. The probability that a given rainfall/flood event will occur in any year.
All Clears	Has the same meaning as the definition of the term on the <a href="#">SES website</a> : The NSW SES will issue an All Clear when it is safe to return to properties in the flood affected area.
ARTC	Australian Rail Track Corporation
BoM	Bureau of Meteorology
CEMP	Construction Environmental Management Plan
CoA	The Minister's conditions of approval for the CSSI.
Construction Boundary	Has the same meaning as the definition of the term in the Project approval: The area required for project construction as described in the documents listed in <b>Condition A1</b> .
CSSI	Critical State Significant Infrastructure, as described in Schedule 1 of the project approval, the carrying out of which is approved under the terms of the project approval.
DPI	NSW Department of Primary Industries
DPIE	NSW Department of Planning, Industry and Environment
DPIE EES Group	Environment, Energy and Science Group of DPIE
DPIE Water Group	Water Group of DPIE and the National Resources Access Regulator
Ecologically sustainable development	Using, conserving and enhancing the community's resources so that the ecological processes on which life depends are maintained and the total quality of life now and in the future, can be increased (Council of Australian Governments, 1992).
EIS	Environmental Impact Statement
ENM	Excavated Natural Material, as defined in <i>The excavated natural material exemption</i> .
EPA	NSW Environment Protection Authority
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPL	Environment Protection Licence under the POEO Act
ER	Environmental Representative for the CSSI
ESCP	Primary Erosion and Sediment Control Plan
Evacuation Orders	Has the same meaning as the definition of the term on the <a href="#">SES website</a> : When you are required to evacuate, the NSW SES will issue an Evacuation Order advising people of what to do and where to go. There are a number of ways you might hear about the need to evacuate including, but not limited to, door knock (by SES or other emergency services), through radio stations, or by automated telephone and/or SMS. Evacuate immediately. You should try to seek shelter with family or friends well away from flood impacted areas. In larger floods, evacuation centres may be established to help people affected by the flooding.

Term/ abbreviation	Definition
Evacuation Warning	Has the same meaning as the definition of the term on the <a href="#">SES website</a> : When flooding is likely to cut evacuation routes or inundate property, the NSW SES issues an Evacuation Warning to indicate that you should get prepared to evacuate. Being prepared will allow you to respond quickly if an Evacuation Order is issued.
EWMS	Environmental Work Method Statement
Flood Warning	Has the same meaning as the definition of the term on the <a href="#">SES website</a> : A Flood Warning is issued by the BoM when flooding is expected to occur or is happening. Flood Warnings provide a predicted flood level and time at which a river will reach that level. Flood Warnings are issued in relation to flood gauges which are situated at a certain point on a river. Flood Warnings may contain observed, peak or predicted river heights.
FMP	Flood Management Sub-Plan
HP	Hold Point: a point in the construction or verification process beyond which work may not proceed without receiving authorisation from the appropriate party.
Local Flood Bulletins	Has the same meaning as the definition of the term on the <a href="#">SES website</a> : NSW SES Flood Bulletins provide information on likely flood consequences and what actions are required to protect yourself and your property.
Minister, the	NSW Minister for Planning and Public Spaces
NA	Not applicable
Non-compliance	Failure to comply with the requirements of the Project Approval or any applicable license, permit or legal requirements.
Non-conformance	Failure to conform to the requirements of project system documentation including this PCEMP or supporting documentation.
OEH	Office of Environment and Heritage
OEMS	Operational Environmental Management System
Planning Secretary, the	Has the same meaning as the definition of the term in the Project approval: Planning Secretary of DPIE (or nominee, whether nominated before or after the date on which the project approval was granted)
Planning Secretary's approval or agreement, the	Has the same meaning as the definition of the term in the Project approval: A written approval or agreement from the Planning Secretary (or nominee)
POEO Act	<i>Protection of the Environment Operations Act 1997 (NSW)</i>
Project, the	Cabramatta Loop
Project approval, the	The Minister's approval for the CSSI.
Publicly Available	Has the same meaning as the definition of the term in the Project approval: To be made available on the website required under Condition B10 of the project approval.
Relevant council(s)	Has the same meaning as the definition of the term in the Project approval: Any or all as relevant, Fairfield City Council or Liverpool City Council.

Term/ abbreviation	Definition
RMM	Revised Mitigation Measure
SES	NSW State Emergency Service
Severe Thunderstorm Warnings	Has the same meaning as the definition of the term on the <a href="#">SES website</a> : The BoM issues Severe Thunderstorm Warnings whenever severe thunderstorms are occurring in an area or are expected to develop or move into the area during the next few hours. The warnings describe the area under threat and the particular hazards likely to be associated with the thunderstorms including flash flooding.
Severe Weather Warnings	Has the same meaning as the definition of the term on the <a href="#">SES website</a> : The BoM issues Severe Weather Warnings whenever severe weather is occurring in an area or is expected to develop or move into an area. The warnings describe the area under threat and the expected hazards. Warnings are issued with varying lead-times, depending on the weather situation, and range from just an hour or two up to about 24 hours. Severe Weather Warnings are issued for: <ul style="list-style-type: none"> <li>▪ Sustained winds of gale force (63 km/h) or more</li> <li>▪ Wind gusts of 90 km/h or more</li> <li>▪ Very heavy rain that may lead to flash flooding</li> <li>▪ Abnormally high tides (or storm tides) expected to exceed highest astronomical tide</li> <li>▪ Unusually large surf waves expected to cause dangerous conditions on the coast</li> <li>▪ Widespread blizzards in Alpine areas</li> </ul>
SWMP	Soil and Water Management Sub-Plan
TfNSW	Transport for NSW
UDLP	Urban Design and Landscape Plan
Work	Has the same meaning as the definition of the term in the Project approval: Any physical work for the purpose of the CSSI including construction and low impact work.



## 1. Introduction

### 1.1. Purpose

This Flood Management Sub-Plan (FMP) describes how Fulton Hogan will manage construction of the Cabramatta Loop Project (the project) to ensure impacts on flooding are minimised and significant adverse impacts to the environment and property are avoided. Flooding impacts to people and mitigation measures will be addressed as part of the Work Health and Safety Management Plan.

This FMP has been prepared to detail how Fulton Hogan will comply with the project approval, and implement and achieve relevant performance outcomes, commitments and mitigation measures specified in the EIS as amended by the Submissions Report (also known as 'Revised Mitigation Measures' (RMM)) during construction of the project. Additionally, this FMP has been prepared to address the requirements of ARTC Technical Specification and Works Description (TSWD) Appendix 04 Additional Environmental Requirements and Environment Protection Licence (EPL) Number 3142 (held by ARTC for railway activities – railway infrastructure operations) to the extent that it applies to Fulton Hogan's activities.

For the avoidance of doubt, the CEMP (including this FMP) relates to the construction phase only. Detailed design environmental requirements will be addressed as part of the detailed design phase, separate to the CEMP approvals process. Detailed design is generally completed about six months after CEMP approval. In addition, operational environmental requirements will be met during the operational phase (upon the completion of construction) and addressed in the Operational Environmental Management System (OEMS) required under CoA D1.

### 1.2. Background

Chapter 13 of the EIS assessed the extent and magnitude of potential impacts of construction and operation of the project on hydrology and flooding. As part of this, a detailed hydrology and flooding impact assessment was undertaken and included in the EIS as:

- EIS Volume 3 – Technical Report 5 – Cabramatta Loop Project: Hydrology and Flooding Impact Assessment, prepared by GHD for ARTC, dated August 2019.

### 1.3. Structure of FMP

This FMP is part of Fulton Hogan's environmental management framework for the project and is supported by other documents, such as Environmental Work Method Statements. The review and document control processes for this FMP are described in Chapters 11 and 12 respectively of the CEMP.

