TECHNICAL NOTE

ESTIMATED SALT LOAD CHANGES RESULTING FROM REGULATOR OPERATIONS ON THE CHOWILLA FLOODPLAIN USING THE CHOWILLA NUMERICAL GROUNDWATER MODEL

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ESTIMATED SALT LOAD CHANGES RESULTING FROM REGULATOR OPERATIONS ON THE CHOWILLA FLOODPLAIN USING THE CHOWILLA NUMERICAL GROUNDWATER MODEL

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The scenarios were refined with input and approval from the Department of Environment, Water and Natural Resources, Operations and Major Programs Division, Resource and Environmental Management Unit, specifically:

- Tony Herbert
- Jan Whittle

Review comments were provided by Aaron Matsinos (MDBA) and Stuart Little (The Living Murray Environmental Monitoring, Ecosystem Management Branch, Environmental Management Division).

The note was peer reviewed by Graham Green (Senior Hydrogeologist), Steve Barnett (Principal Hydrogeologist) and approved by Dragana Zulfic (Team Leader, Groundwater), in the Department of Environment, Water and Natural Resources, Science, Monitoring and Knowledge Branch.

The technical note was edited by Colin Cichon and the GIS figures were reviewed by Martha Augoustinos.

CONTENTS

List of Figures

List of Tables

INTRODUCTION

BACKGROUND

The Chowilla floodplain (Figure 1) is one of six significant ecological assets identified within the Murray-Darling Basin by the Murray-Darling Basin Ministerial Council. As such, Chowilla is a priority site for the delivery of environmental flows using water made available through the Murray-Darling Basin Authority (MDBA) Living Murray Initiative First Step decision. It is also a priority site for investment in structural and operational change through the MDBA Environmental Works and Measures Program.

The Chowilla floodplain is well recognised as a discharge point for regional saline groundwater. Significant volumes of saline groundwater are both intercepted by anabranch creeks and/or stored in floodplain sediments. This salt is ultimately mobilised and transported to the River Murray during and following large floods. Salt load accession to the river following large flood events can exceed 1000 t/d while those during low flow periods are approximately 30 to 40 t/d (Sharley & Huggan 1995).

Like the majority of the lower Murray floodplains, much of the biota of the Chowilla floodplain is under stress resulting from the combined effects of salt accumulation and reduced frequency of inundation. In order to combat these threats, construction of flow management infrastructure has commenced. The flow management infrastructure will consist of a regulator in the Chowilla Creek that would enable the water level in the anabranch creek system to be temporarily raised and large areas of the floodplain to be inundated, even under low river flow conditions.

The impacts of operation of the proposed regulator (hereafter referred to as the regulator) have been considered in terms of water use, vegetation response, groundwater response, and increased salt load accession to the River Murray.

The project involves using an existing numerical groundwater model (Chowilla 2012) to test three sets of regulator operational scenarios as agreed with the Operations and Major Programs Branch of the Department of Environment, Water and Nature Resources (DEWNR). The methodology applied is the same as the 2007 scenario modelling (Howe, Yan and Stadter 2007). The purpose of this study is to estimate changes in salt load (t/d) entering the River Murray through the Chowilla floodplain anabranch system.

OBJECTIVE

The objective of this study is to estimate the potential changes in salt load that would enter the River Murray through the anabranch creeks in the Chowilla floodplain under a range of specified Chowilla Creek regulator operating regimes, including:

- Regulator operation duration: two, three or four months (at full regulator height of 19.87 m AHD at flow of 10 000 ML/d QSA[1])
- Regulator height: 19.87, 19.25 or 18.50 m AHD (at flow of 10 000 ML/d QSA and an operation duration of three months)
- Rate of regulator recession: instant (0 days), rapid (35 days) or slow (75 days) (at full regulator height of 19.87 m AHD at flow of 10 000 ML/d QSA and an operation duration of three months).

[1] QSA flow – Flow to South Australia

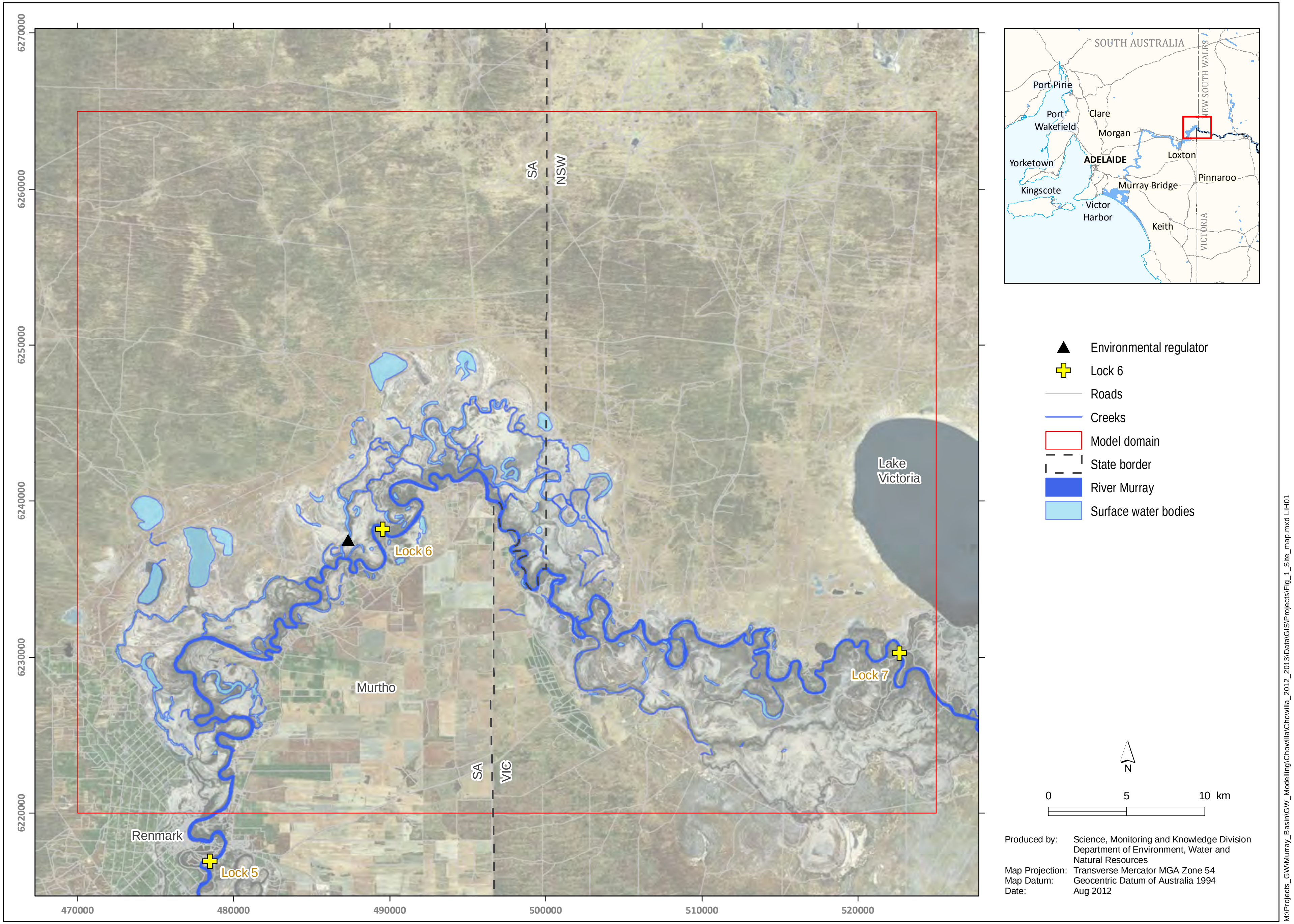

Figure 1. Project site map and model domain

This will be achieved using a subset of the Chowilla 2012 Groundwater model and will be used to inform future operating rules which manage potential EC impact. However the scope of this document is restricted to predicting the salt load impact of the regulator operations above and will not include EC impacts.

MODEL HISTORY

The model history has been included to document the development and changes of the Chowilla model prior to this study. There have been three main modelling programs in 2004, 2007 and 2012, which are referred to in text as:

- Chowilla 2004 model
- Chowilla 2007 model
- Chowilla 2012 model.

In 2004, the Department of Water, Land and Biodiversity Conservation (DWLBC) developed a numerical groundwater flow model capable of simulating the regional aquifer system underlying the Chowilla floodplain (Chowilla 2004 model). At that time, all model structures and boundaries were defined and hydraulic parameters were estimated during calibration, which was based on regional monitoring data and local pumping tests. The Chowilla 2004 model was used to simulate the regional aquifer system under low river flow conditions and did not include the impact of any flooding. This model is comprehensively documented in Yan, Howles and Marsden (2004).

In 2005–06, the 2004 model was used for the first time by DWLBC to simulate the aquifer hydraulic response to natural flooding and flooding induced by the regulator. During the project it was assumed that the regulator was operated on an annual basis over a ten-year period (Overton, Rutherford and Jolly 2005). This assessment indicated that operation of the regulator would induce an increased salt load accession (above that of the same flood magnitude under natural conditions) of up to ~400 t/d immediately after flooding, and an average increase of ~75 t/d over the ten-year period.

In 2007, the Chowilla 2007 model was developed based on the Chowilla 2004 model to cover a longer period (30 years) and a broader range of river flow variability. This enabled the model to simulate a more realistic operating strategy involving an average regulator usage frequency of once every three years. The Chowilla 2007 model was used to simulate the aquifer hydraulic response to historic flood events and flooding induced by the regulator, using a simplified version of the River Murray flow hydrograph of the past 30 years. The fundamental model parameters and conditions did not change from the Chowilla 2004 model, other than to apply the conditions necessary to simulate flooding, with changes documented in Howe, Yan and Stadter (2007).

The Chowilla 2012 model was based on the Chowilla 2007 model and was further updated by RPS Aquaterra (2012). This included:

- updating topography based on LiDAR[2], which resulted in changes to
    - surface topography
    - inundation area
    - stream levels
    - evapotranspiration

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[2] LiDAR – Light Detection and Ranging, an optical remote sensing technology

- refining groundwater salinity zones based on AEM data
- simulating the River Murray using MODFLOW's River package instead of the Constant Head boundary condition
- updating anabranch bed conductance to reflect the dynamic nature of the anabranches during flood conditions
- clarifying and documenting the flood inundation recharge rates.

The Chowilla 2012 model was used to investigate the salt load impact of the regulator. The study found that the scenario with flows of 10 000 ML/d at a regulator height of 19.87 m AHD showed the greatest increase in salt load to the river, with peak impacts (effect due to regulator) ranging from 150 to 300 t/d (RPS Aquaterra 2012).

CURRENT MODELLING EXERCISE

The current modelling exercise is to examine the salt load impact of different specified regulator operation regimes using the Chowilla 2012 model. Consequently three tasks have been developed:

- Task 1: regulator operation duration
- Task 2: regulator height
- Task 3: rate of regulator recession.

Each task consists of three scenarios. Scenario 1 is identical between the tasks and serves as a base for comparison purpose. Table 1 shows a summary of the scenarios undertaken in this study.

Table 1. Model scenario summary

Task	Scenario	Operation period (month)	Regulator height (m AHD)	River Murray level upstream of Lock 6 during operation (m AHD)	Regulator recession	Flow regimes during operation (ML/d)
1	1	3	19.87	19.87	Instant (0 days)	10 000
	2	**2**	19.87	19.87	Instant (0 days)	10 000
	3	**4**	19.87	19.87	Instant (0 days)	10 000
2	1	3	19.87	19.87	Instant (0 days)	10 000
	2	3	**19.25**	**19.25**	Instant (0 days)	10 000
	3	3	**18.50**	**18.50**	Instant (0 days)	10 000
3	1	3	19.87	19.87	Instant (0 days)	10 000
	2	3	19.87	19.87	**Rapid (35 days)**	10 000
	3	3	19.87	19.87	**Slow (75 days)**	10 000

The groundwater model operates under two distinct conditions, operational and non-operational, which refer to periods of regulator use. Operational conditions are defined in detail under each task as they vary between tasks, however non-operational conditions are the same for all tasks. Non-operational conditions include:

- River flows at 5 000 ML/d
- River Murray water level upstream of Lock 6 at 19.25 m AHD
- River Murray water level downstream of Lock 6 at 16.3 m AHD
- Regulator height at 16.3 m AHD
- No groundwater recharge due to flood inundation
- Anabranch creek levels at non-operational levels for each model reaches are shown in Figure 2 and Table 2.

Table 2. Non-Operational Anabranch creek water levels

Groundwater model ID	Hydrodynamic model ID	Anabranch Creek Levels (m AHD)
0	24	18.53
1	23	18.42
2	22	18.23
3	21	18.23
4	20	18.06
5	19	17.73
6	17	17.64
7	15	17.62
8	14	17.57
9	12	17.56
10	10	17.15
11	8	16.75
12	6	16.46
13	4	16.43
14	2	16.38
15	3	16.40
16	1	16.38
17	5	17.61
18	7	16.45
19	18	19.14
20	16	18.22
21	13	18.01
22	11	17.32
23	9	17.04

The groundwater model used for this assessment is based on the Chowilla 2012 model from RPS Aquaterra (2012). The study area and groundwater salinities (derived from AEM) used in salt load calculations are consistent with RPS Aquaterra (2012), and are shown in Figures 1 and 3, respectively.

For the purpose of this study, some modifications have been made to the Chowilla 2012 model, including:

- one regulator event only for each scenario
- a reduced simulation period of three years
- a finer temporal discretisation from monthly to five-day stress periods during the regulator operation and early recession period, and then gradually increases to monthly for the later recession period.

The key model inputs that are varied between scenarios include:

- inundation areas, which are used to define groundwater recharge areas
- anabranch creek water levels (simplified into 24 groups, as shown in Figure 3).

These inputs were estimated using a hydrodynamic model developed by Water Technology (2009). The hydrodynamic model used the same LiDAR data as the Chowilla 2012 model and a river flow regime of 10 000 ML/d during regulator operation.

The output from the model is salt load to the anabranches and the River Murray including the salt load from the southern side of the River Murray. Peak salt load and cumulative salt load are both examined, as well as the difference in the modelled salt load over time compared to modelled salt load prior to regulator operation. This difference is described as the salt load impact, indicating that it is the impact of the regulator operation on either the peak or cumulative salt loads. Cumulative salt loads are representative of the volume of salt exported through the floodplain over the duration of the scenario (2.5 years).

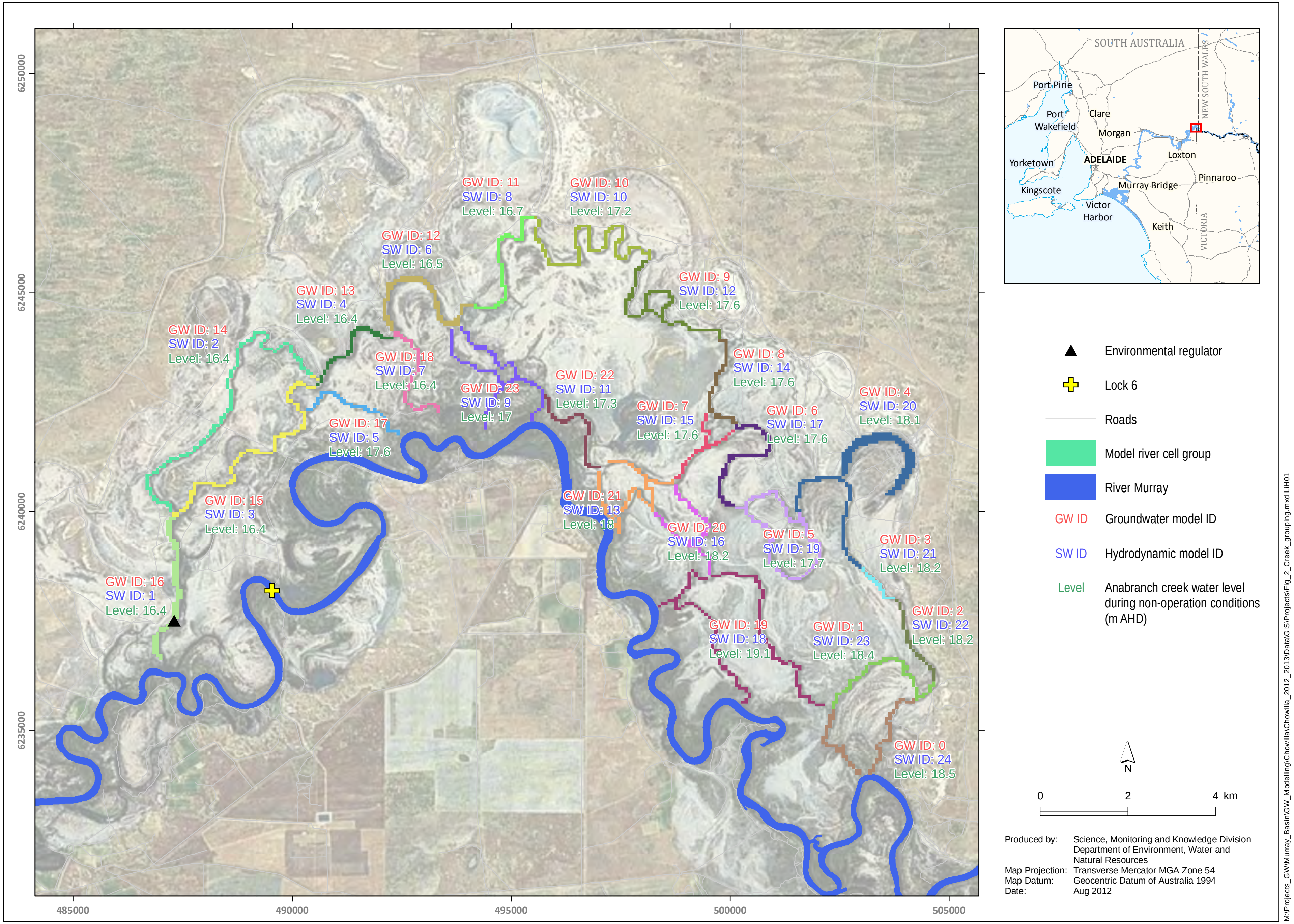


Figure 2. Model anabranch creek location and water levels during non-operational conditions

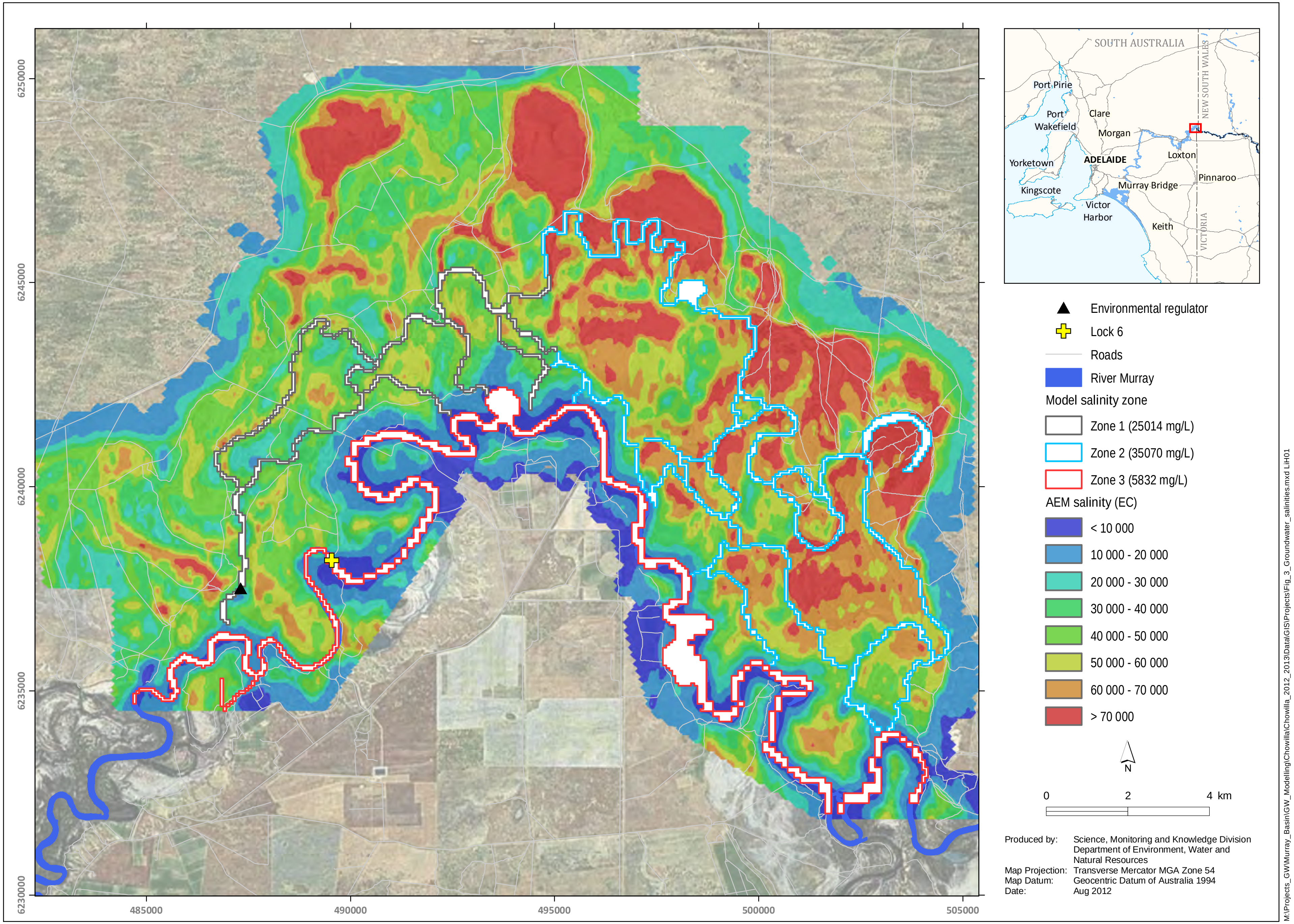


Figure 3. Groundwater salinity zones and values used for salt load calculations

TASK 1 – REGULATOR OPERATION DURATION

PURPOSE

The purpose of Task 1 is to quantify the peak and cumulative salt load due to operating the regulator for two months or four months duration in comparison to the current three month assessment.

SCENARIOS

Task 1 consists of three scenarios that assume the regulator operates for three different durations:

- Scenario 1 (S1): operation of the regulator at 19.87 m AHD for three months
- Scenario 2 (S2): operation of the regulator at 19.87 m AHD for two months
- Scenario 3 (S3): operation of the regulator at 19.87 m AHD for four months

ASSUMPTIONS

The assumptions surrounding the Chowilla 2012 and 2007 models are described in full in RPS Aquaterra (2012) and Howe, Yan and Stadter (2007), respectively. These assumptions are generally conservative in that they are likely to overestimate, rather than underestimate, salt loads. The assumptions that are the most relevant to this task have been adopted from previous work and include:

- there are three months of non-operational conditions, followed by a regulator operation period of different duration (scenario dependent), and then return to non-operational conditions for the rest of the simulation, as illustrated in Figure 4
- groundwater recharge due to inundation is assumed to reach the maximum area immediately at the commencement of the regulator operation and cease immediately after the operation. The rate of recession is investigated further in Task 3
- anabranch creek water levels are assumed to reach the maximum level immediately at the commencement of the regulator operation and return back to non-operational levels immediately after the operation. The rate of recession is investigated further in Task 3
- River Murray water level upstream of Lock 6 is assumed to reach the regulator level 19.87 m AHD immediately at the commencement of the regulator operation and return back to the weir pool level 19.25 m AHD immediately after the operation
- River Murray water level downstream of Lock 6 remains constant at the weir pool level 16.3 m AHD throughout the simulation
- modelled salt loads are calculated by multiplying the modelled groundwater flux entering the anabranch creeks and the river by groundwater salinities. The groundwater salinity changes from bank storage are not accounted for in this calculation.

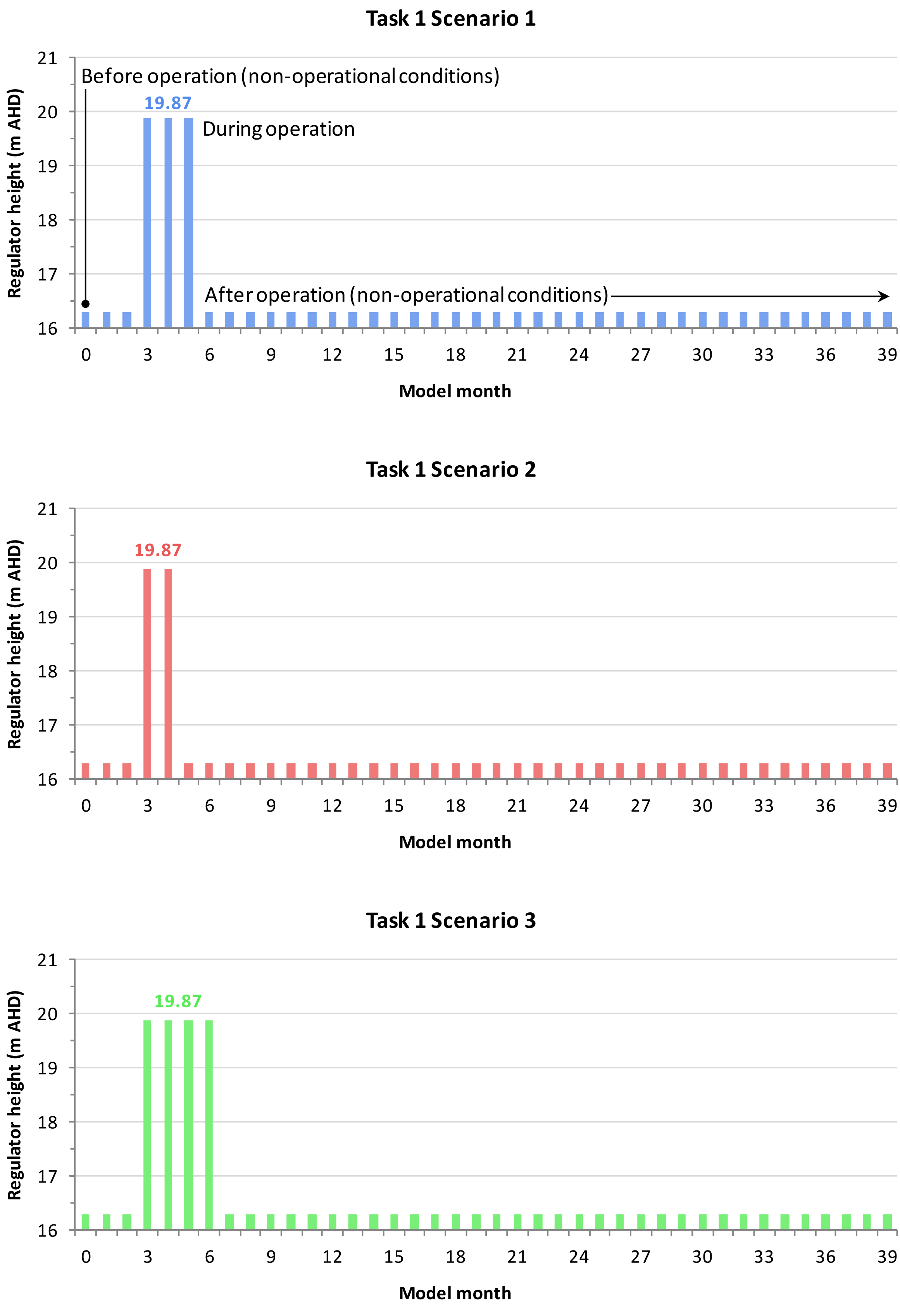


Figure 4. **Regulator heights and duration for Task 1**

MODEL INPUTS

In Task 1, the river flow is assumed to be 10 000 ML/d during regulator operation and 5 000 ML/d for non-operational conditions. The regulator height is at 19.87 m AHD during operation and 16.3 m AHD during non-operational conditions.

The inundation areas during operation were estimated from hydrodynamic modelling by Water Technology. Model groundwater recharge areas are based on these inundation areas. The flood inundation recharge rates and spatial distribution are from the potential groundwater recharge documented in Overton, Rutherford and Jolly (2005). These are combined to provide a spatial distribution of groundwater recharge rate for the model. The groundwater recharge rates and spatial distribution are shown in Figure 5.

The anabranch creek water levels were provided from hydrodynamic modelling by Water Technology. The anabranch creek system is simplified into 24 reaches (Figure 3) and their water level changes used in Task 1 are shown in Table 3.

Note that all the scenarios in Task 1 have the same inundation areas and creek levels during inundation but their durations are different between scenarios.

Table 3. Anabranch creek water levels for Task 1

Groundwater model ID	Hydrodynamic model ID	Anabranch creek water level (m AHD)			
		Non-Operation Levels	S1	S2	S3
0	24	18.53	19.89	19.89	19.89
1	23	18.42	19.90	19.90	19.90
2	22	18.23	19.89	19.89	19.89
3	21	18.23	19.89	19.89	19.89
4	20	18.06	19.89	19.89	19.89
5	19	17.73	19.89	19.89	19.89
6	17	17.64	19.89	19.89	19.89
7	15	17.62	19.89	19.89	19.89
8	14	17.57	19.89	19.89	19.89
9	12	17.56	19.88	19.88	19.88
10	10	17.15	19.88	19.88	19.88
11	8	16.75	19.88	19.88	19.88
12	6	16.46	19.88	19.88	19.88
13	4	16.43	19.88	19.88	19.88
14	2	16.38	19.87	19.87	19.87
15	3	16.40	19.88	19.88	19.88
16	1	16.38	19.87	19.87	19.87
17	5	17.61	19.88	19.88	19.88
18	7	16.45	19.88	19.88	19.88
19	18	19.14	19.90	19.90	19.90
20	16	18.22	19.89	19.89	19.89
21	13	18.01	19.89	19.89	19.89
22	11	17.32	19.89	19.89	19.89
23	9	17.04	19.88	19.88	19.88

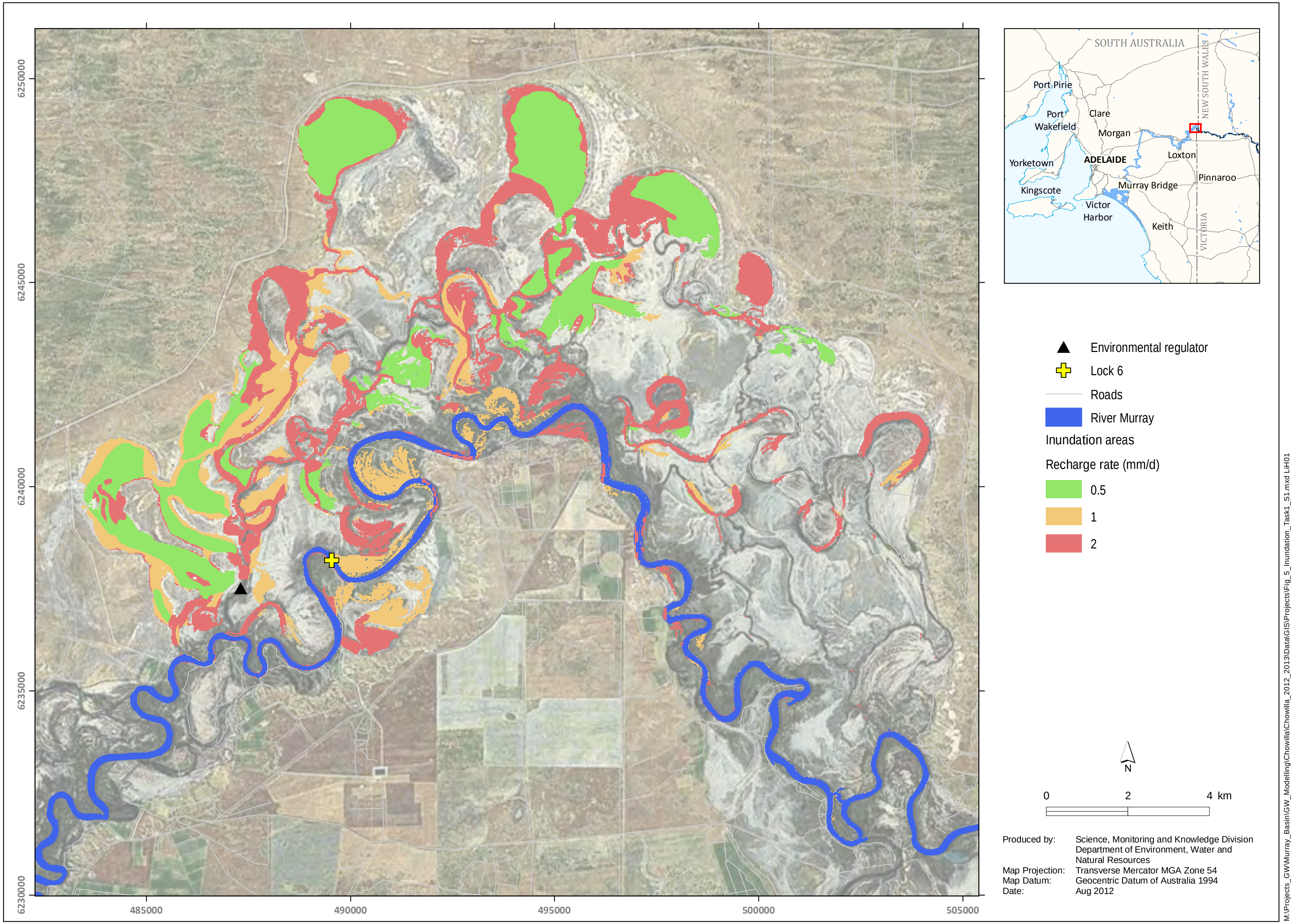


Figure 5. Maximum inundation areas and recharge rates for Task 1 all scenarios

MODEL RESULTS

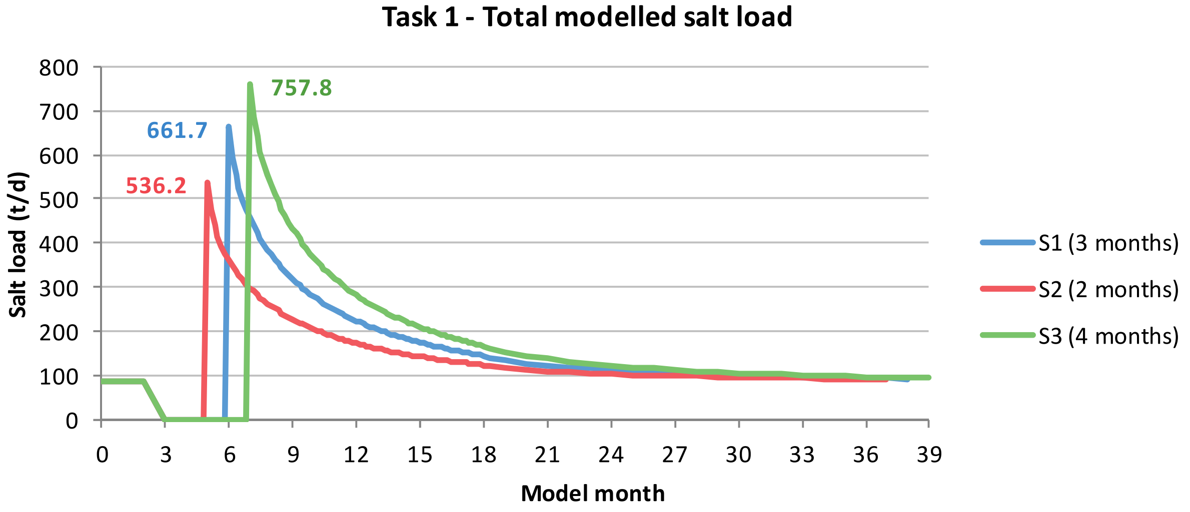
The model results for Task 1 are shown in Figures 6a to c.

Figure 6a displays the total modelled salt load that would enter the River Murray from groundwater through the anabranches and through direct discharge to the river for each scenario, with the dominant salt load contribution from the anabranches. Salt load to the anabranches and the river during regulator operation is negligible due to the increased water levels in the River Murray and the anabranches.

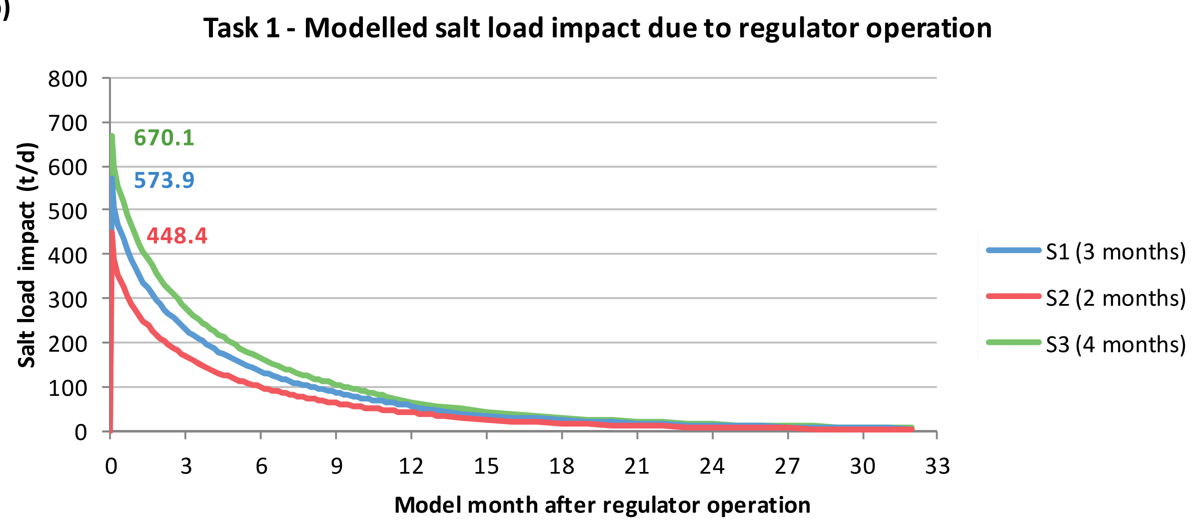
Figure 6b shows the modelled salt load impact (increase in modelled salt load) that is caused by regulator operation for each scenario. It is calculated as the difference between the total modelled salt load (Figure 6a) and the modelled salt load just before the operation.

Figure 6c presents the cumulative modelled salt load impact that is caused the regulator operation for each scenario, which is calculated based on Figure 6b.

(a)



(b)



(c)

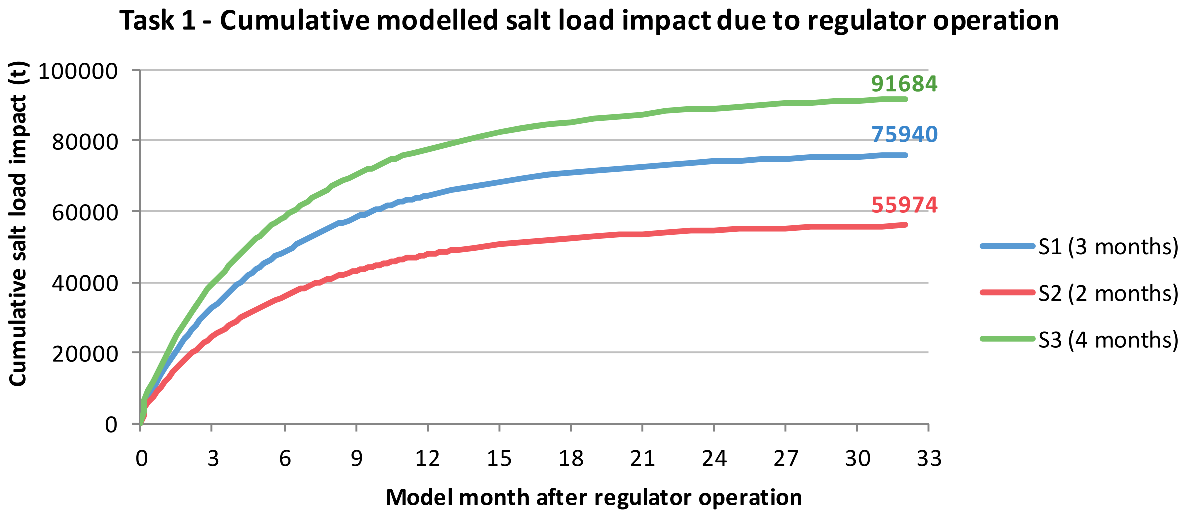


Figure 6. **Modelled salt load for Task 1**

(Labelled value is the highest value for that scenario)

TASK 2 – REGULATOR HEIGHT

PURPOSE

The purpose of Task 2 is to assess salt loads induced by operation of the Regulator and Lock 6 at different operating heights.

SCENARIOS

Task 2 consists of three scenarios that assume three different regulator operating heights:

- Scenario 1 (S1): operation of the regulator at 19.87 m AHD and Lock 6 at 19.87 m AHD for 3 months
- Scenario 2 (S2): operation of the regulator at 19.25 m AHD and Lock 6 at 19.25 m AHD for 3 months
- Scenario 3 (S3): operation of the regulator at 18.50 m AHD and Lock 6 at 18.50 m AHD for 3 months

ASSUMPTIONS

The assumptions surrounding the Chowilla 2012 and 2007 models are described in full in RPS Aquaterra (2012) and Howe, Yan and Stadter (2007), respectively. These assumptions are generally conservative in that they are likely to overestimate, rather than underestimate, salt loads. The assumptions that are the most relevant to this task have been adopted from previous work and include:

- there are three months of non-operational conditions, followed by a regulator operation period of three months, and then return to non-operational conditions for the rest of the simulation, as illustrated in Figure 7
- groundwater recharge due to inundation is assumed to reach the maximum level immediately at the commencement of the regulator operation and cease immediately after the operation
- anabranch creek water levels are assumed to reach the maximum level immediately at the commencement of the regulator operation and return back to non-operational levels immediately after the operation
- River Murray water level upstream of Lock 6 is assumed to reach the regulator level immediately at the commencement of the regulator operation and return back to the weir pool level 19.25 m AHD immediately after the operation
- River Murray water level downstream of Lock 6 remains constant at the weir pool level 16.3 m AHD throughout the simulation
- modelled salt loads are calculated by multiplying the modelled groundwater flux entering the anabranch creeks and the river by groundwater salinities. The groundwater salinity changes from bank storage are not accounted for in this calculation.

