Maranoa Regional Council

Roma Stage 2 Flood Mitigation Project

Operation and Maintenance Manual

April 2016

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1. Introduction

1.1 Operation and Maintenance Manual

The purpose of this document is to provide the operation and maintenance requirements for the Roma Stage 2 Flood Mitigation Project for Maranoa Regional Council (MRC) in accordance with the Queensland Levee Guidelines (DNRW, 2014). These requirements provide the basis of maintaining the diversion drain and levee to ensure they function as designed during a flood event.

The Operation and Maintenance Manual includes the following sections:

Section 1 – Introduction

Section 2 – Roles and Responsibilities

Section 3 – Operation

Section 4 – Maintenance

Section 5 – Inspections

1.2 Background

The primary purpose of the Roma Stage 2 Flood Mitigation Project is to alleviate the backflow occurring from regional flood events at the southern end of the Stage 1 Levee and divert flows from Bungil Creek away from the town centre.

The Stage 2 Project reduces the risk of above floor flooding for properties within the township of Roma and comprises of two components, the Eastern Diversion Drain and the Western Levee.

1.3 Eastern Diversion Drain

The primary function of the Eastern Diversion drain is to improve the flow capacity of the flood plain upstream of the Warrego Highway. This improvement in capacity reduces flood levels within the Roma township.

The Eastern Diversion Drain is located on the eastern side of the town and diverts the Bungil Creek from the north adjacent to the Stage 1 Levee, and extends to the southeast re-connecting near the Warrego Highway. The drain is a 1.8 m to 2.8 m deep, 61 m wide, channel with 1V:4H side slopes to provide safe access for any personnel and animals within the channel and facilitate maintenance with mowers.

The diversion drain contains a central 1 m wide v-drain to provide for drainage of small rainfall events. A causeway is provided along Ashburn Road with an integral 1 m drop to control erosion energy. A 3 m high gabion drop structure within the stilling basin at the southern end of the drain has been provided to dissipate energy and control erosion within the erodible sands at the interface with Bungil Creek.

The channel is grass lined throughout the length, with rock protection provided at critical locations including the drain entrance at Bungil Creek, the downstream area of the causeway, the 3.0 m high gabion drop structure and the northeast bank of the stilling basin at the downstream interface with Bungil Creek.

A plan and location map of the Eastern Diversion Drain is shown below in Figure 1-1.