### 1.4. Consultation for Preparation of the FMP

It was originally contemplated in the EIS that flood management would form part of the SWMP. However, Fulton Hogan manages flooding risks, including emergency management of flooding, in a different manner to how it manages water quality risks associated with soil and water. For this reason and for ease of implementation on site, Fulton Hogan has therefore separately developed this FMP, which is subject to the same consultation requirements as the SWMP.

In accordance with CoA C4(c), consultation with DPIE Water Group, Sydney Water, Liverpool City Council and Fairfield City Council has been undertaken during the preparation of this FMP. This includes consultation with Liverpool City Council, Fairfield City Council and the NSW SES in relation to Appendix A Flood Warning and Evacuation Procedure of this FMP to satisfy the requirements of RMM C6.1.

A summary of the key issues raised is provided below. [REDACTED]

*DPIE Water Group*

[Redacted text block]

*Sydney Water*

[Redacted text block]

*Liverpool City Council*

[Redacted text block]

*Fairfield City Council*

[Redacted text block]

[Redacted text block]

NSW SES

[Redacted text block]

Copies of all consultation correspondence is included at Appendix A5 of the CEMP.

Ongoing consultation will be undertaken during detailed design and construction of the project as required by the environmental documents. This will be subject to a separate consultation process to that required for preparation of this FMP.

## 2. Objectives, Targets and Environmental Performance Outcomes

### 2.1. Objectives

The key objective of the FMP is to ensure that impacts to flooding are minimised and within the scope permitted by the project approval. To achieve this objective, Fulton Hogan will undertake the following:

- Ensure appropriate controls and procedures are implemented during construction activities to avoid or minimise potential adverse impacts to flooding along the Project corridor.
- Ensure appropriate measures are implemented to address the relevant CoA and RMM outlined in Table 2 and Table 3 respectively.
- Ensure appropriate measures are implemented to comply with all relevant legislation and other requirements as described in Chapter 3 of this FMP.

### 2.2. Targets

The following targets have been established for the management of flooding impacts during the project:

- Ensure full compliance with the relevant legislative requirements, CoA and RMM outlined in Table 2 and Table 3 respectively.
- Avoid any significant adverse impacts to people, the environment and property.

### 2.3. Environmental Performance Outcomes

The construction-related environmental performance outcomes relevant to this FMP are listed in Table 1. A cross reference is also included to indicate where the environmental performance outcome is addressed in this FMP in terms of how it will be implemented and achieved.

Table 1: Environmental Performance Outcomes Relevant to Flooding Management

Key Issue (as listed in Table 22.5 of the EIS)	Environmental Performance Outcome	Document Reference
7. Water - hydrology	Construction compounds and work areas are laid out such that flows are not significantly impeded.	Chapter 6 mitigation measure ID FMM3.
	The project avoids long term impacts to surface water	Detailed Design
	Opportunities to reuse water resources are considered during the design process.	Detailed Design
	The use of water during construction is minimised.	SWMP Chapter 6 mitigation measure ID SWMM41, SWMM46.
9. Flooding	Construction is undertaken in a manner that minimises the potential for adverse flooding impacts, through staging of works and the implementation of mitigation measures.	Chapter 6 mitigation measure ID FMM4 and the balance of mitigation measures in Chapter 6.
	Construction compounds and work areas are laid out such that flows are not significantly impeded.	Chapter 6 mitigation measure ID FMM3.
	Flooding design criteria will be achieved.	Detailed Design

Key Issue (as listed in Table 22.5 of the EIS)	Environmental Performance Outcome	Document Reference
	The performance of the downstream drainage network is maintained during construction and operation.	Chapter 6 mitigation measure ID FMM4, FMM5. Operation

### 3. Legal and Other Requirements

#### 3.1. Legislation

Legislation relevant to flooding management includes:

- *Environmental Planning and Assessment Act 1979* (EP&A Act)
- *Protection of the Environment Operations Act 1997* (POEO Act)
- *Water Management Act 2000* (WM Act).

Relevant provisions of the above legislation are explained in the Register of Legal and Other Requirements included in Appendix A1 of the CEMP.

#### 3.2. Guidelines and Standards

The main guidelines, standards and policy documents relevant to this FMP include:

- Floodplain Risk Management Guideline (OEH 2007)
- Australian Rainfall and Runoff (Institution of Engineers, Australia)
- Managing Urban Stormwater: Soils and Construction. Landcom, (4th Edition) March 2004 (reprinted 2006) (the "Blue Book"). Volume 1 and Volume 2
- Managing Urban Stormwater: Soils and Construction Volume 2D Main Roads Construction (DECC 2008)
- Floodplain Development Manual (DIPNR, 2005)
- WorkCover's Storage and Handling of Dangerous Goods Code of Practice (WorkCover, 2005)
- South West Metropolitan Emergency Management District Disaster Plan (NSW Government, 2012)
- The Local Flood Plan for the Georges River developed by NSW SES (NSW Government, 2018)

### 3.3. Conditions of Approval

The CoA relevant to this FMP are listed in Table 2 below. A cross reference is also included to indicate where the condition is addressed in this FMP or other project management documents.

Table 2: Conditions of Approval Relevant to FMP

CoA No.	Condition Requirements	Document Reference												
<b>PART C - CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN</b>														
<b>CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN</b>														
C4	<p><b>CEMP Sub-Plans</b> must be prepared in consultation with the relevant government agency(ies) and council(s) identified for each <b>CEMP Sub-Plan</b> in <b>Table 3</b>.</p> <p><b>Table 3: CEMP Sub-Plan and relevant public authorities</b></p> <table border="1"> <thead> <tr> <th></th> <th>Required CEMP Sub-Plan</th> <th>Relevant government agency(ies) and council(s) to be consulted for each CEMP Sub-Plan</th> </tr> </thead> <tbody> <tr> <td>(a)</td> <td>Traffic and Transport</td> <td>TfNSW and relevant council(s)</td> </tr> <tr> <td>(b)</td> <td>Noise and Vibration</td> <td>Relevant council(s)</td> </tr> <tr> <td>(c)</td> <td>Soil and Water</td> <td>DPIE Water Group, Sydney Water and relevant council(s)</td> </tr> </tbody> </table> <p><i>Note: This condition does not preclude the preparation of subplans the proponent has committed to preparing in documents referenced in Condition A1</i></p>		Required CEMP Sub-Plan	Relevant government agency(ies) and council(s) to be consulted for each CEMP Sub-Plan	(a)	Traffic and Transport	TfNSW and relevant council(s)	(b)	Noise and Vibration	Relevant council(s)	(c)	Soil and Water	DPIE Water Group, Sydney Water and relevant council(s)	Section 1.4
	Required CEMP Sub-Plan	Relevant government agency(ies) and council(s) to be consulted for each CEMP Sub-Plan												
(a)	Traffic and Transport	TfNSW and relevant council(s)												
(b)	Noise and Vibration	Relevant council(s)												
(c)	Soil and Water	DPIE Water Group, Sydney Water and relevant council(s)												
C5	The <b>CEMP Sub-Plans</b> must state how:													
(a)	the environmental performance outcomes identified in the documents listed in <b>Condition A1</b> as modified by these conditions will be achieved;	Section 2.3												
(b)	the mitigation measures identified in the documents listed in <b>Condition A1</b> as modified by these conditions will be implemented;	Through the implementation of this FMP (in particular refer to Section 3.4).												
(c)	the relevant terms of this approval will be complied with; and	Through the implementation of this FMP												
(d)	issues requiring management during construction (including cumulative impacts), as identified through ongoing environmental risk analysis, will be managed.	Chapter 5, second paragraph Chapter 6												
C6	Details of all information requested by an agency to be included in a <b>CEMP Sub-plan</b> as a result of consultation, including copies of all correspondence from those agencies, must be provided with the relevant <b>CEMP Sub-Plan</b> .	Section 1.4												
C7	Construction must not commence until the <b>CEMP</b> and all <b>CEMP Sub-Plans</b> have been approved by the ER and must be implemented for the duration of construction. Where construction of the CSSI is staged, construction of a stage must not commence until the <b>CEMP</b> and sub-plans for that stage have been	CEMP (main section) Sections 1.4 and 2.2												