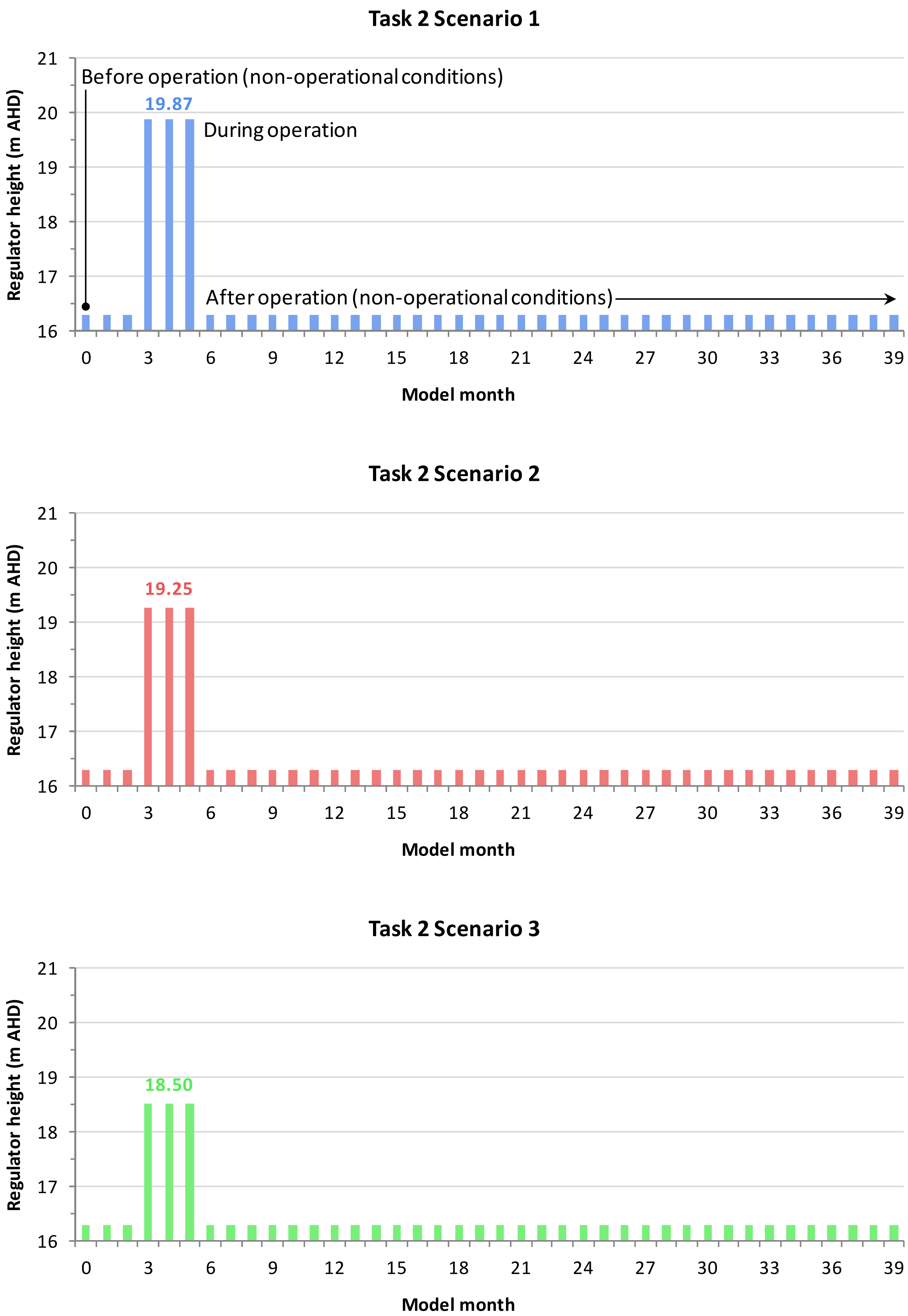


Figure 7. **Regulator heights and duration for Task 2**

MODEL INPUTS

In Task 2, the river flow is assumed to be 10 000 ML/d during regulator operation and 5 000 ML/d for non-operational conditions. The regulator height is at 19.87, 19.25 or 18.50 m AHD during operation and 16.3 m AHD during non-operational conditions.

The inundation areas during operation were estimated from hydrodynamic modelling by Water Technology. Model groundwater recharge areas are based on these inundation areas. The flood inundation recharge rates and spatial distribution are from the potential groundwater recharge documented in Overton, Rutherford and Jolly (2005). These are combined to provide a spatial distribution of groundwater recharge rate for the model. The groundwater recharge rates and spatial distribution are shown in Figures 8 to 10 (note that Figure 8 is identical to Figure 5 and is included for ease of comparison).

The anabranch creek water levels were provided from hydrodynamic modelling by Water Technology. The anabranch creek system is simplified into 24 reaches (Figure 3) and their water levels changes used in Task 2 are shown in Table 4.

Table 4. Anabranch creek water levels for Task 2

Groundwater model ID	Hydrodynamic model ID	Anabranch creek water level (m AHD)			
		Non Operation Levels	S1	S2	S3
0	24	18.53	19.89	19.31	18.69
1	23	18.42	19.90	19.31	18.71
2	22	18.23	19.89	19.31	18.63
3	21	18.23	19.89	19.31	18.63
4	20	18.06	19.89	19.31	18.61
5	19	17.73	19.89	19.31	18.60
6	17	17.64	19.89	19.31	18.59
7	15	17.62	19.89	19.31	18.59
8	14	17.57	19.89	19.31	18.58
9	12	17.56	19.88	19.31	18.58
10	10	17.15	19.88	19.30	18.55
11	8	16.75	19.88	19.30	18.54
12	6	16.46	19.88	19.30	18.54
13	4	16.43	19.88	19.30	18.53
14	2	16.38	19.87	19.29	18.51
15	3	16.40	19.88	19.30	18.51
16	1	16.38	19.87	19.29	18.50
17	5	17.61	19.88	19.30	18.54
18	7	16.45	19.88	19.30	18.56
19	18	19.14	19.90	19.32	19.18
20	16	18.22	19.89	19.31	18.68
21	13	18.01	19.89	19.31	18.63
22	11	17.32	19.89	19.31	18.60
23	9	17.04	19.88	19.31	18.57

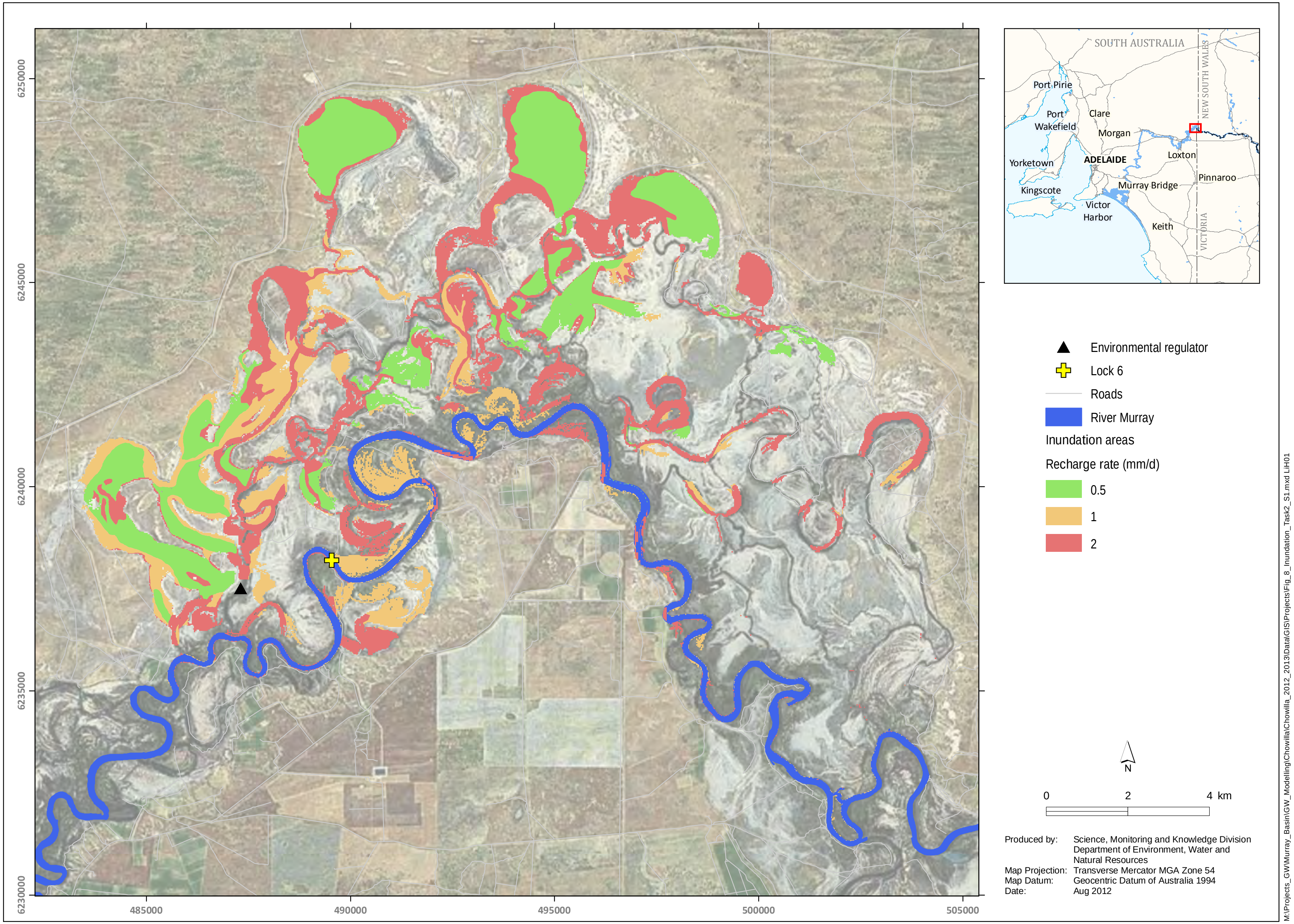


Figure 8. Maximum inundation areas and recharge rates for Task 2 Scenario 1 (19.87 m AHD)

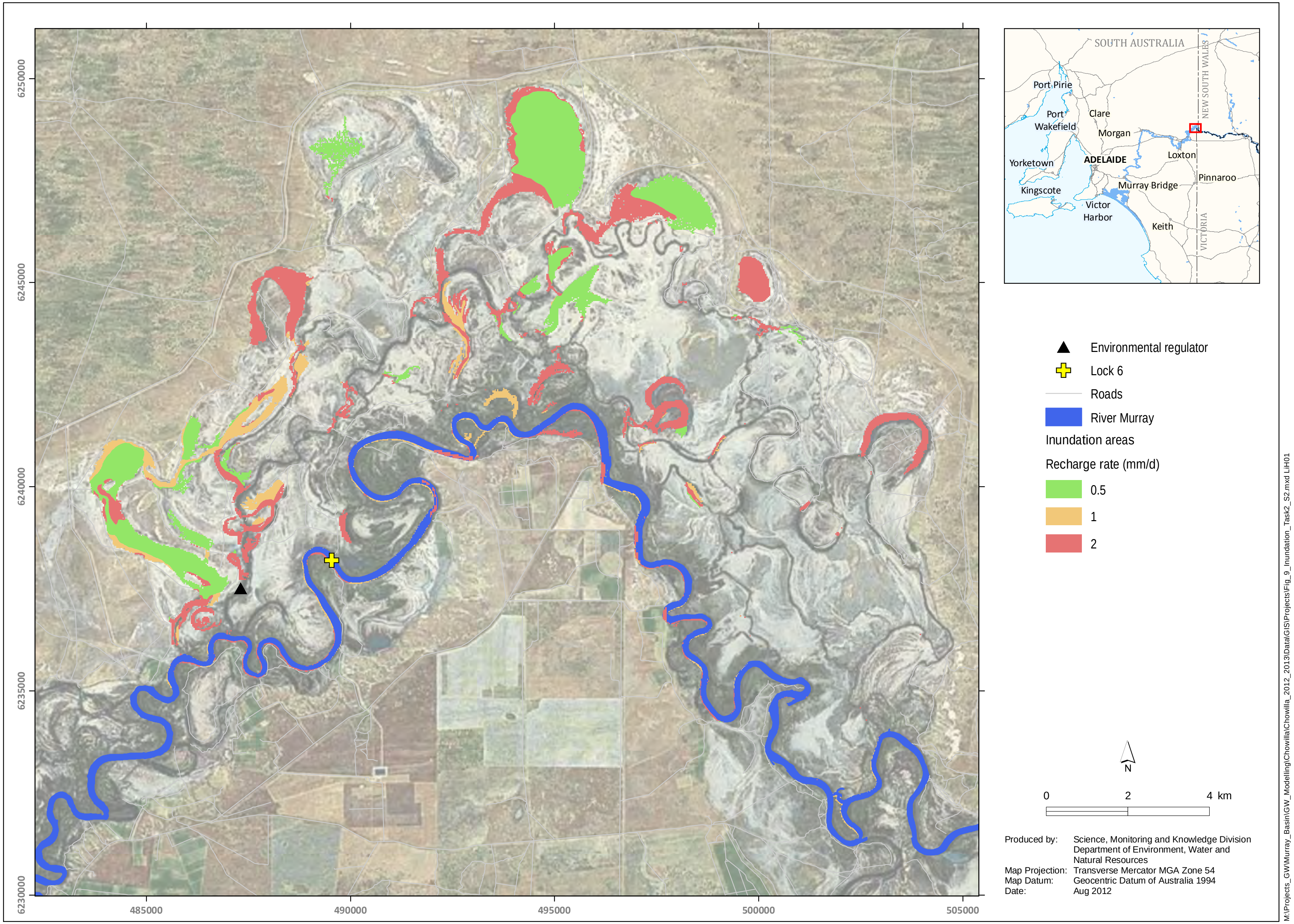


Figure 9. Maximum inundation areas and recharge rates for Task 2 Scenario 2 (19.25 m AHD)

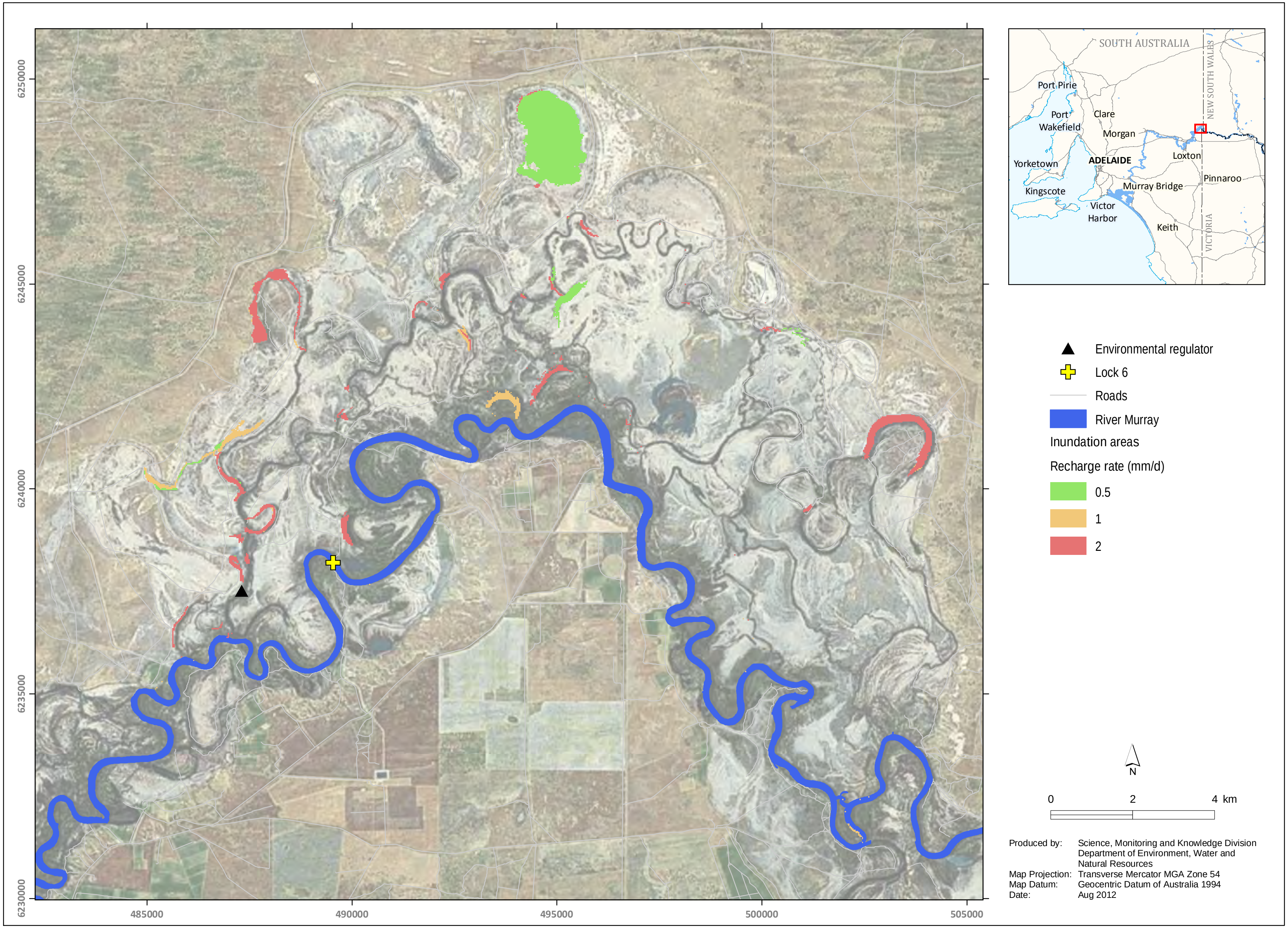


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Figure 10. Maximum inundation areas and recharge rates for Task 2 Scenario 3 (18.50 m AHD)

MODEL RESULTS

The model results for Task 2 are shown in Figures 11a to c.

Figure 11a displays the total modelled salt load that would enter the River Murray from groundwater through direct discharge to the anabranches and the river for each scenario, with the dominant salt load contribution from the anabranches. Salt load to the anabranches and the river during regulator operation for Scenarios 1 and 2 is minimal due to the water level increase in the river and anabranches.

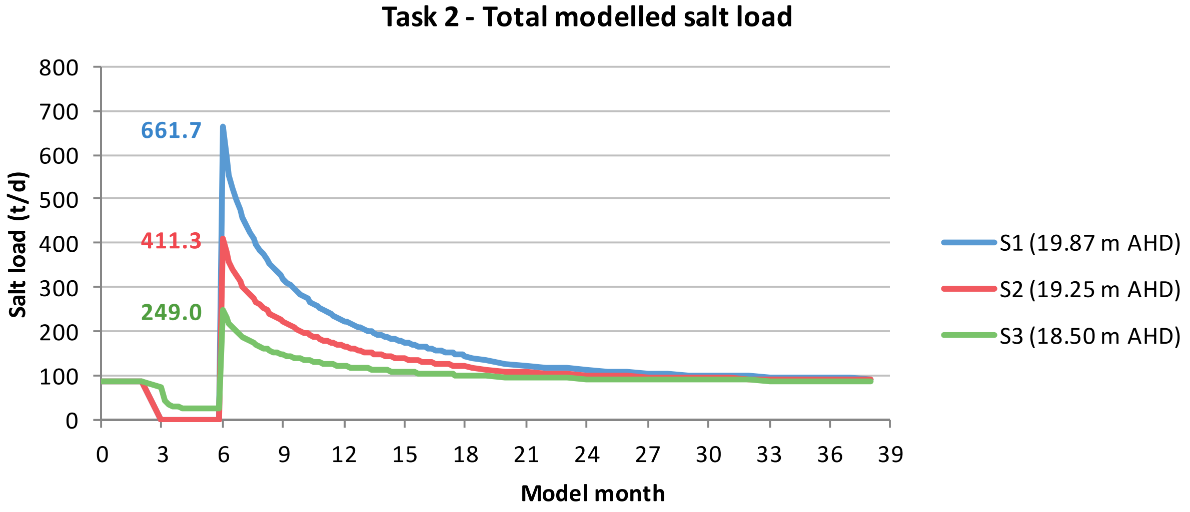
However, there is a relatively small amount of salt load to the river during operation for Scenario 3. This salt load is coming from both the anabranches in the eastern side of the floodplain (Zone 2 in Figure 2) and the river on the eastern edge of the floodplain. This is likely the result of:

- Although the creek water levels in east of the Chowilla Floodplain (Zone 2 in Figure 2) are raised during operation, they are still lower than the regional groundwater level in that area (~19m AHD), resulting in an average of 8.9 t/d of salt load in this area
- River Murray water level upstream of Lock 6 dropping from the weir pool level 19.25 m AHD during the non-operational period to 18.5 m AHD during operation, creating a steeper hydraulic gradient towards the river, which results in an average of 21.7 t/d of salt loads to the river

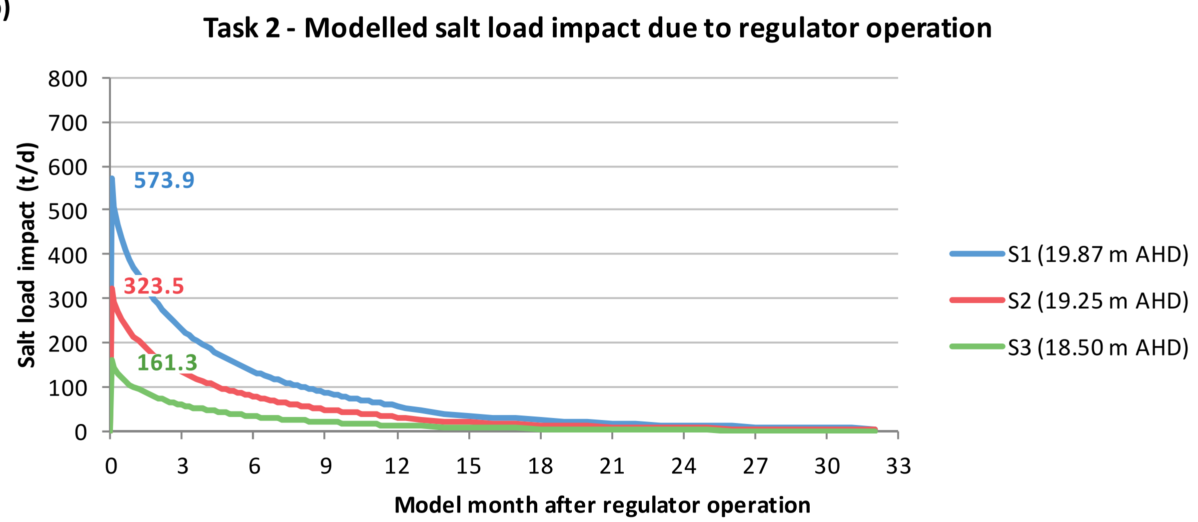
Figure 11b shows the modelled salt load impact (increase in modelled salt load) that is caused by regulator operation for each scenario. It is calculated as the difference between the total modelled salt load (Figure 11a) and the modelled salt load just before the operation.

Figure 11c presents the cumulative modelled salt load impact that is caused the regulator operation for each scenario, which is calculated based on Figure 11b.

(a)



(b)



(c)

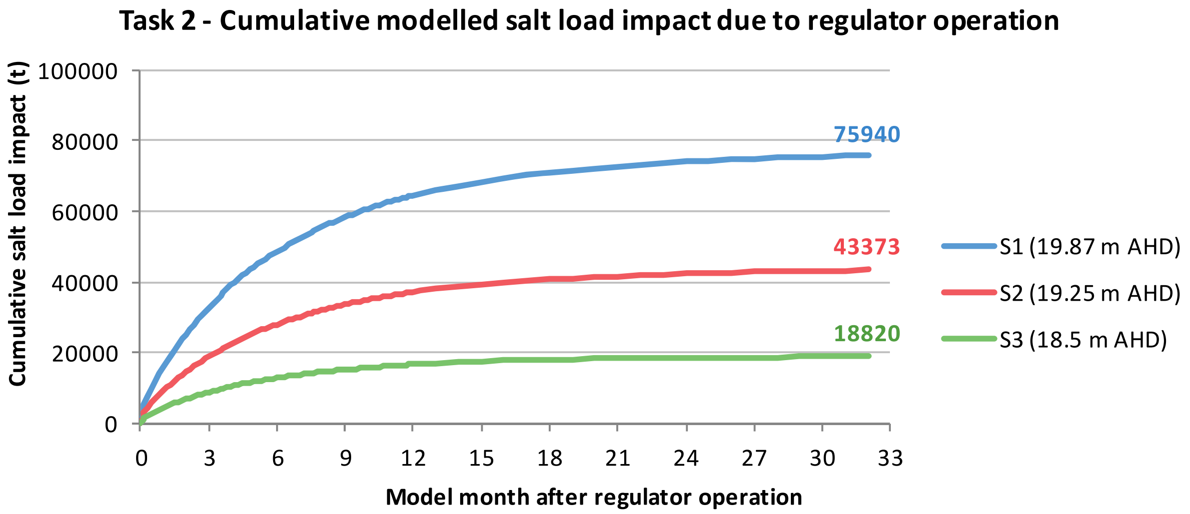


Figure 11. **Modelled salt load for Task 2**
(Labelled value is the highest value for that scenario)

TASK 3 – REGULATOR RECESSION

PURPOSE

The purpose of Task 3 is to quantify the variation of salt load induced by slow, rapid and instant release of flood waters after regulator operation. This task will test the theory that the salt load peak can be reduced by releasing the regulator slowly, although this may result in an increase in the total quantum of salt.

SCENARIOS

Task 3 consists of three scenarios that assume three different rates of regulator recession:

- Scenario 1 (S1): Regulator released to non-operational level - instant (0 days)
- Scenario 2 (S2): Regulator released to non-operational level - rapid (35 days)
- Scenario 3 (S3): Regulator released to non-operational level - slow (75 days)

ASSUMPTIONS

The assumptions surrounding the Chowilla 2012 and 2007 models are described in full in RPS Aquaterra (2012) and Howe, Yan and Stadter (2007), respectively. These assumptions are generally conservative in that they are likely to overestimate, rather than underestimate, salt loads. The assumptions that are the most relevant to this task have been adopted from previous work and include:

- there are three months of non-operational conditions, followed by a regulator operation period of three months, and then return to non-operational conditions over different transitional periods (scenario dependent) for the rest of the simulation, as illustrated in Figure 12
- groundwater recharge due to inundation is assumed to reach the maximum level immediately at the commencement of the regulator operation, and then stepped down to non-operational level over a transitional period of varying length (scenario dependent) after the operation
- anabranch creek water levels are assumed to reach the maximum level immediately at the commencement of the regulator operation, and then stepped down to non-operational levels over a transitional period of varying length (scenario dependent) after the operation
- River Murray water level upstream of Lock 6 is assumed to reach the regulator level 19.87 m AHD immediately at the commencement of the regulator operation, and then stepped down linearly to the weir pool level at 19.25 m AHD over a transitional period of varying length (scenario dependent) after the operation
- River Murray water level downstream of Lock 6 remains constant at the weir pool level 16.3 m AHD throughout the simulation
- modelled salt loads are calculated by multiplying the modelled groundwater flux entering the anabranch creeks and the river by groundwater salinities. The groundwater salinity changes from bank storage are not accounted for in this calculation.

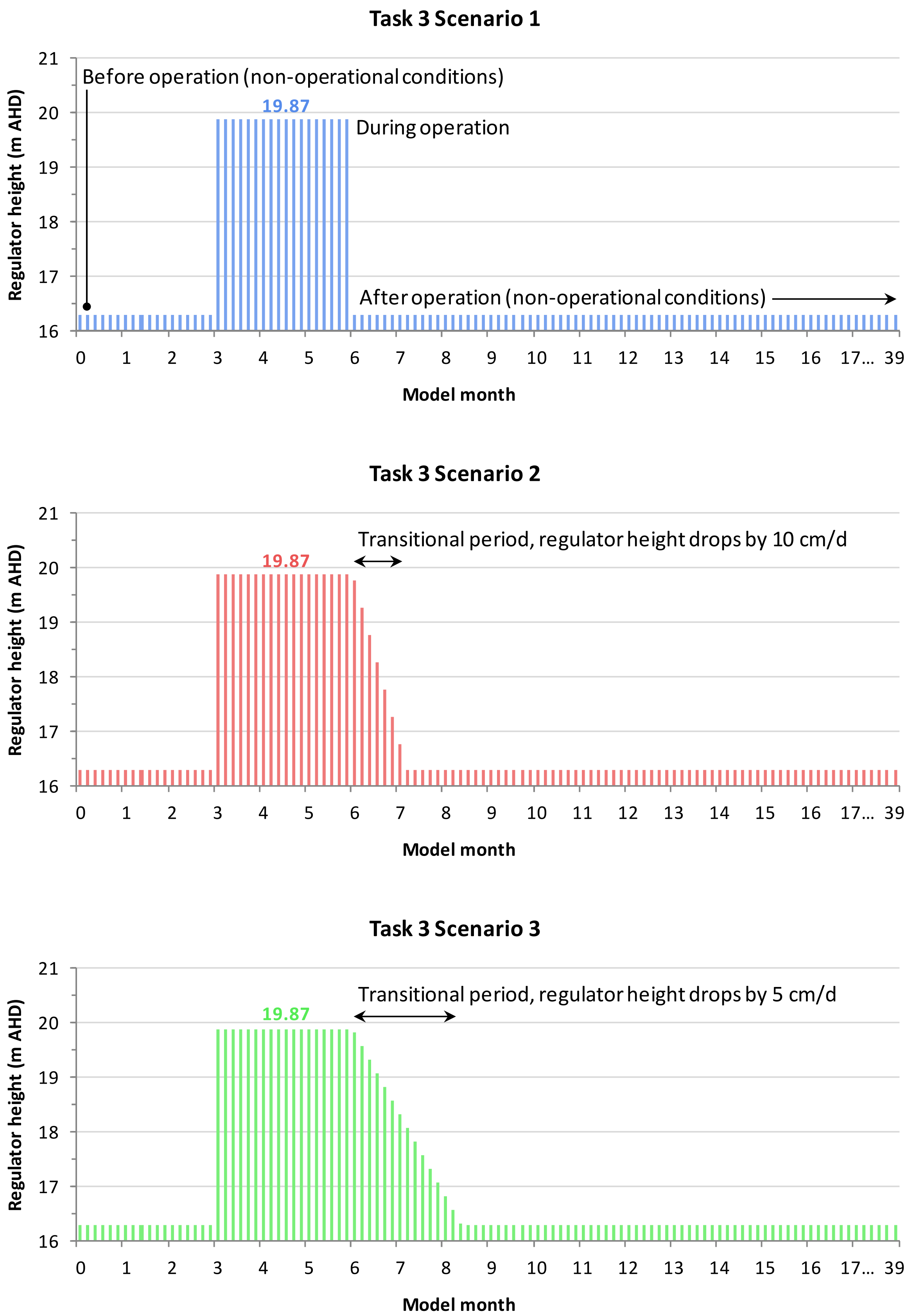


Figure 12. **Regulator heights and duration for Task 3**

MODEL INPUTS

In Task 3, the river flow is assumed to be 10 000 ML/d during regulator operation and 5 000 ML/d for non-operational conditions. The regulator height is at 19.87 m AHD during operation (3 months) and 16.3 m AHD during non-operational conditions.

Task 3 assumes the regulator height drops linearly after the regulator operation from 19.87 m AHD to 16.3 m AHD over 35 days at a rate of 10 cm/d for Scenario 2 and over 75 days at a rate of 5 cm/d for Scenario 3. Similarly, River Murray level drops linearly after operation from 19.87 m AHD to 19.25 m AHD at a rate of 2 cm/d for Scenario 2 and 1 cm/d for Scenario 3.

The inundation areas during operation were estimated from hydrodynamic modelling by Water Technology. Model groundwater recharge areas are based on these inundation areas. The flood inundation recharge rates and spatial distribution are from the potential groundwater recharge documented in Overton, Rutherford and Jolly (2005). These are combined to provide a spatial distribution of groundwater recharge rate for the model. The groundwater recharge rates and spatial distribution are shown in Figures 13 to 10 (note that Figure 8 is identical to Figure 5 and is included for ease of comparison). Note that for Scenario 2 while the recession period for the regulator is for 35 days post regulator operation, the inundation occurs until 40 days post regulator operation as the hydrodynamic model predicts some residual inundation at a regulator level of 16.3 m AHD.

The anabranch creek water levels were estimated from hydrodynamic modelling by Water Technology. The anabranch creek system is simplified into 24 reaches (Figure 3). The creek water level changes in each reach used in Task 3 are shown in Table 5 for Scenario 2 and Table 6 for Scenario 3.

Table 5. Anabranch creek water levels for Task 3 Scenario 2

		Anabranch creek water level (m AHD)									
				Day after operation							
Groundwater model ID	Hydrodynamic model ID	Non-Operational Levels	During Operation	5	10	15	20	25	30	35	40
0	24	18.531	19.89	19.85	19.47	19.10	18.86	18.75	18.69	18.62	18.62
1	23	18.419	19.89	19.85	19.49	19.15	18.91	18.75	18.66	18.56	18.55
2	22	18.232	19.89	19.84	19.45	19.05	18.73	18.54	18.45	18.36	18.34
3	21	18.23	19.89	19.84	19.45	19.05	18.73	18.53	18.44	18.35	18.34
4	20	18.062	19.88	19.84	19.43	19.00	18.64	18.39	18.27	18.18	18.17
5	19	17.734	19.88	19.83	19.42	18.98	18.59	18.26	18.05	17.90	17.85
6	17	17.642	19.88	19.83	19.41	18.97	18.58	18.24	18.01	17.85	17.80
7	15	17.623	19.88	19.83	19.41	18.97	18.57	18.23	18.00	17.83	17.78
8	14	17.572	19.88	19.83	19.40	18.96	18.55	18.19	17.94	17.77	17.72
9	12	17.556	19.88	19.83	19.39	18.94	18.52	18.16	17.91	17.74	17.69
10	10	17.153	19.88	19.82	19.37	18.89	18.43	18.00	17.65	17.40	17.30
11	8	16.748	19.88	19.81	19.34	18.86	18.38	17.92	17.50	17.15	16.96
12	6	16.456	19.88	19.81	19.33	18.84	18.36	17.88	17.43	17.03	16.73
13	4	16.433	19.87	19.80	19.32	18.83	18.34	17.86	17.41	16.99	16.67
14	2	16.38	19.87	19.78	19.29	18.79	18.29	17.79	17.30	16.81	16.35
15	3	16.399	19.87	19.78	19.29	18.80	18.30	17.81	17.33	16.87	16.46
16	1	16.375	19.87	19.77	19.27	18.77	18.27	17.77	17.27	16.77	16.31
17	5	17.613	19.87	19.79	19.32	18.84	18.39	17.99	17.74	17.62	17.62
18	7	16.448	19.88	19.81	19.34	18.85	18.38	17.93	17.54	17.26	17.13
19	18	19.144	19.90	19.87	19.67	19.53	19.43	19.35	19.27	19.18	19.18
20	16	18.221	19.89	19.84	19.47	19.11	18.82	18.60	18.47	18.34	18.32
21	13	18.005	19.89	19.84	19.44	19.03	18.69	18.42	18.26	18.13	18.10
22	11	17.317	19.88	19.83	19.39	18.94	18.53	18.18	17.94	17.77	17.71
23	9	17.037	19.88	19.82	19.36	18.89	18.45	18.05	17.75	17.54	17.45
Regulator height (m AHD)		16.30	19.87	19.77	19.27	18.77	18.27	17.77	17.27	16.77	16.30

Table 6. Anabranch creek water levels for Task 3 Scenario 3

		Anabranch creek water level (m AHD)																
				Day after operation														
Groundwater model ID	**Hydrodynamic model ID**	**Non-Operational Levels**	**During Operation**	**5**	**10**	**15**	**20**	**25**	**30**	**35**	**40**	**45**	**50**	**55**	**60**	**65**	**70**	**75**
0	24	18.531	19.89	19.87	19.68	19.48	19.29	19.11	18.96	18.86	18.80	18.76	18.72	18.69	18.66	18.62	18.62	18.62
1	23	18.419	19.89	19.87	19.69	19.51	19.33	19.16	19.03	18.91	18.82	18.75	18.71	18.66	18.62	18.56	18.55	18.55
2	22	18.232	19.89	19.86	19.67	19.46	19.26	19.06	18.89	18.74	18.62	18.54	18.49	18.45	18.40	18.36	18.34	18.34
3	21	18.23	19.89	19.86	19.67	19.46	19.25	19.06	18.88	18.73	18.61	18.53	18.48	18.44	18.40	18.36	18.34	18.34
4	20	18.062	19.88	19.86	19.65	19.44	19.23	19.02	18.82	18.65	18.50	18.38	18.32	18.27	18.23	18.18	18.17	18.17
5	19	17.734	19.88	19.86	19.65	19.43	19.21	19.00	18.79	18.60	18.42	18.27	18.15	18.05	17.97	17.89	17.86	17.85
6	17	17.642	19.88	19.86	19.65	19.43	19.21	18.99	18.78	18.59	18.41	18.24	18.12	18.01	17.92	17.85	17.81	17.80
7	15	17.623	19.88	19.86	19.64	19.42	19.20	18.99	18.78	18.58	18.40	18.23	18.11	18.00	17.91	17.83	17.79	17.78
8	14	17.572	19.88	19.85	19.64	19.42	19.19	18.97	18.76	18.56	18.37	18.19	18.06	17.94	17.85	17.77	17.73	17.72
9	12	17.556	19.88	19.85	19.64	19.41	19.19	18.96	18.74	18.54	18.34	18.16	18.03	17.91	17.82	17.74	17.70	17.69
10	10	17.153	19.88	19.85	19.62	19.39	19.15	18.91	18.68	18.46	18.23	18.02	17.83	17.66	17.51	17.39	17.32	17.30
11	8	16.748	19.88	19.84	19.61	19.37	19.13	18.89	18.65	18.41	18.18	17.95	17.73	17.53	17.34	17.17	17.04	16.96
12	6	16.456	19.88	19.84	19.60	19.36	19.12	18.88	18.63	18.39	18.16	17.92	17.69	17.47	17.26	17.06	16.88	16.74
13	4	16.433	19.87	19.84	19.60	19.36	19.11	18.87	18.62	18.38	18.14	17.90	17.67	17.45	17.23	17.02	16.84	16.68
14	2	16.38	19.87	19.82	19.58	19.33	19.08	18.83	18.58	18.34	18.09	17.84	17.59	17.34	17.10	16.85	16.61	16.37
15	3	16.399	19.87	19.83	19.58	19.34	19.09	18.84	18.60	18.35	18.10	17.86	17.62	17.38	17.14	16.91	16.69	16.48
16	1	16.375	19.87	19.82	19.57	19.32	19.07	18.82	18.57	18.32	18.07	17.82	17.57	17.32	17.07	16.82	16.58	16.33
17	5	17.613	19.87	19.83	19.59	19.36	19.12	18.88	18.65	18.42	18.21	18.02	17.87	17.75	17.68	17.63	17.62	17.62
18	7	16.448	19.88	19.85	19.61	19.37	19.13	18.89	18.65	18.42	18.19	17.97	17.76	17.57	17.41	17.28	17.19	17.13
19	18	19.144	19.90	19.88	19.78	19.68	19.60	19.54	19.49	19.44	19.40	19.36	19.32	19.27	19.23	19.19	19.18	19.18
20	16	18.221	19.89	19.87	19.68	19.48	19.29	19.12	18.96	18.83	18.71	18.61	18.54	18.47	18.41	18.35	18.32	18.32
21	13	18.005	19.89	19.86	19.66	19.45	19.25	19.05	18.86	18.70	18.55	18.42	18.34	18.26	18.20	18.13	18.11	18.10
22	11	17.317	19.88	19.85	19.64	19.41	19.19	18.97	18.75	18.55	18.36	18.19	18.06	17.94	17.86	17.77	17.73	17.71
23	9	17.037	19.88	19.85	19.62	19.39	19.16	18.92	18.69	18.47	18.26	18.07	17.90	17.76	17.65	17.55	17.48	17.45
Regulator height (m AHD)		16.30	19.87	19.82	19.57	19.32	19.07	18.82	18.57	18.32	18.07	17.82	17.57	17.32	17.07	16.82	16.57	16.32