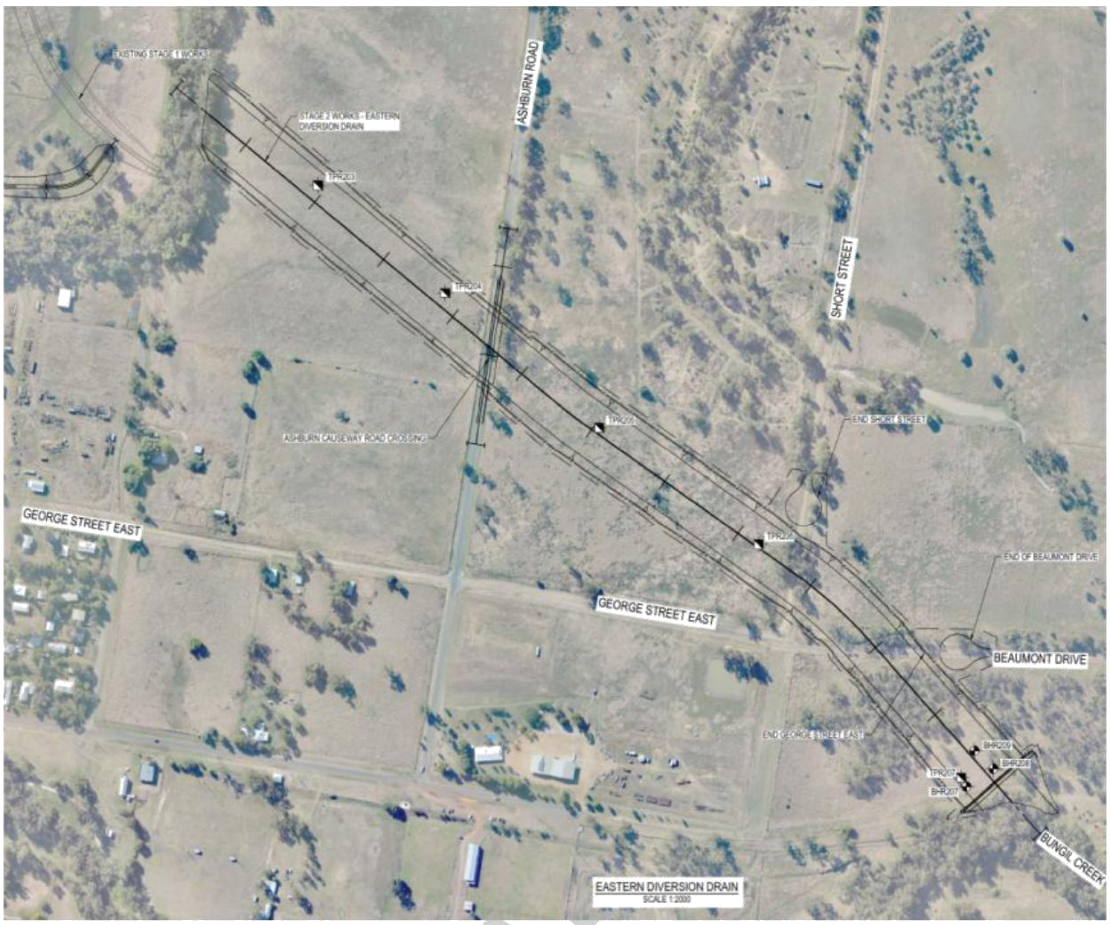

Figure 1-1 Eastern Diversion Drain Plan and Location

1.4 Western Levee

The Western Levee is located on the west side of Bungil Creek and extends from the southern section of the Stage 1 Levee down to the end of Edwardes Street. The levee consists of an earth embankment section and concrete wall section, with a maximum height of 3.0 m and a total length of 790 m. Four (4) drainage structures are located throughout the levee to pass local drainage flows during local events, with penstocks provided on the landward side of each structure to allow closure during major regional events. In sections where the levee is in close proximity to residential houses, a block retaining wall has been utilised on the landward side to minimise the footprint of the levee.

The crest height for the levee is based on the 2012 Design Flood Event (DFE) and includes a 0.8 m freeboard.

A plan and location map of the Western Levee is shown below in Figure 1-2.

Figure 1-2 Western Levee Plan and Location

1.5 Limitations

This report has been prepared by GHD for Maranoa Regional Council and may only be used and relied on by Maranoa Regional Council for the purpose agreed between GHD and the Maranoa Regional Council as set out in section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than Maranoa Regional Council arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer section 1.6 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

1.6 Assumptions

GHD have prepared this report based on the DNRM Levee Guidelines (2014) which stipulates the following requirements. MRC have supplied all details of emergency contacts and their emergency response procedures. The requirements for the Levee Operation and Maintenance

manual is based on the Levee Design, Construction and Maintenance manual (Victoria State Government, 2002) and comprises:

- A statement of the original (and current) intended function and purpose of the levee (refer Section 1).
- The design details, including design flood levels, standard of protection, freeboard allowance, mode of failure and level of failure (refer Section 1).
- Cross-sections (refer drawings in Appendix A).
- 'As-built' drawings (refer drawings in Appendix B).
- Inspection schedule and requirements (periodical, during and after flood events) - (refer Section 5).
- Maintenance of vegetation (trees) and grass cover (grazing, mowing), control of fauna (animal burrows, cattle tracks) and vandalism (refer Section 4, refer Appendix C for Manufacturers Recommendations for maintenance of mechanical items).
- Consideration of the issue of deterioration (desiccation cracking, settlement, animal burrowing, etc.), including methods for inspecting, controlling, mitigating and/or repairing such deterioration (refer Section 4, refer Appendix C for Manufacturers Recommendations for maintenance of mechanical items).
- Details of levee-related structures, such as drainage systems and any temporary pumping that may be required (refer Operations in Section 3).
- A list of contact people and actions to be taken (refer Section 2).

2. Roles and Responsibilities

The roles and responsibilities identified below in Table 2-1 gives reference to the personnel responsible for the Operations and Maintenance of the Eastern Diversion Drain and Western Levee.

Table 2-1 List of Roles and Responsibilities

Role	Personnel	Responsibility	Contact
Chief Executive Officer	MRC to complete	Responsible for the flood mitigation structures and the overall ownership of the Eastern Diversion Drain and Western Levee	04 XXXX XXXX
Executive Manager(s)	MRC to complete	To coordinate during flood events and ensure appropriate activities are undertaken for operation, maintenance and inspections	04 XXXX XXXX
Maintenance Officer(s)	MRC to complete	To ensure maintenance activities are scheduled and carried out accordingly as per Section 4 of this manual	04 XXXX XXXX
Inspection Officer(s)	MRC to complete	To ensure inspection activities are scheduled and carried out accordingly as per Section 5 of this manual	04 XXXX XXXX
Emergency Event Manager/Team	MRC to complete	To coordinate pre, post and during a flood event for emergency management procedures	04 XXXX XXXX

3. Operation

3.1 Eastern Diversion Drain

3.1.1 General

The Eastern Diversion Drain requires manual operation of flood boom gates at the entrances of the Ashburn Road causeway crossing.