CoA No.	Condition Requirements	Document Reference
	approved by the ER.	
<b>PART E – FLOODING</b>		
E2	Construction compounds, construction ancillary facilities and work sites must be located and operated so as to not worsen the existing flooding characteristics in the catchment.	Chapter 6 mitigation measure ID FMM2.
E3	<p>The CSSI must be designed and constructed to not worsen flood characteristics within the vicinity of the CSSI.</p> <p>Not worsen existing flooding characteristics in the vicinity of the CSSI means the following:</p> <p>(a) a maximum increase in the duration of inundation of one hour for all flood events up to and including a one per cent AEP event; and</p> <p>(b) an increase in flood levels of no more than 30 mm within a property boundary where floor levels of residential accommodation are not currently exceeded in a one per cent AEP event, unless agreed by the Planning Secretary. In seeking the Planning Secretary’s agreement, the Proponent must demonstrate that project design changes to meet the 30 mm criteria are not practical. Notwithstanding, an increase in flood levels of more than 50 mm within a property boundary is not permitted; and</p> <p>(c) no flooding of residential accommodation floor levels in a one per cent AEP event, unless agreed by the Planning Secretary; and</p> <p>(d) no change to flood hazard rating as defined in Appendix L of the NSW Government’s Floodplain Development Manual (2005).</p>	Detailed Design Chapter 6 mitigation measure ID FMM2.
E4	Flood information developed during detailed design such as flood reports, models and geographic information system outputs, and work as executed information from a registered surveyor certifying finished ground levels, the dimensions and finished levels of all structures constructed as part of the CSSI within the flood prone land, must be provided to the relevant council(s). The relevant council(s) must be notified in writing what information is available no later than one (1) month following the completion of construction. Information requested by the relevant council(s) must be provided no later than six (6) months following the completion of construction or within another timeframe agreed with the relevant council(s).	Detailed Design Operation

### 3.4. Revised Mitigation Measures

Relevant construction-related RMM from the Submissions Report are listed in Table 3. A cross reference is also included to indicate where the measure is addressed in this FMP or other project management documents.

Table 3: Revised Mitigation Measures Relevant to FMP

ID No.	Revised Mitigation Measure	Document Reference
<b>C6 Hydrology, flooding and water quality</b>		
<b>Flooding, changes to surface water and water quality</b>		
C6.1	A flood management procedure will be prepared as part of the soil and water management plan. It will include specific controls to be implemented during wet weather or forecasts of heavy rainfall for works undertaken near Cabramatta Creek and Jacquie Osmond Reserve and appropriate monitoring strategies following the flood to verify design performance and impact predictions	<p>Controls to be implemented in all situations including, during wet weather - SWMP Chapter 6 mitigation measure ID SWMM1, SWMM4.</p> <p>Controls to be implemented during forecasts of heavy rainfall - SWMP Chapter 6 mitigation measure ID SWMM45</p> <p>SWMP Appendix D Heavy Rainfall Event Procedure.</p> <p>Appropriate monitoring strategies following the flood to verify design performance and impact predictions – will be implemented during the operational phase and addressed in the Operational Environmental Management System (OEMS) required under CoA D1.</p>



ID No.	Revised Mitigation Measure	Document Reference
	<p>It will also include a flood warning and evacuation procedure for emergency management of flooding up to the PMF event. Development of a flood warning and evacuation procedure for the project will be undertaken in consultation with stakeholders including Liverpool City Council and Fairfield City Council and the NSW SES.</p>	<p>Chapter 6 mitigation measure ID FMM1. Appendix A Flood Warning and Evacuation Procedure Section 1.4.</p>
<b>Flooding</b>		
C6.2	<p>The site layout and staging of construction activities will:</p> <ul style="list-style-type: none"> <li>▪ avoid or minimise obstruction of overland flow paths and limit the extent of flow diversion required</li> <li>▪ consider how the works will affect the existing stormwater network such that alternatives are in place prior to any disconnection or diversion of stormwater infrastructure.</li> </ul>	<p>Chapter 6 mitigation measure ID FMM2, FMM3, FMM4, FMM5.  SWMP Chapter 6 mitigation measure ID SWMM1, SWMM3, SWMM6, SWMM13.</p>
C6.3	<p>Detailed construction planning will consider flood risk for compounds and work sites near Jacquie Osmond Reserve and Cabramatta Creek. This will include identification of measures to not worsen existing flooding characteristics.</p> <p>Not worsen is defined as:</p> <ul style="list-style-type: none"> <li>▪ a maximum increase in flood levels of 50 mm in a one per cent AEP event</li> <li>▪ a maximum increase in time of inundation of one hour in a one per cent AEP event</li> <li>▪ no increase in the potential for soil erosion and scouring from any increase in flow velocity in a one per cent AEP flood event.</li> </ul>	<p>Chapter 6 mitigation measure ID FMM2.</p>
<b>Watercourse impacts</b>		
C6.4	<p>Works within or near Cabramatta Creek will be undertaken with consideration given to the NSW Department of Primary Industries (Water) <i>Guidelines for controlled activities on waterfront land – Riparian corridors</i> (2018).</p>	<p>SWMP Chapter 6 mitigation measure ID SWMM34.</p>
<b>Water quality</b>		

ID No.	Revised Mitigation Measure	Document Reference
C6.5	<p>Dewatered groundwater will be stored and reused on site for wetting down and reducing dust in disturbed areas (within existing erosion and sediment controls), or for irrigation in grassed areas. Requirements for testing will be included in the soils and water management plan and will include the following at a minimum:</p> <ul style="list-style-type: none"> <li>▪ No visible sheen or odour is noted.</li> <li>▪ Water pH is between 6.5 and 8.5.</li> <li>▪ Total suspended solids are less than 60 mg/L (approximately equivalent to a turbidity level of 50 NTU). Water may be dosed with gypsum, alum or a similar product to reduce sediment levels if required.</li> <li>▪ All litter and debris must be filtered out and removed prior to reuse.</li> <li>▪ Pump-out events are supervised at all times, and the pump is positioned to prevent reuse of sediment-laden water settled at the bottom of the trench or tank.</li> </ul> <p>Sludge from the bottom of the trench or tank can be placed in a shallow pit lined with heavy duty plastic sheeting to dry out (evaporation pit). Once the sludge has dried out sufficiently to allow it to be spaded this waste can be stored with excess excavated spoil and disposed in accordance with the findings of the preliminary waste classification assessment (refer to Technical Report 6 – Soils and contamination impact assessment).</p>	SWMP Chapter 6 mitigation measure ID SWMM30, SWMM43 SWMP Appendix F
C6.6	<p>A water quality monitoring program will be developed and implemented, to monitor water quality due to the proximity of construction activities to surface water receiving environments.</p> <p>The program will include relevant water quality objectives, parameters, and criteria and specific monitoring locations identified in consultation with DPI (Water) and the EPA.</p>	SWMP Section 7.4 SWMP Appendix B, Table 5 SWMP Section 1.4

## 4. Existing Environment

This Chapter provides a brief summary of what is known about flooding within and adjacent to the project based on information provided in Chapter 13 of the EIS.

### 4.1. Catchments and Watercourses

The project site is located in the Cabramatta Creek catchment, which has an area of about 74 square kilometres. Most of the catchment is located within the Liverpool LGA, however the northern side of Lower Cabramatta Creek is located within the Fairfield LGA and a small proportion of the upper catchment is also located within the Campbelltown LGA (EIS Volume 1, p13.4).