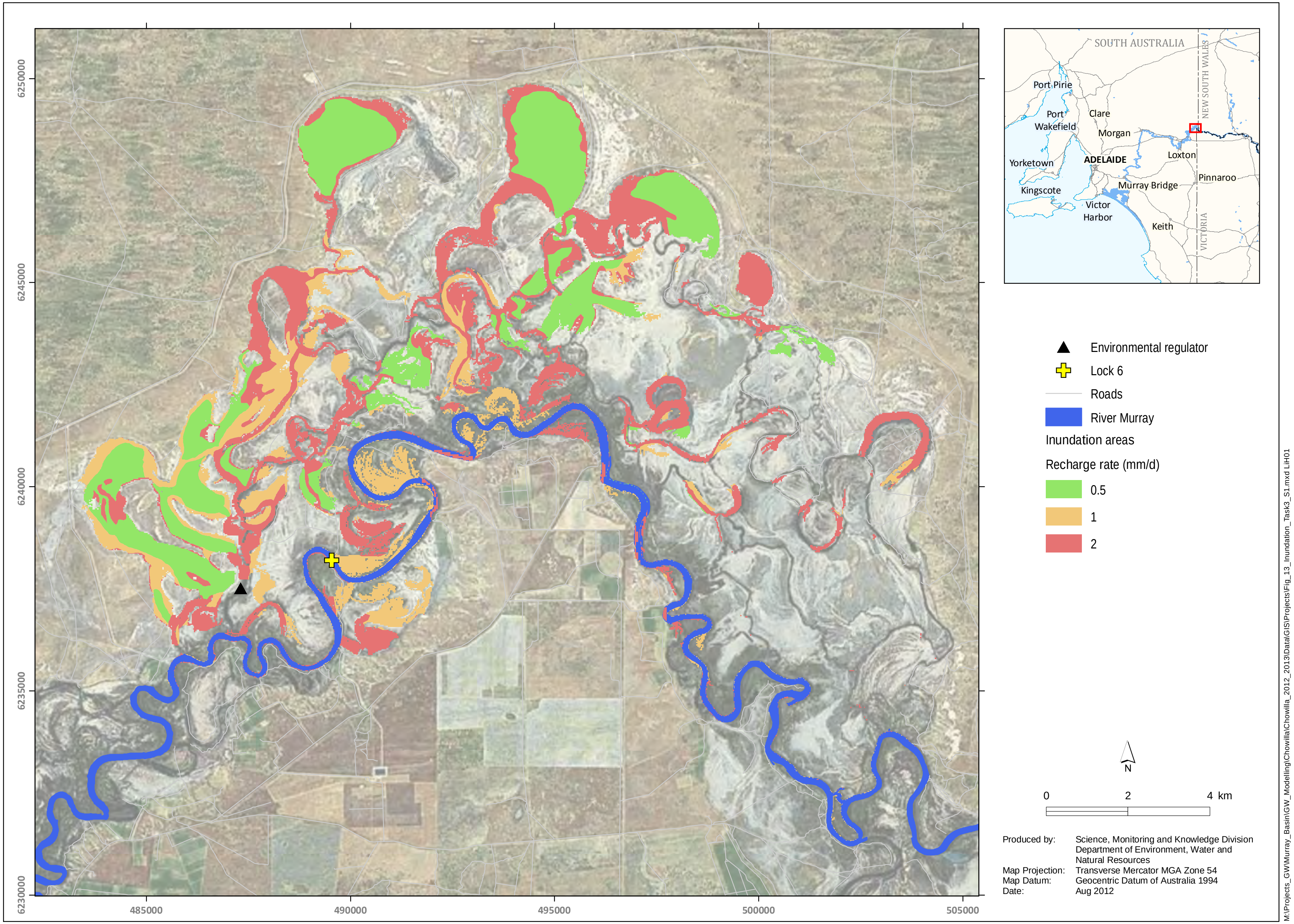


Figure 13. Maximum inundation areas and recharge rates for Task 3 Scenario 1

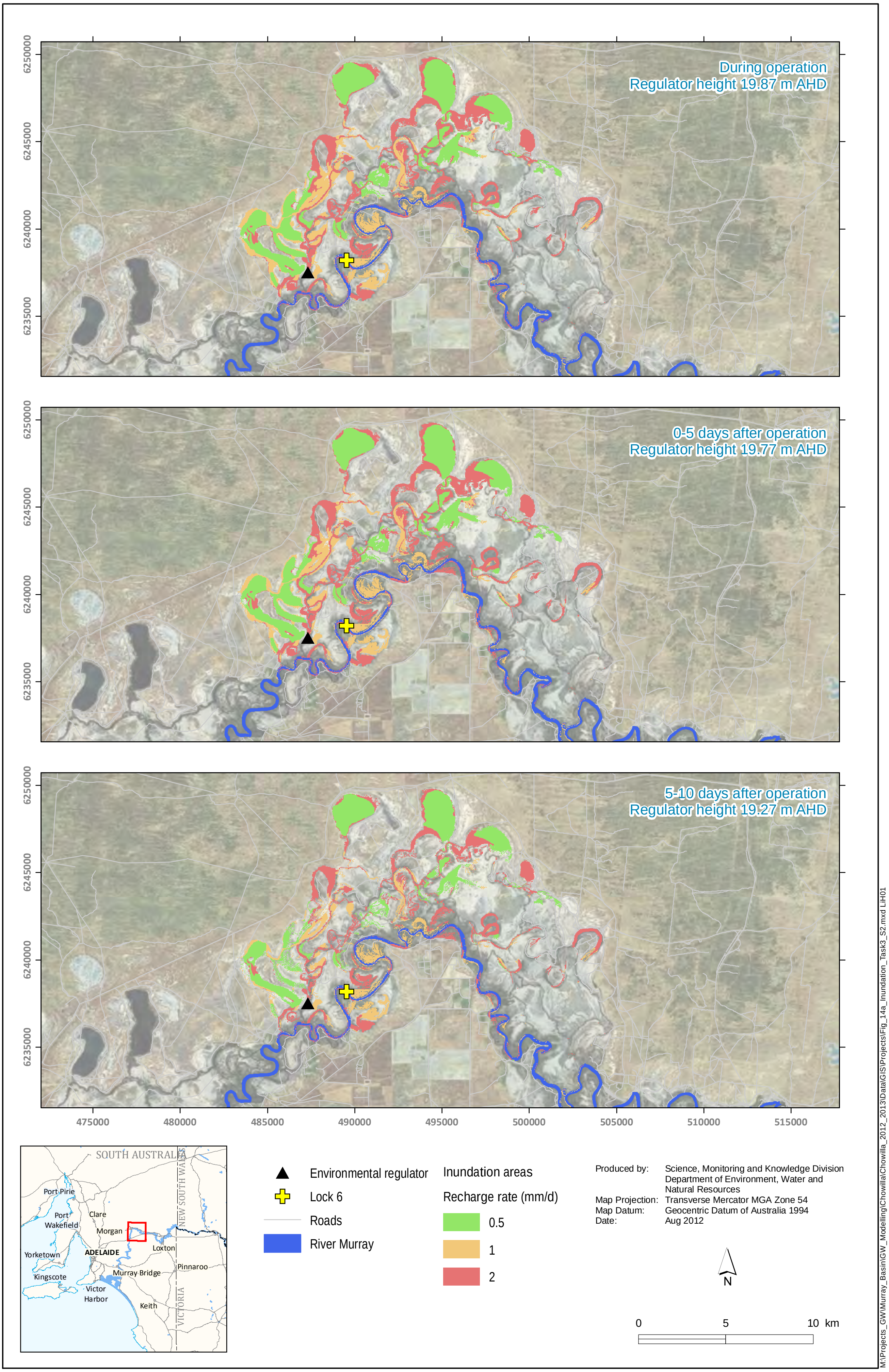


Figure 14a. Inundation areas and recharge rates for Task 3 Scenario 2

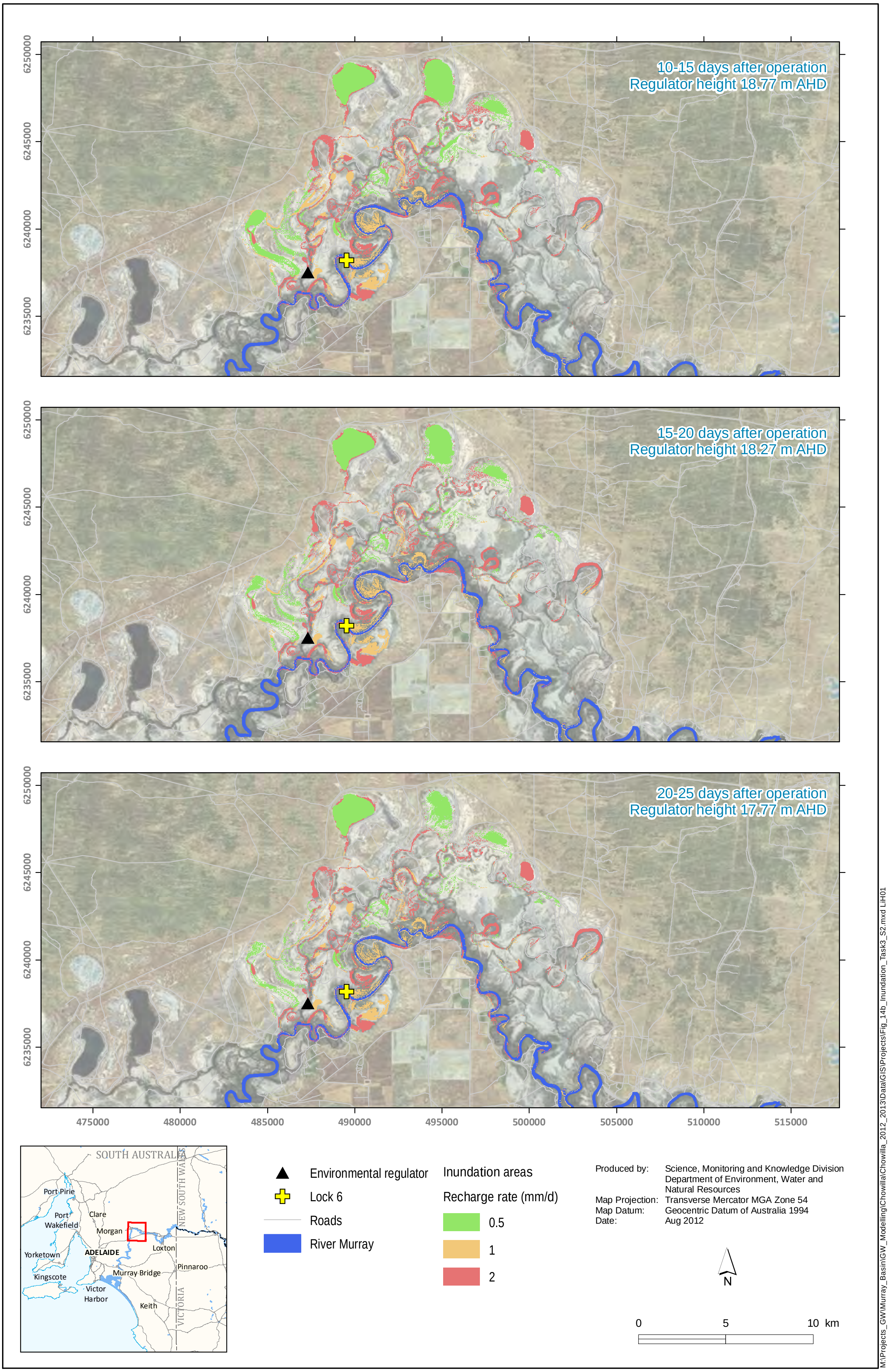


Figure 14b. Inundation areas and recharge rates for Task 3 Scenario 2

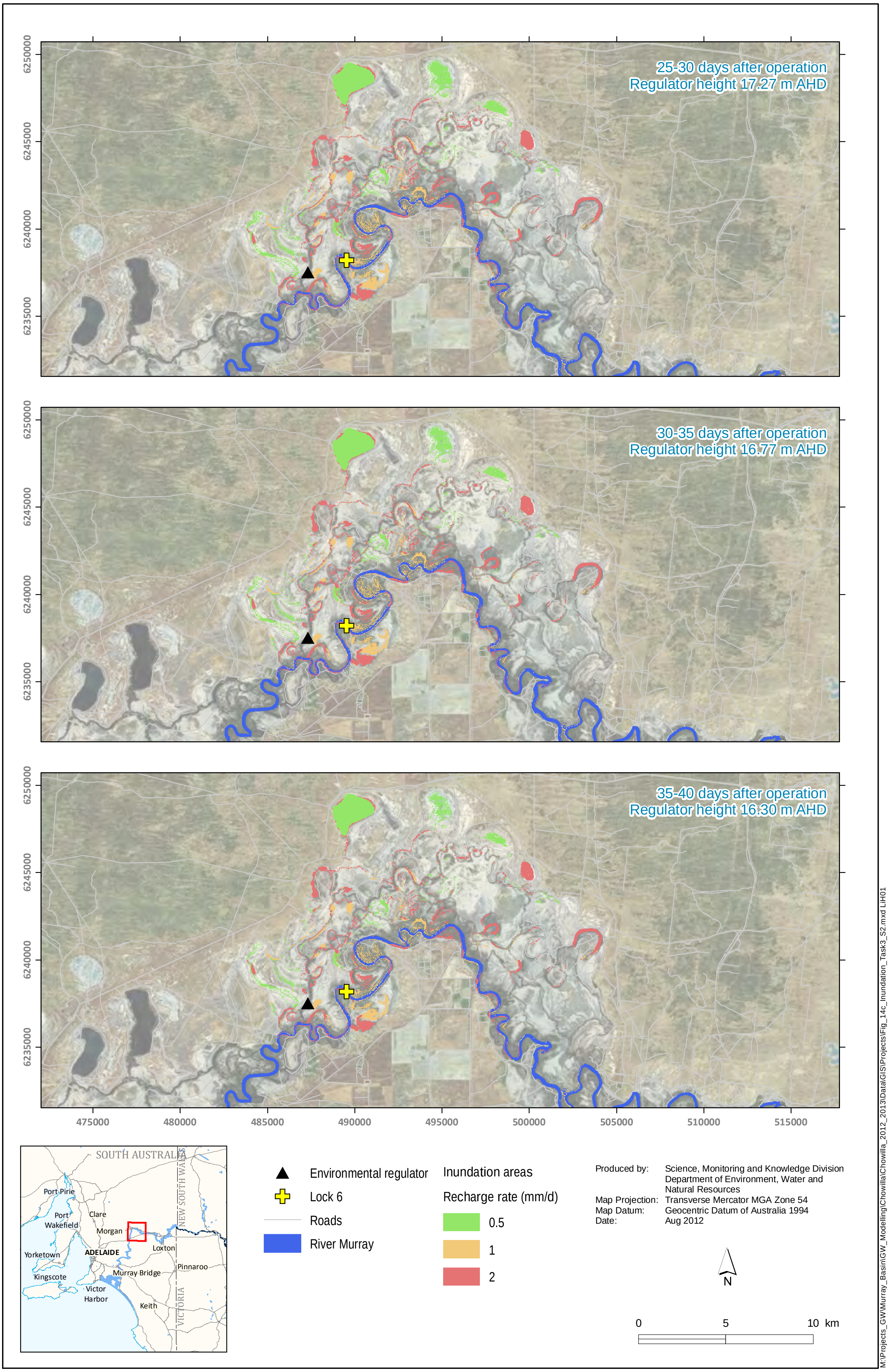


Figure 14c. Inundation areas and recharge rates for Task 3 Scenario 2

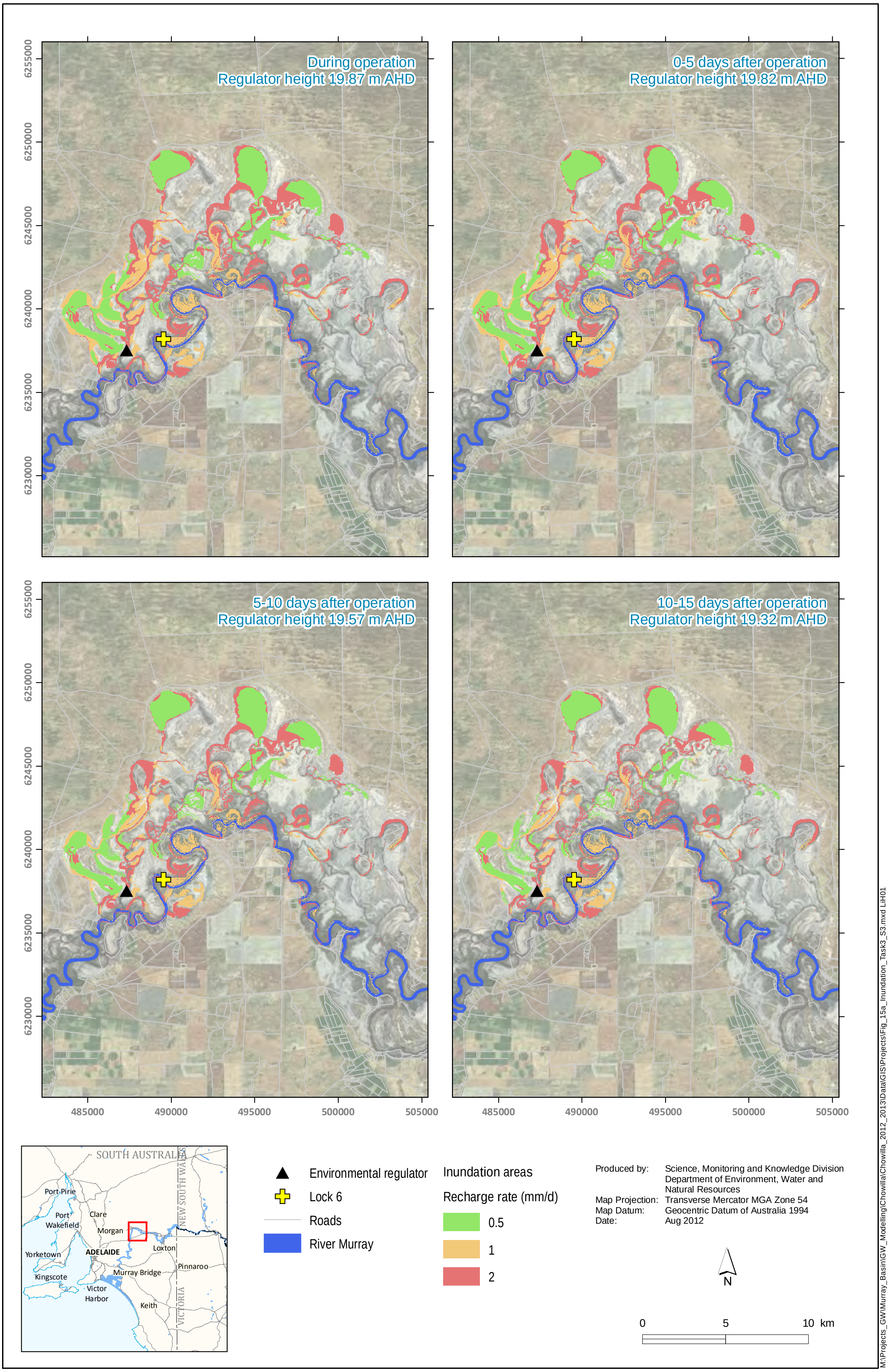


Figure 15a. Inundation areas and recharge rates for Task 3 Scenario 3

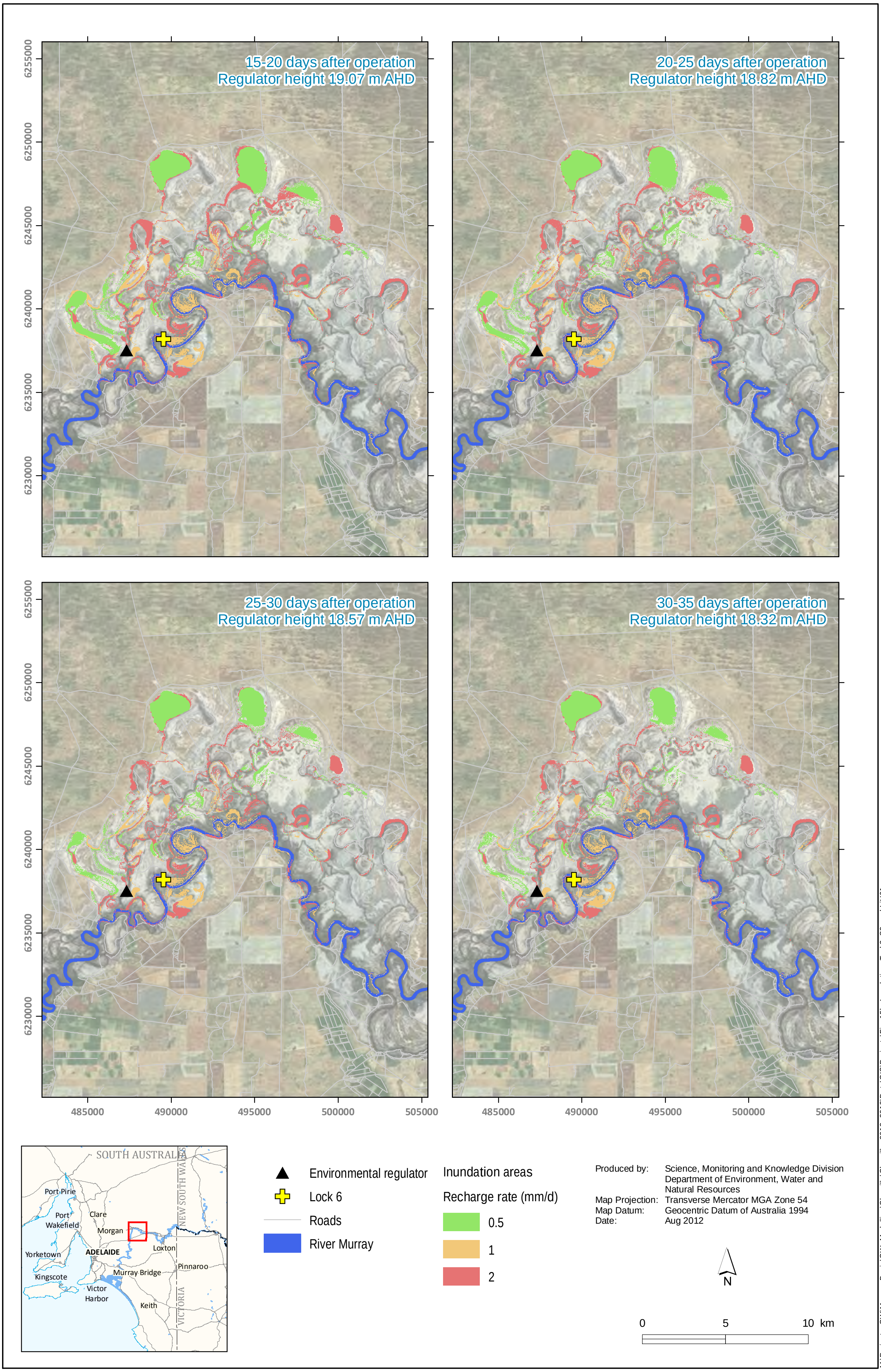


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Figure 15b. Inundation areas and recharge rates for Task 3 Scenario 3

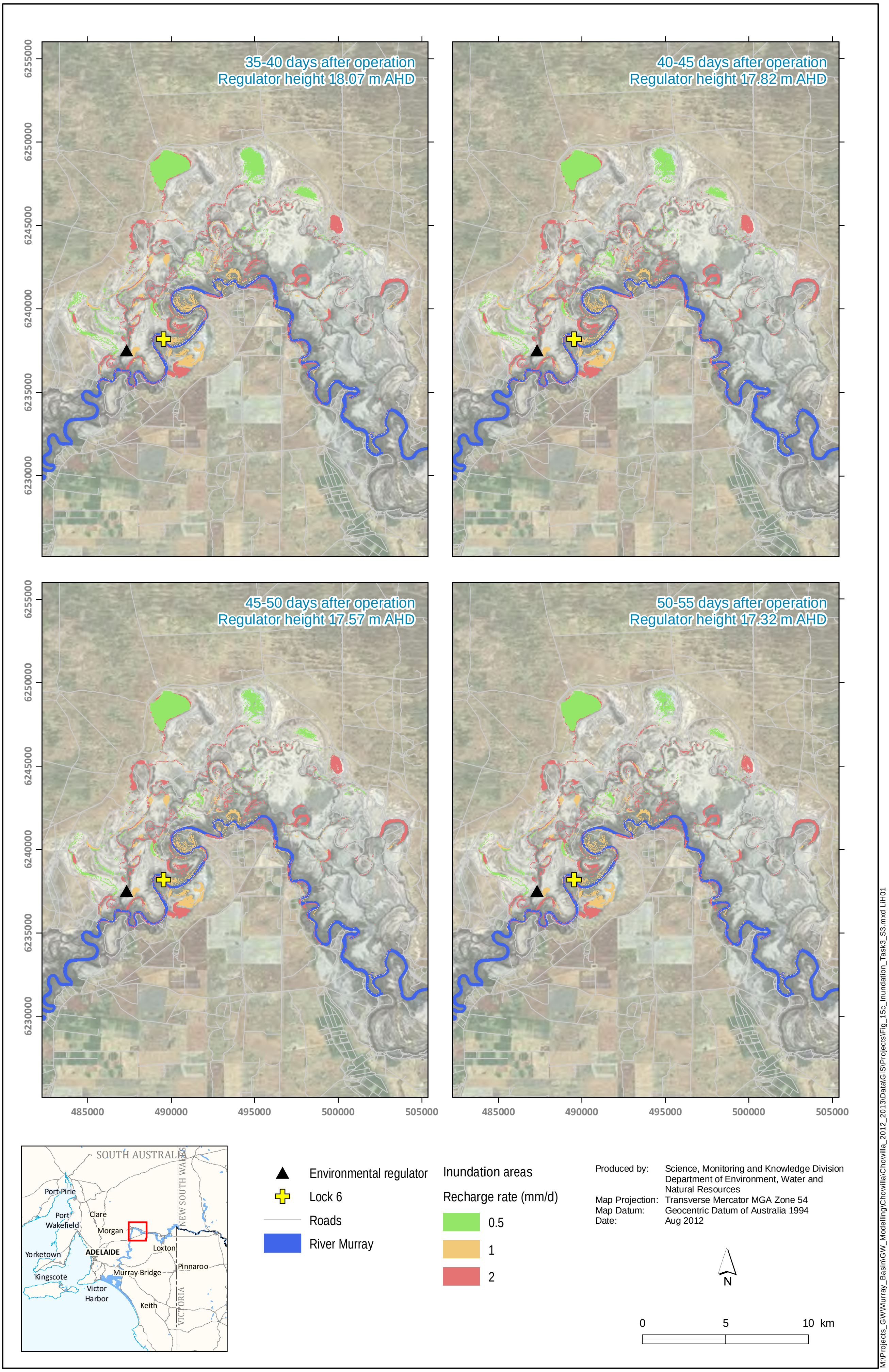

Figure 15c. Inundation areas and recharge rates for Task 3 Scenario 3

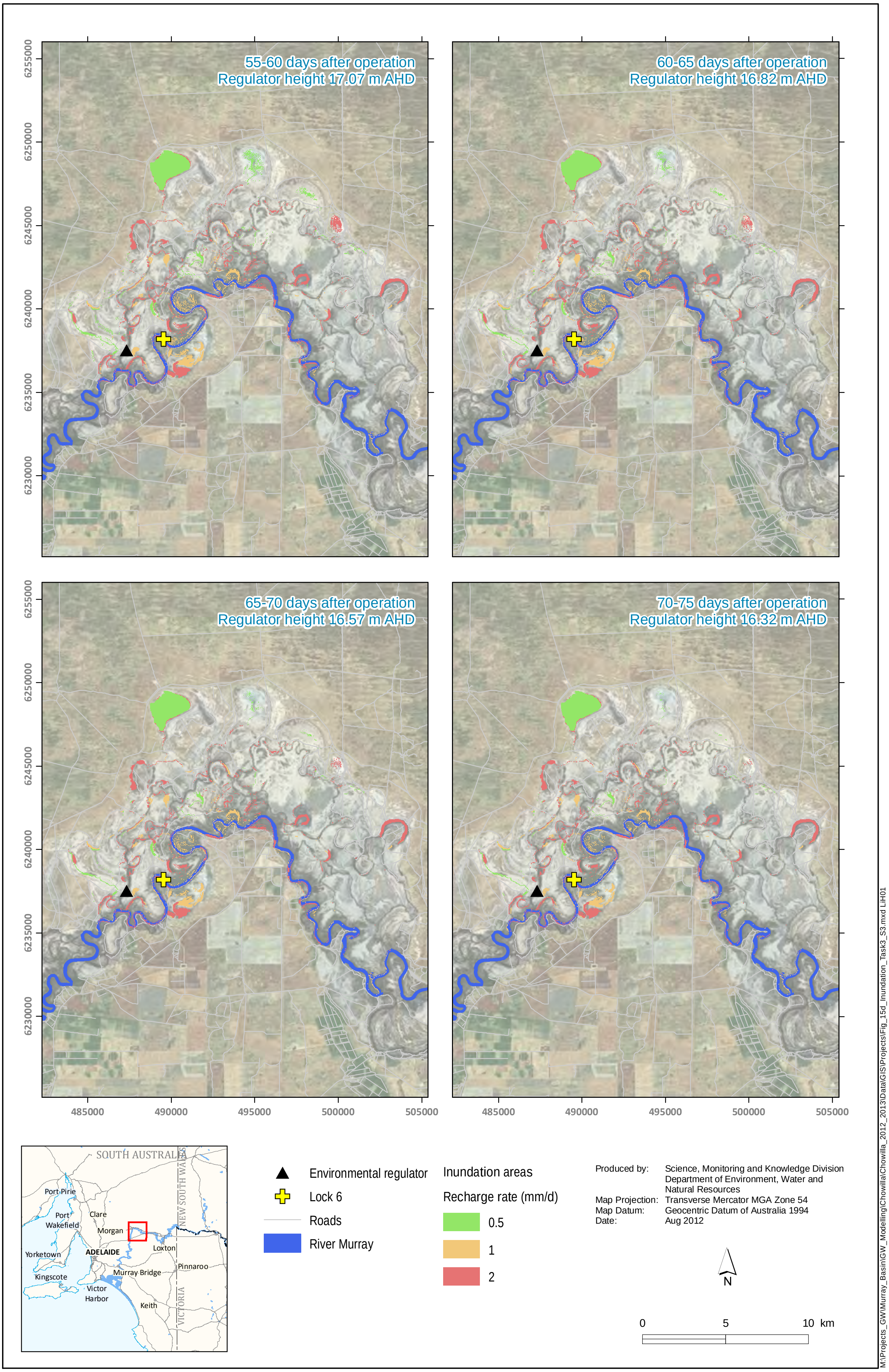

Figure 15d. Inundation areas and recharge rates for Task 3 Scenario 3

MODEL RESULTS

The model results for Task 3 are shown in Figures 16a to c.

Figure 16a displays the total modelled salt load that would enter the River Murray from groundwater through direct discharge to the anabranches and the river for each scenario, with the dominant salt load contribution from the anabranches. Salt load to the anabranches and the river during regulator operation is negligible due to the increase in river and anabranches water levels.

Figure 16b shows the modelled salt load impact (increase in modelled salt load) that is caused by regulator operation for each scenario. It is calculated as the difference between the total modelled salt load (Figure 16a) and the modelled salt load just before the operation.

Figure 16c presents the cumulative modelled salt load impact that is caused the regulator operation for each scenario, which is calculated based on Figure 16b.

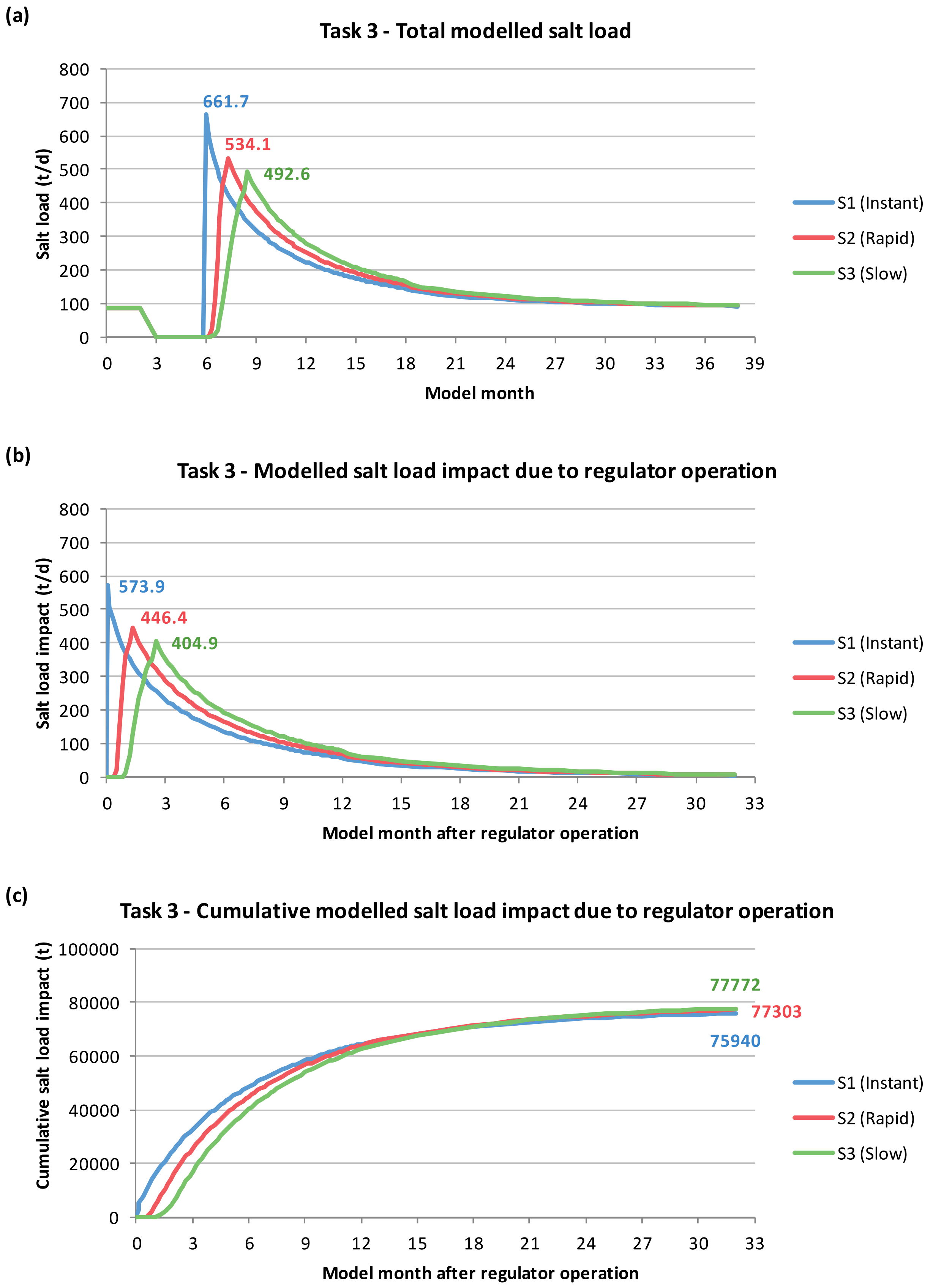

Figure 16. **Modelled salt load for Task 3**
(Labelled value is the highest value for that scenario)

DISCUSSION

The modelled salt load results are presented in Table 7 below. The base case, Scenario 1, outcomes indicate that regulator operation of three months duration at an operating height of 19.87 m AHD, (assuming the regulator is released instantaneously back to 16.3 m AHD) results in a peak salt load of 662 t/d and cumulative salt load impact (potential exported additional salt) of 75 940 t exported through the anabranch system to the River Murray over two and half years.

Table 7. Modelled salt load summary for all Tasks

Task	Scenario	Description†	Peak total salt load (t/d)	Peak salt load impact (t/d)	Cumulative salt load impact (t)
1	1	3 months, 19.87 m AHD	662	574	75940
	2	2 months, 19.87 m AHD	536	448	55974
	3	4 months, 19.87 m AHD	758	670	91684
2	1	19.87 m AHD	662	574	75940
	2	19.25 m AHD	411	324	43373
	3	18.50 m AHD	249	161	18820
3	1	Instant (0 days) , 19.87 m AHD	662	574	75940
	2	Rapid (35 days) , 19.87 m AHD	534	446	77303
	3	Slow (75 days) , 19.87 m AHD	493	405	77772

† Please refer to previous sections for full descriptions of the scenarios

Model results Task 1

Task 1 focused on investigating the salt load impact of different durations of regulator operation.

A regulator operation of two months duration resulted in a peak salt load impact of 448 t/d and a cumulative salt load impact of 55 974 t over two and a half years. Compared with the base case (three months duration of regulator operation), the shorter operation duration (two months) resulted in a reduction of peak salt load by approximately 125 t/d (22%) and a reduction of 19 966 t (26%) in the cumulative load of salt exported through the anabranch system over two and half years.

A regulator operation period of four months duration resulted in a peak salt load impact of 670 t/d and a cumulative salt load impact of 91 684 t over two and a half years. Compared with the base case (three months duration of regulator operation), longer operation duration (four months) resulted in an increase in peak salt load by approximately 96 t/d (17%) and an increase of 15 744 t (21%) in the cumulative load of salt exported through the anabranch system over two and half years.

Model results Task 2

Task 2 focused on investigating the salt load impact of different regulator operating heights.

Operation of the regulator at a height of 19.25 m AHD resulted in a peak salt load impact of 324 t/d and a cumulative salt load impact of 43 373 t over two and a half years. Compared with the base case (operating height of 19.87 m AHD), the reduction in operating height (19.25 m AHD, 0.62m lower) resulted in a reduction in the peak salt load by approximately 250 t/d (44%) and a reduction of 32 567 t (43%) in the cumulative load of salt exported through the anabranch system over two and half years.

Operation of the regulator at a height of 18.5 m AHD resulted in a peak salt load impact of 161 t/d and a cumulative salt load impact of 18 820 t over two and a half years. Compared to the base case (operating height of 19.87 m AHD), the reduction in operating height (18.5 m AHD, 1.37m lower) resulted in a reduction in the peak salt load by approximately 413 t/d (72%) and a reduction of 57 120 t (75%) in salt exported through the anabranch system over two and half years.

Model results Task 3

Task 3 focused on investigating the salt load impact of different rates of regulator recession post operation.

A rapid recession of the regulator, at a rate of 10 cm/d for 35 days, resulted in a peak salt load impact of 446 t/d and a cumulative salt load impact of 77 303 t over two and a half years. Compared to an instantaneous recession of the regulator, the rapid recession rate resulted in a reduction of approximately 128 t/d (22%) in the peak salt load, but an increase of 1 363 t (2%) in the cumulative load of salt exported through the anabranch system over two and half years.

A slow recession of the regulator, at a rate of 5 cm/d for 75 days, resulted in a peak salt load impact of 405 t/d, and a cumulative salt load impact of 77 772 t over two and a half years. Compared to an instantaneous recession of the regulator, the slow recession rate resulted in a reduction of approximately 169 t/d (29%) in the peak salt load, but an increase of 1 832 t (2%) in the cumulative load of salt exported through the anabranch system over two and half years.

The Task 3 results indicate that decreasing the rate of recession post regulator operation considerably reduces the peak salt load impact, with a comparatively small increase in the cumulative salt load impact. The results also indicate a non-linear relationship between the rate of recession and the reduction in peak salt load impact.

Comparison with earlier model results

RPS Aquaterra (2012) predicted the peak salt load to be 530 t/d for their scenario 1, which applied flow and operational conditions similar to Task 1, Scenario 1 in this study. Task 1, Scenario 1 in this study estimated peak salt load to be 662 t/d, which is higher than the RPS Aquaterra (2012) result. The difference in peak salt load can be attributed due to the time discretisation used in the respective models, where RPS Aquaterra (2012) used 1 month time steps compared to the 5 day time steps used in this study. If the current model result of salt load for the first 30 days post regulator operation are averaged, the value is 550 t/d which is very similar to the salt load from RPS Aquaterra (2012) Scenario 1 result (530 t/day).

In addition to the peak salt loads being different, the predicted salt load impacts were also less in RPS Aquaterra (2012). While the difference of time discretisation discussed above does contribute to the differences, the additional reason is the base conditions used to calculate the impact. In this study, salt load impact is calculated as the difference in salt load from the salt load prior to regulator operation. Salt load impact in RPS Aquaterra (2012) was calculated as the difference between a base case model run (historical conditions) and a regulator model run (historical conditions with predicted regulator events). As the impacts were calculated based on two different base conditions it is not valid to directly compare the two values.

POTENTIAL FUTURE WORK

The results from Task 3 indicate that there is a relationship between the rate of recession and the reduction in peak salt load impact, which is possibly non-linear (Figure 16b). Further investigation into this relationship may identify the optimum rate of recession to achieve appropriate reductions in peak salt load impact.

Another knowledge gaps that come out of this assessment is the combined salt load impact of key components of regulator operation. While this body of work established the likely impact of individual key components, there is an underlying assumption that impacts from these components would be cumulative. This may not be the case and subsequent work may be designed to test this assumption to more closely represent actual regulator operation.

The knowledge gaps identified in this document are based on the work undertaken for this report. Additional knowledge gaps were identified in previous reports. These reports also contain background information and assumptions not covered in this document.

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UNITS OF MEASUREMENT

Units of measurement commonly used (SI and non-SI Australian legal)

Name of unit	Symbol	Definition in terms of other metric units	Quantity
day	d	24 h	time interval
gigalitre	GL	10^{6} m^{3}	volume
gram	g	10^{-3} kg	mass
hectare	ha	10^{4} m^{2}	area
hour	h	60 min	time interval
kilogram	kg	base unit	mass
kilolitre	kL	1 m^{3}	volume
kilometre	km	10^{3} m	length
litre	L	10^{-3} m^{3}	volume
megalitre	ML	10^{3} m^{3}	volume
metre	m	base unit	length
microgram	µg	10^{-6} g	mass
microlitre	µL	10^{-9} m^{3}	volume
milligram	mg	10^{-3} g	mass
millilitre	mL	10^{-6} m^{3}	volume
millimetre	mm	10^{-3} m	length
minute	min	60 s	time interval
second	s	base unit	time interval
tonne	t	1000 kg	mass
year	y	365 or 366 days	time interval

Shortened forms

~	approximately equal to
bgs	below ground surface
EC	electrical hydraulic conductivity (µS/cm)
K_h	Horizontal hydraulic conductivity (m/d)
K_v	Vertical hydraulic conductivity (m/d)
pH	acidity
pMC	percent of modern carbon
ppb	parts per billion
ppm	parts per million
ppt	parts per trillion
w/v	weight in volume
w/w	weight in weight

GLOSSARY

Anabranch — A branch of a river that leaves the main channel

Aquifer — An underground layer of rock or sediment that holds water and allows water to percolate through

Aquifer, confined — Aquifer in which the upper surface is impervious (see 'confining layer') and the water is held at greater than atmospheric pressure; water in a penetrating well will rise above the surface of the aquifer

Aquifer test — A hydrological test performed on a well, aimed to increase the understanding of the aquifer properties, including any interference between wells and to more accurately estimate the sustainable use of the water resources available for development from the well

Aquifer, unconfined — Aquifer in which the upper surface has free connection to the ground surface and the water surface is at atmospheric pressure

Aquitard — A layer in the geological profile that separates two aquifers and restricts the flow between them

Basin — The area drained by a major river and its tributaries

Benchmark condition — Points of reference from which change can be measured

BIGMOD — MSM and BIGMOD are two computer based models that work together. Output from MSM (Monthly Simulation Model) feeds into BIGMOD (daily simulation model). The models route flow and salinity in the River Murray and associated storages. Models are used for water accounting, planning and flow and salinity forecasting. MSM-BIGMOD can simulate the operation of the River Murray system to investigate what would happen under a given set of conditions.

Bore — See 'well'

BSMS — Basin Salinity Management Strategy developed by Murray-Darling Basin Authority

Confining layer — A rock unit impervious to water, which forms the upper bound of a confined aquifer; a body of impermeable material adjacent to an aquifer; see also 'aquifer, confined'

CSIRO — Commonwealth Scientific and Industrial Research Organisation

Decision support system — A system of logic or a set of rules derived from experts, to assist decision making. Typically they are constructed as computer programs

DEH — Department for Environment and Heritage (Government of South Australia)

DENR — Department for Environment and Natural Resources (Government of South Australia)

DFW — Department for Water (Government of South Australia)

DWLBC — Department of Water, Land and Biodiversity Conservation (Government of South Australia)

EC — Electrical hydraulic conductivity; 1 EC unit = 1 micro-Siemen per centimetre (µS/cm) measured at 25°C; commonly used as a measure of water salinity as it is quicker and easier than measurement by TDS

Electrical resistivity — a measure of how strongly a material opposes the flow of an electric current.

Groundwater evapotranspiration — The total loss of water as a result of transpiration from plants and evaporation from land and surface water bodies

Floodplain — Of a watercourse means: (1) floodplain (if any) of the watercourse identified in a catchment water management plan or a local water management plan; adopted under the Act; or (2) where (1) does not apply — the floodplain (if any) of the watercourse identified in a development plan under the *Development (SA) Act 1993*; or (3) where neither (1) nor (2) applies — the land adjoining the watercourse that is periodically subject to flooding from the watercourse

GIS — Geographic Information System; computer software linking geographic data (for example land parcels) to textual data (soil type, land value, ownership). It allows for a range of features, from simple map production to complex data analysis

Groundwater — Water occurring naturally below ground level or water pumped, diverted and released into a well for storage underground; see also 'underground water'

Hydraulic conductivity (K) — A measure of the ease of flow through aquifer material: high K indicates low hydraulic resistance, or high flow conditions; measured in metres per day

Hydraulic resistance — measure of how strongly a material opposes fluid flow. Lower hydraulic resistance indicates a greater ease of flow. It is saturated thickness divided by vertical conductivity of a sediment.