3.1.2 Causeway

The diversion drain contains a causeway that will require closing during a flood event to prevent access to the public and subsequently reduce the risk of flood related incidents. Boom gates installed at each causeway entrance shall be closed before the flood level reaches the invert of the causeway, preventing the crossing of traffic.

Assessment of a number of flood events in the Bungil Creek shows that the diversion drain begins to flow at a gauge level (gauge station number 043047) of 4.5 m to 5.0 m. This varies with each flow event as all floods are different in nature. For the purposes of planning closure of Ashburn Road during flood events, the lower flood level is a reasonable data point unless this is further calibrated with a new gauge at the upstream end of the diversion drain. Therefore, Ashburn Road should be closed at a gauge level of 4.5 m for gauge station number 043047.

Depth markers and closure signage is provided at the causeway entrances for operator reference and public notification.

3.2 Western Levee

3.2.1 General

The Western Levee requires operation of four (4) penstocks located at each drainage structure before and after flood events, to allow the levee to function as designed.

The manufacturers' detailed operation procedure for opening and closing of the penstocks is provided in Appendix C.

3.2.2 Normal (Day to Day) Penstock Operation

The penstocks are intended to remain open during normal conditions, local events and when a regional event is not occurring. During local events the penstocks allow local drainage flows to pass through the levee and drain towards the Bungil Creek. They should remain completely open to fully expose the culvert cross section and allow the culvert to pass the design flow.

3.2.3 Major (Regional) Flood Event Penstock Operation

The penstocks are required to be completely closed during a major regional flood event to provide protection against backflow from the Bungil Creek. An operator will be required to close the penstocks at all four (4) locations before the event reaches the level of the levee. The operator is to ensure the manufacturers' detailed operation procedure is followed to close the penstocks.

3.2.4 Vehicle Access along Levee

A light vehicle access track is provided along the top of the earth levee section. During flood events, the levee is likely to be saturated and the pavement will be more susceptible to damage by heavy equipment. It is recommended that access along the top of the levee is conducted

with light vehicles or ATV's except in emergency events. The levee crest alignment is not designed for safe road access at normal road speeds, accordingly a 20 km/h limit is recommended for safe access. Boundary fences are provided at intervals along the levee and are fitted with farm gates. The latch side is toward the Bungil Creek and is intended to provide a point of failure in the event that debris is trapped in the fence and causes the fence to fail.

4. Maintenance

4.1 Eastern Diversion Drain

The maintenance requirements for the Eastern Diversion Drain are shown below in Table 4-1.

Table 4-1 Eastern Diversion Drain Maintenance Requirements

Maintenance Component	Requirements
Vegetation	Ensure that adequate grass cover is established and maintained throughout the diversion drain. Provide appropriate irrigation and grass cover as per the specification for the grassing in Appendix D.
	The grass is required to be mowed to retain an appropriate grass height throughout the diversion drain.
	All trees and woody plants are to be removed from the diversion drain to prevent blockage of the channel.
	Remove large debris including fallen trees and logs.
Access	Fencing and gates around the perimeter of the diversion drain must be maintained to prevent unauthorised access. The access gates are to remain locked when not in use for inspections and maintenance by MRC.
	Where fences are damaged by flood debris these should be repaired at the earliest possible time to provide security to landowner properties.
	No access is to be provided for animals on the levee crest of slopes to prevent grazing and cattle tracks, and maintain an undamaged grass surfacing.
Causeway	Ensure the boom gates operate freely and are lockable when open and closed. These are to be checked on a regular basis by MRC.
	Guide post and gauge markers on the causeway are required to be replaced if damaged or removed due to flows through the diversion drain.
	Rock protection at the causeway should be regularly inspected and replaced if necessary.
Downstream Gabion Drop Structure Stilling Basin	Accumulation of silt is expected to occur in the stilling basin for the gabion structure. This increases the stability of the drop structure and reduces the potential for backward erosion under the drain. The silted stilling basin is likely to be “flushed” after regional flood events. Silt and grasses are permitted within the drop structure, but trees and shrubs should be cut and poisoned.

Maintenance Component	Requirements
Signage	Dead end streets have been created as access across the diversion drain is now via Ashburn Road. Beaumont Drive was formerly a B Double route and through access is not provided. No Exit signage is provided at the junction of each of dead end streets, and end of road signage provided at the street termination. These signs should be maintained to provide safe conditions for road users.

4.2 Western Levee

The maintenance requirements for the Western Levee are shown below in Table 4-2.