Major tributaries of Cabramatta Creek include:

- Hinchinbrook Creek
- Maxwells Creek
- Brickmakers Creek.

The Cabramatta Creek catchment and watercourses in the area are shown on Figure 1. This figure also shows the stream order of watercourses in the area (based on the Strahler stream classification system). Stream order is a

measure of the relative size of the watercourse, with a first order stream being the largest and a fifth order being the smallest (EIS Volume 1, p13.4).

Cabramatta Creek begins in the rural/residential suburb of Denham Court, located at the southern extent of the catchment boundary. From there it flows in a northerly direction towards Hoxton Park. The Cabramatta Creek and Carnes Hill Urban Release Areas are located within the Upper Cabramatta Creek subcatchments and substantial residential development has already occurred in these areas (EIS Volume 1, p13.4).

Cabramatta Creek then flows in an easterly direction towards the Fairfield LGA and the creek's confluence with Georges River. Within the lower catchment, a more prominent creek corridor becomes evident (up to 200 metres wide). This area primarily consists of public open space, playing fields and golf courses (EIS Volume 1, p13.4).

Cabramatta Creek flows through a number of established suburbs including Miller, Cartwright, Sadler, Ashcroft, Mount Pritchard and Warwick Farm. Major transport (road and rail) routes that cross the catchment include Hoxton Park Road, Elizabeth Drive, the Cumberland Highway, the Hume Highway and the SSFL and Main Southern railway line (EIS Volume 1, p13.4).

Tributaries of the creek have been modified from their natural state. This includes Maxwells Creek which has been turned in to a grassed trapezoidal channel downstream of Jedda Road, continuing through to the confluence with Cabramatta Creek (EIS Volume 1, p13.4).

At the location where the project site crosses Cabramatta Creek, the creek is a fifth order stream (EIS Volume 1, p13.4).

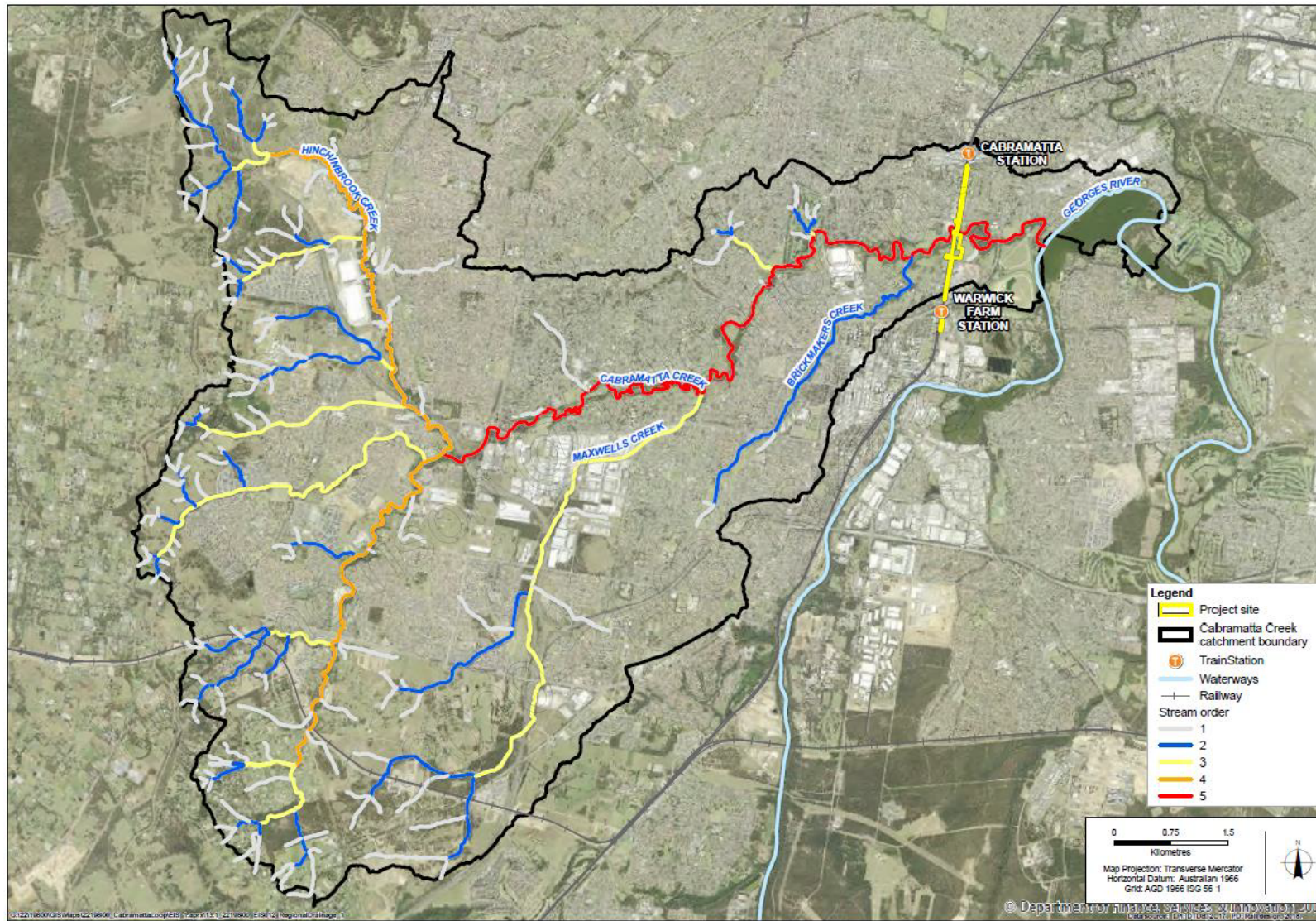


Figure 1: Catchment Area and Watercourse Locations (EIS Volume 1, p13.5)

## 4.2. Existing Flooding and Drainage Conditions

The Cabramatta Creek catchments is typical of many urbanised catchments in that the predominance of impervious surfaces means that rainfall is quickly converted into surface water runoff. The rainfall runoff response means that floods may develop quickly following the onset of intense rainfall events. Flood waters in the main Cabramatta Creek rise within a matter of hours following the onset of intense rainfall, making advance warning difficult (EIS Volume 1, p13.6).

The rail corridor has a track drainage system that conveys water to the local drainage network and then to Cabramatta Creek where it drains to Georges River and Botany Bay. Drainage within the rail corridor consists of a number of open drainage channels that drain in to the track drainage network. The open channels are both earth lined and concrete open dish drain type elements. The capacity of the existing elements within the rail corridor is currently unknown but they only cater for rainfall runoff that falls within the rail corridor (EIS Volume 1, p13.6).

Drainage within Broomfield Street consists of a stormwater drainage line that collects and conveys stormwater runoff from the immediate surrounding area as well as runoff from the rail corridor. The drainage line discharges at the southern end of Broomfield Street to an open channel, located adjacent to 10 Sussex Street. This channel then extends for approximately 50 metres before it connects to Cabramatta Creek (EIS Volume 3 Technical Report 5, p15).

## 4.3. Surface Hydrology and Identified Project-Specific Flooding Conditions

The mapping shows that the project site, from the Cabramatta Road West overbridge to the Hume Highway overbridge, is affected by flooding from Cabramatta Creek during the 0.5 per cent (0.5%) AEP flood event and above. The majority of the project site is located within a high flood risk precinct, and in Jacquie Osmond Reserve flood levels during the one per cent (1%) and five per cent (5%) AEP flood events are about 7.2 metres Australian Height Datum (AHD) and 6.2 metres AHD, respectively (EIS Volume 1, p13.6). The extent and depth of existing flooding for the one per cent (1%) AEP event and the five per cent (5%) AEP event is shown in Figure 2 and Figure 3, respectively.