Hydrogeology — The study of groundwater, which includes its occurrence, recharge and discharge processes and the properties of aquifers; see also 'hydrology'

Hydrology — The study of the characteristics, occurrence, movement and utilisation of water on and below the Earth's surface and within its atmosphere; see also 'hydrogeology'

IAG-Salinity — Independent Audit Group for Salinity

m AHD — Defines elevation in metres (m) according to the Australian Height Datum (AHD)

MDBA — Murray–Darling Basin Authority

MDBC — Murray–Darling Basin Commission

Model — A conceptual or mathematical means of understanding elements of the real world that allows for predictions of outcomes given certain conditions. Examples include estimating storm run-off, assessing the impacts of dams or predicting ecological response to environmental change

Monitoring — (1) The repeated measurement of parameters to assess the current status and changes over time of the parameters measured (2) Periodic or continuous surveillance or testing to determine the level of compliance with statutory requirements and/or pollutant levels in various media or in humans, animals and other living things

NanoTEM — A geophysical method that measures the electrical resistivity of subsurface materials. Electrical resistivity is affected by the properties, porosity and saturation of the subsurface materials and water salinity.

Natural recharge — The infiltration of water into an aquifer from the surface (rainfall, streamflow, irrigation etc). See also recharge area

Observation well — A narrow well or piezometer whose sole function is to permit water level measurements

Obswell — Observation Well Network

Penetrating well — See 'fully-penetrating well'

Percentile — A way of describing sets of data by ranking the dataset and establishing the value for each percentage of the total number of data records. The 90th percentile of the distribution is the value such that 90% of the observations fall at or below it.

Permeability — A measure of the ease with which water flows through an aquifer or aquitard, measured in m^2/d

Phreatophytic vegetation — Vegetation that exists in a climate more arid than its normal range by virtue of its access to groundwater

Piezometer — A narrow tube, pipe or well; used for measuring moisture in soil, water levels in an aquifer, or pressure head in a tank, pipeline, etc

PIRSA — Primary Industries and Resources South Australia (Government of South Australia)

Potentiometric head — The potentiometric head or surface is the level to which water rises in a well due to water pressure in the aquifer, measured in metres (m); also known as piezometric surface

Production well — The pumped well in an aquifer test, as opposed to observation wells; a wide-hole well, fully developed and screened for water supply, drilled on the basis of previous exploration wells

Recharge area — The area of land from which water from the surface (rainfall, streamflow, irrigation, etc.) infiltrates into an aquifer. See also artificial recharge, natural recharge

River kilometre — It is a measure of distance in kilometres along the River Murray from its mouth

Run of River (RoR) — Instream salinity surveys (when river flow conditions allow) that produce a kilometre-by-kilometre "snapshot" of salinity accessions along the length of the river

SA Geodata — A collection of linked databases storing geological and hydrogeological data, which the public can access through the offices of PIRSA. Custodianship of data related to minerals, petroleum and groundwater is vested in PIRSA and DWLBC, respectively. DWLBC should be contacted for database extracts related to groundwater

Salt interception scheme (SIS) — a series of production wells that are designed to lower the hydraulic head gradient towards the River Murray, hence reducing saline groundwater flux and salt load entering the river

SA Water — South Australian Water Corporation (Government of South Australia)

Specific storage (S_s) — Specific storativity; the amount of stored water realised from a unit volume of aquifer per unit decline in head; it has a unit of /m

Specific yield (S_y) — The volume ratio of water that drains by gravity, to that of total volume of the porous medium. It is dimensionless

Storativity/Storage coefficient (S) — The volume of groundwater released or taken into storage per unit plan area of aquifer per unit change of head; it is dimensionless

TDS — Total dissolved solids, measured in milligrams per litre (mg/L); a measure of water salinity

Tertiary aquifer — A term used to describe a water-bearing rock formation deposited in the Tertiary geological period (1–70 million years ago)

Transmissivity (T) — A parameter indicating the ease of groundwater flow through a metre width of aquifer section (taken perpendicular to the direction of flow), measured in m^2/d

Underground water (groundwater) — Water occurring naturally below ground level or water pumped, diverted or released into a well for storage underground

USGS — United States Geological Survey

Water table — The surface in an unconfined aquifer or confining bed at which the pore water pressure is atmospheric.

Well — (1) An opening in the ground excavated for the purpose of obtaining access to underground water. (2) An opening in the ground excavated for some other purpose but that gives access to underground water. (3) A natural opening in the ground that gives access to underground water

APPENDIXES

A. MODELLED GROUNDWATER FLUX AND SALT LOAD

TASK 1 SALT LOAD SUMMARY

			Task 1 Scenario 1			Task 1 Scenario 2			Task 1 Scenario 3		
Start (d)	Stop (d)	Month	Salt load (t/d)	Salt load impact (t/d)	Cumulative salt load impact (t)	Salt load (t/d)	Salt load impact (t/d)	Cumulative salt load impact (t)	Salt load (t/d)	Salt load impact (t/d)	Cumulative salt load impact (t)
0	30	0.0	87.9			87.9			87.9		
30	60	1.0	87.8			87.8			87.8		
60	90	2.0	87.7			87.7			87.7		
90	95	3.0	0.2			0.2			0.2		
95	100	3.2	0.2			0.2			0.2		
100	105	3.3	0.2			0.2			0.2		
105	110	3.5	0.2			0.2			0.2		
110	115	3.7	0.3			0.3			0.3		
115	120	3.8	0.3			0.3			0.3		
120	125	4.0	0.3			0.3			0.3		
125	130	4.2	0.3			0.3			0.3		
130	135	4.3	0.3			0.3			0.3		
135	140	4.5	0.3			0.3			0.3		
140	145	4.7	0.3			0.3			0.3		
145	150	4.8	0.3			0.3			0.3		
150	155	5.0	0.3			536.2	448.4	2242	0.3		
155	160	5.2	0.3			475.0	387.3	4179	0.3		
160	165	5.3	0.3			439.5	351.7	5937	0.3		
165	170	5.5	0.4			413.8	326.1	7568	0.4		
170	175	5.7	0.4			393.5	305.8	9097	0.4		
175	180	5.8	0.4			376.7	289.0	10541	0.4		
180	185	6.0	661.7	573.9	2870	362.0	274.3	11913	0.4		
185	190	6.2	594.4	506.7	5403	348.9	261.2	13219	0.5		
190	195	6.3	553.7	466.0	7733	337.0	249.3	14465	0.5		
195	200	6.5	523.0	435.3	9909	326.2	238.5	15658	0.5		
200	205	6.7	497.9	410.1	11960	316.3	228.5	16800	0.5		
205	210	6.8	476.3	388.6	13903	307.1	219.3	17897	0.6		
210	215	7.0	457.4	369.6	15751	298.5	210.8	18951	757.8	670.1	3350
215	220	7.2	440.4	352.6	17514	290.5	202.8	19965	685.8	598.1	6341
220	225	7.3	424.9	337.2	19200	283.1	195.4	20942	641.3	553.5	9109
225	230	7.5	410.7	323.0	20815	276.1	188.4	21884	607.1	519.4	11706
230	235	7.7	397.7	310.0	22365	269.6	181.9	22793	578.6	490.9	14160
235	240	7.8	385.5	297.8	23854	263.4	175.7	23672	553.9	466.1	16491
240	245	8.0	374.2	286.5	25287	257.5	169.8	24521	531.9	444.2	18712
245	250	8.2	363.5	275.8	26666	252.0	164.3	25342	512.1	424.4	20834
250	255	8.3	353.5	265.8	27995	246.7	159.0	26137	494.0	406.3	22865
255	260	8.5	344.1	256.4	29277	241.7	153.9	26907	477.3	389.6	24813
260	265	8.7	335.2	247.5	30514	236.9	149.2	27653	461.8	374.1	26683
265	270	8.8	326.8	239.1	31710	232.3	144.6	28376	447.4	359.6	28481
270	275	9.0	318.8	231.1	32865	227.9	140.2	29077	433.9	346.1	30212
275	280	9.2	311.2	223.5	33982	223.8	136.0	29757	421.2	333.5	31880
280	285	9.3	304.0	216.3	35064	219.8	132.0	30417	409.3	321.6	33488
285	290	9.5	297.2	209.5	36111	215.9	128.2	31058	398.1	310.4	35040
290	295	9.7	290.7	202.9	37126	212.3	124.5	31681	387.5	299.8	36538
295	300	9.8	284.4	196.7	38110	208.7	121.0	32286	377.4	289.7	37987
300	305	10.0	278.5	190.8	39064	205.3	117.6	32874	367.8	280.1	39387
305	310	10.2	272.9	185.2	39989	202.0	114.3	33445	358.7	271.0	40742
310	315	10.3	267.5	179.8	40888	198.9	111.2	34001	350.1	262.3	42054
315	320	10.5	262.3	174.6	41761	195.9	108.1	34542	341.8	254.1	43325
320	325	10.7	257.3	169.6	42609	192.9	105.2	35068	333.9	246.2	44556
325	330	10.8	252.5	164.8	43433	190.1	102.4	35580	326.4	238.7	45749
330	335	11.0	247.9	160.2	44234	187.4	99.7	36078	319.2	231.5	46906
335	340	11.2	243.5	155.8	45013	184.8	97.1	36564	312.3	224.6	48029
340	345	11.3	239.3	151.5	45771	182.2	94.5	37036	305.7	218.0	49119
345	350	11.5	235.2	147.4	46508	179.8	92.1	37497	299.4	211.7	50178
350	355	11.7	231.2	143.5	47225	177.4	89.7	37945	293.3	205.6	51206
355	360	11.8	227.4	139.7	47924	175.1	87.4	38382	287.5	199.8	52205
360	365	12.0	223.8	136.0	48604	172.9	85.2	38808	282.0	194.2	53176

			Task 1 Scenario 1			Task 1 Scenario 2			Task 1 Scenario 3		
Start (d)	Stop (d)	Month	Salt load (t/d)	Salt load impact (t/d)	Cumulative salt load impact (t)	Salt load (t/d)	Salt load impact (t/d)	Cumulative salt load impact (t)	Salt load (t/d)	Salt load impact (t/d)	Cumulative salt load impact (t)
365	370	12.2	220.2	132.5	49266	170.8	83.1	39223	276.6	188.9	54121
370	375	12.3	216.8	129.1	49912	168.7	81.0	39628	271.5	183.7	55039
375	380	12.5	213.5	125.7	50540	166.7	79.0	40023	266.5	178.8	55933
380	385	12.7	210.3	122.5	51153	164.8	77.0	40409	261.8	174.0	56803
385	390	12.8	207.2	119.4	51750	162.9	75.2	40784	257.2	169.4	57651
390	395	13.0	204.2	116.5	52333	161.0	73.3	41151	252.7	165.0	58476
395	400	13.2	201.3	113.6	52900	159.3	71.5	41509	248.4	160.7	59279
400	405	13.3	198.5	110.8	53454	157.5	69.8	41858	244.3	156.6	60062
405	410	13.5	195.8	108.0	53994	155.9	68.1	42198	240.3	152.6	60825
410	415	13.7	193.1	105.4	54521	154.2	66.5	42531	236.4	148.7	61568
415	420	13.8	190.6	102.8	55036	152.7	64.9	42856	232.7	145.0	62293
420	425	14.0	188.1	100.4	55537	151.1	63.4	43173	229.1	141.4	63000
425	430	14.2	185.7	98.0	56027	149.6	61.9	43482	225.6	137.9	63689
430	435	14.3	183.3	95.6	56505	148.2	60.5	43785	222.2	134.5	64362
435	440	14.5	181.1	93.4	56972	146.8	59.1	44080	218.9	131.2	65018
440	445	14.7	178.9	91.2	57428	145.4	57.7	44368	215.7	128.0	65658
445	450	14.8	176.7	89.0	57873	144.1	56.3	44650	212.6	124.9	66282
450	455	15.0	174.7	87.0	58308	142.8	55.0	44925	209.7	121.9	66892
455	460	15.2	172.7	84.9	58732	141.5	53.8	45194	206.8	119.0	67487
460	465	15.3	170.7	83.0	59147	140.3	52.5	45457	203.9	116.2	68068
465	470	15.5	168.8	81.1	59553	139.1	51.4	45714	201.2	113.5	68636
470	475	15.7	166.9	79.2	59949	137.9	50.2	45965	198.6	110.8	69190
475	480	15.8	165.1	77.4	60336	136.8	49.1	46210	196.0	108.3	69731
480	485	16.0	163.4	75.6	60714	135.7	48.0	46450	193.5	105.8	70260
485	490	16.2	161.7	73.9	61084	134.6	46.9	46684	191.1	103.3	70777
490	495	16.3	160.0	72.3	61445	133.6	45.8	46913	188.7	101.0	71281
495	500	16.5	158.4	70.7	61798	132.5	44.8	47137	186.4	98.7	71775
500	505	16.7	156.8	69.1	62144	131.5	43.8	47356	184.2	96.4	72257
505	510	16.8	155.3	67.6	62481	130.6	42.8	47571	182.0	94.3	72728
510	515	17.0	153.8	66.1	62812	129.6	41.9	47780	179.9	92.2	73189
515	520	17.2	152.3	64.6	63135	128.7	41.0	47985	177.8	90.1	73640
520	525	17.3	150.9	63.2	63451	127.8	40.1	48185	175.8	88.1	74080
525	530	17.5	149.5	61.8	63760	126.9	39.2	48382	173.9	86.2	74511
530	535	17.7	148.2	60.5	64062	126.1	38.4	48573	172.0	84.3	74932
535	540	17.8	146.9	59.2	64358	125.3	37.5	48761	170.1	82.4	75344
540	550	18.0	144.4	56.6	64641	123.7	36.0	48941	166.6	78.8	75739
550	570	18.3	139.7	52.0	65161	120.7	33.0	49271	160.0	72.3	76461
570	600	19.0	133.5	45.8	66076	116.8	29.1	49853	151.4	63.6	77734
600	630	20.0	128.1	40.4	67287	113.4	25.7	50623	143.9	56.2	79419
630	660	21.0	123.4	35.7	68358	110.4	22.7	51303	137.4	49.7	80909
660	690	22.0	119.4	31.6	69308	107.8	20.1	51906	131.7	44.0	82228
690	720	23.0	115.8	28.1	70151	105.6	17.8	52441	126.8	39.0	83399
720	750	24.0	112.7	25.0	70900	103.6	15.9	52916	122.4	34.7	84440
750	780	25.0	109.9	22.2	71566	101.9	14.1	53340	118.6	30.9	85368
780	810	26.0	107.5	19.8	72160	100.3	12.6	53718	115.3	27.6	86195
810	840	27.0	105.4	17.7	72691	99.0	11.3	54056	112.4	24.6	86934
840	870	28.0	103.6	15.8	73167	97.8	10.1	54358	109.8	22.0	87596
870	900	29.0	101.9	14.2	73593	96.7	9.0	54628	107.5	19.7	88188
900	930	30.0	100.5	12.8	73976	95.8	8.0	54869	105.4	17.7	88719
930	960	31.0	99.2	11.5	74320	94.9	7.2	55085	103.7	15.9	89197
960	990	32.0	98.1	10.3	74630	94.2	6.4	55278	102.1	14.4	89628
990	1020	33.0	97.0	9.3	74909	93.5	5.8	55450	100.7	13.0	90017
1020	1050	34.0	96.1	8.4	75160	92.9	5.1	55604	99.4	11.7	90368
1050	1080	35.0	95.3	7.5	75387	92.3	4.6	55742	98.3	10.6	90686
1080	1110	36.0	94.5	6.8	75590	91.8	4.1	55865	97.3	9.6	90973
1110	1140	37.0	93.8	6.1	75774	91.4	3.6	55974	96.4	8.7	91234
1140	1170	38.0	93.2	5.5	75940	91.0	3.2	56072	95.6	7.9	91470
1170	1200	39.0	92.7	5.0	76089	90.6	2.9	56158	94.9	7.1	91684

TASK 2 SALT LOAD SUMMARY

			Task 2 Scenario 1			Task 2 Scenario 2			Task 2 Scenario 3		
Start (d)	Stop (d)	Month	Salt load (t/d)	Salt load impact (t/d)	Cumulative salt load impact (t)	Salt load (t/d)	Salt load impact (t/d)	Cumulative salt load impact (t)	Salt load (t/d)	Salt load impact (t/d)	Cumulative salt load impact (t)
0	30	0.0	87.9			87.9			87.9		
30	60	1.0	87.8			87.8			87.8		
60	90	2.0	87.7			87.7			87.7		
90	95	3.0	0.2			0.2			73.9		
95	100	3.2	0.2			0.3			44.8		
100	105	3.3	0.2			0.3			35.9		
105	110	3.5	0.2			0.3			32.0		
110	115	3.7	0.3			0.3			29.8		
115	120	3.8	0.3			0.3			28.4		
120	125	4.0	0.3			0.4			27.4		
125	130	4.2	0.3			0.4			26.7		
130	135	4.3	0.3			0.4			26.2		
135	140	4.5	0.3			0.4			25.8		
140	145	4.7	0.3			0.4			25.5		
145	150	4.8	0.3			0.4			25.3		
150	155	5.0	0.3			0.4			25.2		
155	160	5.2	0.3			0.4			25.0		
160	165	5.3	0.3			0.4			25.0		
165	170	5.5	0.4			0.4			24.9		
170	175	5.7	0.4			0.4			24.9		
175	180	5.8	0.4			0.4			24.9		
180	185	6.0	661.7	573.9	2870	411.3	323.5	1618	249.0	161.3	806.5
185	190	6.2	594.4	506.7	5403	380.1	292.4	3080	230.6	142.8	714.2
190	195	6.3	553.7	466.0	7733	358.2	270.4	4432	218.0	130.3	651.5
195	200	6.5	523.0	435.3	9909	340.7	253.0	5697	208.3	120.6	603.0
200	205	6.7	497.9	410.1	11960	326.1	238.4	6889	200.4	112.7	563.3
205	210	6.8	476.3	388.6	13903	313.4	225.7	8017	193.7	105.9	529.7
210	215	7.0	457.4	369.6	15751	302.2	214.5	9090	187.8	100.1	500
215	220	7.2	440.4	352.6	17514	292.1	204.4	10112	182.6	94.9	975
220	225	7.3	424.9	337.2	19200	282.9	195.2	11088	178.0	90.3	1426
225	230	7.5	410.7	323.0	20815	274.5	186.8	12022	173.8	86.0	1856
230	235	7.7	397.7	310.0	22365	266.8	179.1	12917	169.9	82.2	2267
235	240	7.8	385.5	297.8	23854	259.7	172.0	13777	166.3	78.6	2660
240	245	8.0	374.2	286.5	25287	253.1	165.4	14604	163.0	75.3	3037
245	250	8.2	363.5	275.8	26666	246.9	159.2	15400	160.0	72.3	3398
250	255	8.3	353.5	265.8	27995	241.2	153.4	16167	157.1	69.4	3745
255	260	8.5	344.1	256.4	29277	235.7	148.0	16907	154.5	66.7	4079
260	265	8.7	335.2	247.5	30514	230.6	142.9	17622	151.9	64.2	4400
265	270	8.8	326.8	239.1	31710	225.7	138.0	18312	149.6	61.8	4709
270	275	9.0	318.8	231.1	32865	221.1	133.4	18979	147.3	59.6	5007
275	280	9.2	311.2	223.5	33982	216.7	129.0	19624	145.2	57.5	5294
280	285	9.3	304.0	216.3	35064	212.6	124.9	20248	143.2	55.5	5572
285	290	9.5	297.2	209.5	36111	208.6	120.9	20853	141.3	53.6	5840
290	295	9.7	290.7	202.9	37126	204.9	117.1	21438	139.5	51.7	6098
295	300	9.8	284.4	196.7	38110	201.3	113.5	22006	137.7	50.0	6348
300	305	10.0	278.5	190.8	39064	197.8	110.1	22556	136.1	48.4	6590
305	310	10.2	272.9	185.2	39989	194.5	106.8	23090	134.5	46.8	6824
310	315	10.3	267.5	179.8	40888	191.3	103.6	23608	133.0	45.3	7051
315	320	10.5	262.3	174.6	41761	188.3	100.6	24111	131.6	43.9	7270
320	325	10.7	257.3	169.6	42609	185.4	97.7	24599	130.3	42.5	7483
325	330	10.8	252.5	164.8	43433	182.6	94.9	25074	129.0	41.2	7689
330	335	11.0	247.9	160.2	44234	179.9	92.2	25535	127.7	40.0	7889
335	340	11.2	243.5	155.8	45013	177.3	89.6	25983	126.5	38.8	8083
340	345	11.3	239.3	151.5	45771	174.8	87.1	26418	125.4	37.7	8271
345	350	11.5	235.2	147.4	46508	172.5	84.7	26842	124.3	36.6	8454
350	355	11.7	231.2	143.5	47225	170.2	82.4	27254	123.2	35.5	8631
355	360	11.8	227.4	139.7	47924	167.9	80.2	27655	122.2	34.5	8804
360	365	12.0	223.8	136.0	48604	165.8	78.1	28046	121.2	33.5	8972

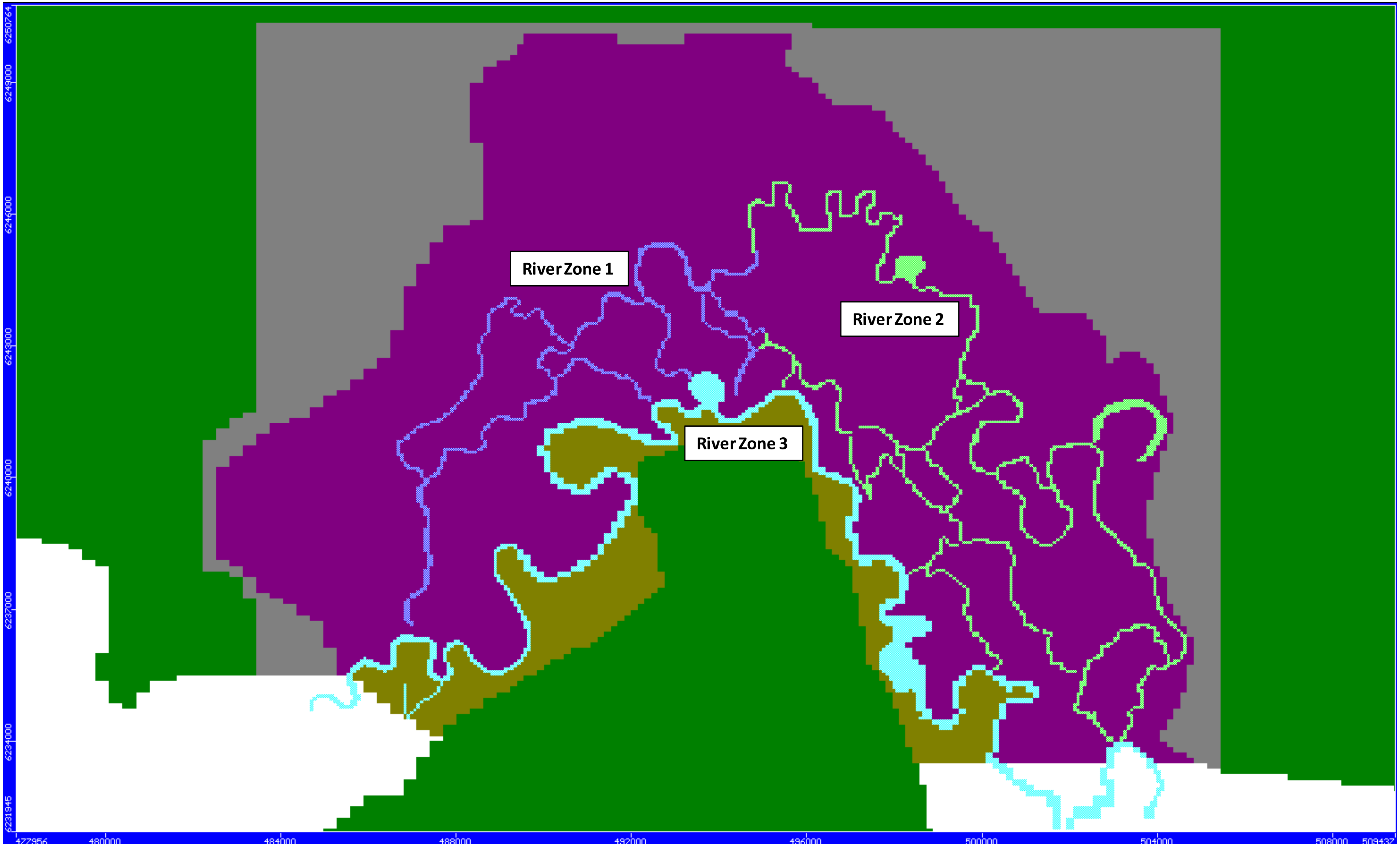
Start (d)	Stop (d)	Month	Task 2 Scenario 1			Task 2 Scenario 2			Task 2 Scenario 3		
			Salt load (t/d)	Salt load impact (t/d)	Cumulative salt load impact (t)	Salt load (t/d)	Salt load impact (t/d)	Cumulative salt load impact (t)	Salt load (t/d)	Salt load impact (t/d)	Cumulative salt load impact (t)
365	370	12.2	220.2	132.5	49266	163.7	76.0	28426	120.3	32.6	9134
370	375	12.3	216.8	129.1	49912	161.7	74.0	28796	119.4	31.7	9293
375	380	12.5	213.5	125.7	50540	159.8	72.1	29156	118.5	30.8	9447
380	385	12.7	210.3	122.5	51153	158.0	70.2	29508	117.7	29.9	9596
385	390	12.8	207.2	119.4	51750	156.2	68.4	29850	116.9	29.1	9742
390	395	13.0	204.2	116.5	52333	154.4	66.7	30183	116.1	28.3	9884
395	400	13.2	201.3	113.6	52900	152.7	65.0	30508	115.3	27.6	10022
400	405	13.3	198.5	110.8	53454	151.1	63.3	30825	114.6	26.8	10156
405	410	13.5	195.8	108.0	53994	149.5	61.8	31134	113.8	26.1	10287
410	415	13.7	193.1	105.4	54521	147.9	60.2	31435	113.2	25.4	10414
415	420	13.8	190.6	102.8	55036	146.4	58.7	31728	112.5	24.8	10538
420	425	14.0	188.1	100.4	55537	145.0	57.3	32015	111.8	24.1	10658
425	430	14.2	185.7	98.0	56027	143.6	55.9	32294	111.2	23.5	10776
430	435	14.3	183.3	95.6	56505	142.2	54.5	32567	110.6	22.9	10890
435	440	14.5	181.1	93.4	56972	140.9	53.2	32833	110.0	22.3	11002
440	445	14.7	178.9	91.2	57428	139.6	51.9	33092	109.5	21.7	11110
445	450	14.8	176.7	89.0	57873	138.4	50.7	33345	108.9	21.2	11216
450	455	15.0	174.7	87.0	58308	137.2	49.5	33593	108.4	20.6	11319
455	460	15.2	172.7	84.9	58732	136.0	48.3	33834	107.8	20.1	11420
460	465	15.3	170.7	83.0	59147	134.9	47.2	34070	107.3	19.6	11518
465	470	15.5	168.8	81.1	59553	133.8	46.1	34300	106.9	19.1	11614
470	475	15.7	166.9	79.2	59949	132.7	45.0	34525	106.4	18.7	11707
475	480	15.8	165.1	77.4	60336	131.7	43.9	34745	105.9	18.2	11798
480	485	16.0	163.4	75.6	60714	130.7	42.9	34959	105.5	17.8	11887
485	490	16.2	161.7	73.9	61084	129.7	41.9	35169	105.0	17.3	11974
490	495	16.3	160.0	72.3	61445	128.7	41.0	35374	104.6	16.9	12058
495	500	16.5	158.4	70.7	61798	127.8	40.1	35574	104.2	16.5	12141
500	505	16.7	156.8	69.1	62144	126.9	39.1	35770	103.8	16.1	12221
505	510	16.8	155.3	67.6	62481	126.0	38.3	35962	103.4	15.7	12299
510	515	17.0	153.8	66.1	62812	125.1	37.4	36149	103.1	15.3	12376
515	520	17.2	152.3	64.6	63135	124.3	36.6	36331	102.7	15.0	12451
520	525	17.3	150.9	63.2	63451	123.5	35.8	36510	102.3	14.6	12524
525	530	17.5	149.5	61.8	63760	122.7	35.0	36685	102.0	14.3	12595
530	535	17.7	148.2	60.5	64062	121.9	34.2	36856	101.6	13.9	12665
535	540	17.8	146.9	59.2	64358	121.2	33.4	37023	101.3	13.6	12733
540	550	18.0	144.4	56.6	64641	119.7	32.0	37183	100.7	13.0	12798
550	570	18.3	139.7	52.0	65161	117.0	29.3	37476	99.5	11.8	12916
570	600	19.0	133.5	45.8	66076	113.5	25.7	37990	98.0	10.3	13121
600	630	20.0	128.1	40.4	67287	110.4	22.6	38670	96.7	8.9	13390
630	660	21.0	123.4	35.7	68358	107.7	20.0	39269	95.5	7.8	13624
660	690	22.0	119.4	31.6	69308	105.4	17.7	39799	94.5	6.8	13828
690	720	23.0	115.8	28.1	70151	103.4	15.6	40268	93.7	5.9	14006
720	750	24.0	112.7	25.0	70900	101.6	13.9	40684	92.9	5.2	14161
750	780	25.0	109.9	22.2	71566	100.0	12.3	41053	92.2	4.5	14296
780	810	26.0	107.5	19.8	72160	98.7	10.9	41381	91.6	3.9	14413
810	840	27.0	105.4	17.7	72691	97.5	9.7	41674	91.1	3.4	14514
840	870	28.0	103.6	15.8	73167	96.4	8.7	41933	90.6	2.9	14601
870	900	29.0	101.9	14.2	73593	95.4	7.7	42165	90.2	2.5	14675
900	930	30.0	100.5	12.8	73976	94.6	6.9	42370	89.8	2.1	14738
930	960	31.0	99.2	11.5	74320	93.8	6.1	42554	89.5	1.8	14791
960	990	32.0	98.1	10.3	74630	93.2	5.4	42717	89.2	1.5	14835
990	1020	33.0	97.0	9.3	74909	92.6	4.8	42862	88.9	1.2	14871
1020	1050	34.0	96.1	8.4	75160	92.0	4.3	42991	88.7	0.9	14899
1050	1080	35.0	95.3	7.5	75387	91.5	3.8	43105	88.4	0.7	14921
1080	1110	36.0	94.5	6.8	75590	91.1	3.4	43206	88.2	0.5	14937
1110	1140	37.0	93.8	6.1	75774	90.7	3.0	43295	88.1	0.3	14947
1140	1170	38.0	93.2	5.5	75940	90.3	2.6	43373	87.9	0.2	14952
1170	1200	39.0	92.7	5.0	76089	90.0	2.3	43441	87.7	0.0	14953

TASK 3 SALT LOAD SUMMARY

			Task 3 Scenario 1			Task 3 Scenario 2			Task 3 Scenario 3		
Start (d)	Stop (d)	Month	Salt load (t/d)	Salt load impact (t/d)	Cumulative salt load impact (t)	Salt load (t/d)	Salt load impact (t/d)	Cumulative salt load impact (t)	Salt load (t/d)	Salt load impact (t/d)	Cumulative salt load impact (t)
0	30	0.0	87.9			87.9			87.9		
30	60	1.0	87.8			87.8			87.8		
60	90	2.0	87.7			87.7			87.7		
90	95	3.0	0.2			0.2			0.2		
95	100	3.2	0.2			0.3			0.3		
100	105	3.3	0.2			0.3			0.3		
105	110	3.5	0.2			0.3			0.3		
110	115	3.7	0.3			0.3			0.3		
115	120	3.8	0.3			0.3			0.3		
120	125	4.0	0.3			0.3			0.3		
125	130	4.2	0.3			0.3			0.3		
130	135	4.3	0.3			0.3			0.3		
135	140	4.5	0.3			0.4			0.4		
140	145	4.7	0.3			0.4			0.4		
145	150	4.8	0.3			0.4			0.4		
150	155	5.0	0.3			0.4			0.4		
155	160	5.2	0.3			0.4			0.4		
160	165	5.3	0.3			0.4			0.4		
165	170	5.5	0.4			0.5			0.5		
170	175	5.7	0.4			0.5			0.5		
175	180	5.8	0.4			0.5			0.5		
180	185	6.0	661.7	573.9	2870	1.0	0.0	0	0.7	0.0	0.0
185	190	6.2	594.4	506.7	5403	2.5	0.0	0	0.9	0.0	0.0
190	195	6.3	553.7	466.0	7733	25.2	0.0	0	2.1	0.0	0.0
195	200	6.5	523.0	435.3	9909	107.7	20.0	100	8.7	0.0	0.0
200	205	6.7	497.9	410.1	11960	241.6	153.9	870	22.7	0.0	0.0
205	210	6.8	476.3	388.6	13903	359.3	271.6	2227	51.6	0.0	0.0
210	215	7.0	457.4	369.6	15751	448.6	360.9	4032	98.4	10.7	53
215	220	7.2	440.4	352.6	17514	487.5	399.7	6031	154.5	66.7	387
220	225	7.3	424.9	337.2	19200	534.1	446.4	8263	218.0	130.2	1038
225	230	7.5	410.7	323.0	20815	509.0	421.3	10369	272.8	185.1	1964
230	235	7.7	397.7	310.0	22365	488.0	400.3	12371	322.7	234.9	3138
235	240	7.8	385.5	297.8	23854	469.4	381.7	14279	367.2	279.4	4536
240	245	8.0	374.2	286.5	25287	452.7	365.0	16104	405.5	317.8	6124
245	250	8.2	363.5	275.8	26666	437.4	349.6	17852	426.1	338.4	7817
250	255	8.3	353.5	265.8	27995	423.2	335.5	19530	436.5	348.7	9560
255	260	8.5	344.1	256.4	29277	410.2	322.4	21142	492.6	404.9	11585
260	265	8.7	335.2	247.5	30514	398.0	310.2	22693	472.9	385.1	13510
265	270	8.8	326.8	239.1	31710	386.5	298.8	24187	455.8	368.1	15351
270	275	9.0	318.8	231.1	32865	375.8	288.0	25627	440.5	352.8	17115
275	280	9.2	311.2	223.5	33982	365.6	277.9	27017	426.5	338.8	18809
280	285	9.3	304.0	216.3	35064	356.0	268.3	28358	413.6	325.9	20439
285	290	9.5	297.2	209.5	36111	346.9	259.2	29654	401.6	313.8	22008
290	295	9.7	290.7	202.9	37126	338.3	250.6	30907	390.3	302.5	23520
295	300	9.8	284.4	196.7	38110	330.1	242.4	32119	379.6	291.9	24980
300	305	10.0	278.5	190.8	39064	322.3	234.6	33291	369.6	281.9	26389
305	310	10.2	272.9	185.2	39989	314.9	227.2	34427	360.1	272.3	27751
310	315	10.3	267.5	179.8	40888	307.8	220.1	35528	351.1	263.3	29068
315	320	10.5	262.3	174.6	41761	301.1	213.4	36595	342.5	254.8	30341
320	325	10.7	257.3	169.6	42609	294.6	206.9	37629	334.3	246.6	31574
325	330	10.8	252.5	164.8	43433	288.5	200.8	38633	326.6	238.9	32769
330	335	11.0	247.9	160.2	44234	282.6	194.9	39608	319.2	231.5	33926
335	340	11.2	243.5	155.8	45013	277.0	189.3	40554	312.1	224.4	35048
340	345	11.3	239.3	151.5	45771	271.6	183.9	41474	305.4	217.7	36137
345	350	11.5	235.2	147.4	46508	266.5	178.7	42367	298.9	211.2	37193
350	355	11.7	231.2	143.5	47225	261.5	173.8	43236	292.8	205.0	38218
355	360	11.8	227.4	139.7	47924	256.7	169.0	44081	286.8	199.1	39213
360	365	12.0	223.8	136.0	48604	252.1	164.4	44903	281.2	193.4	40181

			Task 3 Scenario 1			Task 3 Scenario 2			Task 3 Scenario 3		
Start (d)	Stop (d)	Month	Salt load (t/d)	Salt load impact (t/d)	Cumulative salt load impact (t)	Salt load (t/d)	Salt load impact (t/d)	Cumulative salt load impact (t)	Salt load (t/d)	Salt load impact (t/d)	Cumulative salt load impact (t)
365	370	12.2	220.2	132.5	49266	247.6	159.9	45702	275.7	188.0	41121
370	375	12.3	216.8	129.1	49912	243.4	155.6	46480	270.5	182.8	42035
375	380	12.5	213.5	125.7	50540	239.2	151.5	47238	265.5	177.8	42924
380	385	12.7	210.3	122.5	51153	235.3	147.5	47976	260.7	173.0	43789
385	390	12.8	207.2	119.4	51750	231.4	143.7	48694	256.1	168.3	44631
390	395	13.0	204.2	116.5	52333	227.7	140.0	49394	251.6	163.9	45450
395	400	13.2	201.3	113.6	52900	224.1	136.4	50076	247.3	159.5	46248
400	405	13.3	198.5	110.8	53454	220.7	132.9	50741	243.1	155.4	47024
405	410	13.5	195.8	108.0	53994	217.3	129.6	51389	239.1	151.3	47781
410	415	13.7	193.1	105.4	54521	214.1	126.3	52020	235.2	147.4	48518
415	420	13.8	190.6	102.8	55036	210.9	123.2	52636	231.4	143.7	49237
420	425	14.0	188.1	100.4	55537	207.9	120.2	53237	227.8	140.1	49937
425	430	14.2	185.7	98.0	56027	204.9	117.2	53823	224.3	136.5	50620
430	435	14.3	183.3	95.6	56505	202.1	114.4	54395	220.9	133.1	51285
435	440	14.5	181.1	93.4	56972	199.3	111.6	54953	217.6	129.8	51935
440	445	14.7	178.9	91.2	57428	196.6	108.9	55497	214.4	126.7	52568
445	450	14.8	176.7	89.0	57873	194.0	106.3	56029	211.3	123.6	53186
450	455	15.0	174.7	87.0	58308	191.5	103.8	56548	208.3	120.6	53789
455	460	15.2	172.7	84.9	58732	189.0	101.3	57054	205.4	117.7	54377
460	465	15.3	170.7	83.0	59147	186.6	98.9	57549	202.6	114.9	54951
465	470	15.5	168.8	81.1	59553	184.3	96.6	58032	199.9	112.1	55512
470	475	15.7	166.9	79.2	59949	182.1	94.3	58503	197.2	109.5	56059
475	480	15.8	165.1	77.4	60336	179.9	92.2	58964	194.6	106.9	56594
480	485	16.0	163.4	75.6	60714	177.8	90.0	59414	192.1	104.4	57116
485	490	16.2	161.7	73.9	61084	175.7	88.0	59854	189.7	102.0	57626
490	495	16.3	160.0	72.3	61445	173.7	86.0	60284	187.3	99.6	58124
495	500	16.5	158.4	70.7	61798	171.7	84.0	60704	185.0	97.3	58610
500	505	16.7	156.8	69.1	62144	169.8	82.1	61115	182.8	95.1	59086
505	510	16.8	155.3	67.6	62481	168.0	80.2	61516	180.6	92.9	59550
510	515	17.0	153.8	66.1	62812	166.2	78.4	61908	178.5	90.8	60004
515	520	17.2	152.3	64.6	63135	164.4	76.7	62291	176.5	88.8	60448
520	525	17.3	150.9	63.2	63451	162.7	75.0	62666	174.5	86.8	60882
525	530	17.5	149.5	61.8	63760	161.0	73.3	63033	172.5	84.8	61306
530	535	17.7	148.2	60.5	64062	159.4	71.7	63392	170.6	82.9	61720
535	540	17.8	146.9	59.2	64358	157.9	70.1	63742	168.8	81.1	62126
540	550	18.0	144.4	56.6	64641	154.8	67.1	64078	165.3	77.5	62513
550	570	18.3	139.7	52.0	65161	149.2	61.5	64693	158.7	71.0	63223
570	600	19.0	133.5	45.8	66076	141.8	54.1	65774	150.1	62.4	64472
600	630	20.0	128.1	40.4	67287	135.4	47.6	67203	142.7	55.0	66121
630	660	21.0	123.4	35.7	68358	129.8	42.1	68465	136.2	48.5	67577
660	690	22.0	119.4	31.6	69308	125.0	37.2	69582	130.6	42.9	68865
690	720	23.0	115.8	28.1	70151	120.7	33.0	70573	125.8	38.0	70006
720	750	24.0	112.7	25.0	70900	117.0	29.3	71452	121.5	33.8	71019
750	780	25.0	109.9	22.2	71566	113.8	26.1	72234	117.8	30.0	71920
780	810	26.0	107.5	19.8	72160	110.9	23.2	72929	114.5	26.7	72722
810	840	27.0	105.4	17.7	72691	108.4	20.6	73549	111.6	23.8	73437
840	870	28.0	103.6	15.8	73167	106.2	18.4	74102	109.0	21.3	74075
870	900	29.0	101.9	14.2	73593	104.2	16.5	74597	106.7	19.0	74645
900	930	30.0	100.5	12.8	73976	102.5	14.8	75040	104.7	17.0	75156
930	960	31.0	99.2	11.5	74320	101.0	13.3	75438	103.0	15.3	75614
960	990	32.0	98.1	10.3	74630	99.6	11.9	75795	101.5	13.7	76027
990	1020	33.0	97.0	9.3	74909	98.4	10.7	76117	100.1	12.4	76398
1020	1050	34.0	96.1	8.4	75160	97.4	9.6	76406	98.9	11.1	76732
1050	1080	35.0	95.3	7.5	75387	96.4	8.7	76667	97.8	10.0	77033
1080	1110	36.0	94.5	6.8	75590	95.5	7.8	76901	96.8	9.1	77305
1110	1140	37.0	93.8	6.1	75774	94.8	7.0	77112	95.9	8.2	77550
1140	1170	38.0	93.2	5.5	75940	94.1	6.3	77303	95.1	7.4	77772
1170	1200	39.0	92.7	5.0	76089	93.4	5.7	77474	94.4	6.7	77972