Table 4-2 Western Levee Maintenance Requirements

Maintenance Component	Requirements
Vegetation	Ensure that adequate grass cover is established and maintained throughout the levee. Provide appropriate irrigation and grass cover as per the specification for the grassing in Appendix D.
	The grass is required to be mowed to retain an appropriate grass height throughout the levee.
	All trees and woody plants are to be removed from the levee and within 1.0 m of the levee embankment toe to prevent the growth of roots and reduce the risk of piping.
Access	Fencing and gates around the perimeter of the levee must be maintained to prevent unauthorised access. The access gates are to remain locked when not in use for inspections and maintenance by MRC.
	Where fences are damaged by flood debris these should be repaired at the earliest possible time to provide security to landowner properties.
	No access is to be provided for animals to prevent grazing and cattle tracks, and maintain an undamaged grass surfacing throughout the levee.
Embankment Crest, Batters and Toe	Inspection of the embankment and batters is required to identify any potential failure surfaces on the faces or crest of the levee embankment. Cracking, slumping or bulging of the earth embankment are signs of movement or slope failure. Any sign of significant slope failure should be documented and remedial works undertaken in conjunction with a suitably qualified professional engineer (RPEQ).

Maintenance Component	Requirements
	Settlement of the levee embankment can cause a drop in the levee crest level. This also equates to a loss of freeboard for the levee and a reduced flood immunity. Any sign of settlement identified should be documented and remedial works undertaken in conjunction with a suitably qualified professional engineer (RPEQ).
	Any holes identified on the embankment, batters or in the vicinity of the embankment toe (including sand boils) should be documented and notified to a suitably qualified professional engineer (RPEQ). In the event of sand boils occurring during flood events, a safe method of temporary repair is to bund the area with sand bags and backfill the inside of the bunded area with fine sand.
	In the event of sand boils occurring at the landward toe of the wall during flood events, a safe method of temporary repair is to bund the area with sand bags and backfill the inside of the bunded area with fine sand.
Penstocks	The penstock gates, seals, guiderails and access platforms are to be inspected to ensure no damage, blockages or deterioration has occurred. Removal of blockages or debris is required to maintain adequate design capacity of the drainage structures. Refer to the manufacturer for remedial works if damage to these components is identified. Regular maintenance in accordance with the manufacturers recommendations is to be conducted. Appendix ___ lists manufacturers recommendations.
Concrete Structures	The concrete levee wall should be inspected for cracking of the wall, joints or penstock locations. Any cracks identified that are greater than 2 mm in width should be documented and notified to a suitably qualified professional engineer (RPEQ).
	Any drop in level of the concrete wall or movement in the landward or waterward direction should be documented and notified to a suitably qualified professional engineer (RPEQ).

Maintenance Component	Requirements
Drainage Pits	Drainage Pits 2A & 2B are required to be cleaned out if build-up of debris occurs within each of the pit sills or on the inlet cage of Pit 2B. Access to drainage Pit 2A is through the manhole provided in the pit lid, as well as access for operating the penstock through the penetration in the pit lid. The pit lid also has lifting points to allow removal and potential maintenance of the penstock gate within the pit. Drainage Pit 2B has an inlet cage at the opening which allows drainage of surface flow.

5. Inspections

Regular inspection of the Eastern Diversion Drain and Western Levee is recommended to maintain adequate functionality as part of the Queensland Levee Guidelines (DNRW, 2014).

The components listed in Table 4-1 and Table 4-2 represent the key items that require ongoing inspection and maintenance.

There are four (4) types of inspections recommended by DNRW and the International Levees Handbook (CIRIA, 2013). Listed below is the type and frequency of inspections and the

Table 5-1 Recommended Inspection Types and Frequencies

Inspection	Purpose	Frequency
Initial Inspection	The initial inspection is to evaluate and document the condition of the levee immediately after completion of construction.	Once – At Completion of Construction.
Routine Inspection	Routine inspections provide repeated assessment of the condition of the structure assisting in determining if the structure continues to meet minimum acceptable standards for operations and maintenance.	Annual
In-flood Inspection	In-flood inspections are performed during a flood event and can be valuable in understanding any critical areas that could potentially lead to a failure in the future. This type of inspection should only be undertaken if it is safe to do so.	During Flood Event
Post-flood Inspection	Post-flood inspections are critical for observing any damage or changes that may have occurred during a flood event. They also provide information on how the levee performed and what potential remedial work could be required before the next event occurs.	Post Flood Event

Should damage be observed during inspections, the recommended maintenance procedures listed in this document should be followed. Should further work be required, an RPEQ engineer experienced in dams and levees should be consulted to provide specific advice to suit the circumstances.

Appendices

Appendix A – Typical Cross Sections

[Under Review]

Appendix B – As Built Drawings

[To be provided at completion of construction]

Appendix C – Manufacturers Manual(s)

[To be provided by manufacturers]

Appendix D – Grass Specification (To be Provided by Subconsultant to MRC)

[To be provided by subconsultant]

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