During the one per cent (1%) and five per cent (5%) flood events, houses on the following streets have existing flooding issues:

- Sussex Street
- Church Street
- Broomfield Street
- Railway Parade
- Lawrence Hargrave Road.

The rail corridor is largely unaffected by flooding except in rare events (EIS Volume 1, p13.6).

## 4.4. Existing Flood Hazard

The EIS identified that the project traverses high, transitional and low flood hazard areas. Some construction activities (e.g. Cabramatta Creek bridge works, embankment and retaining wall works), work sites and compounds will be located within areas of existing high flood hazard. The existing provisional flood hazard mapping for the five per cent (5%) AEP event is shown in Figure 4.

However, due to the generally small sizes of compounds and work sites relative to the size of the floodplain, the EIS concluded that minimal impacts on flood hazard would result from the proposed works (EIS Volume 3 Technical Report 5, p36).

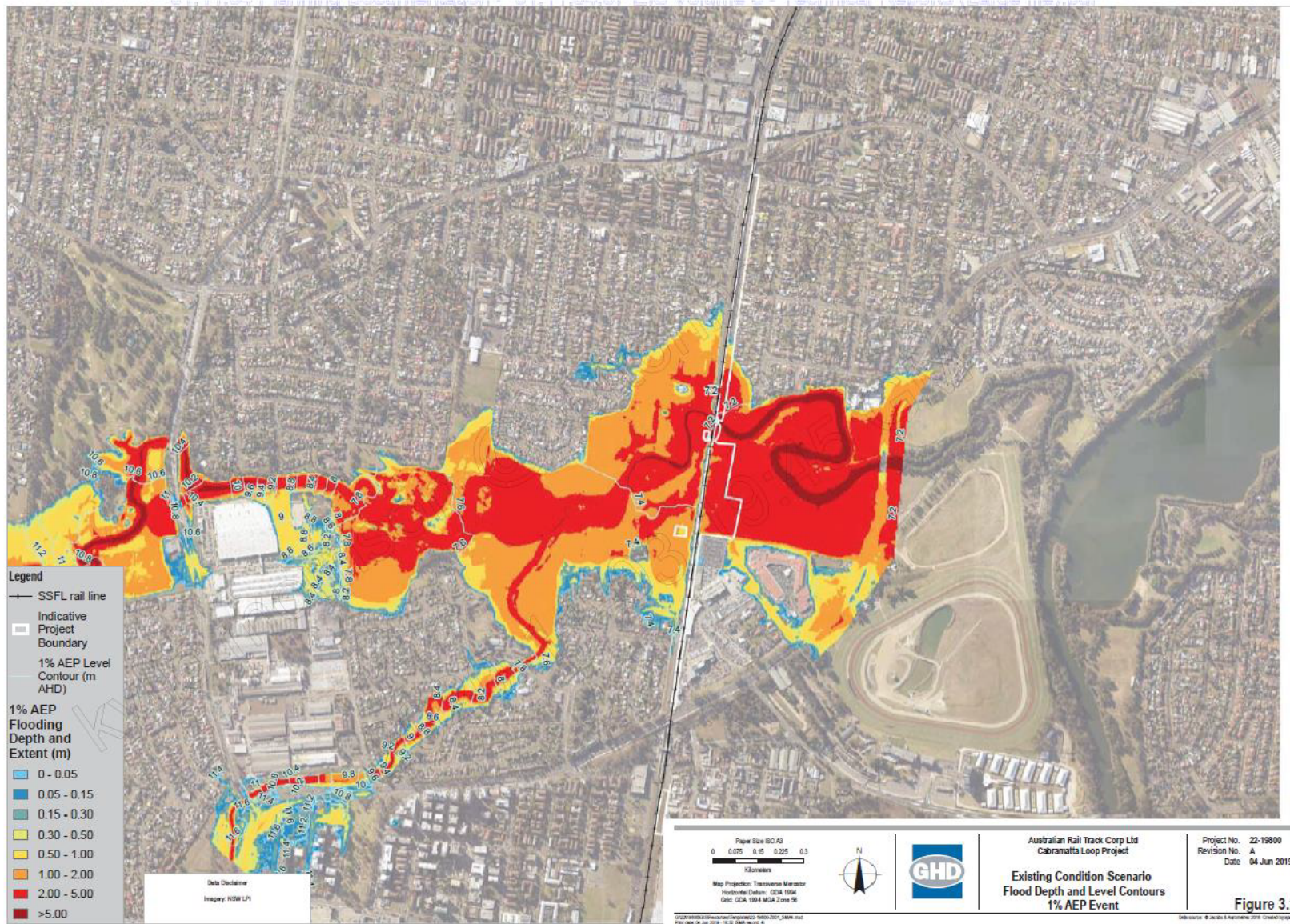


Figure 2: Existing Flood Depth and Extent – One Per Cent (1%) AEP (EIS Volume 3 Technical Report 5, p20)