LOCATION OF SALT LOAD REPORT ZONES



TASKS 1, 2 AND 3 SCENARIO 1 DETAILED SALT LOAD

Start day	Stop day	Month	Modelled salt load (t/d)			
			Zone 1 (West)	Zone 2 (East)	Zone 3 (South)	Total
0	30	0.0	17.1	70.6	0.2	87.9
30	60	1.0	17.1	70.5	0.2	87.8
60	90	2.0	17.1	70.4	0.2	87.7
90	95	3.0	0.0	0.0	0.2	0.2
95	100	3.2	0.0	0.0	0.2	0.2
100	105	3.3	0.0	0.0	0.2	0.2
105	110	3.5	0.0	0.0	0.2	0.2
110	115	3.7	0.0	0.0	0.3	0.3
115	120	3.8	0.0	0.0	0.3	0.3
120	125	4.0	0.0	0.0	0.3	0.3
125	130	4.2	0.0	0.0	0.3	0.3
130	135	4.3	0.0	0.0	0.3	0.3
135	140	4.5	0.0	0.0	0.3	0.3
140	145	4.7	0.0	0.0	0.3	0.3
145	150	4.8	0.0	0.0	0.3	0.3
150	155	5.0	0.0	0.0	0.3	0.3
155	160	5.2	0.0	0.0	0.3	0.3
160	165	5.3	0.0	0.0	0.3	0.3
165	170	5.5	0.0	0.0	0.4	0.4
170	175	5.7	0.0	0.0	0.4	0.4
175	180	5.8	0.0	0.0	0.4	0.4
180	185	6.0	242.8	384.3	34.5	661.7
185	190	6.2	223.1	357.3	14.1	594.4
190	195	6.3	208.6	337.7	7.4	553.7
195	200	6.5	196.9	321.8	4.4	523.0
200	205	6.7	186.9	308.2	2.7	497.9
205	210	6.8	178.1	296.3	1.8	476.3
210	215	7.0	170.3	285.7	1.3	457.4
215	220	7.2	163.2	276.1	1.0	440.4
220	225	7.3	156.7	267.3	0.8	424.9
225	230	7.5	150.8	259.2	0.7	410.7
230	235	7.7	145.4	251.7	0.6	397.7
235	240	7.8	140.3	244.7	0.5	385.5
240	245	8.0	135.5	238.2	0.5	374.2
245	250	8.2	131.1	232.0	0.5	363.5
250	255	8.3	126.9	226.2	0.4	353.5
255	260	8.5	122.9	220.8	0.4	344.1
260	265	8.7	119.2	215.6	0.4	335.2
265	270	8.8	115.7	210.7	0.4	326.8
270	275	9.0	112.3	206.1	0.4	318.8
275	280	9.2	109.1	201.7	0.3	311.2
280	285	9.3	106.1	197.6	0.3	304.0
285	290	9.5	103.2	193.6	0.3	297.2
290	295	9.7	100.5	189.8	0.3	290.7
295	300	9.8	97.9	186.2	0.3	284.4
300	305	10.0	95.5	182.8	0.3	278.5
305	310	10.2	93.1	179.5	0.3	272.9
310	315	10.3	90.9	176.3	0.3	267.5
315	320	10.5	88.7	173.3	0.3	262.3
320	325	10.7	86.7	170.3	0.3	257.3
325	330	10.8	84.7	167.6	0.3	252.5
330	335	11.0	82.8	164.9	0.3	247.9
335	340	11.2	81.0	162.3	0.3	243.5
340	345	11.3	79.2	159.8	0.3	239.3
345	350	11.5	77.5	157.4	0.3	235.2
350	355	11.7	75.8	155.1	0.3	231.2
355	360	11.8	74.3	152.9	0.3	227.4
360	365	12.0	72.7	150.8	0.3	223.8
		Salinity (mg/L)	*25014*	*35070*	*5832*	*-*

Start day	Stop day	Month	Modelled salt load (t/d)			
			Zone 1 (West)	Zone 2 (East)	Zone 3 (South)	Total
365	370	12.2	71.2	148.7	0.3	220.2
370	375	12.3	69.8	146.7	0.2	216.8
375	380	12.5	68.4	144.8	0.2	213.5
380	385	12.7	67.1	142.9	0.2	210.3
385	390	12.8	65.8	141.1	0.2	207.2
390	395	13.0	64.6	139.4	0.2	204.2
395	400	13.2	63.4	137.7	0.2	201.3
400	405	13.3	62.2	136.1	0.2	198.5
405	410	13.5	61.0	134.5	0.2	195.8
410	415	13.7	59.9	132.9	0.2	193.1
415	420	13.8	58.9	131.5	0.2	190.6
420	425	14.0	57.8	130.0	0.2	188.1
425	430	14.2	56.8	128.6	0.2	185.7
430	435	14.3	55.9	127.3	0.2	183.3
435	440	14.5	54.9	126.0	0.2	181.1
440	445	14.7	54.0	124.7	0.2	178.9
445	450	14.8	53.1	123.4	0.2	176.7
450	455	15.0	52.2	122.2	0.2	174.7
455	460	15.2	51.4	121.1	0.2	172.7
460	465	15.3	50.5	119.9	0.2	170.7
465	470	15.5	49.7	118.8	0.2	168.8
470	475	15.7	49.0	117.7	0.2	166.9
475	480	15.8	48.2	116.7	0.2	165.1
480	485	16.0	47.5	115.7	0.2	163.4
485	490	16.2	46.8	114.7	0.2	161.7
490	495	16.3	46.1	113.7	0.2	160.0
495	500	16.5	45.4	112.8	0.2	158.4
500	505	16.7	44.7	111.8	0.2	156.8
505	510	16.8	44.1	111.0	0.2	155.3
510	515	17.0	43.5	110.1	0.2	153.8
515	520	17.2	42.9	109.2	0.2	152.3
520	525	17.3	42.3	108.4	0.2	150.9
525	530	17.5	41.7	107.6	0.2	149.5
530	535	17.7	41.2	106.8	0.2	148.2
535	540	17.8	40.6	106.0	0.2	146.9
540	550	18.0	39.6	104.6	0.2	144.4
550	570	18.3	37.6	101.8	0.2	139.7
570	600	19.0	35.1	98.2	0.2	133.5
600	630	20.0	32.9	95.0	0.2	128.1
630	660	21.0	31.0	92.2	0.2	123.4
660	690	22.0	29.4	89.7	0.2	119.4
690	720	23.0	28.1	87.6	0.2	115.8
720	750	24.0	26.9	85.6	0.2	112.7
750	780	25.0	25.8	83.9	0.2	109.9
780	810	26.0	24.9	82.5	0.2	107.5
810	840	27.0	24.1	81.1	0.2	105.4
840	870	28.0	23.4	80.0	0.2	103.6
870	900	29.0	22.8	79.0	0.2	101.9
900	930	30.0	22.3	78.0	0.2	100.5
930	960	31.0	21.8	77.2	0.2	99.2
960	990	32.0	21.4	76.5	0.2	98.1
990	1020	33.0	21.0	75.9	0.2	97.0
1020	1050	34.0	20.6	75.3	0.2	96.1
1050	1080	35.0	20.3	74.8	0.2	95.3
1080	1110	36.0	20.1	74.3	0.2	94.5
1110	1140	37.0	19.8	73.9	0.2	93.8
1140	1170	38.0	19.6	73.5	0.2	93.2
1170	1200	39.0	19.4	73.1	0.2	92.7
		Salinity (mg/L)	*25014*	*35070*	*5832*	*-*

TASK 1 SCENARIO 2 DETAILED SALT LOAD

			Modelled salt load (t/d)			
Start day	Stop day	Month	Zone 1 (West)	Zone 2 (East)	Zone 3 (South)	Total
0	30	0.0	17.1	70.6	0.2	87.9
30	60	1.0	17.1	70.5	0.2	87.8
60	90	2.0	17.1	70.4	0.2	87.7
90	95	3.0	0.0	0.0	0.2	0.2
95	100	3.2	0.0	0.0	0.2	0.2
100	105	3.3	0.0	0.0	0.2	0.2
105	110	3.5	0.0	0.0	0.2	0.2
110	115	3.7	0.0	0.0	0.3	0.3
115	120	3.8	0.0	0.0	0.3	0.3
120	125	4.0	0.0	0.0	0.3	0.3
125	130	4.2	0.0	0.0	0.3	0.3
130	135	4.3	0.0	0.0	0.3	0.3
135	140	4.5	0.0	0.0	0.3	0.3
140	145	4.7	0.0	0.0	0.3	0.3
145	150	4.8	0.0	0.0	0.3	0.3
150	155	5.0	189.9	315.6	30.6	536.2
155	160	5.2	172.2	291.6	11.2	475.0
160	165	5.3	159.8	274.7	5.0	439.5
165	170	5.5	150.1	261.3	2.5	413.8
170	175	5.7	142.1	250.1	1.3	393.5
175	180	5.8	135.4	240.4	0.9	376.7
180	185	6.0	129.5	231.9	0.6	362.0
185	190	6.2	124.1	224.2	0.5	348.9
190	195	6.3	119.3	217.3	0.4	337.0
195	200	6.5	114.9	210.9	0.4	326.2
200	205	6.7	110.9	205.0	0.3	316.3
205	210	6.8	107.1	199.6	0.3	307.1
210	215	7.0	103.6	194.6	0.3	298.5
215	220	7.2	100.4	189.9	0.3	290.5
220	225	7.3	97.4	185.5	0.3	283.1
225	230	7.5	94.6	181.3	0.3	276.1
230	235	7.7	91.9	177.4	0.3	269.6
235	240	7.8	89.4	173.8	0.3	263.4
240	245	8.0	87.0	170.3	0.3	257.5
245	250	8.2	84.7	167.0	0.3	252.0
250	255	8.3	82.6	163.9	0.2	246.7
255	260	8.5	80.5	160.9	0.2	241.7
260	265	8.7	78.5	158.1	0.2	236.9
265	270	8.8	76.7	155.4	0.2	232.3
270	275	9.0	74.9	152.8	0.2	227.9
275	280	9.2	73.1	150.4	0.2	223.8
280	285	9.3	71.5	148.0	0.2	219.8
285	290	9.5	69.9	145.8	0.2	215.9
290	295	9.7	68.4	143.6	0.2	212.3
295	300	9.8	66.9	141.6	0.2	208.7
300	305	10.0	65.5	139.6	0.2	205.3
305	310	10.2	64.1	137.7	0.2	202.0
310	315	10.3	62.8	135.8	0.2	198.9
315	320	10.5	61.6	134.1	0.2	195.9
320	325	10.7	60.3	132.4	0.2	192.9
325	330	10.8	59.2	130.7	0.2	190.1
330	335	11.0	58.0	129.2	0.2	187.4
335	340	11.2	56.9	127.6	0.2	184.8
340	345	11.3	55.8	126.2	0.2	182.2
345	350	11.5	54.8	124.8	0.2	179.8
350	355	11.7	53.8	123.4	0.2	177.4
355	360	11.8	52.8	122.1	0.2	175.1
360	365	12.0	51.9	120.8	0.2	172.9
		Salinity (mg/L)	*25014*	*35070*	*5832*	*-*

Start day	Stop day	Month	Modelled salt load (t/d)			
			Zone 1 (West)	Zone 2 (East)	Zone 3 (South)	Total
365	370	12.2	51.0	119.6	0.2	170.8
370	375	12.3	50.1	118.4	0.2	168.7
375	380	12.5	49.3	117.2	0.2	166.7
380	385	12.7	48.5	116.1	0.2	164.8
385	390	12.8	47.7	115.0	0.2	162.9
390	395	13.0	46.9	113.9	0.2	161.0
395	400	13.2	46.2	112.9	0.2	159.3
400	405	13.3	45.4	111.9	0.2	157.5
405	410	13.5	44.7	110.9	0.2	155.9
410	415	13.7	44.0	110.0	0.2	154.2
415	420	13.8	43.4	109.1	0.2	152.7
420	425	14.0	42.7	108.2	0.2	151.1
425	430	14.2	42.1	107.3	0.2	149.6
430	435	14.3	41.5	106.5	0.2	148.2
435	440	14.5	40.9	105.7	0.2	146.8
440	445	14.7	40.3	104.9	0.2	145.4
445	450	14.8	39.7	104.1	0.2	144.1
450	455	15.0	39.2	103.4	0.2	142.8
455	460	15.2	38.7	102.6	0.2	141.5
460	465	15.3	38.1	101.9	0.2	140.3
465	470	15.5	37.6	101.2	0.2	139.1
470	475	15.7	37.2	100.5	0.2	137.9
475	480	15.8	36.7	99.9	0.2	136.8
480	485	16.0	36.2	99.2	0.2	135.7
485	490	16.2	35.8	98.6	0.2	134.6
490	495	16.3	35.3	98.0	0.2	133.6
495	500	16.5	34.9	97.4	0.2	132.5
500	505	16.7	34.5	96.8	0.2	131.5
505	510	16.8	34.1	96.3	0.2	130.6
510	515	17.0	33.7	95.7	0.2	129.6
515	520	17.2	33.3	95.2	0.2	128.7
520	525	17.3	33.0	94.6	0.2	127.8
525	530	17.5	32.6	94.1	0.2	126.9
530	535	17.7	32.3	93.6	0.2	126.1
535	540	17.8	31.9	93.1	0.2	125.3
540	550	18.0	31.3	92.2	0.2	123.7
550	570	18.3	30.1	90.4	0.2	120.7
570	600	19.0	28.6	88.1	0.2	116.8
600	630	20.0	27.2	86.0	0.2	113.4
630	660	21.0	26.1	84.2	0.2	110.4
660	690	22.0	25.1	82.6	0.2	107.8
690	720	23.0	24.2	81.2	0.2	105.6
720	750	24.0	23.5	79.9	0.2	103.6
750	780	25.0	22.8	78.9	0.2	101.9
780	810	26.0	22.2	77.9	0.2	100.3
810	840	27.0	21.7	77.1	0.2	99.0
840	870	28.0	21.3	76.3	0.2	97.8
870	900	29.0	20.9	75.7	0.2	96.7
900	930	30.0	20.5	75.1	0.2	95.8
930	960	31.0	20.2	74.5	0.2	94.9
960	990	32.0	19.9	74.0	0.2	94.2
990	1020	33.0	19.7	73.6	0.2	93.5
1020	1050	34.0	19.5	73.2	0.2	92.9
1050	1080	35.0	19.3	72.9	0.2	92.3
1080	1110	36.0	19.1	72.6	0.2	91.8
1110	1140	37.0	18.9	72.3	0.2	91.4
1140	1170	38.0	18.8	72.0	0.2	91.0
1170	1200	39.0	18.7	71.8	0.2	90.6
		Salinity (mg/L)	*25014*	*35070*	*5832*	*-*

TASK 1 SCENARIO 3 DETAILED SALT LOAD

Start day	Stop day	Month	Modelled salt load (t/d)			
			Zone 1 (West)	Zone 2 (East)	Zone 3 (South)	Total
0	30	0.0	17.1	70.6	0.2	87.9
30	60	1.0	17.1	70.5	0.2	87.8
60	90	2.0	17.1	70.4	0.2	87.7
90	95	3.0	0.0	0.0	0.2	0.2
95	100	3.2	0.0	0.0	0.2	0.2
100	105	3.3	0.0	0.0	0.2	0.2
105	110	3.5	0.0	0.0	0.2	0.2
110	115	3.7	0.0	0.0	0.3	0.3
115	120	3.8	0.0	0.0	0.3	0.3
120	125	4.0	0.0	0.0	0.3	0.3
125	130	4.2	0.0	0.0	0.3	0.3
130	135	4.3	0.0	0.0	0.3	0.3
135	140	4.5	0.0	0.0	0.3	0.3
140	145	4.7	0.0	0.0	0.3	0.3
145	150	4.8	0.0	0.0	0.3	0.3
150	155	5.0	0.0	0.0	0.3	0.3
155	160	5.2	0.0	0.0	0.3	0.3
160	165	5.3	0.0	0.0	0.3	0.3
165	170	5.5	0.0	0.0	0.4	0.4
170	175	5.7	0.0	0.0	0.4	0.4
175	180	5.8	0.0	0.0	0.4	0.4
180	185	6.0	0.0	0.0	0.4	0.4
185	190	6.2	0.0	0.0	0.5	0.5
190	195	6.3	0.0	0.0	0.5	0.5
195	200	6.5	0.0	0.0	0.5	0.5
200	205	6.7	0.0	0.0	0.5	0.5
205	210	6.8	0.0	0.0	0.6	0.6
210	215	7.0	282.6	437.8	37.4	757.8
215	220	7.2	261.3	408.3	16.2	685.8
220	225	7.3	245.5	386.5	9.3	641.3
225	230	7.5	232.4	368.8	6.0	607.1
230	235	7.7	221.0	353.5	4.1	578.6
235	240	7.8	211.0	340.0	2.9	553.9
240	245	8.0	201.9	327.9	2.1	531.9
245	250	8.2	193.6	316.8	1.7	512.1
250	255	8.3	186.0	306.7	1.4	494.0
255	260	8.5	178.9	297.2	1.1	477.3
260	265	8.7	172.3	288.5	1.0	461.8
265	270	8.8	166.2	280.3	0.8	447.4
270	275	9.0	160.4	272.7	0.7	433.9
275	280	9.2	155.1	265.5	0.7	421.2
280	285	9.3	150.0	258.7	0.6	409.3
285	290	9.5	145.2	252.3	0.6	398.1
290	295	9.7	140.7	246.2	0.5	387.5
295	300	9.8	136.5	240.4	0.5	377.4
300	305	10.0	132.4	234.9	0.5	367.8
305	310	10.2	128.5	229.7	0.5	358.7
310	315	10.3	124.9	224.7	0.4	350.1
315	320	10.5	121.4	220.0	0.4	341.8
320	325	10.7	118.0	215.5	0.4	333.9
325	330	10.8	114.8	211.2	0.4	326.4
330	335	11.0	111.8	207.0	0.4	319.2
335	340	11.2	108.9	203.1	0.4	312.3
340	345	11.3	106.1	199.3	0.4	305.7
345	350	11.5	103.4	195.6	0.4	299.4
350	355	11.7	100.9	192.1	0.3	293.3
355	360	11.8	98.5	188.7	0.3	287.5
360	365	12.0	96.1	185.5	0.3	282.0
		Salinity (mg/L)	*25014*	*35070*	*5832*	*-*

Start day	Stop day	Month	Modelled salt load (t/d)			
			Zone 1 (West)	Zone 2 (East)	Zone 3 (South)	Total
365	370	12.2	93.9	182.4	0.3	276.6
370	375	12.3	91.8	179.4	0.3	271.5
375	380	12.5	89.7	176.5	0.3	266.5
380	385	12.7	87.8	173.7	0.3	261.8
385	390	12.8	85.9	171.0	0.3	257.2
390	395	13.0	84.0	168.4	0.3	252.7
395	400	13.2	82.3	165.9	0.3	248.4
400	405	13.3	80.6	163.4	0.3	244.3
405	410	13.5	78.9	161.1	0.3	240.3
410	415	13.7	77.3	158.8	0.3	236.4
415	420	13.8	75.8	156.7	0.3	232.7
420	425	14.0	74.3	154.5	0.3	229.1
425	430	14.2	72.8	152.5	0.3	225.6
430	435	14.3	71.4	150.5	0.3	222.2
435	440	14.5	70.1	148.6	0.3	218.9
440	445	14.7	68.7	146.7	0.3	215.7
445	450	14.8	67.5	144.9	0.3	212.6
450	455	15.0	66.2	143.2	0.3	209.7
455	460	15.2	65.0	141.5	0.3	206.8
460	465	15.3	63.9	139.8	0.3	203.9
465	470	15.5	62.7	138.2	0.3	201.2
470	475	15.7	61.6	136.7	0.3	198.6
475	480	15.8	60.6	135.2	0.2	196.0
480	485	16.0	59.5	133.7	0.2	193.5
485	490	16.2	58.5	132.3	0.2	191.1
490	495	16.3	57.6	130.9	0.2	188.7
495	500	16.5	56.6	129.5	0.2	186.4
500	505	16.7	55.7	128.2	0.2	184.2
505	510	16.8	54.8	127.0	0.2	182.0
510	515	17.0	53.9	125.7	0.2	179.9
515	520	17.2	53.1	124.5	0.2	177.8
520	525	17.3	52.2	123.4	0.2	175.8
525	530	17.5	51.4	122.2	0.2	173.9
530	535	17.7	50.6	121.1	0.2	172.0
535	540	17.8	49.9	120.0	0.2	170.1
540	550	18.0	48.4	117.9	0.2	166.6
550	570	18.3	45.7	114.1	0.2	160.0
570	600	19.0	42.2	109.0	0.2	151.4
600	630	20.0	39.1	104.5	0.2	143.9
630	660	21.0	36.5	100.7	0.2	137.4
660	690	22.0	34.2	97.3	0.2	131.7
690	720	23.0	32.2	94.3	0.2	126.8
720	750	24.0	30.5	91.7	0.2	122.4
750	780	25.0	29.0	89.4	0.2	118.6
780	810	26.0	27.8	87.3	0.2	115.3
810	840	27.0	26.7	85.5	0.2	112.4
840	870	28.0	25.7	83.9	0.2	109.8
870	900	29.0	24.8	82.5	0.2	107.5
900	930	30.0	24.1	81.2	0.2	105.4
930	960	31.0	23.4	80.1	0.2	103.7
960	990	32.0	22.8	79.1	0.2	102.1
990	1020	33.0	22.3	78.2	0.2	100.7
1020	1050	34.0	21.8	77.4	0.2	99.4
1050	1080	35.0	21.4	76.7	0.2	98.3
1080	1110	36.0	21.1	76.1	0.2	97.3
1110	1140	37.0	20.7	75.5	0.2	96.4
1140	1170	38.0	20.4	75.0	0.2	95.6
1170	1200	39.0	20.2	74.5	0.2	94.9
		Salinity (mg/L)	*25014*	*35070*	*5832*	*-*

TASK 2 SCENARIO 2 DETAILED SALT LOAD

Start day	Stop day	Month	Modelled salt load (t/d)			
			Zone 1 (West)	Zone 2 (East)	Zone 3 (South)	Total
0	30	0.0	17.1	70.6	0.2	87.9
30	60	1.0	17.1	70.5	0.2	87.8
60	90	2.0	17.1	70.4	0.2	87.7
90	95	3.0	0.0	0.0	0.2	0.2
95	100	3.2	0.0	0.0	0.3	0.3
100	105	3.3	0.0	0.0	0.3	0.3
105	110	3.5	0.0	0.0	0.3	0.3
110	115	3.7	0.0	0.0	0.3	0.3
115	120	3.8	0.0	0.0	0.3	0.3
120	125	4.0	0.0	0.0	0.4	0.4
125	130	4.2	0.0	0.0	0.4	0.4
130	135	4.3	0.0	0.0	0.4	0.4
135	140	4.5	0.0	0.0	0.4	0.4
140	145	4.7	0.0	0.0	0.4	0.4
145	150	4.8	0.0	0.0	0.4	0.4
150	155	5.0	0.0	0.0	0.4	0.4
155	160	5.2	0.0	0.0	0.4	0.4
160	165	5.3	0.0	0.0	0.4	0.4
165	170	5.5	0.0	0.0	0.4	0.4
170	175	5.7	0.0	0.0	0.4	0.4
175	180	5.8	0.0	0.0	0.4	0.4
180	185	6.0	147.9	263.2	0.2	411.3
185	190	6.2	134.1	245.8	0.2	380.1
190	195	6.3	124.6	233.4	0.2	358.2
195	200	6.5	117.1	223.4	0.2	340.7
200	205	6.7	111.0	215.0	0.2	326.1
205	210	6.8	105.7	207.6	0.2	313.4
210	215	7.0	101.0	201.0	0.2	302.2
215	220	7.2	96.9	195.1	0.2	292.1
220	225	7.3	93.1	189.6	0.2	282.9
225	230	7.5	89.7	184.6	0.2	274.5
230	235	7.7	86.6	180.0	0.2	266.8
235	240	7.8	83.8	175.8	0.2	259.7
240	245	8.0	81.1	171.8	0.2	253.1
245	250	8.2	78.7	168.1	0.2	246.9
250	255	8.3	76.4	164.6	0.2	241.2
255	260	8.5	74.3	161.3	0.2	235.7
260	265	8.7	72.2	158.2	0.2	230.6
265	270	8.8	70.3	155.2	0.2	225.7
270	275	9.0	68.5	152.4	0.2	221.1
275	280	9.2	66.8	149.8	0.2	216.7
280	285	9.3	65.2	147.2	0.2	212.6
285	290	9.5	63.6	144.8	0.2	208.6
290	295	9.7	62.1	142.6	0.2	204.9
295	300	9.8	60.7	140.4	0.2	201.3
300	305	10.0	59.3	138.3	0.2	197.8
305	310	10.2	58.0	136.3	0.2	194.5
310	315	10.3	56.8	134.4	0.2	191.3
315	320	10.5	55.6	132.5	0.2	188.3
320	325	10.7	54.4	130.8	0.2	185.4
325	330	10.8	53.3	129.1	0.2	182.6
330	335	11.0	52.2	127.5	0.2	179.9
335	340	11.2	51.2	125.9	0.2	177.3
340	345	11.3	50.2	124.4	0.2	174.8
345	350	11.5	49.3	123.0	0.2	172.5
350	355	11.7	48.4	121.6	0.2	170.2
355	360	11.8	47.5	120.3	0.2	167.9
360	365	12.0	46.6	119.0	0.2	165.8
		Salinity (mg/L)	*25014*	*35070*	*5832*	*-*

Start day	Stop day	Month	Modelled salt load (t/d)			
			Zone 1 (West)	Zone 2 (East)	Zone 3 (South)	Total
365	370	12.2	45.8	117.7	0.2	163.7
370	375	12.3	45.0	116.5	0.2	161.7
375	380	12.5	44.3	115.4	0.2	159.8
380	385	12.7	43.5	114.2	0.2	158.0
385	390	12.8	42.8	113.2	0.2	156.2
390	395	13.0	42.1	112.1	0.2	154.4
395	400	13.2	41.4	111.1	0.2	152.7
400	405	13.3	40.8	110.1	0.2	151.1
405	410	13.5	40.2	109.1	0.2	149.5
410	415	13.7	39.5	108.2	0.2	147.9
415	420	13.8	38.9	107.3	0.2	146.4
420	425	14.0	38.4	106.4	0.2	145.0
425	430	14.2	37.8	105.6	0.2	143.6
430	435	14.3	37.3	104.8	0.2	142.2
435	440	14.5	36.8	104.0	0.2	140.9
440	445	14.7	36.3	103.2	0.2	139.6
445	450	14.8	35.8	102.4	0.2	138.4
450	455	15.0	35.3	101.7	0.2	137.2
455	460	15.2	34.8	101.0	0.2	136.0
460	465	15.3	34.4	100.3	0.2	134.9
465	470	15.5	34.0	99.6	0.2	133.8
470	475	15.7	33.6	98.9	0.2	132.7
475	480	15.8	33.2	98.3	0.2	131.7
480	485	16.0	32.8	97.7	0.2	130.7
485	490	16.2	32.4	97.1	0.2	129.7
490	495	16.3	32.0	96.5	0.2	128.7
495	500	16.5	31.7	95.9	0.2	127.8
500	505	16.7	31.3	95.3	0.2	126.9
505	510	16.8	31.0	94.8	0.2	126.0
510	515	17.0	30.7	94.3	0.2	125.1
515	520	17.2	30.4	93.7	0.2	124.3
520	525	17.3	30.1	93.2	0.2	123.5
525	530	17.5	29.8	92.7	0.2	122.7
530	535	17.7	29.5	92.2	0.2	121.9
535	540	17.8	29.2	91.8	0.2	121.2
540	550	18.0	28.7	90.9	0.2	119.7
550	570	18.3	27.7	89.2	0.2	117.0
570	600	19.0	26.4	86.9	0.2	113.5
600	630	20.0	25.3	84.9	0.2	110.4
630	660	21.0	24.3	83.2	0.2	107.7
660	690	22.0	23.5	81.7	0.2	105.4
690	720	23.0	22.8	80.4	0.2	103.4
720	750	24.0	22.2	79.2	0.2	101.6
750	780	25.0	21.7	78.2	0.2	100.0
780	810	26.0	21.2	77.3	0.2	98.7
810	840	27.0	20.8	76.5	0.2	97.5
840	870	28.0	20.4	75.8	0.2	96.4
870	900	29.0	20.1	75.2	0.2	95.4
900	930	30.0	19.8	74.6	0.2	94.6
930	960	31.0	19.5	74.1	0.2	93.8
960	990	32.0	19.3	73.7	0.2	93.2
990	1020	33.0	19.1	73.3	0.2	92.6
1020	1050	34.0	18.9	72.9	0.2	92.0
1050	1080	35.0	18.8	72.6	0.2	91.5
1080	1110	36.0	18.6	72.3	0.2	91.1
1110	1140	37.0	18.5	72.0	0.2	90.7
1140	1170	38.0	18.4	71.8	0.2	90.3
1170	1200	39.0	18.3	71.5	0.2	90.0
		Salinity (mg/L)	*25014*	*35070*	*5832*	*-*

TASK 2 SCENARIO 3 DETAILED SALT LOAD

Start day	Stop day	Month	Modelled salt load (t/d)			
			Zone 1 (West)	Zone 2 (East)	Zone 3 (South)	Total
0	30	0.0	17.1	70.6	0.2	87.9
30	60	1.0	17.1	70.5	0.2	87.8
60	90	2.0	17.1	70.4	0.2	87.7
90	95	3.0	0.0	3.7	70.2	73.9
95	100	3.2	0.0	3.9	40.9	44.8
100	105	3.3	0.0	4.4	31.5	35.9
105	110	3.5	0.0	5.1	26.9	32.0
110	115	3.7	0.0	5.9	23.9	29.8
115	120	3.8	0.0	6.7	21.7	28.4
120	125	4.0	0.0	7.5	19.9	27.4
125	130	4.2	0.0	8.2	18.5	26.7
130	135	4.3	0.0	8.9	17.3	26.2
135	140	4.5	0.0	9.6	16.2	25.8
140	145	4.7	0.0	10.2	15.3	25.5
145	150	4.8	0.0	10.8	14.5	25.3
150	155	5.0	0.0	11.4	13.8	25.2
155	160	5.2	0.0	11.9	13.1	25.0
160	165	5.3	0.0	12.5	12.5	25.0
165	170	5.5	0.0	12.9	12.0	24.9
170	175	5.7	0.0	13.4	11.5	24.9
175	180	5.8	0.0	13.9	11.0	24.9
180	185	6.0	89.2	159.7	0.1	249.0
185	190	6.2	80.4	150.1	0.1	230.6
190	195	6.3	74.5	143.3	0.1	218.0
195	200	6.5	70.1	138.1	0.1	208.3
200	205	6.7	66.5	133.7	0.1	200.4
205	210	6.8	63.5	130.0	0.2	193.7
210	215	7.0	60.9	126.7	0.2	187.8
215	220	7.2	58.7	123.8	0.2	182.6
220	225	7.3	56.6	121.2	0.2	178.0
225	230	7.5	54.8	118.8	0.2	173.8
230	235	7.7	53.1	116.7	0.2	169.9
235	240	7.8	51.5	114.7	0.2	166.3
240	245	8.0	50.1	112.8	0.2	163.0
245	250	8.2	48.7	111.1	0.2	160.0
250	255	8.3	47.5	109.5	0.2	157.1
255	260	8.5	46.3	108.0	0.2	154.5
260	265	8.7	45.2	106.6	0.2	151.9
265	270	8.8	44.1	105.3	0.2	149.6
270	275	9.0	43.1	104.0	0.2	147.3
275	280	9.2	42.2	102.8	0.2	145.2
280	285	9.3	41.3	101.7	0.2	143.2
285	290	9.5	40.4	100.7	0.2	141.3
290	295	9.7	39.6	99.7	0.2	139.5
295	300	9.8	38.8	98.7	0.2	137.7
300	305	10.0	38.1	97.8	0.2	136.1
305	310	10.2	37.4	97.0	0.2	134.5
310	315	10.3	36.7	96.1	0.2	133.0
315	320	10.5	36.1	95.3	0.2	131.6
320	325	10.7	35.5	94.6	0.2	130.3
325	330	10.8	34.9	93.9	0.2	129.0
330	335	11.0	34.4	93.2	0.2	127.7
335	340	11.2	33.8	92.5	0.2	126.5
340	345	11.3	33.3	91.9	0.2	125.4
345	350	11.5	32.9	91.2	0.2	124.3
350	355	11.7	32.4	90.6	0.2	123.2
355	360	11.8	32.0	90.1	0.2	122.2
360	365	12.0	31.5	89.5	0.2	121.2
		Salinity (mg/L)	*25014*	*35070*	*5832*	*-*

Start day	Stop day	Month	Modelled salt load (t/d)			
			Zone 1 (West)	Zone 2 (East)	Zone 3 (South)	Total
365	370	12.2	31.1	89.0	0.2	120.3
370	375	12.3	30.7	88.5	0.2	119.4
375	380	12.5	30.4	88.0	0.2	118.5
380	385	12.7	30.0	87.5	0.2	117.7
385	390	12.8	29.6	87.0	0.2	116.9
390	395	13.0	29.3	86.6	0.2	116.1
395	400	13.2	29.0	86.2	0.2	115.3
400	405	13.3	28.7	85.7	0.2	114.6
405	410	13.5	28.3	85.3	0.2	113.8
410	415	13.7	28.0	84.9	0.2	113.2
415	420	13.8	27.8	84.6	0.2	112.5
420	425	14.0	27.5	84.2	0.2	111.8
425	430	14.2	27.2	83.8	0.2	111.2
430	435	14.3	27.0	83.5	0.2	110.6
435	440	14.5	26.7	83.1	0.2	110.0
440	445	14.7	26.5	82.8	0.2	109.5
445	450	14.8	26.2	82.5	0.2	108.9
450	455	15.0	26.0	82.2	0.2	108.4
455	460	15.2	25.8	81.9	0.2	107.8
460	465	15.3	25.6	81.6	0.2	107.3
465	470	15.5	25.4	81.3	0.2	106.9
470	475	15.7	25.2	81.1	0.2	106.4
475	480	15.8	25.0	80.8	0.2	105.9
480	485	16.0	24.8	80.5	0.2	105.5
485	490	16.2	24.6	80.3	0.2	105.0
490	495	16.3	24.4	80.0	0.2	104.6
495	500	16.5	24.2	79.8	0.2	104.2
500	505	16.7	24.1	79.6	0.2	103.8
505	510	16.8	23.9	79.3	0.2	103.4
510	515	17.0	23.7	79.1	0.2	103.1
515	520	17.2	23.6	78.9	0.2	102.7
520	525	17.3	23.4	78.7	0.2	102.3
525	530	17.5	23.3	78.5	0.2	102.0
530	535	17.7	23.2	78.3	0.2	101.6
535	540	17.8	23.0	78.1	0.2	101.3
540	550	18.0	22.7	77.8	0.2	100.7
550	570	18.3	22.3	77.1	0.2	99.5
570	600	19.0	21.6	76.2	0.2	98.0
600	630	20.0	21.1	75.4	0.2	96.7
630	660	21.0	20.6	74.8	0.2	95.5
660	690	22.0	20.2	74.2	0.2	94.5
690	720	23.0	19.8	73.6	0.2	93.7
720	750	24.0	19.5	73.2	0.2	92.9
750	780	25.0	19.3	72.8	0.2	92.2
780	810	26.0	19.0	72.4	0.2	91.6
810	840	27.0	18.8	72.1	0.2	91.1
840	870	28.0	18.7	71.8	0.2	90.6
870	900	29.0	18.5	71.5	0.2	90.2
900	930	30.0	18.4	71.3	0.2	89.8
930	960	31.0	18.2	71.1	0.2	89.5
960	990	32.0	18.1	70.9	0.2	89.2
990	1020	33.0	18.0	70.7	0.2	88.9
1020	1050	34.0	17.9	70.6	0.2	88.7
1050	1080	35.0	17.9	70.4	0.2	88.4
1080	1110	36.0	17.8	70.3	0.2	88.2
1110	1140	37.0	17.7	70.2	0.2	88.1
1140	1170	38.0	17.7	70.1	0.2	87.9
1170	1200	39.0	17.6	70.0	0.2	87.7
		Salinity (mg/L)	*25014*	*35070*	*5832*	*-*

TASK 3 SCENARIO 2 DETAILED SALT LOAD

Start day	Stop day	Month	Modelled salt load (t/d)			
			Zone 1 (West)	Zone 2 (East)	Zone 3 (South)	Total
0	30	0.0	17.1	70.6	0.2	87.9
30	60	1.0	17.1	70.5	0.2	87.8
60	90	2.0	17.1	70.4	0.2	87.7
90	95	3.0	0.0	0.0	0.2	0.2
95	100	3.2	0.0	0.0	0.3	0.3
100	105	3.3	0.0	0.0	0.3	0.3
105	110	3.5	0.0	0.0	0.3	0.3
110	115	3.7	0.0	0.0	0.3	0.3
115	120	3.8	0.0	0.0	0.3	0.3
120	125	4.0	0.0	0.0	0.3	0.3
125	130	4.2	0.0	0.0	0.3	0.3
130	135	4.3	0.0	0.0	0.3	0.3
135	140	4.5	0.0	0.0	0.4	0.4
140	145	4.7	0.0	0.0	0.4	0.4
145	150	4.8	0.0	0.0	0.4	0.4
150	155	5.0	0.0	0.0	0.4	0.4
155	160	5.2	0.0	0.0	0.4	0.4
160	165	5.3	0.0	0.0	0.4	0.4
165	170	5.5	0.0	0.0	0.5	0.5
170	175	5.7	0.0	0.0	0.5	0.5
175	180	5.8	0.0	0.0	0.5	0.5
180	185	6.0	0.0	0.0	1.0	1.0
185	190	6.2	0.0	1.1	1.4	2.5
190	195	6.3	0.5	23.3	1.4	25.2
195	200	6.5	10.6	93.8	3.4	107.7
200	205	6.7	48.8	185.4	7.4	241.6
205	210	6.8	102.3	244.9	12.1	359.3
210	215	7.0	152.4	287.7	8.6	448.6
215	220	7.2	189.9	292.0	5.6	487.5
220	225	7.3	202.6	328.8	2.7	534.1
225	230	7.5	192.4	315.0	1.6	509.0
230	235	7.7	183.6	303.3	1.1	488.0
235	240	7.8	175.8	292.9	0.8	469.4
240	245	8.0	168.6	283.5	0.6	452.7
245	250	8.2	162.1	274.8	0.5	437.4
250	255	8.3	156.0	266.8	0.4	423.2
255	260	8.5	150.5	259.4	0.3	410.2
260	265	8.7	145.3	252.4	0.3	398.0
265	270	8.8	140.4	245.9	0.2	386.5
270	275	9.0	135.8	239.7	0.2	375.8
275	280	9.2	131.5	233.9	0.2	365.6
280	285	9.3	127.5	228.4	0.1	356.0
285	290	9.5	123.6	223.2	0.1	346.9
290	295	9.7	119.9	218.2	0.1	338.3
295	300	9.8	116.5	213.5	0.1	330.1
300	305	10.0	113.2	209.1	0.1	322.3
305	310	10.2	110.0	204.8	0.1	314.9
310	315	10.3	107.1	200.7	0.1	307.8
315	320	10.5	104.2	196.8	0.1	301.1
320	325	10.7	101.5	193.1	0.0	294.6
325	330	10.8	98.9	189.5	0.0	288.5
330	335	11.0	96.5	186.1	0.0	282.6
335	340	11.2	94.1	182.8	0.0	277.0
340	345	11.3	91.9	179.7	0.0	271.6
345	350	11.5	89.8	176.7	0.0	266.5
350	355	11.7	87.7	173.8	0.0	261.5
355	360	11.8	85.7	171.0	0.0	256.7
360	365	12.0	83.8	168.3	0.0	252.1
		Salinity (mg/L)	*25014*	*35070*	*5832*	*-*

Start day	Stop day	Month	Modelled salt load (t/d)			
			Zone 1 (West)	Zone 2 (East)	Zone 3 (South)	Total
365	370	12.2	82.0	165.7	0.0	247.6
370	375	12.3	80.2	163.2	0.0	243.4
375	380	12.5	78.5	160.7	0.0	239.2
380	385	12.7	76.8	158.4	0.0	235.3
385	390	12.8	75.2	156.2	0.0	231.4
390	395	13.0	73.7	154.0	0.0	227.7
395	400	13.2	72.2	151.9	0.0	224.1
400	405	13.3	70.8	149.9	0.0	220.7
405	410	13.5	69.4	147.9	0.0	217.3
410	415	13.7	68.0	146.0	0.0	214.1
415	420	13.8	66.7	144.2	0.0	210.9
420	425	14.0	65.5	142.4	0.0	207.9
425	430	14.2	64.3	140.7	0.0	204.9
430	435	14.3	63.1	139.0	0.0	202.1
435	440	14.5	61.9	137.4	0.0	199.3
440	445	14.7	60.8	135.8	0.0	196.6
445	450	14.8	59.7	134.3	0.0	194.0
450	455	15.0	58.7	132.8	0.0	191.5
455	460	15.2	57.6	131.4	0.0	189.0
460	465	15.3	56.7	130.0	0.0	186.6
465	470	15.5	55.7	128.6	0.0	184.3
470	475	15.7	54.8	127.3	0.0	182.1
475	480	15.8	53.9	126.0	0.0	179.9
480	485	16.0	53.0	124.8	0.0	177.8
485	490	16.2	52.1	123.6	0.0	175.7
490	495	16.3	51.3	122.4	0.0	173.7
495	500	16.5	50.5	121.3	0.0	171.7
500	505	16.7	49.7	120.1	0.0	169.8
505	510	16.8	48.9	119.1	0.0	168.0
510	515	17.0	48.2	118.0	0.0	166.2
515	520	17.2	47.4	117.0	0.0	164.4
520	525	17.3	46.7	116.0	0.0	162.7
525	530	17.5	46.1	115.0	0.0	161.0
530	535	17.7	45.4	114.0	0.0	159.4
535	540	17.8	44.8	113.1	0.0	157.9
540	550	18.0	43.5	111.3	0.0	154.8
550	570	18.3	41.2	108.0	0.0	149.2
570	600	19.0	38.2	103.6	0.0	141.8
600	630	20.0	35.6	99.8	0.0	135.4
630	660	21.0	33.3	96.5	0.0	129.8
660	690	22.0	31.4	93.5	0.0	125.0
690	720	23.0	29.8	91.0	0.0	120.7
720	750	24.0	28.3	88.7	0.0	117.0
750	780	25.0	27.1	86.7	0.0	113.8
780	810	26.0	26.0	84.9	0.0	110.9
810	840	27.0	25.1	83.3	0.0	108.4
840	870	28.0	24.2	81.9	0.0	106.2
870	900	29.0	23.5	80.7	0.0	104.2
900	930	30.0	22.9	79.6	0.0	102.5
930	960	31.0	22.3	78.7	0.0	101.0
960	990	32.0	21.8	77.8	0.0	99.6
990	1020	33.0	21.4	77.0	0.0	98.4
1020	1050	34.0	21.0	76.3	0.0	97.4
1050	1080	35.0	20.7	75.7	0.0	96.4
1080	1110	36.0	20.4	75.2	0.0	95.5
1110	1140	37.0	20.1	74.7	0.0	94.8
1140	1170	38.0	19.9	74.2	0.0	94.1
1170	1200	39.0	19.6	73.8	0.0	93.4
		Salinity (mg/L)	*25014*	*35070*	*5832*	*-*