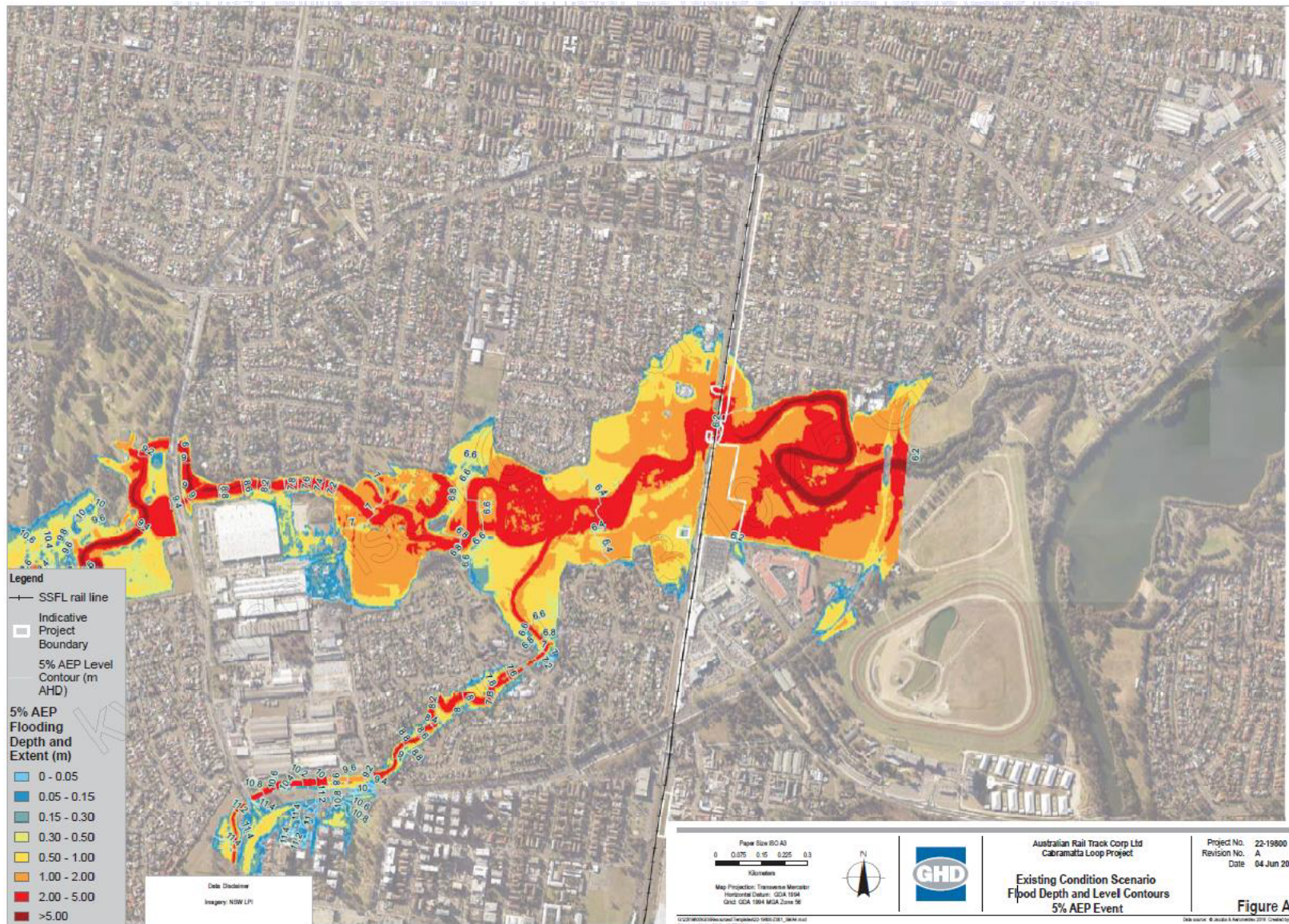


Figure A.1

Figure 3: Existing Flood Depth and Extent – Five Per Cent (5%) AEP (EIS Volume 3 Technical Report 5 Appendix A)

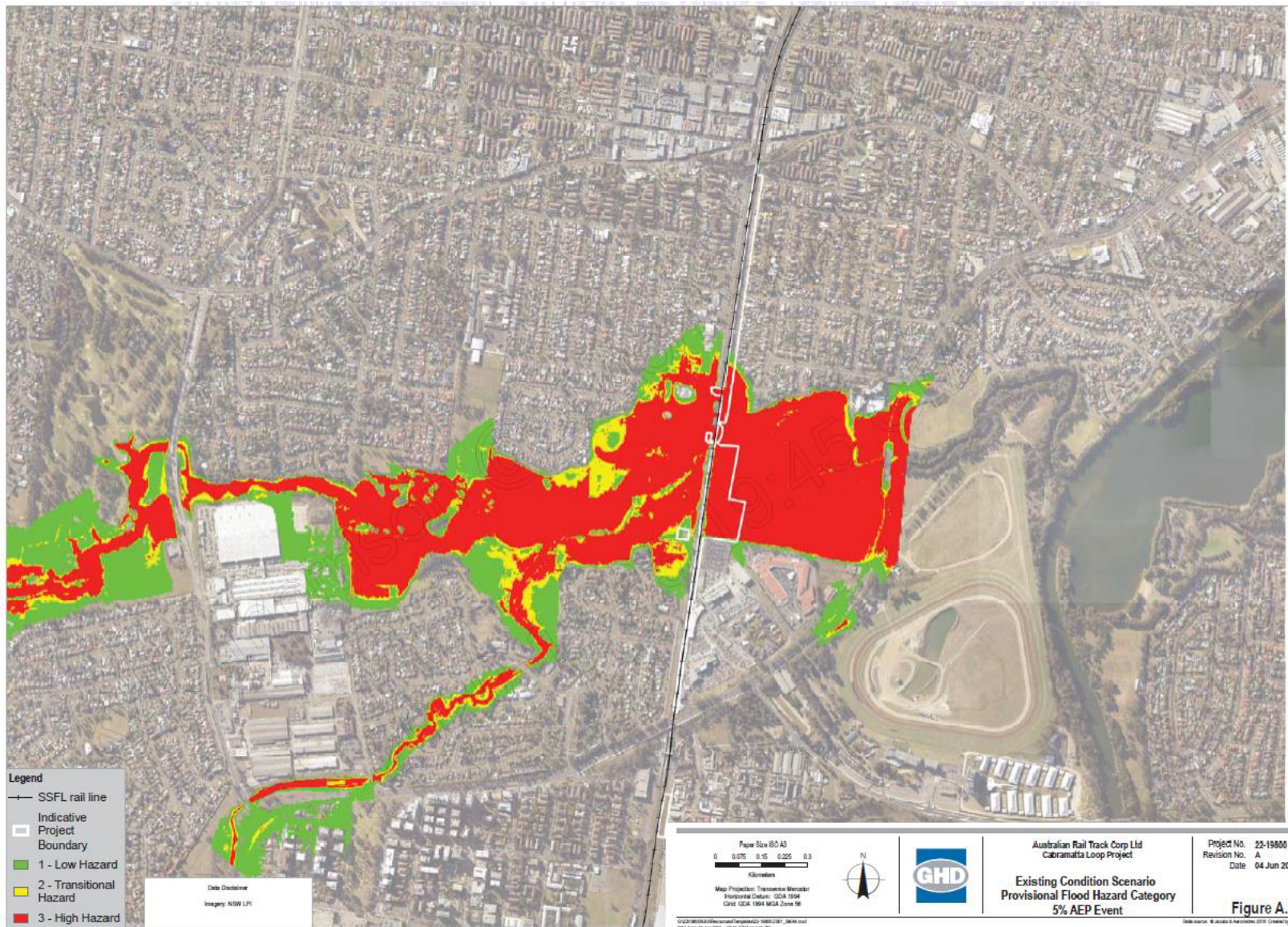


Figure 4: Existing Provisional Flood Hazard Category – Five Per Cent (5%) AEP Event (EIS Volume 3 Technical Report 5 Appendix A)



## 5. Environmental Aspects and Impacts

The key construction activities and the associated potential sources of flooding impact are identified through a risk management approach. The consequence and likelihood of each activity's impact on the environment has been assessed to prioritise its significance. The results of this risk assessment are included in Appendix A3 of the CEMP.

Ongoing environmental risk analysis will be undertaken during construction through regular inspections, monitoring and auditing as described in Chapter 8. This will ensure that issues requiring management (including cumulative impacts) are appropriately managed.

### 5.1. Impacts on Flood Behaviour and Overland Flows During Construction

The EIS (p13.10) identified that the majority of construction activities and the presence of construction compounds and work sites have the potential to impact local overland flows and flood behaviour. Runoff or rainfall within the project site has the potential to cause localised flooding issues and adverse downstream impacts if not appropriately managed. Potential impacts on flood behaviour and overland flows include:

- changed flood behaviour due to the construction of Cabramatta Creek bridge
- blocking of drainage networks through increased sedimentation of surface water
- interruption of overland flow paths by the installation of temporary construction ancillary facilities, erosion and sediment controls or construction hoarding
- changed flood behaviour as a result of changes to site topography and installation of temporary buildings/ site offices and other structures within the floodplain, resulting in increased flooding of adjacent areas due to temporary loss of floodplain storage or conveyance of floodwaters
- small increase in impervious areas, including from site compounds and work sites, which would have the potential to increase the volume of water flowing to watercourses.

During construction, there may also be a need to temporarily disconnect or divert existing stormwater drainage pipes if:

- existing drainage pipes are interfering with proposed railway corridor works
- there are constructability issues with constructing new infrastructure
- possible safety concerns during construction.

This could result in localised modifications to existing flooding patterns, flow volumes, and velocities, which could also result in the scouring of downstream areas, particularly where soil has been exposed during construction. Any flood impacts during construction are expected to be localised and relatively minor and would be effectively managed through the implementation of mitigation measures provided in Chapter 6. The EIS identified that the locations of compounds, work sites and undertaking of activities within designated flood hazard areas would not result in flood affectation of other properties, assets and infrastructure.

### 5.2. Impacts of Flooding on Construction

Works in Jacquie Osmond Reserve and near Cabramatta Creek, including the presence of compounds C2 and C3 and work sites W1 to W3 (as shown in Figure 4 of the CEMP(main section), would be undertaken where there is an existing flood hazard.