TASK 3 SCENARIO 3 DETAILED SALT LOAD

Start day	Stop day	Month	Modelled salt load (t/d)			
			Zone 1 (West)	Zone 2 (East)	Zone 3 (South)	Total
0	30	0.0	17.1	70.6	0.2	87.9
30	60	1.0	17.1	70.5	0.2	87.8
60	90	2.0	17.1	70.4	0.2	87.7
90	95	3.0	0.0	0.0	0.2	0.2
95	100	3.2	0.0	0.0	0.3	0.3
100	105	3.3	0.0	0.0	0.3	0.3
105	110	3.5	0.0	0.0	0.3	0.3
110	115	3.7	0.0	0.0	0.3	0.3
115	120	3.8	0.0	0.0	0.3	0.3
120	125	4.0	0.0	0.0	0.3	0.3
125	130	4.2	0.0	0.0	0.3	0.3
130	135	4.3	0.0	0.0	0.3	0.3
135	140	4.5	0.0	0.0	0.4	0.4
140	145	4.7	0.0	0.0	0.4	0.4
145	150	4.8	0.0	0.0	0.4	0.4
150	155	5.0	0.0	0.0	0.4	0.4
155	160	5.2	0.0	0.0	0.4	0.4
160	165	5.3	0.0	0.0	0.4	0.4
165	170	5.5	0.0	0.0	0.5	0.5
170	175	5.7	0.0	0.0	0.5	0.5
175	180	5.8	0.0	0.0	0.5	0.5
180	185	6.0	0.0	0.0	0.7	0.7
185	190	6.2	0.0	0.0	0.9	0.9
190	195	6.3	0.0	1.0	1.1	2.1
195	200	6.5	0.0	7.5	1.2	8.7
200	205	6.7	0.4	21.0	1.4	22.7
205	210	6.8	2.2	48.0	1.5	51.6
210	215	7.0	8.9	87.8	1.7	98.4
215	220	7.2	19.3	133.1	2.1	154.5
220	225	7.3	40.1	175.0	2.9	218.0
225	230	7.5	64.7	204.1	4.0	272.8
230	235	7.7	88.4	228.7	5.5	322.7
235	240	7.8	111.0	248.8	7.3	367.2
240	245	8.0	133.1	266.2	6.2	405.5
245	250	8.2	152.2	270.3	3.7	426.1
250	255	8.3	168.4	265.3	2.8	436.5
255	260	8.5	185.7	305.7	1.2	492.6
260	265	8.7	177.5	294.6	0.8	472.9
265	270	8.8	170.3	285.0	0.6	455.8
270	275	9.0	163.7	276.4	0.5	440.5
275	280	9.2	157.7	268.5	0.4	426.5
280	285	9.3	152.1	261.2	0.3	413.6
285	290	9.5	147.0	254.3	0.3	401.6
290	295	9.7	142.1	247.9	0.2	390.3
295	300	9.8	137.6	241.9	0.2	379.6
300	305	10.0	133.3	236.2	0.2	369.6
305	310	10.2	129.2	230.7	0.1	360.1
310	315	10.3	125.3	225.6	0.1	351.1
315	320	10.5	121.7	220.7	0.1	342.5
320	325	10.7	118.2	216.0	0.1	334.3
325	330	10.8	114.9	211.6	0.1	326.6
330	335	11.0	111.7	207.4	0.1	319.2
335	340	11.2	108.7	203.3	0.1	312.1
340	345	11.3	105.9	199.5	0.1	305.4
345	350	11.5	103.1	195.8	0.1	298.9
350	355	11.7	100.5	192.2	0.0	292.8
355	360	11.8	98.0	188.8	0.0	286.8
360	365	12.0	95.6	185.5	0.0	281.2
		Salinity (mg/L)	*25014*	*35070*	*5832*	*-*

Start day	Stop day	Month	Modelled salt load (t/d)			
			Zone 1 (West)	Zone 2 (East)	Zone 3 (South)	Total
365	370	12.2	93.4	182.3	0.0	275.7
370	375	12.3	91.2	179.3	0.0	270.5
375	380	12.5	89.1	176.4	0.0	265.5
380	385	12.7	87.1	173.6	0.0	260.7
385	390	12.8	85.2	170.8	0.0	256.1
390	395	13.0	83.3	168.2	0.0	251.6
395	400	13.2	81.6	165.7	0.0	247.3
400	405	13.3	79.8	163.2	0.0	243.1
405	410	13.5	78.2	160.9	0.0	239.1
410	415	13.7	76.5	158.6	0.0	235.2
415	420	13.8	75.0	156.4	0.0	231.4
420	425	14.0	73.5	154.3	0.0	227.8
425	430	14.2	72.0	152.2	0.0	224.3
430	435	14.3	70.6	150.2	0.0	220.9
435	440	14.5	69.2	148.3	0.0	217.6
440	445	14.7	67.9	146.4	0.0	214.4
445	450	14.8	66.6	144.6	0.0	211.3
450	455	15.0	65.4	142.9	0.0	208.3
455	460	15.2	64.2	141.2	0.0	205.4
460	465	15.3	63.0	139.5	0.0	202.6
465	470	15.5	61.9	137.9	0.0	199.9
470	475	15.7	60.8	136.4	0.0	197.2
475	480	15.8	59.8	134.9	0.0	194.6
480	485	16.0	58.7	133.4	0.0	192.1
485	490	16.2	57.7	132.0	0.0	189.7
490	495	16.3	56.7	130.6	0.0	187.3
495	500	16.5	55.8	129.2	0.0	185.0
500	505	16.7	54.9	127.9	0.0	182.8
505	510	16.8	54.0	126.7	0.0	180.6
510	515	17.0	53.1	125.4	0.0	178.5
515	520	17.2	52.2	124.2	0.0	176.5
520	525	17.3	51.4	123.1	0.0	174.5
525	530	17.5	50.6	121.9	0.0	172.5
530	535	17.7	49.8	120.8	0.0	170.6
535	540	17.8	49.1	119.7	0.0	168.8
540	550	18.0	47.6	117.6	0.0	165.3
550	570	18.3	45.0	113.8	0.0	158.7
570	600	19.0	41.5	108.7	0.0	150.1
600	630	20.0	38.4	104.3	0.0	142.7
630	660	21.0	35.8	100.4	0.0	136.2
660	690	22.0	33.6	97.1	0.0	130.6
690	720	23.0	31.7	94.1	0.0	125.8
720	750	24.0	30.0	91.5	0.0	121.5
750	780	25.0	28.6	89.2	0.0	117.8
780	810	26.0	27.3	87.1	0.0	114.5
810	840	27.0	26.2	85.3	0.0	111.6
840	870	28.0	25.3	83.7	0.0	109.0
870	900	29.0	24.4	82.3	0.0	106.7
900	930	30.0	23.7	81.1	0.0	104.7
930	960	31.0	23.1	80.0	0.0	103.0
960	990	32.0	22.5	79.0	0.0	101.5
990	1020	33.0	22.0	78.1	0.0	100.1
1020	1050	34.0	21.5	77.3	0.0	98.9
1050	1080	35.0	21.2	76.6	0.0	97.8
1080	1110	36.0	20.8	76.0	0.0	96.8
1110	1140	37.0	20.5	75.4	0.0	95.9
1140	1170	38.0	20.2	74.9	0.0	95.1
1170	1200	39.0	20.0	74.4	0.0	94.4
		Salinity (mg/L)	*25014*	*35070*	*5832*	*-*

TASK 1 FLUX SUMMARY

Start (d)	Stop (d)	Month	Modelled groundwater flux (m³/d)		
			Task 1 Scenario 1	Task 1 Scenario 2	Task 1 Scenario 3
0	30	0.0	2727	2727	2727
30	60	1.0	2724	2724	2724
60	90	2.0	2722	2722	2722
90	95	3.0	34	34	34
95	100	3.2	38	38	38
100	105	3.3	40	40	40
105	110	3.5	42	42	42
110	115	3.7	43	43	43
115	120	3.8	44	44	44
120	125	4.0	45	45	45
125	130	4.2	46	46	46
130	135	4.3	47	47	47
135	140	4.5	48	48	48
140	145	4.7	50	50	50
145	150	4.8	52	52	52
150	155	5.0	54	21842	54
155	160	5.2	56	17116	56
160	165	5.3	59	15074	59
165	170	5.5	63	13870	63
170	175	5.7	66	13044	66
175	180	5.8	70	12417	70
180	185	6.0	26586	11897	75
185	190	6.2	21515	11444	79
190	195	6.3	19240	11040	84
195	200	6.5	17796	10674	89
200	205	6.7	16728	10338	94
205	210	6.8	15884	10029	99
210	215	7.0	15182	9743	30195
215	220	7.2	14575	9477	24869
220	225	7.3	14031	9229	22424
225	230	7.5	13541	8997	20834
230	235	7.7	13093	8779	19614
235	240	7.8	12680	8573	18622
240	245	8.0	12295	8377	17787
245	250	8.2	11935	8192	17059
250	255	8.3	11597	8016	16411
255	260	8.5	11280	7849	15821
260	265	8.7	10980	7689	15280
265	270	8.8	10696	7537	14781
270	275	9.0	10428	7392	14318
275	280	9.2	10174	7252	13886
280	285	9.3	9933	7119	13481
285	290	9.5	9703	6991	13100
290	295	9.7	9485	6869	12740
295	300	9.8	9278	6751	12399
300	305	10.0	9080	6637	12076
305	310	10.2	8891	6528	11769
310	315	10.3	8711	6423	11476
315	320	10.5	8537	6322	11198
320	325	10.7	8371	6225	10933
325	330	10.8	8211	6131	10680
330	335	11.0	8058	6040	10438
335	340	11.2	7910	5953	10207
340	345	11.3	7769	5868	9986
345	350	11.5	7632	5786	9774
350	355	11.7	7500	5707	9571
355	360	11.8	7373	5631	9376
360	365	12.0	7250	5557	9189

Start (d)	Stop (d)	Month	Modelled groundwater flux (m³/d)		
			Task 1 Scenario 1	Task 1 Scenario 2	Task 1 Scenario 3
365	370	12.2	7132	5486	9010
370	375	12.3	7017	5416	8838
375	380	12.5	6907	5349	8673
380	385	12.7	6800	5284	8514
385	390	12.8	6697	5221	8360
390	395	13.0	6597	5160	8212
395	400	13.2	6500	5101	8069
400	405	13.3	6406	5043	7931
405	410	13.5	6316	4987	7798
410	415	13.7	6228	4933	7669
415	420	13.8	6142	4880	7544
420	425	14.0	6060	4829	7423
425	430	14.2	5979	4779	7306
430	435	14.3	5901	4731	7193
435	440	14.5	5826	4683	7083
440	445	14.7	5753	4637	6977
445	450	14.8	5681	4593	6874
450	455	15.0	5612	4549	6774
455	460	15.2	5545	4507	6678
460	465	15.3	5479	4466	6584
465	470	15.5	5415	4426	6493
470	475	15.7	5353	4387	6404
475	480	15.8	5293	4350	6318
480	485	16.0	5235	4313	6235
485	490	16.2	5177	4277	6154
490	495	16.3	5122	4242	6075
495	500	16.5	5068	4208	5999
500	505	16.7	5016	4175	5924
505	510	16.8	4964	4143	5852
510	515	17.0	4915	4111	5781
515	520	17.2	4866	4081	5713
520	525	17.3	4819	4051	5646
525	530	17.5	4773	4022	5581
530	535	17.7	4728	3994	5518
535	540	17.8	4684	3966	5456
540	550	18.0	4600	3914	5337
550	570	18.3	4444	3816	5119
570	600	19.0	4237	3686	4830
600	630	20.0	4059	3572	4582
630	660	21.0	3904	3473	4366
660	690	22.0	3769	3388	4177
690	720	23.0	3652	3314	4013
720	750	24.0	3549	3248	3869
750	780	25.0	3458	3192	3744
780	810	26.0	3378	3141	3634
810	840	27.0	3309	3097	3537
840	870	28.0	3248	3058	3451
870	900	29.0	3194	3022	3375
900	930	30.0	3146	2991	3309
930	960	31.0	3104	2963	3250
960	990	32.0	3066	2938	3198
990	1020	33.0	3032	2916	3152
1020	1050	34.0	3002	2896	3111
1050	1080	35.0	2975	2878	3075
1080	1110	36.0	2950	2861	3042
1110	1140	37.0	2928	2847	3012
1140	1170	38.0	2908	2833	2985
1170	1200	39.0	2890	2821	2961

TASK 2 FLUX SUMMARY

Start (d)	Stop (d)	Month	Modelled groundwater flux (m^3/d)		
			Task 2 Scenario 1	Task 2 Scenario 2	Task 2 Scenario 3
0	30	0.0	2727	2727	2727
30	60	1.0	2724	2724	2724
60	90	2.0	2722	2722	2722
90	95	3.0	34	42	12139
95	100	3.2	38	53	7124
100	105	3.3	40	57	5529
105	110	3.5	42	58	4751
110	115	3.7	43	59	4262
115	120	3.8	44	60	3908
120	125	4.0	45	60	3631
125	130	4.2	46	61	3406
130	135	4.3	47	62	3217
135	140	4.5	48	63	3056
140	145	4.7	50	63	2916
145	150	4.8	52	64	2794
150	155	5.0	54	65	2685
155	160	5.2	56	66	2589
160	165	5.3	59	66	2501
165	170	5.5	63	67	2422
170	175	5.7	66	68	2349
175	180	5.8	70	69	2283
180	185	6.0	26586	13448	8138
185	190	6.2	21515	12403	7513
190	195	6.3	19240	11667	7090
195	200	6.5	17796	11084	6764
200	205	6.7	16728	10596	6498
205	210	6.8	15884	10174	6272
210	215	7.0	15182	9801	6076
215	220	7.2	14575	9465	5903
220	225	7.3	14031	9161	5747
225	230	7.5	13541	8883	5605
230	235	7.7	13093	8628	5476
235	240	7.8	12680	8392	5357
240	245	8.0	12295	8174	5246
245	250	8.2	11935	7970	5144
250	255	8.3	11597	7779	5049
255	260	8.5	11280	7599	4959
260	265	8.7	10980	7429	4874
265	270	8.8	10696	7269	4794
270	275	9.0	10428	7117	4719
275	280	9.2	10174	6973	4648
280	285	9.3	9933	6836	4580
285	290	9.5	9703	6705	4516
290	295	9.7	9485	6580	4455
295	300	9.8	9278	6461	4397
300	305	10.0	9080	6347	4342
305	310	10.2	8891	6238	4289
310	315	10.3	8711	6133	4239
315	320	10.5	8537	6033	4191
320	325	10.7	8371	5937	4146
325	330	10.8	8211	5845	4102
330	335	11.0	8058	5756	4060
335	340	11.2	7910	5670	4020
340	345	11.3	7769	5588	3982
345	350	11.5	7632	5509	3945
350	355	11.7	7500	5433	3910
355	360	11.8	7373	5360	3876
360	365	12.0	7250	5290	3843

Start (d)	Stop (d)	Month	Modelled groundwater flux (m^3/d)		
			Task 2 Scenario 1	Task 2 Scenario 2	Task 2 Scenario 3
365	370	12.2	7132	5221	3812
370	375	12.3	7017	5155	3782
375	380	12.5	6907	5092	3752
380	385	12.7	6800	5030	3724
385	390	12.8	6697	4970	3697
390	395	13.0	6597	4912	3670
395	400	13.2	6500	4856	3645
400	405	13.3	6406	4802	3620
405	410	13.5	6316	4749	3596
410	415	13.7	6228	4698	3573
415	420	13.8	6142	4649	3551
420	425	14.0	6060	4601	3529
425	430	14.2	5979	4555	3508
430	435	14.3	5901	4510	3488
435	440	14.5	5826	4466	3468
440	445	14.7	5753	4424	3449
445	450	14.8	5681	4383	3431
450	455	15.0	5612	4343	3413
455	460	15.2	5545	4304	3396
460	465	15.3	5479	4267	3379
465	470	15.5	5415	4231	3363
470	475	15.7	5353	4195	3347
475	480	15.8	5293	4161	3331
480	485	16.0	5235	4128	3316
485	490	16.2	5177	4095	3302
490	495	16.3	5122	4064	3288
495	500	16.5	5068	4033	3274
500	505	16.7	5016	4003	3261
505	510	16.8	4964	3975	3248
510	515	17.0	4915	3946	3235
515	520	17.2	4866	3919	3223
520	525	17.3	4819	3892	3211
525	530	17.5	4773	3866	3200
530	535	17.7	4728	3840	3189
535	540	17.8	4684	3816	3178
540	550	18.0	4600	3768	3157
550	570	18.3	4444	3680	3118
570	600	19.0	4237	3563	3067
600	630	20.0	4059	3463	3023
630	660	21.0	3904	3376	2984
660	690	22.0	3769	3300	2951
690	720	23.0	3652	3234	2922
720	750	24.0	3549	3176	2897
750	780	25.0	3458	3126	2875
780	810	26.0	3378	3081	2855
810	840	27.0	3309	3042	2837
840	870	28.0	3248	3007	2822
870	900	29.0	3194	2976	2808
900	930	30.0	3146	2948	2796
930	960	31.0	3104	2924	2785
960	990	32.0	3066	2902	2775
990	1020	33.0	3032	2883	2766
1020	1050	34.0	3002	2865	2758
1050	1080	35.0	2975	2849	2750
1080	1110	36.0	2950	2835	2744
1110	1140	37.0	2928	2822	2738
1140	1170	38.0	2908	2810	2732
1170	1200	39.0	2890	2800	2727

TASK 3 FLUX SUMMARY

Start (d)	Stop (d)	Month	Modelled groundwater flux (m³/d)		
			Task 3 Scenario 1	Task 3 Scenario 2	Task 3 Scenario 3
0	30	0.0	2727	2727	2727
30	60	1.0	2724	2724	2724
60	90	2.0	2722	2722	2722
90	95	3.0	34	37	37
95	100	3.2	38	45	45
100	105	3.3	40	49	49
105	110	3.5	42	52	52
110	115	3.7	43	53	53
115	120	3.8	44	55	55
120	125	4.0	45	56	56
125	130	4.2	46	58	58
130	135	4.3	47	59	59
135	140	4.5	48	61	61
140	145	4.7	50	64	64
145	150	4.8	52	66	66
150	155	5.0	54	69	69
155	160	5.2	56	73	73
160	165	5.3	59	76	76
165	170	5.5	63	80	80
170	175	5.7	66	84	84
175	180	5.8	70	90	90
180	185	6.0	26586	166	125
185	190	6.2	21515	268	157
190	195	6.3	19240	927	215
195	200	6.5	17796	3675	416
200	205	6.7	16728	8513	847
205	210	6.8	15884	13142	1711
210	215	7.0	15182	15767	3152
215	220	7.2	14575	16871	4928
220	225	7.3	14031	17946	7085
225	230	7.5	13541	16950	9096
230	235	7.7	13093	16172	11006
235	240	7.8	12680	15512	12785
240	245	8.0	12295	14925	13974
245	250	8.2	11935	14395	14424
250	255	8.3	11597	13910	14774
255	260	8.5	11280	13464	16343
260	265	8.7	10980	13049	15631
265	270	8.8	10696	12661	15035
270	275	9.0	10428	12297	14505
275	280	9.2	10174	11954	14025
280	285	9.3	9933	11631	13583
285	290	9.5	9703	11325	13173
290	295	9.7	9485	11035	12790
295	300	9.8	9278	10760	12430
300	305	10.0	9080	10498	12090
305	310	10.2	8891	10250	11769
310	315	10.3	8711	10013	11465
315	320	10.5	8537	9787	11177
320	325	10.7	8371	9571	10903
325	330	10.8	8211	9366	10642
330	335	11.0	8058	9170	10393
335	340	11.2	7910	8982	10157
340	345	11.3	7769	8803	9931
345	350	11.5	7632	8630	9714
350	355	11.7	7500	8464	9507
355	360	11.8	7373	8305	9309
360	365	12.0	7250	8151	9119

Start (d)	Stop (d)	Month	Modelled groundwater flux (m^3/d)		
			Task 3 Scenario 1	Task 3 Scenario 2	Task 3 Scenario 3
365	370	12.2	7132	8003	8938
370	375	12.3	7017	7860	8765
375	380	12.5	6907	7723	8598
380	385	12.7	6800	7590	8437
385	390	12.8	6697	7462	8282
390	395	13.0	6597	7339	8132
395	400	13.2	6500	7219	7988
400	405	13.3	6406	7104	7849
405	410	13.5	6316	6992	7715
410	415	13.7	6228	6884	7585
415	420	13.8	6142	6780	7460
420	425	14.0	6060	6678	7339
425	430	14.2	5979	6580	7221
430	435	14.3	5901	6485	7108
435	440	14.5	5826	6393	6998
440	445	14.7	5753	6304	6892
445	450	14.8	5681	6217	6789
450	455	15.0	5612	6133	6690
455	460	15.2	5545	6051	6593
460	465	15.3	5479	5971	6499
465	470	15.5	5415	5894	6409
470	475	15.7	5353	5819	6320
475	480	15.8	5293	5747	6234
480	485	16.0	5235	5676	6151
485	490	16.2	5177	5607	6071
490	495	16.3	5122	5540	5992
495	500	16.5	5068	5475	5916
500	505	16.7	5016	5412	5842
505	510	16.8	4964	5350	5769
510	515	17.0	4915	5290	5699
515	520	17.2	4866	5232	5631
520	525	17.3	4819	5175	5565
525	530	17.5	4773	5120	5500
530	535	17.7	4728	5067	5437
535	540	17.8	4684	5014	5376
540	550	18.0	4600	4914	5258
550	570	18.3	4444	4727	5042
570	600	19.0	4237	4481	4756
600	630	20.0	4059	4267	4510
630	660	21.0	3904	4083	4296
660	690	22.0	3769	3923	4110
690	720	23.0	3652	3784	3949
720	750	24.0	3549	3662	3808
750	780	25.0	3458	3555	3686
780	810	26.0	3378	3461	3577
810	840	27.0	3309	3377	3482
840	870	28.0	3248	3305	3397
870	900	29.0	3194	3241	3323
900	930	30.0	3146	3185	3258
930	960	31.0	3104	3136	3201
960	990	32.0	3066	3092	3151
990	1020	33.0	3032	3052	3106
1020	1050	34.0	3002	3017	3066
1050	1080	35.0	2975	2986	3030
1080	1110	36.0	2950	2958	2998
1110	1140	37.0	2928	2933	2970
1140	1170	38.0	2908	2910	2944
1170	1200	39.0	2890	2889	2920

Tasks 1, 2 and 3 SCENARIO 1 DETAILED FLUX

Start day	Stop day	Month	Modelled groundwater flux (m^3/d)			
			Zone 1 (West)	Zone 2 (East)	Zone 3 (South)	Total
0	30	0.0	685	2012	29	2727
30	60	1.0	685	2010	29	2724
60	90	2.0	685	2008	29	2722
90	95	3.0	0	0	34	34
95	100	3.2	0	0	38	38
100	105	3.3	0	0	40	40
105	110	3.5	0	0	42	42
110	115	3.7	0	0	43	43
115	120	3.8	0	0	44	44
120	125	4.0	0	0	45	45
125	130	4.2	0	0	46	46
130	135	4.3	0	0	47	47
135	140	4.5	0	0	48	48
140	145	4.7	0	0	50	50
145	150	4.8	0	0	52	52
150	155	5.0	0	0	54	54
155	160	5.2	0	0	56	56
160	165	5.3	0	0	59	59
165	170	5.5	0	0	63	63
170	175	5.7	0	0	66	66
175	180	5.8	0	0	70	70
180	185	6.0	9708	10958	5920	26586
185	190	6.2	8918	10187	2410	21515
190	195	6.3	8340	9628	1272	19240
195	200	6.5	7872	9175	750	17796
200	205	6.7	7473	8789	466	16728
205	210	6.8	7122	8450	312	15884
210	215	7.0	6809	8148	225	15182
215	220	7.2	6525	7873	176	14575
220	225	7.3	6266	7623	142	14031
225	230	7.5	6030	7391	120	13541
230	235	7.7	5812	7177	105	13093
235	240	7.8	5608	6978	94	12680
240	245	8.0	5418	6791	86	12295
245	250	8.2	5240	6616	79	11935
250	255	8.3	5073	6451	74	11597
255	260	8.5	4915	6295	70	11280
260	265	8.7	4766	6148	66	10980
265	270	8.8	4624	6009	63	10696
270	275	9.0	4490	5878	61	10428
275	280	9.2	4363	5753	59	10174
280	285	9.3	4242	5634	57	9933
285	290	9.5	4127	5521	55	9703
290	295	9.7	4018	5413	54	9485
295	300	9.8	3915	5310	53	9278
300	305	10.0	3816	5211	52	9080
305	310	10.2	3723	5117	51	8891
310	315	10.3	3633	5027	50	8711
315	320	10.5	3548	4940	49	8537
320	325	10.7	3465	4857	49	8371
325	330	10.8	3386	4778	48	8211
330	335	11.0	3310	4701	47	8058
335	340	11.2	3236	4628	47	7910
340	345	11.3	3166	4557	46	7769
345	350	11.5	3098	4489	45	7632
350	355	11.7	3032	4423	45	7500
355	360	11.8	2968	4360	44	7373
360	365	12.0	2907	4299	44	7250

Start day	Stop day	Month	Modelled groundwater flux (m³/d)			
			Zone 1 (West)	Zone 2 (East)	Zone 3 (South)	Total
365	370	12.2	2848	4240	43	7132
370	375	12.3	2791	4183	43	7017
375	380	12.5	2736	4128	42	6907
380	385	12.7	2683	4075	42	6800
385	390	12.8	2631	4024	42	6697
390	395	13.0	2581	3974	41	6597
395	400	13.2	2533	3926	41	6500
400	405	13.3	2486	3880	41	6406
405	410	13.5	2441	3834	41	6316
410	415	13.7	2396	3791	41	6228
415	420	13.8	2354	3748	40	6142
420	425	14.0	2312	3707	40	6060
425	430	14.2	2272	3667	40	5979
430	435	14.3	2233	3629	40	5901
435	440	14.5	2195	3591	40	5826
440	445	14.7	2158	3555	40	5753
445	450	14.8	2122	3520	39	5681
450	455	15.0	2087	3485	39	5612
455	460	15.2	2054	3452	39	5545
460	465	15.3	2021	3420	39	5479
465	470	15.5	1989	3388	39	5415
470	475	15.7	1958	3357	39	5353
475	480	15.8	1927	3327	38	5293
480	485	16.0	1898	3298	38	5235
485	490	16.2	1869	3270	38	5177
490	495	16.3	1842	3242	38	5122
495	500	16.5	1815	3216	38	5068
500	505	16.7	1789	3189	38	5016
505	510	16.8	1763	3164	37	4964
510	515	17.0	1738	3139	37	4915
515	520	17.2	1714	3115	37	4866
520	525	17.3	1691	3091	37	4819
525	530	17.5	1668	3068	37	4773
530	535	17.7	1646	3046	37	4728
535	540	17.8	1624	3024	37	4684
540	550	18.0	1582	2982	36	4600
550	570	18.3	1505	2904	36	4444
570	600	19.0	1403	2799	35	4237
600	630	20.0	1316	2709	35	4059
630	660	21.0	1241	2629	34	3904
660	690	22.0	1177	2559	34	3769
690	720	23.0	1122	2497	33	3652
720	750	24.0	1074	2442	33	3549
750	780	25.0	1032	2394	32	3458
780	810	26.0	995	2351	32	3378
810	840	27.0	963	2314	32	3309
840	870	28.0	936	2281	31	3248
870	900	29.0	911	2251	31	3194
900	930	30.0	890	2226	31	3146
930	960	31.0	871	2202	31	3104
960	990	32.0	854	2182	31	3066
990	1020	33.0	839	2163	30	3032
1020	1050	34.0	825	2146	30	3002
1050	1080	35.0	813	2132	30	2975
1080	1110	36.0	802	2118	30	2950
1110	1140	37.0	793	2106	30	2928
1140	1170	38.0	784	2095	30	2908
1170	1200	39.0	776	2085	29	2890

TASK 1 SCENARIO 2 DETAILED FLUX

Start day	Stop day	Month	Modelled groundwater flux (m^3/d)			
			Zone 1 (West)	Zone 2 (East)	Zone 3 (South)	Total
0	30	0.0	685	2012	29	2727
30	60	1.0	685	2010	29	2724
60	90	2.0	685	2008	29	2722
90	95	3.0	0	0	34	34
95	100	3.2	0	0	38	38
100	105	3.3	0	0	40	40
105	110	3.5	0	0	42	42
110	115	3.7	0	0	43	43
115	120	3.8	0	0	44	44
120	125	4.0	0	0	45	45
125	130	4.2	0	0	46	46
130	135	4.3	0	0	47	47
135	140	4.5	0	0	48	48
140	145	4.7	0	0	50	50
145	150	4.8	0	0	52	52
150	155	5.0	7592	9000	5249	21842
155	160	5.2	6885	8315	1916	17116
160	165	5.3	6390	7832	852	15074
165	170	5.5	6000	7450	421	13870
170	175	5.7	5682	7131	231	13044
175	180	5.8	5413	6855	150	12417
180	185	6.0	5175	6612	110	11897
185	190	6.2	4963	6394	87	11444
190	195	6.3	4771	6195	74	11040
195	200	6.5	4595	6014	65	10674
200	205	6.7	4432	5847	59	10338
205	210	6.8	4283	5692	55	10029
210	215	7.0	4143	5548	52	9743
215	220	7.2	4014	5414	50	9477
220	225	7.3	3893	5288	48	9229
225	230	7.5	3780	5170	47	8997
230	235	7.7	3674	5059	46	8779
235	240	7.8	3573	4955	45	8573
240	245	8.0	3478	4856	44	8377
245	250	8.2	3387	4762	43	8192
250	255	8.3	3301	4673	43	8016
255	260	8.5	3218	4589	42	7849
260	265	8.7	3140	4508	41	7689
265	270	8.8	3065	4432	41	7537
270	275	9.0	2993	4358	40	7392
275	280	9.2	2924	4288	40	7252
280	285	9.3	2858	4222	40	7119
285	290	9.5	2795	4157	39	6991
290	295	9.7	2734	4096	39	6869
295	300	9.8	2675	4037	39	6751
300	305	10.0	2619	3980	39	6637
305	310	10.2	2564	3926	38	6528
310	315	10.3	2512	3874	38	6423
315	320	10.5	2461	3823	38	6322
320	325	10.7	2412	3775	38	6225
325	330	10.8	2365	3728	38	6131
330	335	11.0	2319	3683	38	6040
335	340	11.2	2275	3640	38	5953
340	345	11.3	2232	3598	38	5868
345	350	11.5	2191	3558	38	5786
350	355	11.7	2151	3519	37	5707
355	360	11.8	2113	3481	37	5631
360	365	12.0	2075	3444	37	5557

Start day	Stop day	Month	Modelled groundwater flux (m³/d)			
			Zone 1 (West)	Zone 2 (East)	Zone 3 (South)	Total
365	370	12.2	2039	3409	37	5486
370	375	12.3	2004	3375	37	5416
375	380	12.5	1970	3342	37	5349
380	385	12.7	1938	3310	37	5284
385	390	12.8	1906	3279	37	5221
390	395	13.0	1875	3249	37	5160
395	400	13.2	1845	3219	36	5101
400	405	13.3	1816	3191	36	5043
405	410	13.5	1788	3163	36	4987
410	415	13.7	1760	3137	36	4933
415	420	13.8	1734	3111	36	4880
420	425	14.0	1708	3085	36	4829
425	430	14.2	1683	3061	36	4779
430	435	14.3	1658	3037	36	4731
435	440	14.5	1634	3014	35	4683
440	445	14.7	1611	2991	35	4637
445	450	14.8	1589	2969	35	4593
450	455	15.0	1567	2947	35	4549
455	460	15.2	1546	2927	35	4507
460	465	15.3	1525	2906	35	4466
465	470	15.5	1505	2886	35	4426
470	475	15.7	1486	2867	35	4387
475	480	15.8	1467	2848	35	4350
480	485	16.0	1448	2830	35	4313
485	490	16.2	1430	2812	35	4277
490	495	16.3	1413	2795	35	4242
495	500	16.5	1396	2778	34	4208
500	505	16.7	1379	2761	34	4175
505	510	16.8	1363	2745	34	4143
510	515	17.0	1348	2729	34	4111
515	520	17.2	1333	2714	34	4081
520	525	17.3	1318	2699	34	4051
525	530	17.5	1304	2684	34	4022
530	535	17.7	1290	2670	34	3994
535	540	17.8	1277	2656	34	3966
540	550	18.0	1251	2629	34	3914
550	570	18.3	1204	2578	33	3816
570	600	19.0	1142	2511	33	3686
600	630	20.0	1088	2452	33	3572
630	660	21.0	1042	2400	32	3473
660	690	22.0	1002	2354	32	3388
690	720	23.0	967	2315	32	3314
720	750	24.0	938	2280	31	3248
750	780	25.0	912	2249	31	3192
780	810	26.0	889	2222	31	3141
810	840	27.0	868	2198	31	3097
840	870	28.0	851	2177	30	3058
870	900	29.0	835	2157	30	3022
900	930	30.0	821	2140	30	2991
930	960	31.0	808	2125	30	2963
960	990	32.0	797	2111	30	2938
990	1020	33.0	787	2099	30	2916
1020	1050	34.0	778	2088	30	2896
1050	1080	35.0	770	2078	29	2878
1080	1110	36.0	763	2069	29	2861
1110	1140	37.0	757	2061	29	2847
1140	1170	38.0	751	2053	29	2833
1170	1200	39.0	746	2046	29	2821

TASK 1 SCENARIO 3 DETAILED FLUX

Start day	Stop day	Month	Modelled groundwater flux (m³/d)			
			Zone 1 (West)	Zone 2 (East)	Zone 3 (South)	Total
0	30	0.0	685	2012	29	2727
30	60	1.0	685	2010	29	2724
60	90	2.0	685	2008	29	2722
90	95	3.0	0	0	34	34
95	100	3.2	0	0	38	38
100	105	3.3	0	0	40	40
105	110	3.5	0	0	42	42
110	115	3.7	0	0	43	43
115	120	3.8	0	0	44	44
120	125	4.0	0	0	45	45
125	130	4.2	0	0	46	46
130	135	4.3	0	0	47	47
135	140	4.5	0	0	48	48
140	145	4.7	0	0	50	50
145	150	4.8	0	0	52	52
150	155	5.0	0	0	54	54
155	160	5.2	0	0	56	56
160	165	5.3	0	0	59	59
165	170	5.5	0	0	63	63
170	175	5.7	0	0	66	66
175	180	5.8	0	0	70	70
180	185	6.0	0	0	75	75
185	190	6.2	0	0	79	79
190	195	6.3	0	0	84	84
195	200	6.5	0	0	89	89
200	205	6.7	0	0	94	94
205	210	6.8	0	1	98	99
210	215	7.0	11296	12485	6414	30195
215	220	7.2	10448	11642	2779	24869
220	225	7.3	9813	11022	1590	22424
225	230	7.5	9289	10515	1030	20834
230	235	7.7	8836	10080	698	19614
235	240	7.8	8434	9695	493	18622
240	245	8.0	8071	9349	367	17787
245	250	8.2	7740	9034	285	17059
250	255	8.3	7435	8744	232	16411
255	260	8.5	7153	8476	192	15821
260	265	8.7	6890	8227	164	15280
265	270	8.8	6644	7994	144	14781
270	275	9.0	6414	7775	128	14318
275	280	9.2	6199	7570	117	13886
280	285	9.3	5997	7377	107	13481
285	290	9.5	5807	7194	100	13100
290	295	9.7	5626	7020	93	12740
295	300	9.8	5455	6856	88	12399
300	305	10.0	5293	6699	83	12076
305	310	10.2	5139	6551	79	11769
310	315	10.3	4992	6409	76	11476
315	320	10.5	4852	6273	73	11198
320	325	10.7	4719	6144	70	10933
325	330	10.8	4591	6021	67	10680
330	335	11.0	4470	5903	65	10438
335	340	11.2	4354	5790	64	10207
340	345	11.3	4242	5682	62	9986
345	350	11.5	4136	5578	61	9774
350	355	11.7	4034	5478	59	9571
355	360	11.8	3936	5382	58	9376
360	365	12.0	3843	5289	57	9189

Start day	Stop day	Month	Modelled groundwater flux (m³/d)			
			Zone 1 (West)	Zone 2 (East)	Zone 3 (South)	Total
365	370	12.2	3754	5200	56	9010
370	375	12.3	3669	5114	55	8838
375	380	12.5	3587	5032	54	8673
380	385	12.7	3509	4952	53	8514
385	390	12.8	3433	4875	52	8360
390	395	13.0	3360	4801	52	8212
395	400	13.2	3289	4730	51	8069
400	405	13.3	3221	4661	50	7931
405	410	13.5	3154	4594	49	7798
410	415	13.7	3091	4529	49	7669
415	420	13.8	3029	4467	48	7544
420	425	14.0	2969	4407	47	7423
425	430	14.2	2911	4348	47	7306
430	435	14.3	2855	4292	46	7193
435	440	14.5	2801	4237	46	7083
440	445	14.7	2748	4184	45	6977
445	450	14.8	2697	4132	45	6874
450	455	15.0	2648	4082	44	6774
455	460	15.2	2600	4034	44	6678
460	465	15.3	2553	3987	44	6584
465	470	15.5	2508	3942	43	6493
470	475	15.7	2464	3897	43	6404
475	480	15.8	2422	3854	43	6318
480	485	16.0	2380	3812	42	6235
485	490	16.2	2340	3772	42	6154
490	495	16.3	2301	3732	42	6075
495	500	16.5	2263	3694	41	5999
500	505	16.7	2226	3657	41	5924
505	510	16.8	2190	3621	41	5852
510	515	17.0	2155	3585	41	5781
515	520	17.2	2121	3551	41	5713
520	525	17.3	2088	3517	40	5646
525	530	17.5	2056	3485	40	5581
530	535	17.7	2025	3453	40	5518
535	540	17.8	1994	3422	40	5456
540	550	18.0	1935	3363	39	5337
550	570	18.3	1827	3253	39	5119
570	600	19.0	1685	3107	38	4830
600	630	20.0	1564	2981	37	4582
630	660	21.0	1459	2871	36	4366
660	690	22.0	1367	2775	35	4177
690	720	23.0	1288	2690	35	4013
720	750	24.0	1220	2615	34	3869
750	780	25.0	1161	2549	34	3744
780	810	26.0	1111	2490	33	3634
810	840	27.0	1066	2438	33	3537
840	870	28.0	1027	2392	32	3451
870	900	29.0	992	2351	32	3375
900	930	30.0	962	2315	32	3309
930	960	31.0	935	2283	31	3250
960	990	32.0	912	2255	31	3198
990	1020	33.0	891	2230	31	3152
1020	1050	34.0	873	2207	31	3111
1050	1080	35.0	857	2187	31	3075
1080	1110	36.0	842	2169	30	3042
1110	1140	37.0	829	2153	30	3012
1140	1170	38.0	817	2138	30	2985
1170	1200	39.0	807	2125	30	2961

TASK 2 SCENARIO 2 DETAILED FLUX

Start day	Stop day	Month	Modelled groundwater flux (m³/d)			
			Zone 1 (West)	Zone 2 (East)	Zone 3 (South)	Total
0	30	0.0	685	2012	29	2727
30	60	1.0	685	2010	29	2724
60	90	2.0	685	2008	29	2722
90	95	3.0	0	0	42	42
95	100	3.2	0	0	53	53
100	105	3.3	0	0	57	57
105	110	3.5	0	0	58	58
110	115	3.7	0	0	59	59
115	120	3.8	0	0	60	60
120	125	4.0	0	0	60	60
125	130	4.2	0	0	61	61
130	135	4.3	0	0	62	62
135	140	4.5	0	0	63	63
140	145	4.7	0	0	63	63
145	150	4.8	0	0	64	64
150	155	5.0	0	0	65	65
155	160	5.2	0	0	66	66
160	165	5.3	0	0	66	66
165	170	5.5	0	0	67	67
170	175	5.7	0	0	68	68
175	180	5.8	0	0	69	69
180	185	6.0	5914	7504	31	13448
185	190	6.2	5362	7010	31	12403
190	195	6.3	4981	6655	31	11667
195	200	6.5	4683	6371	31	11084
200	205	6.7	4436	6130	31	10596
205	210	6.8	4224	5919	31	10174
210	215	7.0	4038	5732	31	9801
215	220	7.2	3872	5562	31	9465
220	225	7.3	3722	5407	31	9161
225	230	7.5	3586	5265	31	8883
230	235	7.7	3462	5134	32	8628
235	240	7.8	3348	5012	32	8392
240	245	8.0	3243	4899	32	8174
245	250	8.2	3146	4792	32	7970
250	255	8.3	3054	4693	32	7779
255	260	8.5	2969	4599	32	7599
260	265	8.7	2888	4510	32	7429
265	270	8.8	2811	4426	32	7269
270	275	9.0	2739	4346	32	7117
275	280	9.2	2670	4270	32	6973
280	285	9.3	2605	4199	32	6836
285	290	9.5	2543	4130	32	6705
290	295	9.7	2483	4065	32	6580
295	300	9.8	2426	4003	32	6461
300	305	10.0	2372	3943	32	6347
305	310	10.2	2320	3886	32	6238
310	315	10.3	2270	3832	32	6133
315	320	10.5	2222	3779	32	6033
320	325	10.7	2175	3729	32	5937
325	330	10.8	2131	3681	32	5845
330	335	11.0	2089	3635	32	5756
335	340	11.2	2048	3591	32	5670
340	345	11.3	2008	3548	32	5588
345	350	11.5	1970	3507	32	5509
350	355	11.7	1934	3467	32	5433
355	360	11.8	1898	3429	32	5360
360	365	12.0	1865	3393	32	5290

Start day	Stop day	Month	Modelled groundwater flux (m³/d)			
			Zone 1 (West)	Zone 2 (East)	Zone 3 (South)	Total
365	370	12.2	1832	3357	32	5221
370	375	12.3	1800	3323	32	5155
375	380	12.5	1770	3290	32	5092
380	385	12.7	1740	3258	32	5030
385	390	12.8	1711	3227	32	4970
390	395	13.0	1684	3197	32	4912
395	400	13.2	1657	3168	32	4856
400	405	13.3	1631	3139	32	4802
405	410	13.5	1605	3112	32	4749
410	415	13.7	1581	3086	32	4698
415	420	13.8	1557	3060	32	4649
420	425	14.0	1534	3035	32	4601
425	430	14.2	1512	3011	32	4555
430	435	14.3	1491	2987	32	4510
435	440	14.5	1470	2964	32	4466
440	445	14.7	1450	2942	32	4424
445	450	14.8	1430	2921	32	4383
450	455	15.0	1411	2900	32	4343
455	460	15.2	1393	2879	32	4304
460	465	15.3	1376	2860	32	4267
465	470	15.5	1359	2840	32	4231
470	475	15.7	1342	2821	32	4195
475	480	15.8	1326	2803	32	4161
480	485	16.0	1311	2785	32	4128
485	490	16.2	1296	2768	32	4095
490	495	16.3	1281	2751	32	4064
495	500	16.5	1267	2735	32	4033
500	505	16.7	1253	2719	32	4003
505	510	16.8	1240	2703	32	3975
510	515	17.0	1227	2688	32	3946
515	520	17.2	1214	2673	32	3919
520	525	17.3	1202	2658	32	3892
525	530	17.5	1190	2644	32	3866
530	535	17.7	1179	2630	31	3840
535	540	17.8	1167	2617	31	3816
540	550	18.0	1146	2591	31	3768
550	570	18.3	1106	2542	31	3680
570	600	19.0	1055	2478	31	3563
600	630	20.0	1011	2421	31	3463
630	660	21.0	973	2372	31	3376
660	690	22.0	940	2329	31	3300
690	720	23.0	912	2291	30	3234
720	750	24.0	888	2259	30	3176
750	780	25.0	866	2230	30	3126
780	810	26.0	847	2204	30	3081
810	840	27.0	830	2182	30	3042
840	870	28.0	816	2162	30	3007
870	900	29.0	803	2144	30	2976
900	930	30.0	791	2128	29	2948
930	960	31.0	781	2114	29	2924
960	990	32.0	772	2101	29	2902
990	1020	33.0	764	2089	29	2883
1020	1050	34.0	757	2079	29	2865
1050	1080	35.0	751	2069	29	2849
1080	1110	36.0	745	2061	29	2835
1110	1140	37.0	740	2053	29	2822
1140	1170	38.0	735	2046	29	2810
1170	1200	39.0	731	2040	29	2800

TASK 2 SCENARIO 3 DETAILED FLUX

Start day	Stop day	Month	Modelled groundwater flux (m³/d)			
			Zone 1 (West)	Zone 2 (East)	Zone 3 (South)	Total
0	30	0.0	685	2012	29	2727
30	60	1.0	685	2010	29	2724
60	90	2.0	685	2008	29	2722
90	95	3.0	0	106	12033	12139
95	100	3.2	0	110	7014	7124
100	105	3.3	0	125	5404	5529
105	110	3.5	0	147	4605	4751
110	115	3.7	0	169	4093	4262
115	120	3.8	0	191	3717	3908
120	125	4.0	0	213	3419	3631
125	130	4.2	0	234	3172	3406
130	135	4.3	0	254	2964	3217
135	140	4.5	0	273	2783	3056
140	145	4.7	0	291	2626	2916
145	150	4.8	0	308	2486	2794
150	155	5.0	0	325	2361	2685
155	160	5.2	0	340	2248	2589
160	165	5.3	0	355	2146	2501
165	170	5.5	0	369	2053	2422
170	175	5.7	0	383	1967	2349
175	180	5.8	0	396	1887	2283
180	185	6.0	3568	4553	17	8138
185	190	6.2	3213	4279	21	7513
190	195	6.3	2980	4087	23	7090
195	200	6.5	2803	3937	24	6764
200	205	6.7	2659	3813	25	6498
205	210	6.8	2540	3707	26	6272
210	215	7.0	2437	3613	26	6076
215	220	7.2	2345	3530	27	5903
220	225	7.3	2264	3456	27	5747
225	230	7.5	2190	3388	27	5605
230	235	7.7	2122	3326	28	5476
235	240	7.8	2059	3269	28	5357
240	245	8.0	2002	3217	28	5246
245	250	8.2	1948	3168	28	5144
250	255	8.3	1898	3122	29	5049
255	260	8.5	1851	3079	29	4959
260	265	8.7	1806	3039	29	4874
265	270	8.8	1764	3002	29	4794
270	275	9.0	1724	2966	29	4719
275	280	9.2	1686	2933	29	4648
280	285	9.3	1650	2901	29	4580
285	290	9.5	1616	2871	29	4516
290	295	9.7	1583	2843	29	4455
295	300	9.8	1552	2815	29	4397
300	305	10.0	1523	2790	29	4342
305	310	10.2	1495	2765	29	4289
310	315	10.3	1468	2741	29	4239
315	320	10.5	1443	2719	30	4191
320	325	10.7	1419	2697	30	4146
325	330	10.8	1396	2677	30	4102
330	335	11.0	1374	2657	30	4060
335	340	11.2	1353	2638	30	4020
340	345	11.3	1333	2619	30	3982
345	350	11.5	1314	2602	30	3945
350	355	11.7	1296	2585	30	3910
355	360	11.8	1278	2569	30	3876
360	365	12.0	1261	2553	30	3843

Start day	Stop day	Month	Modelled groundwater flux (m^3/d)			
			Zone 1 (West)	Zone 2 (East)	Zone 3 (South)	Total
365	370	12.2	1245	2538	30	3812
370	375	12.3	1229	2523	30	3782
375	380	12.5	1214	2509	30	3752
380	385	12.7	1199	2495	30	3724
385	390	12.8	1185	2482	30	3697
390	395	13.0	1171	2469	30	3670
395	400	13.2	1158	2457	30	3645
400	405	13.3	1146	2445	30	3620
405	410	13.5	1133	2433	30	3596
410	415	13.7	1121	2422	30	3573
415	420	13.8	1110	2411	30	3551
420	425	14.0	1099	2401	30	3529
425	430	14.2	1088	2390	30	3508
430	435	14.3	1078	2381	30	3488
435	440	14.5	1068	2371	30	3468
440	445	14.7	1058	2362	30	3449
445	450	14.8	1049	2353	30	3431
450	455	15.0	1040	2344	30	3413
455	460	15.2	1031	2335	30	3396
460	465	15.3	1022	2327	30	3379
465	470	15.5	1014	2319	30	3363
470	475	15.7	1006	2311	30	3347
475	480	15.8	998	2304	30	3331
480	485	16.0	990	2296	30	3316
485	490	16.2	983	2289	30	3302
490	495	16.3	976	2282	30	3288
495	500	16.5	969	2275	30	3274
500	505	16.7	962	2269	30	3261
505	510	16.8	956	2263	30	3248
510	515	17.0	949	2256	30	3235
515	520	17.2	943	2250	30	3223
520	525	17.3	937	2245	30	3211
525	530	17.5	931	2239	30	3200
530	535	17.7	926	2233	30	3189
535	540	17.8	920	2228	30	3178
540	550	18.0	909	2218	30	3157
550	570	18.3	890	2198	30	3118
570	600	19.0	864	2173	30	3067
600	630	20.0	842	2151	29	3023
630	660	21.0	823	2132	29	2984
660	690	22.0	807	2115	29	2951
690	720	23.0	793	2100	29	2922
720	750	24.0	781	2087	29	2897
750	780	25.0	770	2075	29	2875
780	810	26.0	761	2065	29	2855
810	840	27.0	753	2056	29	2837
840	870	28.0	746	2047	29	2822
870	900	29.0	739	2040	29	2808
900	930	30.0	734	2033	29	2796
930	960	31.0	729	2027	29	2785
960	990	32.0	724	2022	29	2775
990	1020	33.0	720	2017	29	2766
1020	1050	34.0	717	2012	29	2758
1050	1080	35.0	714	2008	28	2750
1080	1110	36.0	711	2005	28	2744
1110	1140	37.0	708	2001	28	2738
1140	1170	38.0	706	1998	28	2732
1170	1200	39.0	704	1995	28	2727

TASK 3 SCENARIO 2 DETAILED FLUX

Start day	Stop day	Month	Modelled groundwater flux (m³/d)			
			Zone 1 (West)	Zone 2 (East)	Zone 3 (South)	Total
0	30	0.0	685	2012	29	2727
30	60	1.0	685	2010	29	2724
60	90	2.0	685	2008	29	2722
90	95	3.0	0	0	37	37
95	100	3.2	0	0	45	45
100	105	3.3	0	0	49	49
105	110	3.5	0	0	52	52
110	115	3.7	0	0	53	53
115	120	3.8	0	0	55	55
120	125	4.0	0	0	56	56
125	130	4.2	0	0	58	58
130	135	4.3	0	0	59	59
135	140	4.5	0	0	61	61
140	145	4.7	0	0	64	64
145	150	4.8	0	0	66	66
150	155	5.0	0	0	69	69
155	160	5.2	0	0	73	73
160	165	5.3	0	0	76	76
165	170	5.5	0	0	80	80
170	175	5.7	0	0	84	84
175	180	5.8	0	0	90	90
180	185	6.0	0	0	166	166
185	190	6.2	0	32	236	268
190	195	6.3	22	664	242	927
195	200	6.5	422	2675	579	3675
200	205	6.7	1950	5287	1276	8513
205	210	6.8	4091	6983	2068	13142
210	215	7.0	6092	8202	1473	15767
215	220	7.2	7592	8327	953	16871
220	225	7.3	8101	9375	470	17946
225	230	7.5	7693	8982	275	16950
230	235	7.7	7341	8648	184	16172
235	240	7.8	7027	8352	134	15512
240	245	8.0	6741	8083	101	14925
245	250	8.2	6480	7836	79	14395
250	255	8.3	6239	7608	63	13910
255	260	8.5	6016	7396	52	13464
260	265	8.7	5808	7198	43	13049
265	270	8.8	5614	7011	36	12661
270	275	9.0	5431	6836	31	12297
275	280	9.2	5258	6670	26	11954
280	285	9.3	5095	6513	23	11631
285	290	9.5	4941	6364	19	11325
290	295	9.7	4795	6223	17	11035
295	300	9.8	4656	6089	15	10760
300	305	10.0	4525	5961	13	10498
305	310	10.2	4399	5840	11	10250
310	315	10.3	4280	5724	10	10013
315	320	10.5	4166	5613	9	9787
320	325	10.7	4057	5507	8	9571
325	330	10.8	3954	5405	7	9366
330	335	11.0	3856	5307	6	9170
335	340	11.2	3763	5214	6	8982
340	345	11.3	3674	5124	5	8803
345	350	11.5	3588	5038	5	8630
350	355	11.7	3506	4955	4	8464
355	360	11.8	3427	4875	4	8305
360	365	12.0	3350	4798	3	8151

Start day	Stop day	Month	Modelled groundwater flux (m³/d)			
			Zone 1 (West)	Zone 2 (East)	Zone 3 (South)	Total
365	370	12.2	3277	4724	3	8003
370	375	12.3	3206	4652	2	7860
375	380	12.5	3137	4584	2	7723
380	385	12.7	3071	4517	2	7590
385	390	12.8	3008	4453	2	7462
390	395	13.0	2946	4392	1	7339
395	400	13.2	2887	4332	1	7219
400	405	13.3	2829	4274	1	7104
405	410	13.5	2774	4218	1	6992
410	415	13.7	2720	4164	0	6884
415	420	13.8	2668	4111	0	6780
420	425	14.0	2618	4061	0	6678
425	430	14.2	2569	4011	0	6580
430	435	14.3	2521	3964	0	6485
435	440	14.5	2475	3918	0	6393
440	445	14.7	2431	3873	0	6304
445	450	14.8	2388	3829	0	6217
450	455	15.0	2346	3787	0	6133
455	460	15.2	2305	3746	0	6051
460	465	15.3	2265	3706	0	5971
465	470	15.5	2227	3668	0	5894
470	475	15.7	2189	3630	0	5819
475	480	15.8	2153	3594	0	5747
480	485	16.0	2118	3558	0	5676
485	490	16.2	2083	3524	0	5607
490	495	16.3	2050	3490	0	5540
495	500	16.5	2018	3458	0	5475
500	505	16.7	1986	3426	0	5412
505	510	16.8	1955	3395	0	5350
510	515	17.0	1926	3365	0	5290
515	520	17.2	1897	3335	0	5232
520	525	17.3	1869	3307	0	5175
525	530	17.5	1841	3279	0	5120
530	535	17.7	1815	3252	0	5067
535	540	17.8	1789	3225	0	5014
540	550	18.0	1739	3174	0	4914
550	570	18.3	1647	3080	0	4727
570	600	19.0	1526	2955	0	4481
600	630	20.0	1421	2846	0	4267
630	660	21.0	1332	2751	0	4083
660	690	22.0	1256	2668	0	3923
690	720	23.0	1190	2594	0	3784
720	750	24.0	1133	2529	0	3662
750	780	25.0	1084	2471	0	3555
780	810	26.0	1040	2421	0	3461
810	840	27.0	1002	2375	0	3377
840	870	28.0	969	2336	0	3305
870	900	29.0	940	2301	0	3241
900	930	30.0	915	2270	0	3185
930	960	31.0	893	2243	0	3136
960	990	32.0	873	2218	0	3092
990	1020	33.0	856	2196	0	3052
1020	1050	34.0	840	2177	0	3017
1050	1080	35.0	827	2159	0	2986
1080	1110	36.0	814	2143	0	2958
1110	1140	37.0	803	2129	0	2933
1140	1170	38.0	794	2116	0	2910
1170	1200	39.0	785	2105	0	2889

TASK 3 SCENARIO 3 DETAILED FLUX

Start day	Stop day	Month	Modelled groundwater flux (m³/d)			
			Zone 1 (West)	Zone 2 (East)	Zone 3 (South)	Total
0	30	0.0	685	2012	29	2727
30	60	1.0	685	2010	29	2724
60	90	2.0	685	2008	29	2722
90	95	3.0	0	0	37	37
95	100	3.2	0	0	45	45
100	105	3.3	0	0	49	49
105	110	3.5	0	0	52	52
110	115	3.7	0	0	53	53
115	120	3.8	0	0	55	55
120	125	4.0	0	0	56	56
125	130	4.2	0	0	58	58
130	135	4.3	0	0	59	59
135	140	4.5	0	0	61	61
140	145	4.7	0	0	64	64
145	150	4.8	0	0	66	66
150	155	5.0	0	0	69	69
155	160	5.2	0	0	73	73
160	165	5.3	0	0	76	76
165	170	5.5	0	0	80	80
170	175	5.7	0	0	84	84
175	180	5.8	0	0	90	90
180	185	6.0	0	0	125	125
185	190	6.2	0	0	157	157
190	195	6.3	0	29	186	215
195	200	6.5	0	213	203	416
200	205	6.7	14	599	233	847
205	210	6.8	86	1368	257	1711
210	215	7.0	355	2504	294	3152
215	220	7.2	770	3794	364	4928
220	225	7.3	1605	4989	491	7085
225	230	7.5	2586	5820	690	9096
230	235	7.7	3533	6522	950	11006
235	240	7.8	4439	7095	1251	12785
240	245	8.0	5321	7590	1062	13974
245	250	8.2	6084	7706	633	14424
250	255	8.3	6731	7565	478	14774
255	260	8.5	7425	8717	201	16343
260	265	8.7	7097	8399	135	15631
265	270	8.8	6807	8126	102	15035
270	275	9.0	6545	7880	80	14505
275	280	9.2	6304	7655	65	14025
280	285	9.3	6082	7447	54	13583
285	290	9.5	5876	7252	46	13173
290	295	9.7	5682	7069	40	12790
295	300	9.8	5499	6897	34	12430
300	305	10.0	5327	6734	29	12090
305	310	10.2	5165	6579	26	11769
310	315	10.3	5010	6433	22	11465
315	320	10.5	4864	6293	19	11177
320	325	10.7	4725	6160	17	10903
325	330	10.8	4593	6034	15	10642
330	335	11.0	4467	5913	13	10393
335	340	11.2	4347	5798	12	10157
340	345	11.3	4232	5688	10	9931
345	350	11.5	4123	5582	9	9714
350	355	11.7	4018	5480	8	9507
355	360	11.8	3918	5383	8	9309
360	365	12.0	3823	5289	7	9119

Start day	Stop day	Month	Modelled groundwater flux (m³/d)			
			Zone 1 (West)	Zone 2 (East)	Zone 3 (South)	Total
365	370	12.2	3733	5199	6	8938
370	375	12.3	3647	5113	6	8765
375	380	12.5	3563	5029	5	8598
380	385	12.7	3484	4949	5	8437
385	390	12.8	3406	4871	4	8282
390	395	13.0	3332	4797	4	8132
395	400	13.2	3260	4724	3	7988
400	405	13.3	3191	4655	3	7849
405	410	13.5	3125	4588	3	7715
410	415	13.7	3060	4523	2	7585
415	420	13.8	2998	4460	2	7460
420	425	14.0	2937	4400	2	7339
425	430	14.2	2879	4341	1	7221
430	435	14.3	2823	4284	1	7108
435	440	14.5	2768	4229	1	6998
440	445	14.7	2716	4176	1	6892
445	450	14.8	2665	4124	1	6789
450	455	15.0	2615	4074	0	6690
455	460	15.2	2567	4026	0	6593
460	465	15.3	2521	3979	0	6499
465	470	15.5	2475	3933	0	6409
470	475	15.7	2432	3889	0	6320
475	480	15.8	2389	3846	0	6234
480	485	16.0	2347	3804	0	6151
485	490	16.2	2307	3763	0	6071
490	495	16.3	2268	3724	0	5992
495	500	16.5	2230	3685	0	5916
500	505	16.7	2193	3648	0	5842
505	510	16.8	2158	3612	0	5769
510	515	17.0	2123	3577	0	5699
515	520	17.2	2089	3542	0	5631
520	525	17.3	2056	3509	0	5565
525	530	17.5	2024	3476	0	5500
530	535	17.7	1992	3445	0	5437
535	540	17.8	1962	3414	0	5376
540	550	18.0	1904	3354	0	5258
550	570	18.3	1797	3245	0	5042
570	600	19.0	1657	3099	0	4756
600	630	20.0	1536	2974	0	4510
630	660	21.0	1432	2864	0	4296
660	690	22.0	1342	2768	0	4110
690	720	23.0	1265	2683	0	3949
720	750	24.0	1199	2609	0	3808
750	780	25.0	1142	2543	0	3686
780	810	26.0	1092	2485	0	3577
810	840	27.0	1049	2433	0	3482
840	870	28.0	1010	2387	0	3397
870	900	29.0	976	2347	0	3323
900	930	30.0	947	2311	0	3258
930	960	31.0	922	2280	0	3201
960	990	32.0	899	2252	0	3151
990	1020	33.0	879	2227	0	3106
1020	1050	34.0	861	2205	0	3066
1050	1080	35.0	846	2185	0	3030
1080	1110	36.0	832	2167	0	2998
1110	1140	37.0	819	2150	0	2970
1140	1170	38.0	808	2136	0	2944
1170	1200	39.0	798	2123	0	2920

B FOLDER ARCHIVING STRUCTURE AND MODEL FILE NAMES

Folder Archiving Structure

- Chowilla_Scenario_Modelling_2012
  - Correspondence
    - Contracts
    - Emails
    - Finance
    - Meetings
    - Minutes
  - Data
    - GIS
    - Hydrogeology
    - Model_Layer_Elevations
    - Observed_Groundwater_Levels
    - Production_Bore_Extractions
    - Recharge_and_Discharge
    - Salinity_and_Chemistry
    - Surface_Water
  - Model_Files
    - Predictions
      - Analysis
      - Scenario_models
        - Task_1
        - Task_2
        - Task_3
    - Sensitivity_Tests
      - No_regulator
      - Vegetation_negative_recharge
      - Water_balance_downstream_Lock6
  - Reporting
    - Appendices
    - Draft_Reports
    - Figures
    - Final_Report
    - Other_Reports
    - Presentations
    - Reviews
    - Tables
- Old_Model Files
- Presentations
- SubDocuments_to_MDBA_2009

Model File Names

Task	Scenario	File Name
1	1	CHW2012_Task1_S1_Jul2012.vmf
	2	CHW2012_Task1_S2_Jul2012.vmf
	3	CHW2012_Task1_S3_Jul2012.vmf
2	1	CHW2012_Task1_S1_Jul2012.vmf
	2	CHW2012_Task2_S2_Jul2012.vmf
	3	CHW2012_Task2_S3_Jul2012.vmf
3	1	CHW2012_Task1_S1_Jul2012.vmf
	2	CHW2012_Task3_S2_Jul2012.vmf
	3	CHW2012_Task3_S3_Jul2012.vmf

C PREVIOUS TASK DOCUMENTS

Task 1 – Different Duration of Regulator Operation

Purpose

The purpose of this task is to quantify the peak, increasing and total (cumulative) salt loads due to operation of the regulator for 2, 3 and 4 months. IT is assumed that the operational height of the regulator is 19.87 m AHD.

Scenarios

Variables of flood magnitude and flood (regulator operation) duration were altered for a total of nine scenarios for this task, shown in Table 1.

Table 1. Variables for the nine scenarios and abbreviated scenario names

		Flood magnitude (ML/day)		
		10,000	40,000	60,000
Flood Duration (months)	2	S10-2	S40-2	S60-2
	3	S10-3	S40-3	S60-3
	4	S10-4	S40-4	S60-4

Model Inputs and Assumptions

Each scenario was run for three years with one month (30 days) time steps. The model results represent the salt load at end of each time step. Each scenario model run incorporates a three month low flow period, operating period (two, three or four months) and then approximately 18 months post operation (see example in Figure 1).

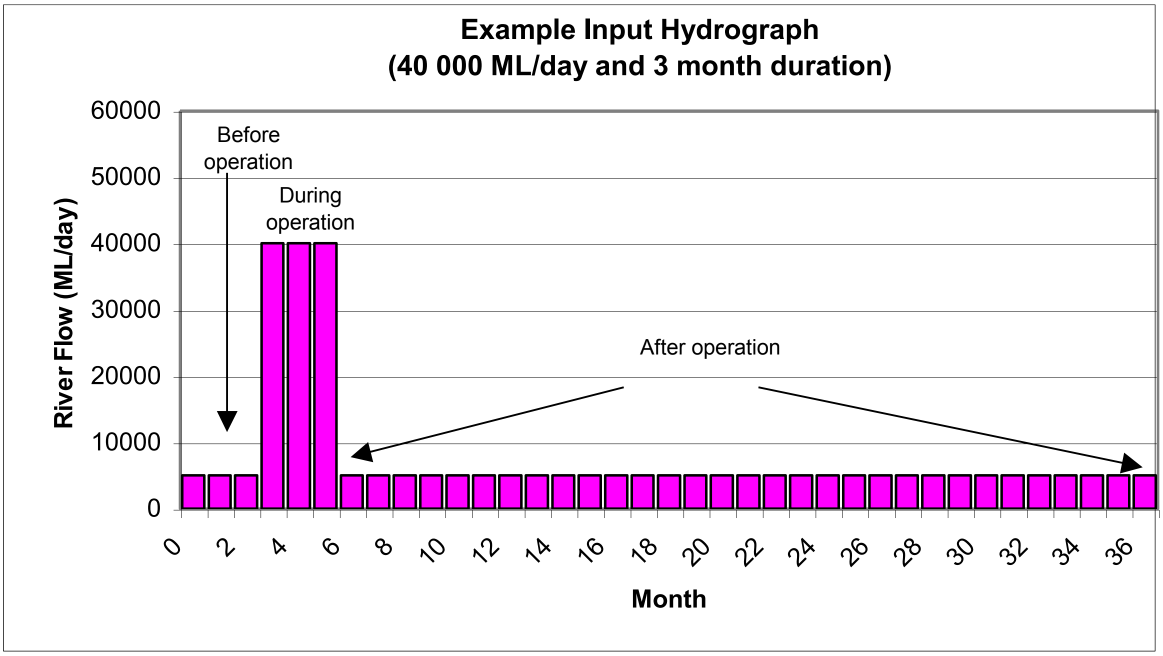


Figure 1. Example input hydrograph (S40-3)

The inundation areas and creek levels are identical to those assumed for the 30 year model scenarios, described in Report DWLBC 2007/28 (Howe 2007).

Results

10 000 ML/day Scenarios

Figure 2a shows model estimated salt load before, during and after operating the regulator for 10 000 ML/day event. The model results show salt load peaks and indicate that after the surface water level returns to the original level, the salt load may take approximately 14 months (2 month duration scenario), 16 months (3 month duration scenario), and 17 months (4 month duration scenario)to return to the pre-operating level.

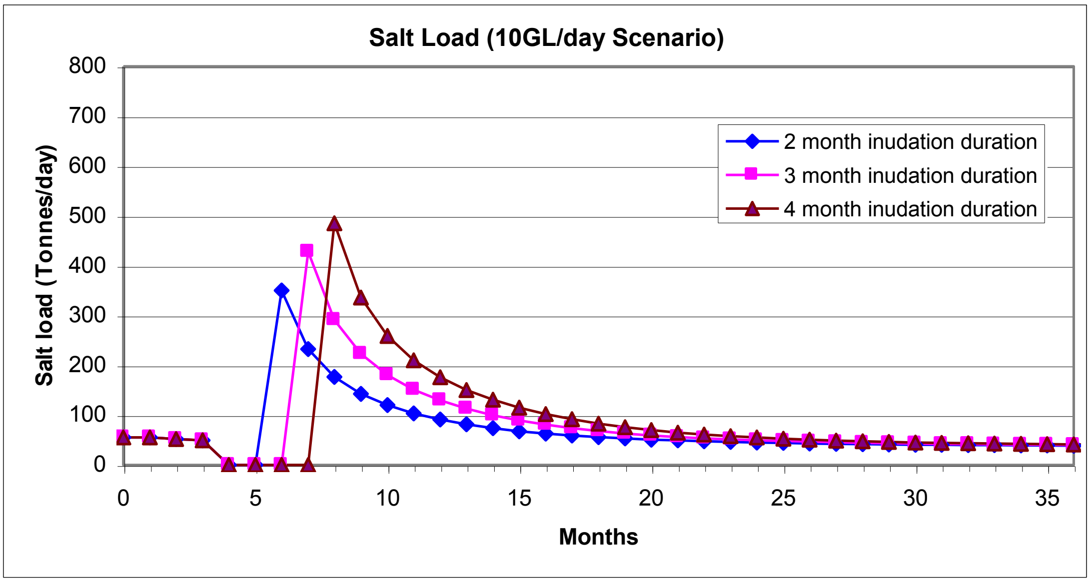


Figure 2a. Model estimated salt load for 10 000 ML/day scenarios

Figure 2b shows model estimated increased salt load resulting from operation of the regulator for 2, 3 and 4 month during a 10 000 ML/day event. The zero on time scale in Figure 2b represents the moment surface water level returns to original or pre-operation level.

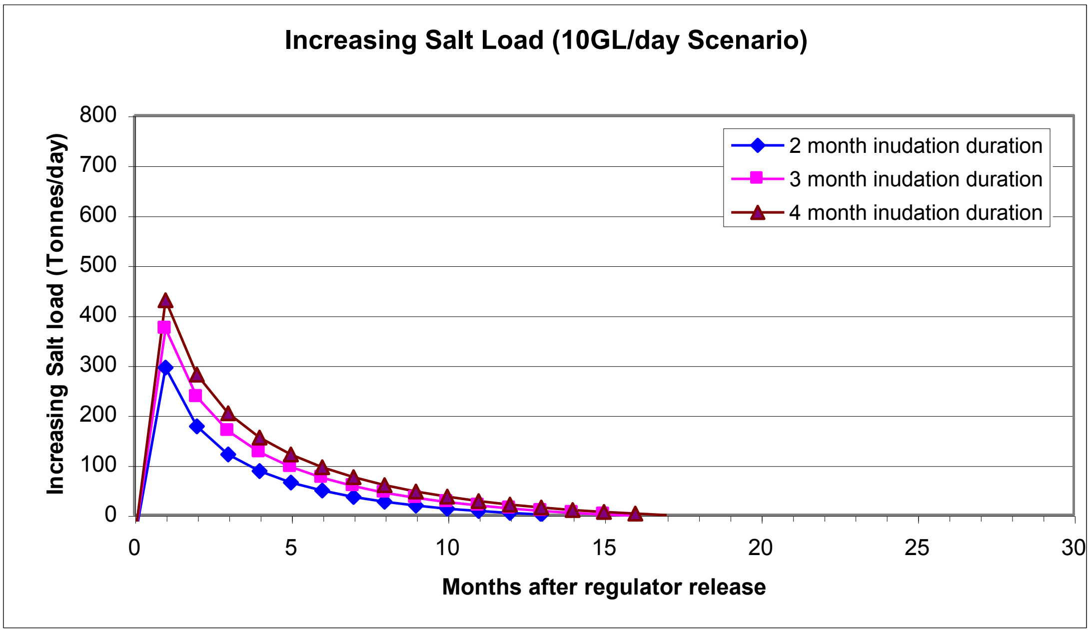


Figure 2b. Model estimated increasing salt load for 10 000 ML/day scenarios

Figure 2c shows model estimated total salt load into the anabranch creek system due to operating regulator for 2, 3 and 4 months. This figure indicates a total of approximately 27 000 tonnes, 38 000 tonnes and 48 000 tones of additional salt could be released from the groundwater system and transported into the River Murray through the anabranch system over a 17 month following inundation of the floodplain.

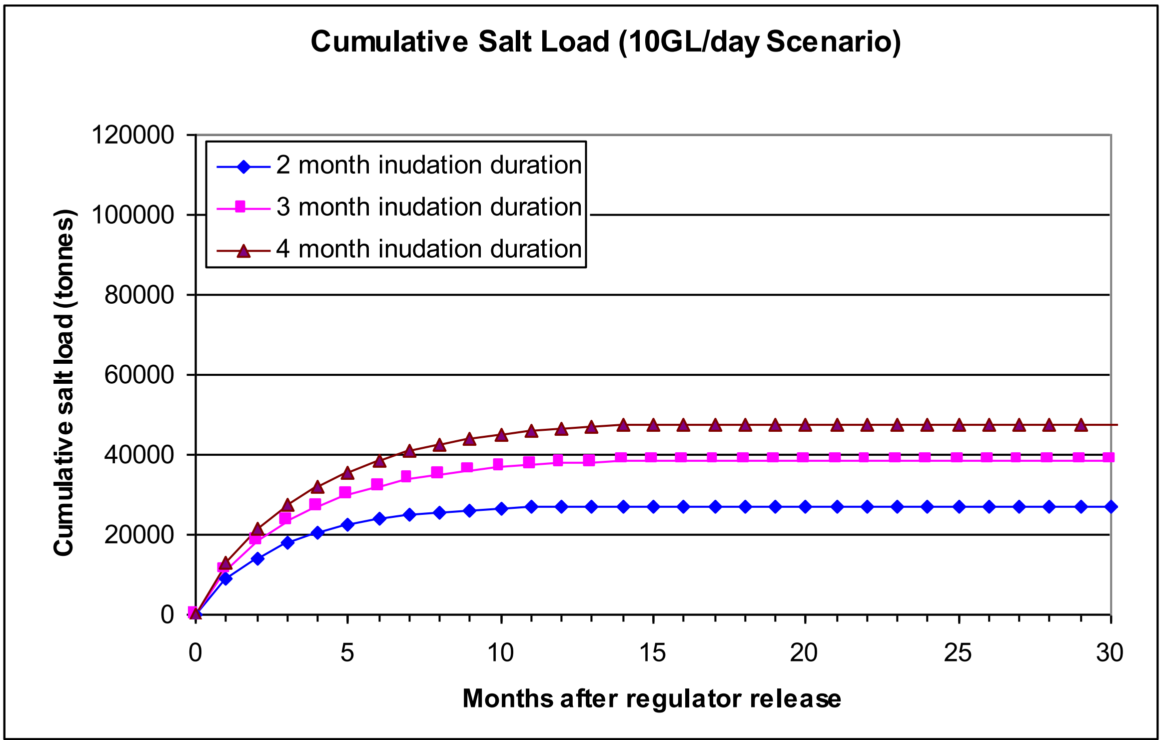


Figure 2c. Cumulative increasing salt load for 10 000 ML/day scenarios

A summary of the model estimated salt load at monthly time steps are given in Table 2.

Table 2. Summary of salt loads (tonnes/day) for 10 000 ML/day scenarios

	Months after regulator release						
	1	**3**	**5**	**8**	**12**	**18**	**24**
2 month inundation duration	350	233	120	82	63	46	41
3 month inundation duration	428	223	151	100	68	50	35
4 month inundation duration	485	259	176	115	76	53	44

40 000 ML/day Scenarios

Figure 3a shows model estimated salt load before, during and after operating the regulator for 40 000 ML/day event. The model results show salt load peaks and indicates that after surface water level returns to the pre-operating level, the salt load may take approximately 15 months (2 month duration scenario), 17 months (3 month duration scenario), and 19 months (4 month duration scenario) to return to the pre-operating level.

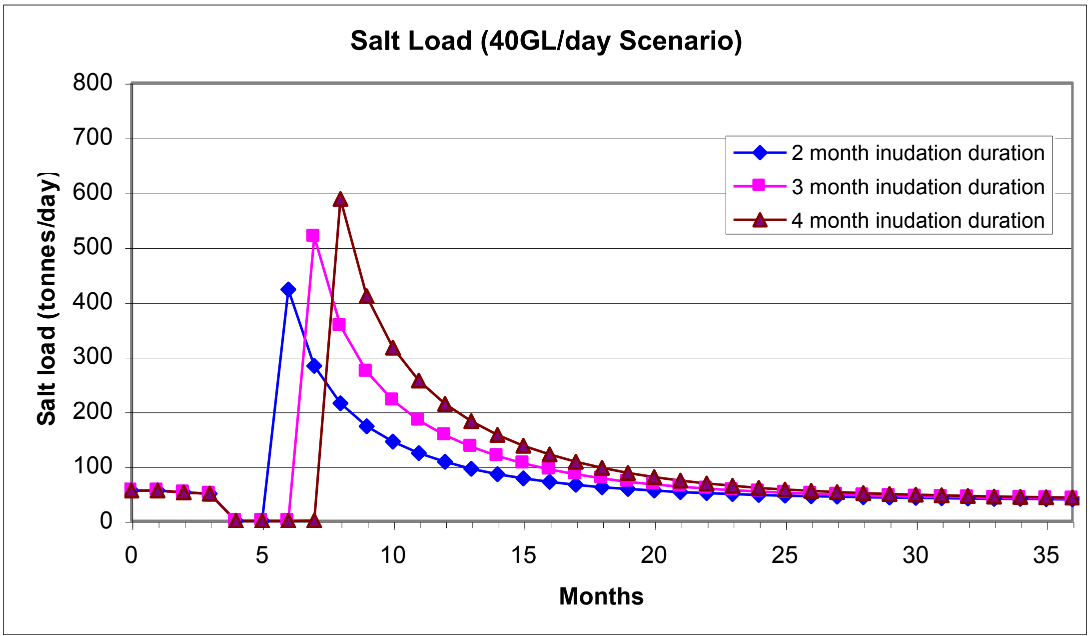


Figure 3a. Model estimated salt load for 40 000 ML/day scenarios

Figure 3b shows model estimated increased salt load resulting from operation of the regulator for 2, 3 and 4 month during a 40 000 ML/day event. The zero on time scale in Figure 3b represents the moment surface water level returns to original or pre-operation level.

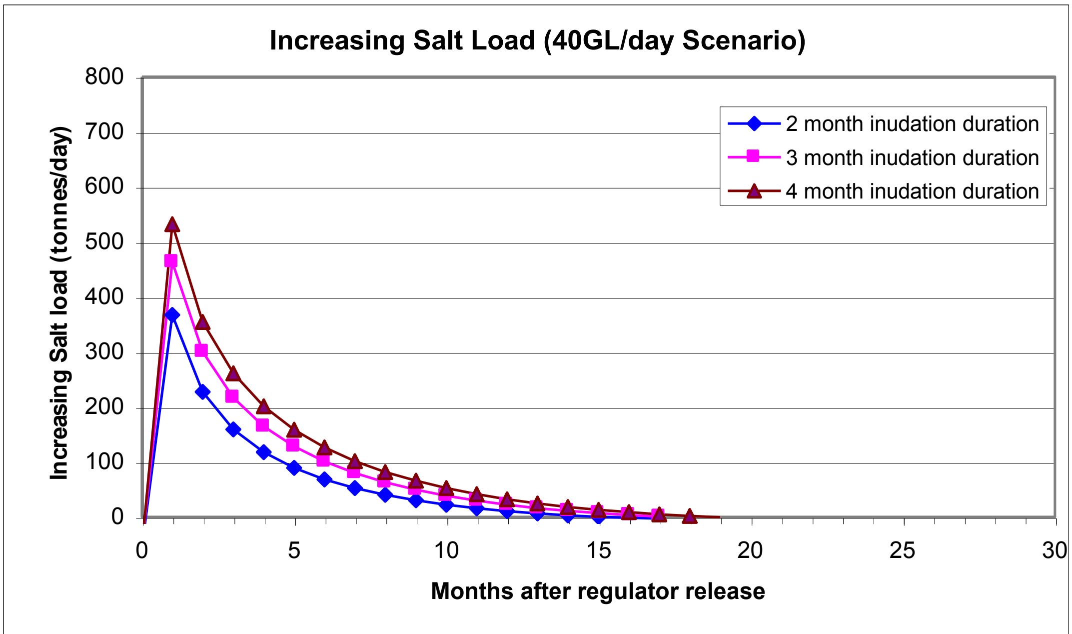


Figure 3b. Model estimated increasing salt load for 40 000 ML/day scenarios

Figure 3c shows model estimated total salt load into the anabranch creek system due to operating regulator for 2, 3 and 4 months. This figure indicates a total of approximately 36 000 tonnes, 51 000 tonnes and 62 000 tones of additional salt could be released from the groundwater system and transported into the River Murray through the anabranch system over a 19 month following inundation of the floodplain.

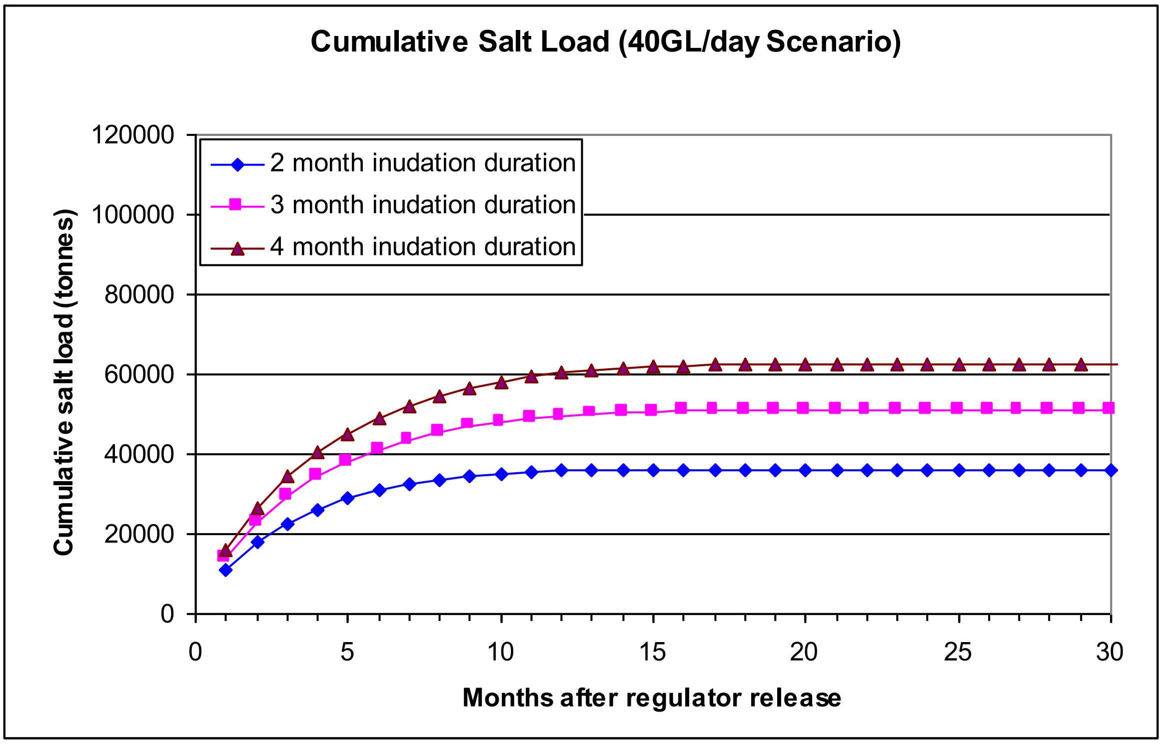


Figure 3c. Cumulative increasing salt load for 40 000 ML/day scenarios

A summary of the model estimated salt load at monthly time steps are given in Table 3.

Table 3. Summary of salt loads (tonnes/day) for 40 000 ML/day scenarios

	Months after regulator release						
	1	**3**	**5**	**8**	**12**	**18**	**24**
2 month inundation duration	423	283	144	95	71	49	43
3 month inundation duration	519	272	183	119	78	53	35
4 month inundation duration	588	316	214	137	88	57	47

60 000 ML/day Scenarios

Figure 4a shows model estimated salt load before, during and after operating the regulator for 60 000 ML/day event. The model results show salt load peaks and indicate that after the surface water level returns to the original level, the salt load may take approximately 17 months (2 month duration scenario), 20 months (3 month duration scenario), and 20 months (4 month duration scenario) to return to the pre-operating level.

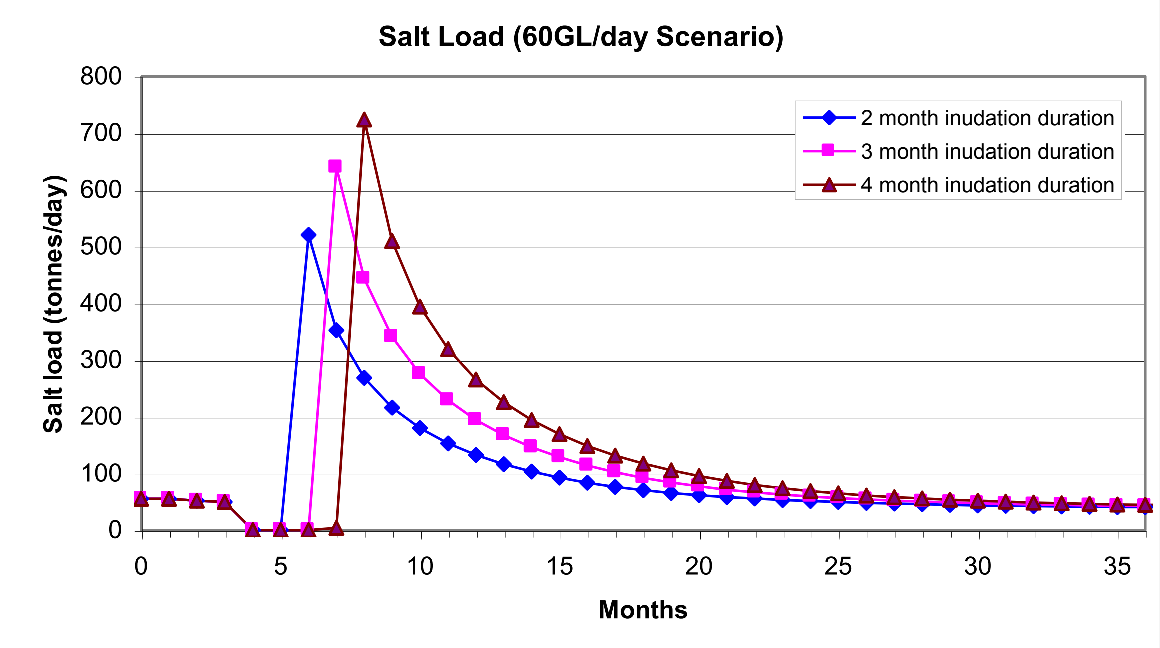


Figure 4a. Model estimated salt load for 60 000 ML/day scenarios

Figure 4b shows model estimated increased salt load resulting from operation of the regulator for 2, 3 and 4 month during a 60 000 ML/day event. The zero on time scale in Figure 4b represents the moment surface water level returns to original or pre-operation level.