Flooding during construction could impact the following:

- safety of workers
- integrity of erosion and sediment control measures
- access to work and compound sites
- plant and equipment used during construction
- temporary drainage structures

- integrity of material stockpiles

The layout of construction compounds and work sites would be undertaken with consideration of overland flow paths as per the mitigation measures provided in Chapter 6. Following completion of construction, no further impacts would occur.

### 5.3. Consistency with Council Floodplain Risk Management Plans

The EIS (p13.11) identified that the *Georges River Floodplain Risk Management Study and Plan* (Bewsher, 2004) and the *Cabramatta Creek Flood Study and Plan* (Bewsher, 2004) discussed a number of potential floodplain management measures. However, no specific measures were recommended within the project site. Therefore, construction of the project would not prevent or comprise any of the works proposed in these plans. The construction works are therefore considered to be consistent with Council's floodplain risk management plans (EIS, p13.11)

### 5.4. Impacts on Existing Emergency Management Arrangements

With the implementation of mitigation measures provided in Chapter 6, no impacts on existing emergency management arrangements are expected during construction. In addition, consultation with stakeholders including Liverpool City Council and Fairfield City Council and the NSW SES has been undertaken during the preparation of the Flood Warning and Evacuation Procedure contained in Appendix A to achieve this.

## 6. Environmental Mitigation Measures

Specific mitigation measures to address impacts on flooding are outlined in Table 4.

Table 4: Flooding Mitigation Measures

ID	Mitigation Measure	Timing		Responsibility
		PC <sup>1</sup>	C <sup>2</sup>	
<b>EVACUATION</b>				
FMM1	In the event of a Flood Warning and/ or flood evacuation, follow the process described in the Flood Warning and Evacuation Procedure contained in Appendix A.		✓	Project Director Emergency Coordinator Emergency Response Team Environmental Manager
<b>ANCILLARY FACILITIES AND WORK SITES</b>				
FMM2	Carry out flood modelling to confirm that the location and operation of construction ancillary facilities (including compounds) and work sites will not worsen the existing flooding characteristics in the catchment. Where flood modelling identifies further additional mitigation measures to be implemented, this FMP would be updated accordingly.	✓	✓	Project Engineers Designers
FMM3	Layout construction ancillary facilities (including compounds) and work areas such that flows are not significantly impeded.		✓	Project Engineers Foreman
<b>DRAINAGE/ OVERLAND FLOW</b>				

ID	Mitigation Measure	Timing		Responsibility
		PC <sup>1</sup>	C <sup>2</sup>	
FMM4	Install permanent cross drainage prior to or concurrent with rail formation. Then divert overland flow into the permanent drainage system. This will ensure overland flow is maintained via the permanent drainage system. Ensure controls are in place to manage sediment risks.		✓	Project Engineers Foreman
FMM5	Stage/ construct the works (e.g. haul roads, piling and crane pads, drainage works) in a manner that minimises the potential for adverse flooding impacts.	✓	✓	Project Engineers

<sup>1</sup> PC means pre-construction; <sup>2</sup> C means construction

## 7. Compliance Management

### 7.1. Roles and Responsibilities

Fulton Hogan's Project Team organisational structure and overall roles and responsibilities are outlined in Section 4.1 of the CEMP. Specific responsibilities for the implementation of environmental controls are detailed in Table 4 of this FMP.

### 7.2. Training

All employees, subcontractors and utility staff working on site will undergo site induction training relating to flooding management issues, including:

- requirements of this FMP
- relevant legislation
- roles and responsibilities for flooding management

Further details regarding staff induction and training are outlined in Chapter 5 of the CEMP.

### 7.3. Complaints

Complaints will be recorded and addressed in accordance with Section 6.2.3 of the CEMP and the Communication Strategy (CS).

### 7.4. Inspections and Monitoring

Regular inspections and monitoring specific to flooding will be undertaken during construction in accordance with Table 5 in Appendix A. General requirements and responsibilities in relation to inspections and monitoring are documented in Sections 8.1 and 8.2 of the CEMP respectively.

### 7.5. Auditing

Auditing (both internal and external) will be undertaken to assess the effectiveness of environmental mitigation measures, compliance with this FMP, ARTC specifications and other relevant approvals, permits and licences. Auditing requirements are detailed in Section 8.4 of the CEMP.

### 7.6. Reporting

General reporting requirements and responsibilities are documented in Chapter 9 of the CEMP.

## **7.7. Non-conformances**

Non-conformances will be dealt with and documented in accordance with Chapter 10 of the CEMP.

## **8. Review and Improvement of FMP**

The FMP will be reviewed to ensure compliance with legislative requirements and its suitability and effectiveness for the project.

The review may be in the form of:

- A formal management review
- A second party audit, and/or
- An inclusion as a separate item at a site meeting.

The Environmental Manager may review and update the FMP more regularly where:

- Significant changes in construction activities occur
- Where targets are not being achieved, or
- In response to audits and non-conformance reports.

Any changes to the FMP will be approved by the ER and made in accordance with the process outlined in Section 1.6 of the CEMP.

## **Appendix A: Flood Warning and Evacuation Procedure**

## Appendix A Flood Warning and Evacuation Procedure

### 1 Purpose

This procedure details the actions to be taken in the event that a Flood Warning is issued by the Bureau of Meteorology (BoM) and evacuation of the project site is required.

For the actions to be taken in the event of a 'heavy' or 'violent' rainfall forecast, refer to the Heavy Rainfall Event Procedure contained in Appendix D of the Soil and Water Management Sub-Plan (SWMP).

### 2 Scope

This procedure applies to all personnel working on the project site.

### 3 Induction and training

All site personnel and subcontractors will be trained in the relevant parts of this procedure.

### 4 Procedure

#### 4.1 Flood Warning

The Bureau of Meteorology (BoM) will issue Flood Warnings for the Georges River through their website. They will also issue Severe Thunderstorm Warnings and Severe Weather Warnings for weather which may cause flooding on the Georges River.

The SES augments this information to coordinate public information management strategies and provide information to the community relating to the potential impacts of flooding and what actions need to be undertaken. The SES will issue Local Flood Bulletins, Evacuation Warnings, Evacuation Orders and All Clears for areas impacted by floods on the Georges River and share these on the SES website.

Local radio stations (SWR 99.9 FM and ABC 702 AM) and other media outlets also provide information updates and advice.

The Environmental Manager will regularly consult these resources to stay abreast of any flood threats that may arise. Table 5 summarises the monitoring associated with Flood Warnings, weather forecasts and post-flood site inspections. It is noted that for safety reasons, SES or other emergency service authorities may undertake their own inspections and risk assessments.

Table 5: Flood Monitoring and Inspections

Monitoring details	Record	Flood Monitoring Frequency	Responsibility
'Flood Warning' issued by BoM	BoM weather data	At least twice daily	Environmental Manager
Weather Forecast	BoM weather data Pre-start Meeting Record	Daily	Safety Manager Environmental Manager
Post-flood site inspection	Environmental inspection checklist	Within 24-hours of the flood event receding, or as soon as allowable, subject to Fulton Hogan safety requirements and after communicating with the SES	Environmental Manager (for environmental component)

## 4.2 Key Locations and Muster Points

Refer to the Site Layout Plan contained in the Incident and Emergency Response Plan (IERP) for details regarding:

- Location of the site compound
- Location of emergency equipment and first aid facilities
- Location of site evacuation muster points
- Site evacuation route
- Entrances and exits.

The Site Layout Plan will be displayed on the site notice board, to help staff during an evacuation.

## 4.3 Site Access and Egress

The site will need to be evacuated safely and quickly during flood events, or if training drills are implemented.

Refer to the Site Layout Plan contained in the Incident and Emergency Response Plan (IERP) for the site evacuation route.

## 4.4 Site Evacuation

If the direction to evacuate the project has been issued by the SES or the Project Director has made the decision to evacuate, the following actions must be undertaken by personnel (refer to Table 6 and Figure 5) designated with the responsibility of coordinating the evacuation of the site:

1. The Project Director must direct the Emergency Coordinator to assign the emergency response team roles and responsibilities for the duration of the evacuation.
2. Before the storm hits:
  - a. Inspect and maintain erosion and sediment controls, especially those around stockpile sites and near Cabramatta Creek and Jacquie Osmond Reserve. Also inspect and maintain waste and chemical storage areas.
  - b. Ensure site drainage is established, clear and where relevant directed to water treatment controls. Local reshaping of land may be required as part of this process.
  - c. Where possible remove plant, isolate remaining plant, stow or tie down loose items.
3. Should BoM issue a Flood Warning, then the emergency response team must instruct Fulton Hogan and subcontractor personnel to make their work areas safe and leave their work areas for higher ground.
4. Before leaving the work areas, operators must remove plant and machinery from the low points across the project, and station them at the higher elevations including at Jacquie Osmond Reserve Compound or offsite where flood waters should have the least impact, but only if safe to do so.
5. Key tools and hazardous materials should be removed from the work areas (using utility vehicles and light trucks), if it is safe to do so. These resources can be placed in or near storage containers.
6. Fuel tanks should be anchored or removed where possible; and water, electricity and gas mains must be turned off.
7. All utility vehicles will be relocated to higher elevations where flood waters should have the least impact, but only if safe to do so.
8. All personnel will then relocate to the emergency evacuation muster point, where a roll call will be facilitated by the Emergency Coordinator.
9. If the flood event passes and the Emergency Coordinator determines it is safe to return to site (in compliance with advice from the SES, or other emergency service authorities), then the following steps will be followed:
  - a. The site, including equipment, will be inspected and made safe

- b. The site will be cleaned up. This includes retrieval of any material washed from the site, where safe to do so.
  - c. The Emergency Coordinator must give the “all clear” to resume work.
- 10. Should evacuation from site be required then the following steps are to be followed:
  - a. After the roll call, the Emergency Coordinator will communicate the potential evacuation routes.
  - b. Staff will be reminded that when leaving the site, they must follow the guidance and instructions of the SES, NSW Police force, fire brigade and any other authority tasked with flood evacuations procedures.
- 11. Refer to Section 4.5 for procedures relating to returning to site.

The following resources should be consulted before evacuating the site, to ensure roads that are closed or areas where movement is restricted are avoided:

[www.livetraffic.com.au](http://www.livetraffic.com.au); and  
[www.myroadinfo.com.au](http://www.myroadinfo.com.au).

Table 6: Emergency Management Roles and Responsibilities

Role	Responsibility
Project Director	Implement measures in this Flood Warning and Evacuation Procedure.
Emergency Coordinator	Implement measures in this Flood Warning and Evacuation Procedure.
Emergency Response Team	Ensure the measures in this Flood Warning and Evacuation Procedure are implemented and ample resources are allocated.
Environmental Manager	Ensure the measures in this Flood Warning and Evacuation Procedure are implemented and ample resources are allocated. Inspect erosion and sediment controls, waste and chemical storage areas to ensure readiness for potential flooding.

#### 4.5 Returning to the Project

Site inspections will be undertaken within 24-hours of the flood event receding, or as soon as allowable, subject to Fulton Hogan safety requirements and after communicating with the SES.

A post-flood site inspection must be undertaken prior to the site being re-occupied. This inspection will include a review of:

- any potential flood damage, including damage to environmental controls
- health and safety risks, and
- material which may have been lost during the event.

Results of the initial site inspection will be provided to the Project Director and reported to ARTC.

It is noted that appropriate monitoring strategies will also be implemented during the operational phase to verify the permanent design performance and impact predictions following a flood, consistent with the requirements of RMM C6.1. This will be addressed in the Operational Environmental Management System (OEMS) required under CoA D1.



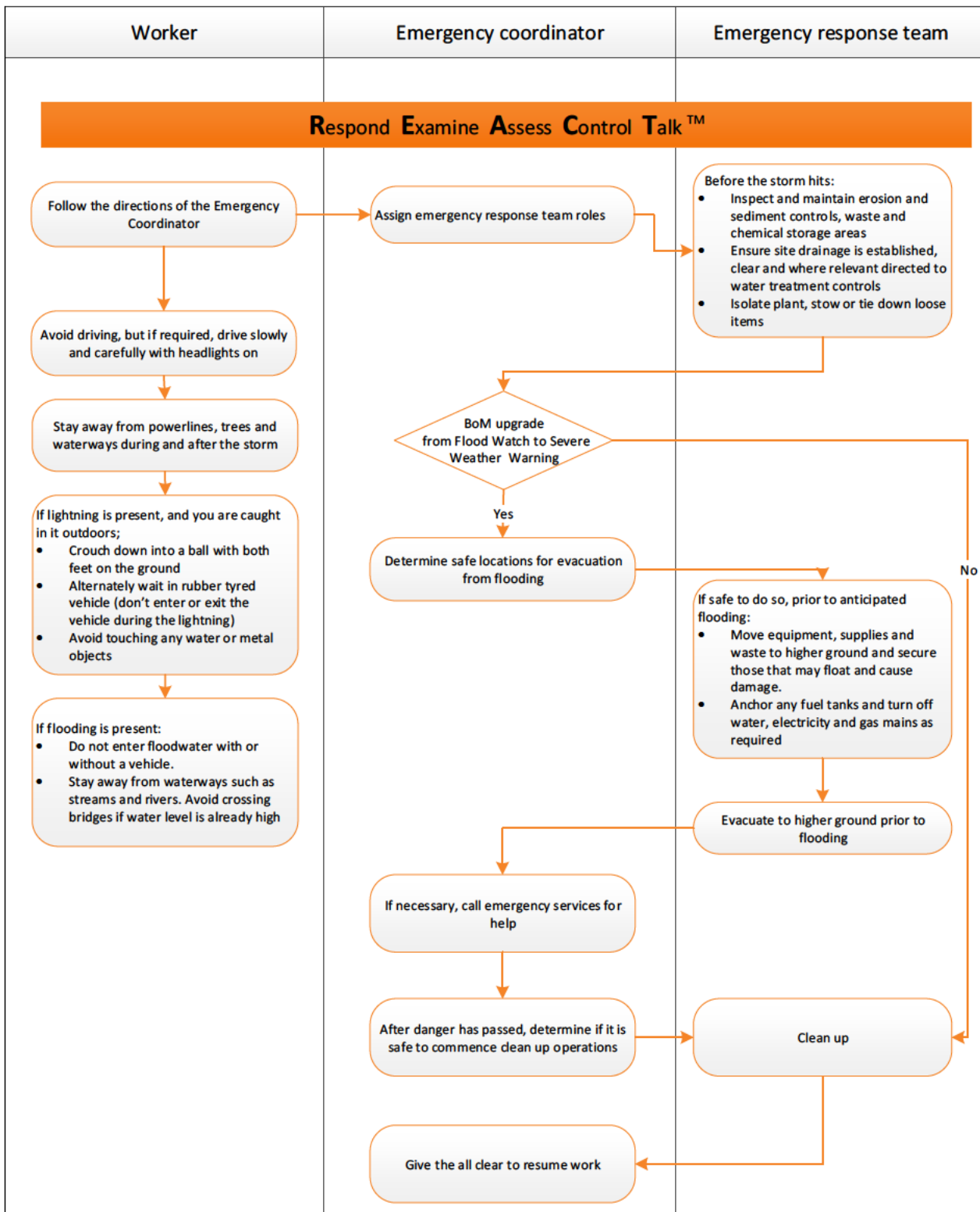


Figure 5: Fulton Hogan Incident and Emergency Response Plan Flowchart – Storms and Flooding