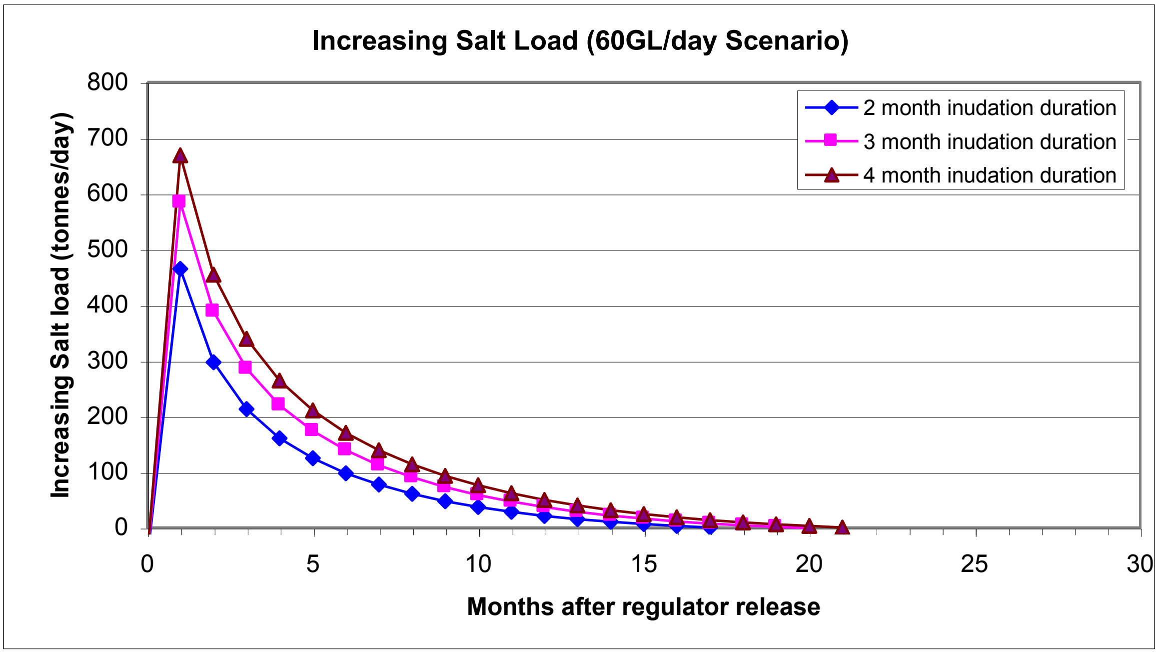


Figure 4b. Model estimated increasing salt load for 60 000 ML/day scenarios

Figure 4c shows model estimated total salt load into the anabranch creek system due to operating regulator for 2, 3 and 4 months. This figure indicates a total of approximately 50 000 tonnes, 69 000 tonnes and 83 000 tones of additional salt could be released from the groundwater system and transported into the River Murray through the anabranch system over a 30 month following inundation of the floodplain.

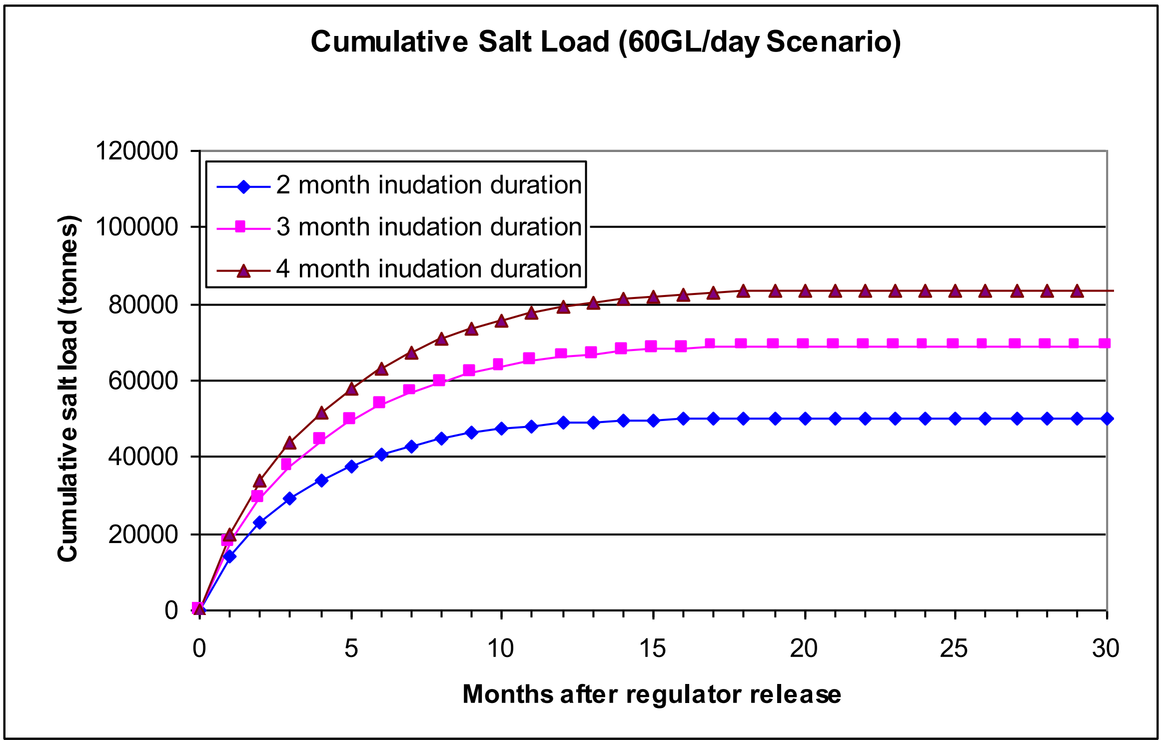


Figure 4c. Cumulative increasing salt load for 60 000 ML/day scenarios

A summary of the model estimated salt load at monthly time steps are given in Table 4.

Table 4. Summary of salt loads (tonnes/day) for 60 000 ML/day scenarios

	Months after regulator release						
	1	**3**	**5**	**8**	**12**	**18**	**24**
2 month inundation duration	520	352	180	116	83	53	44
3 month inundation duration	639	340	229	146	92	59	35
4 month inundation duration	724	394	266	169	105	65	50

Discussion and analysis

The model results indicate that the peak salt load, increased salt load and total cumulative salt load vary proportionally with flood (and regulator operation) duration and magnitude. The modelled salt load for 3 month regulator operation during a 60000 ML/day flood scenario was compared with measure salt load in similar events in 1980 and 1992. The result matches observed salt loads during the 1992 event quiet well.

Peak (maximum) salt load

The peak salt loads for all model scenarios are summarised in Table 5.

Table 5. Summary of peak salt loads (Tonnes/day) for all scenarios

	flood magnitude ML/day		
	10 000	**40 000**	**60 000**
2 month duration	350	423	520
3 month duration	428	519	639
4 month duration	485	588	724

The percentage change in peak salt load that may be expected by operating the regulator for 2 and 4 months in comparison to the proposed 3 month duration is presented in Table 6. The table indicates that, regardless of the magnitude of a flood, a peak salt load reduction of ~18% may be achieved if the regulator is operated for only 2 months rather than the proposed 3 months. Similarly, if the regulator were operated for 4 months rather than 3 months, an additional salt load of ~13% may be induced.

Table 6. Peak salt load percent change resulting from varying regulator operating duration

	flood magnitude ML/day		
	10 000	**40 000**	**60 000**
2 month duration	-18.2%	-18.5%	-18.6%
3 month duration	-	-	-
4 month duration	13.3%	13.3%	13.3%

Task 2 – Watering at Gum Flat

Purpose

To use existing model inputs to simulate the Red Gum watering event at Gum Flat and compare modelled with observed salt loads[1].

Gum Flat is a site where extensive monitoring data has been collected in terms of watering inundation area and duration, groundwater levels, and surface water flow and salinity in the nearby Punkah Creek. This modelling simulation will asses the ability of the model to simulate salt loads induced from watering sites, with a view to assessing the remaining sites in the future.

Input Data and Assumptions

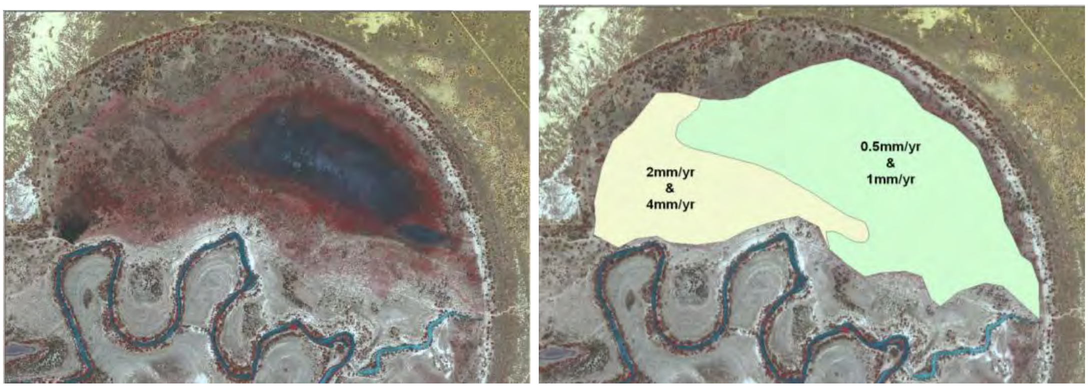


Figure 1. Aerial photograph, digitised inundation area and recharge zones and rates.

The aerial photography used to digitise the maximum inundation area is shown in Figure 1. The potential recharge zones, which were adopted from CSIRO work (Howe et al, 2007), are also shown in Figure 1. During the watering event, pumping onto the floodplain commenced in November 2006. The modelling assumption was to apply recharge over the maximum inundation area for a two-month duration (December-January). No other stresses were applied to the model.

[1] "Observed salt load"   Salt load calculated using data from in-stream gauging stations

Observed Salt load

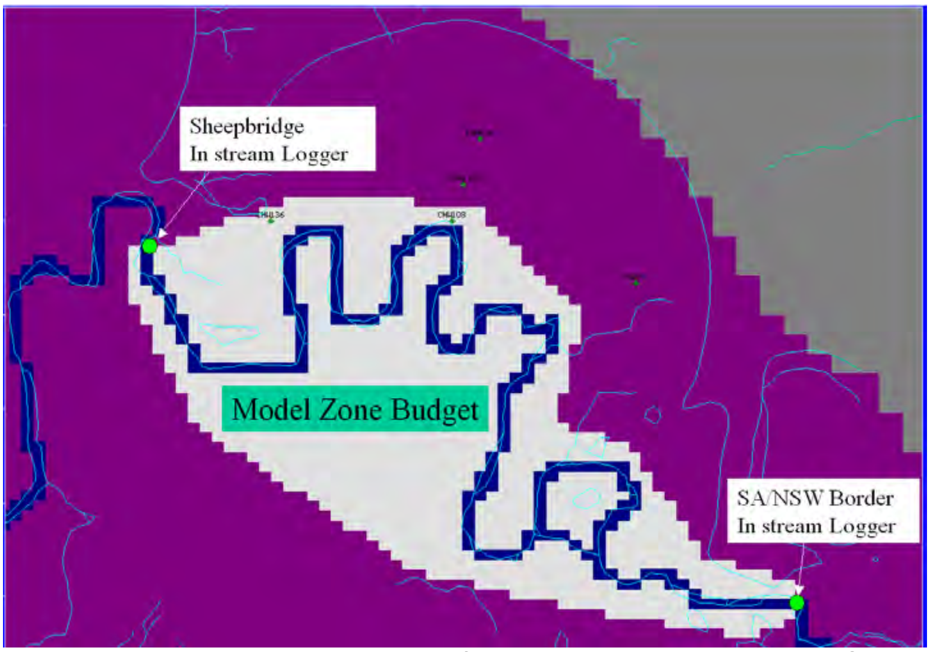


Figure 2. Model budget zone and location of in-stream loggers in Punkah Creek.

Observed increasing salt load was calculated using daily salinity and flow measurements at two locations in Punkah Creek, upstream and downstream of Gum Flat (Figure 2). The salinity difference between the stations was applied to the mean daily stream discharge observed at the Sheepbridge station.

The model budget zone that was set up to calculate the flux of saline water entering the creek between the in-stream loggers is also shown in Figure 2. By this method the observed and modelled salt loads can be compared.

Groundwater Salinity

The Monoman sands aquifer in the Gum Flat area has a groundwater salinity consistently in the order of >50,000 mg/L. Therefore a salinity of 50 000 mg/L has been applied to model results to determine salt loads for this task.

The „whole of floodplain' average salinity[2] of 25,000 mg/L was originally derived for the 30-year flooding scenarios but is unsuitable for this task. This value assumes variability of salinity across the entire floodplain as a result of flooding and other processes and matches well with observed salt loads in the River Murray during the 30-year scenario.

During modelling of the watering event, no mixing of flood water and groundwater is assumed to occur but rather a displacement of near creek saline groundwater.

[2] "Average Salinity" Groundwater salinity that represents an average over the entire floodplain, derived for use during the 30 year flooding scenarios (25 000 mg/L).

Calibration - Recharge Rates

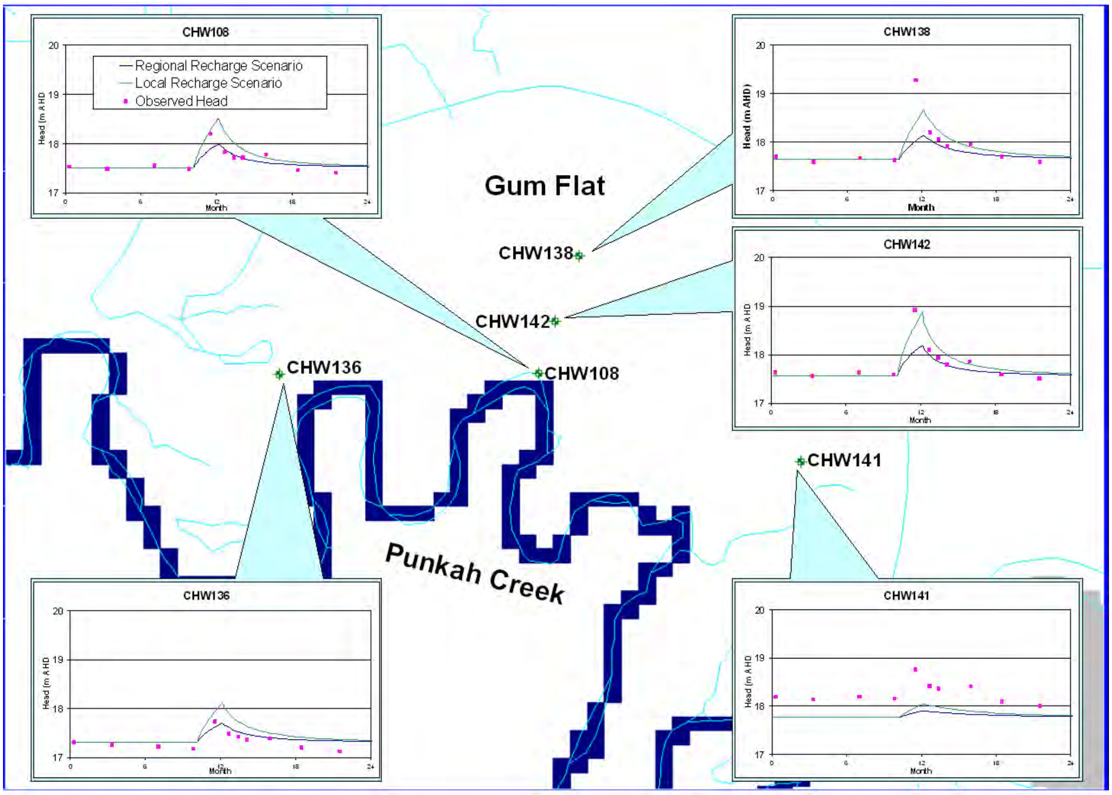


Figure 3. Location and performance of observation wells

The modelled and observed hydrographs for the five observation wells considered are shown in Figure 3. Modelled head levels from two different recharge rate scenarios were considered to identify the best fit with observed groundwater levels.

The modelled heads (at most locations) match closely with observed heads prior to the watering event (Figure 3 - graphs).

Modelled heads under the regional recharge[3] scenario underestimated the observed head level rise that resulted from the event, particularly in the centre of Gum Flat.

The local recharge[4] scenario overestimated the observed head level rise resulting from the event in some areas and underestimated it in others. However, the local recharge scenario produces an overall better match with observation data. This „middle ground' approach provides the best possible calibration that can be achieved using the CSIRO distribution of recharge zones (Figure1) and potential rates.

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[3] "Regional recharge" Recharge rates that were used during the 30-year flooding scenarios (2 & 0.5 mm/d at Gum Flat)

[4] "Local recharge" Recharge rates required to achieve a reasonable calibration with observed groundwater levels for this task (4 & 1 mm/day at Gum Flat)

Results - Salt load

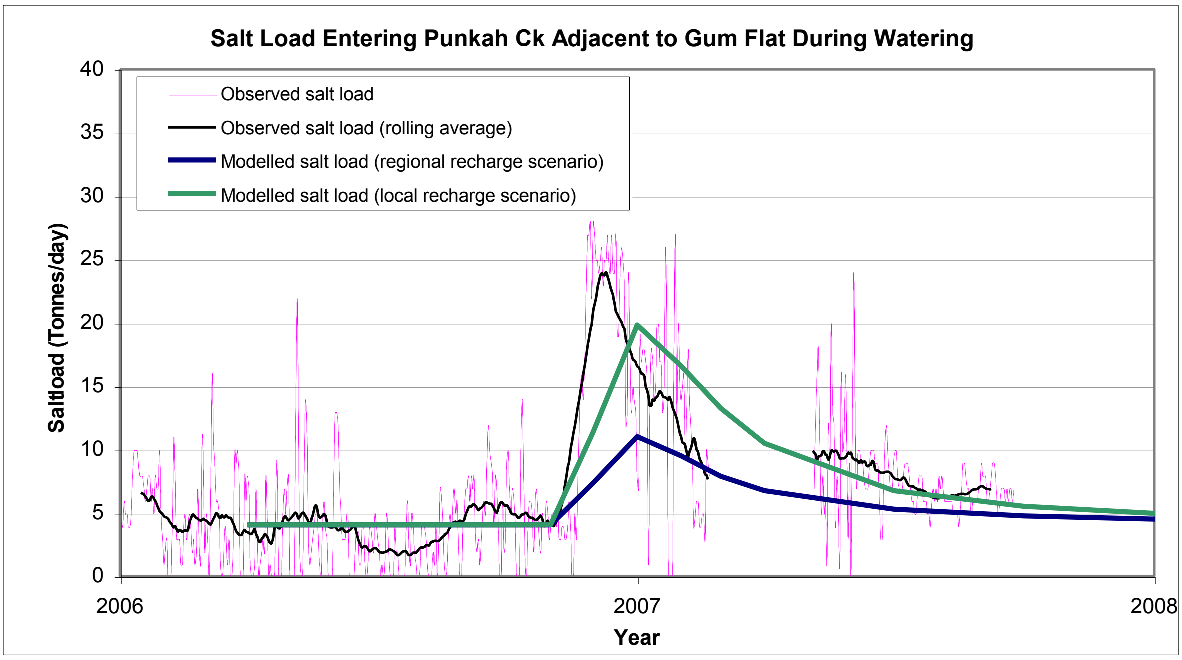


Figure 4. Observed and modelled increase in salt loads for two scenarios.

The observed increase in salt load and modelled salt loads for both recharge scenarios are shown in Figure 4. Observed salt load is also provided as a rolling monthly average for comparison with modelled salt loads. The figure shows that, prior to the watering event, the modelled salt load compares well with the observed salt load. The measured peak salt load occurred earlier and was higher than modelled salt load. This increase may also have been influenced by a 10 – 15 cm water level drop in Punkah Creek during the watering trial.

During and after the watering event, salt load induced under the local recharge scenario compares quite well with the observed salt load peak and recession curve. The regional recharge scenario underestimates the peak and recession salt load.

Monitoring Data

Throughout the watering event at Gum Flat, a comprehensive monitoring dataset was collected, including groundwater level and in-stream conditions. This has allowed an opportunity to test the capability of the model.

The Gum Flat site is unique in that it allows „observed salt load' to be reasonably calculated due to the close proximity of in-stream gauging stations and closed nature of Punkah Creek. Such a useful comparison dataset will not be readily obtainable at most Red Gum watering sites.

Conclusions

This task has shown that the model can be used to reasonably simulate salt loads resulting from watering projects at Gum Flat, provided that the model is calibrated with observed data. In the regional recharge scenario, the model underestimated the observed groundwater level rise and hence salt loads from the Gum Flat watering.

If the model is calibrated to observed groundwater level and salinity data, we assume it can be used to reasonably estimate the salt load impact of a watering event at any location on the floodplain, provided that groundwater data exists for that watering event.

In the absence of suitable in-stream monitoring data, that is, observed salt load, the model can provide a useful impact (salt load) assessment tool.

The task has also shown that the model cannot reliably be used to predict the salt load likely to result from future watering events, unless groundwater data was available to calibrate the model against.

Task 3 – Slow vs Rapid Regulator Recession

Purpose

The purpose of this task is to quantify the variation of salt load induced by comparing different rates of release of flood waters after regulator operation. The task tests the theory that the salt load spike induced by the regulator can be reduced by releasing the regulator slowly (although the total quantum of salt may increase). This task was done by comparing three different scenarios:

1. Slow Regulator Recession
2. Rapid Regulator Recession
3. Instant Regulator Recession

Model Inputs and Assumptions

The regulator is assumed to operate for 3 months at full level (19.87m AHD) before being released. The rate of release of the regulator varies for each scenario as summarised by the inputs shown in Figure 1.

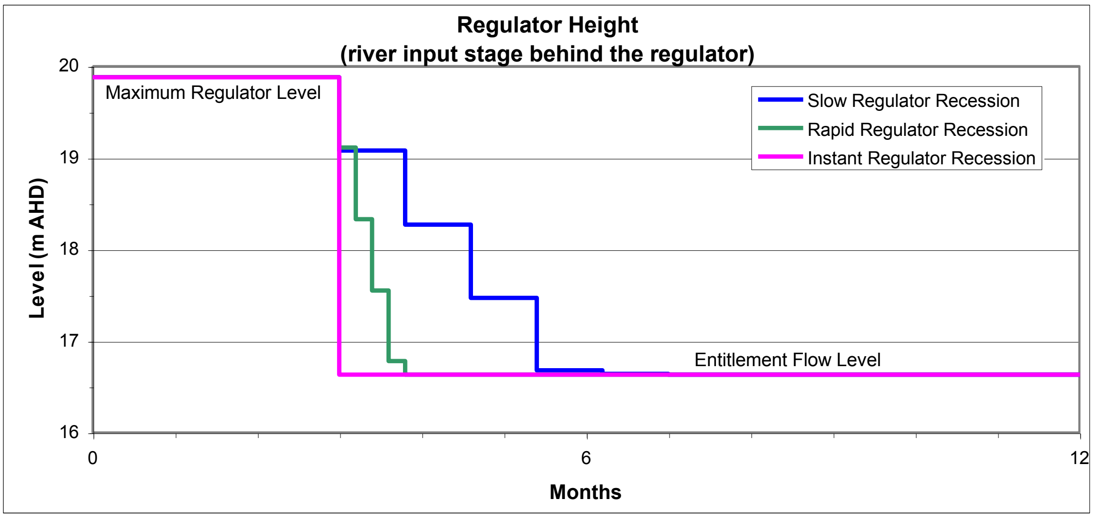


Figure 1. Creek level immediately upstream of the regulator for all scenarios

Comparison of Flow Hydrographs

The hydrographs for all three scenarios assume an initial flow in the River Murray of 60,000 ML/day for the first 3 months (while the regulator is being operated), which decreases to 5,000 ML/day (entitlement) around the same time the regulator is released.

Ideally for this task, the flow hydrographs would be identical for each scenario and only the management of the regulator would vary. However, there are slight differences between the hydrographs of each scenario (Figure 2) due to assumptions required for hydrodynamic modelling.

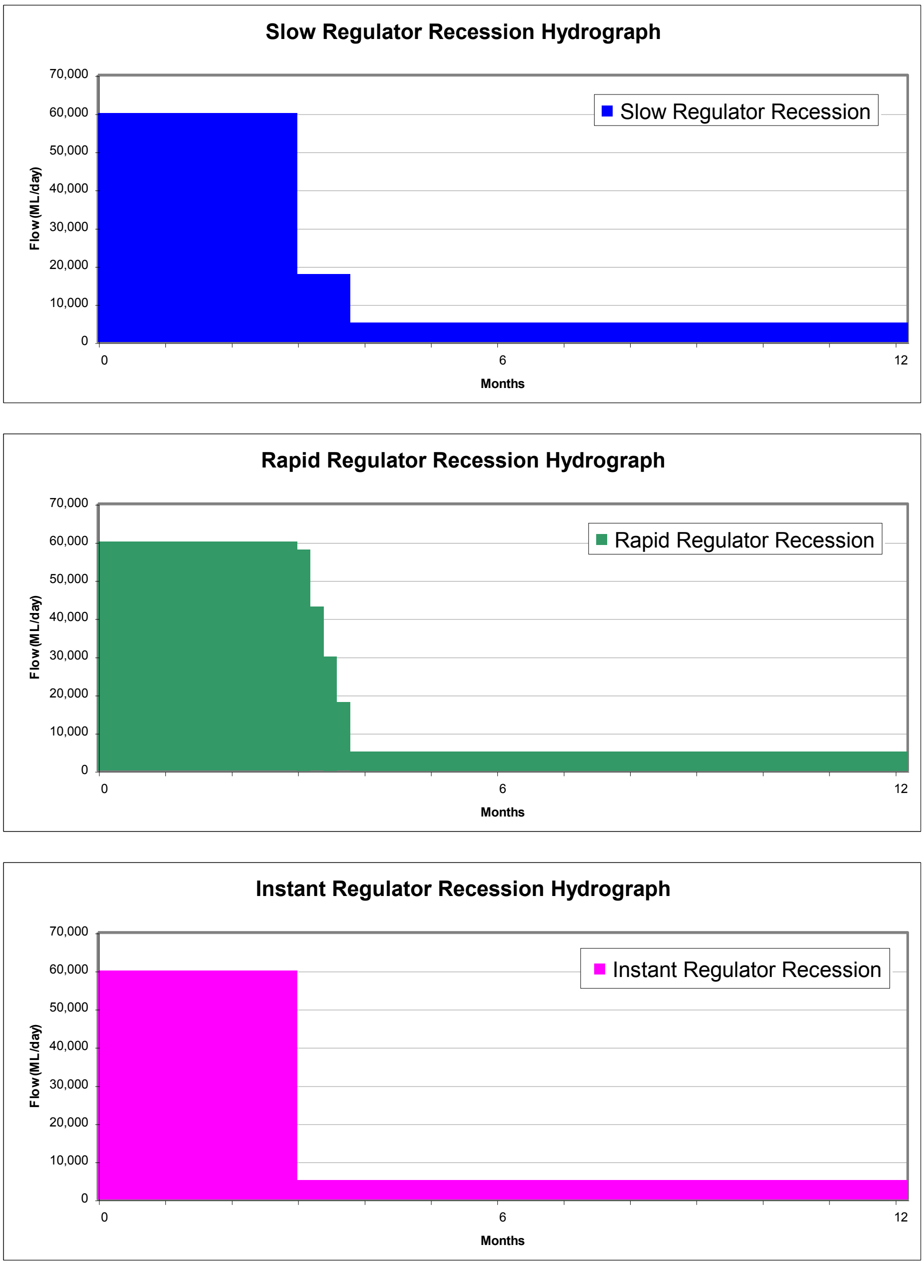


Figure 2. Assumed hydrograph for each scenario

Slow Regulator Recession

In this scenario the regulator is released slowly from 19.87 m AHD at a rate of 1m per month and takes approximately 3 months to return to entitlement flow level. Model conditions were changed every 24 days during drawdown, as indicated in Figure 1.

The creek head levels and inundation extents for the slow regulator recession scenario are shown in Table 1 and Figure 3. Location of each river group shows in Figure 4.

Table 1. River head elevations assumed for slow recession scenario

MODFLOW River Cell Group #	Stream elevation (m AHD) @ River Flow (ML/day)					
	Period 1 60,000	Period 2 17,692	Period 3 5,000	Period 4 5,000	Period 5 5,000	Period 6 5,000
5	21.70	20.09	19.71	19.69	19.66	19.61
6	21.59	20.10	19.70	19.69	19.67	19.64
7	21.46	20.08	19.71	19.69	19.66	19.69
8	21.39	20.07	19.74	19.69	19.67	19.70
9	21.28	20.05	19.71	19.68	19.66	19.69
10	21.14	20.07	19.00	18.10	18.10	18.10
11	20.92	19.76	18.92	18.46	17.99	17.99
12	20.85	19.75	18.92	18.46	17.68	17.68
13	20.71	19.69	18.87	18.27	17.82	17.82
14	20.65	19.65	18.73	18.23	17.98	17.96
16	20.53	19.59	18.74	18.21	17.71	17.52
17	20.51	19.54	18.70	18.15	17.69	17.39
18	20.46	19.49	18.68	18.11	17.47	17.15
19	20.38	19.44	18.64	18.07	17.44	17.10
20	20.00	19.25	18.60	18.06	17.43	17.10
21	20.12	19.22	18.43	17.75	17.06	16.77
22	19.88	19.08	18.27	17.47	16.68	16.63
23	20.35	19.46	18.87	18.57	18.38	18.28
26	20.45	19.47	18.67	18.09	17.46	17.12
27	21.26	19.98	19.63	19.57	19.50	19.45
28	20.97	19.96	19.64	19.59	19.55	19.54
29	20.91	19.90	19.59	19.56	19.54	19.52
30	20.75	19.72	18.90	18.66	18.54	18.37
31	20.61	19.65	18.87	18.65	18.55	18.34

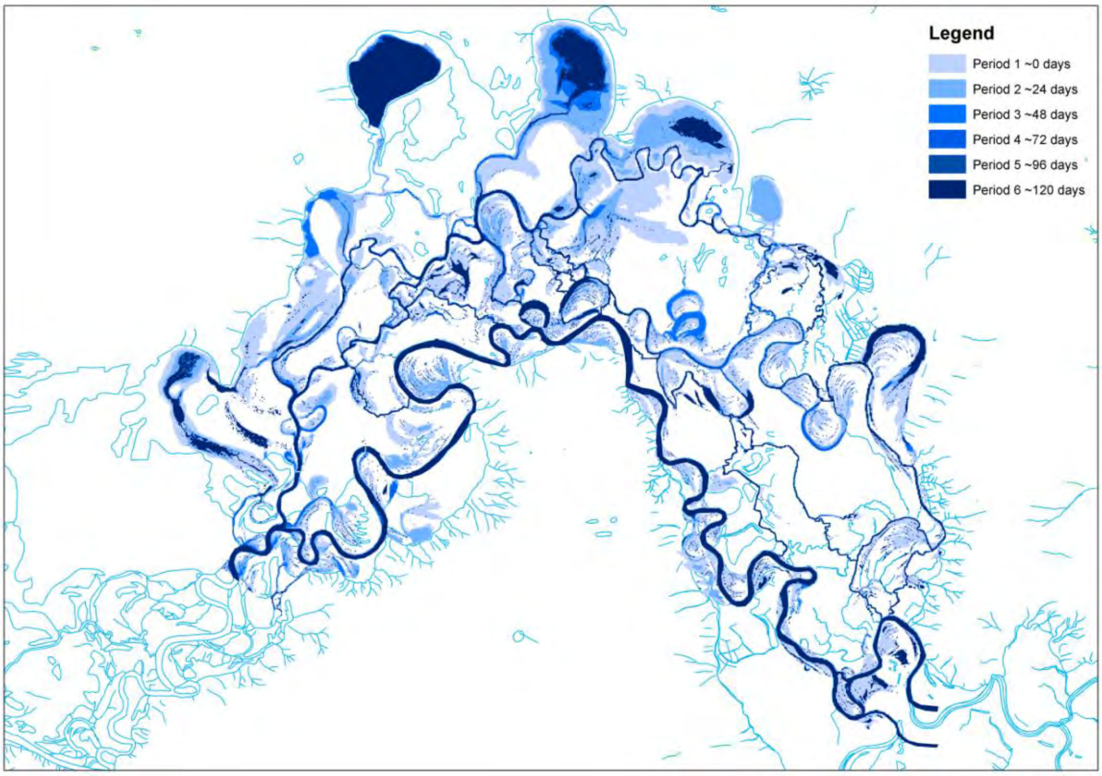


Figure 3. Inundation extents for slow recession scenario

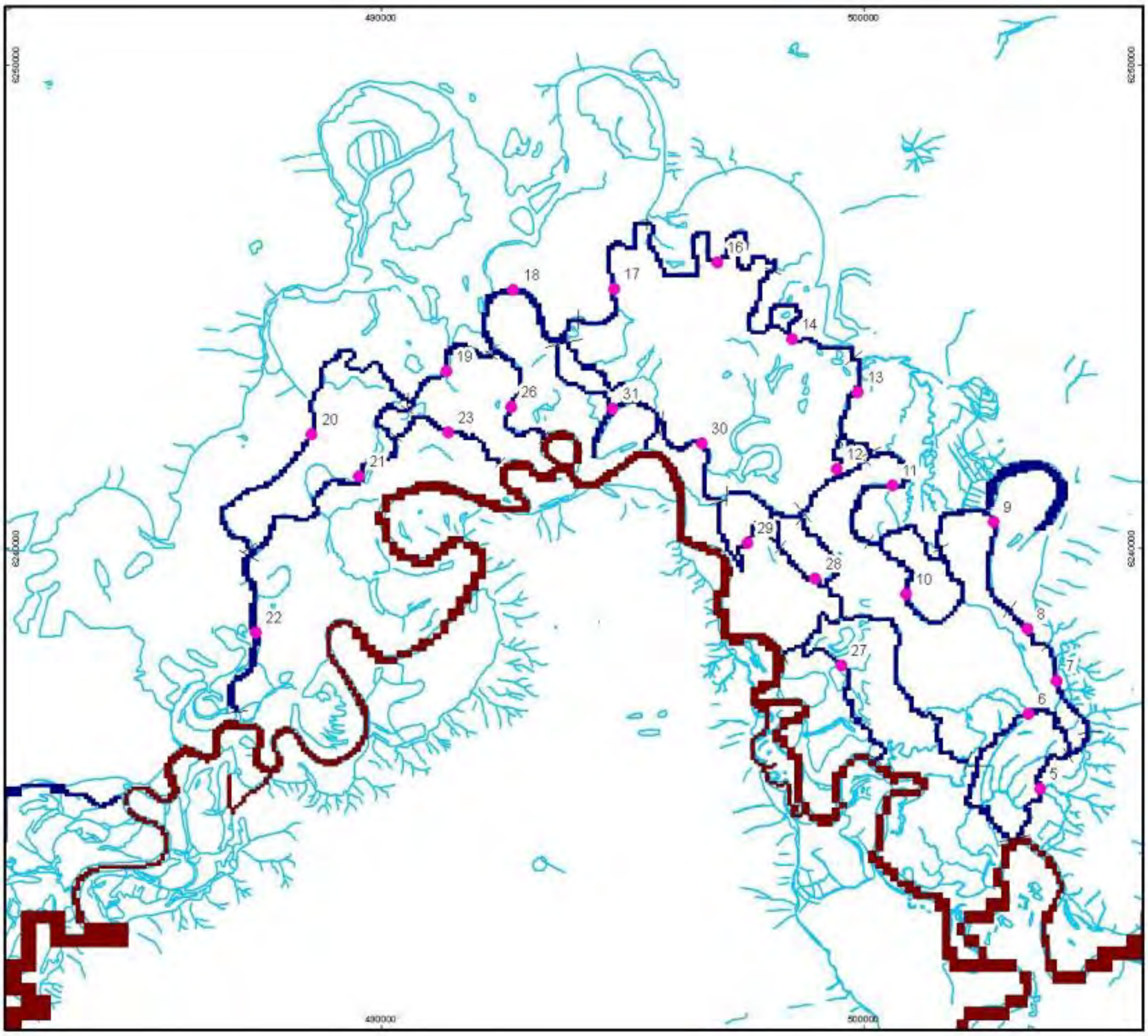


Figure 4. Location of model river boundary cells (blue) and group numbers

Rapid Regulator Recession

In this scenario the regulator is released from full level (19.87 m AHD) entirely in the space of one month. Inundation area and creek levels were changed every 6 days during drawdown, as indicated in Figure 1.

The creek head levels and inundation extents for the rapid regulator recession scenario are shown in Table 2 and Figure 5. Location of each river group shows in Figure 4.

Table 2. River head elevations assumed for rapid recession scenario

MODFLOW River Cell Group #	Stream elevation (m AHD) @ River Flow (ML/day)					
	Period 1 60,000	Period 2 56,000	Period 3 43,000	Period 4 30,000	Period 5 18,000	Period 6 5,000
5	21.70	21.58	21.05	20.47	19.94	19.62
6	21.59	21.49	20.99	20.45	19.91	19.57
7	21.46	21.37	20.92	20.42	19.94	19.61
8	21.39	21.31	20.88	20.40	19.92	19.63
9	21.28	21.20	20.77	20.35	19.91	19.63
10	21.14	21.06	20.65	20.30	19.99	19.69
11	20.92	20.83	20.41	19.88	18.98	18.56
12	20.85	20.74	20.34	19.84	18.96	18.56
13	20.71	20.61	20.23	19.73	18.88	18.59
14	20.65	20.54	20.16	19.63	18.49	17.99
16	20.53	20.40	20.01	19.51	18.49	17.54
17	20.51	20.36	19.92	19.36	18.44	17.42
18	20.46	20.29	19.83	19.22	18.34	17.19
19	20.38	20.18	19.72	19.11	18.26	17.12
20	20.00	19.61	19.19	18.86	18.26	17.12
21	20.12	19.68	19.03	18.35	17.58	16.78
22	19.88	19.11	18.33	17.55	16.78	16.63
23	20.35	20.14	19.64	19.08	18.58	18.28
26	20.45	20.28	19.80	19.18	18.30	17.14
27	21.26	21.15	20.71	20.20	19.77	19.43
28	20.97	20.89	20.53	20.13	19.78	19.51
29	20.91	20.82	20.45	20.04	19.70	19.47
30	20.75	20.63	20.24	19.75	18.87	18.37
31	20.61	20.49	20.11	19.59	18.79	18.34

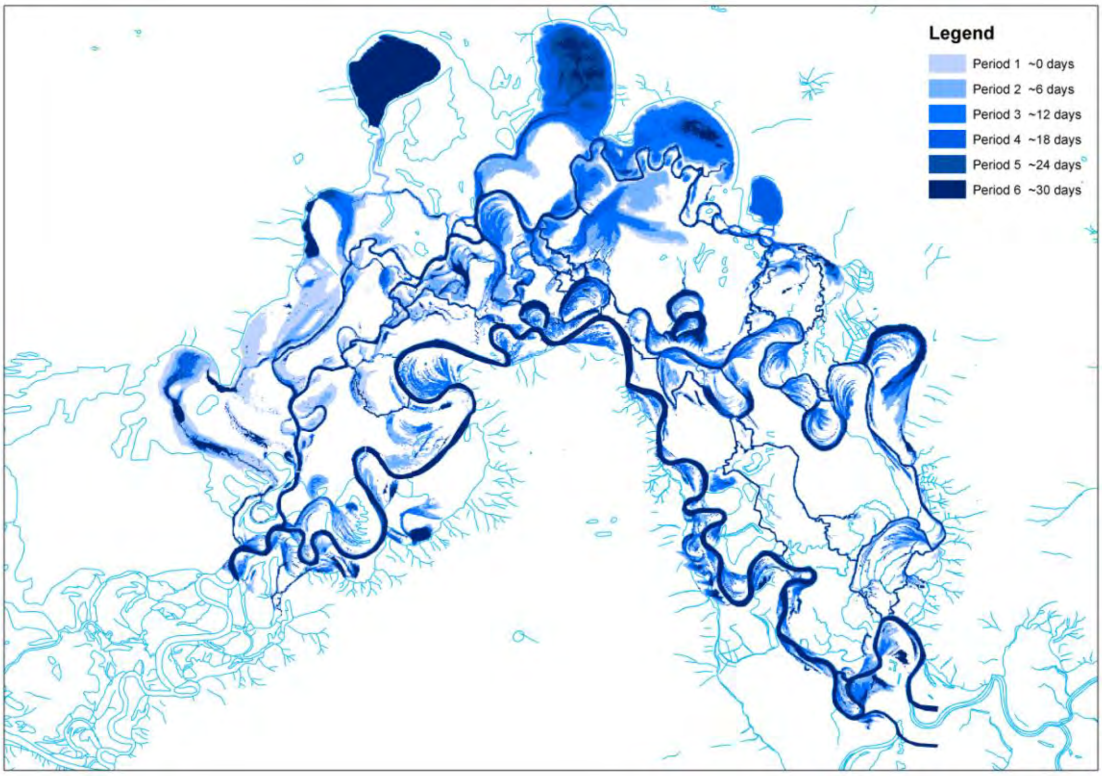


Figure 5. Inundation extents for rapid recession scenario

Instant Regulator Recession

This scenario assumes that the regulator instantly draws down in a single time-step from full level to entitlement flow level (Figure 1). This hypothetical scenario has been included in the task as a useful comparison since this was the condition assumed for the 30-year scenarios during earlier work (Report DWLBC 2007/28).

Results and Discussion

Modelled salt load for each scenario is shown in Figure 5. The modelling has indicated that it may be possible to both decrease and delay the peak salt load induced by the regulator by slowly releasing the flood waters after an operation event. The peculiar shape of the slow recession scenario is due to the assumed incremental lowering of the pool level behind the regulator.

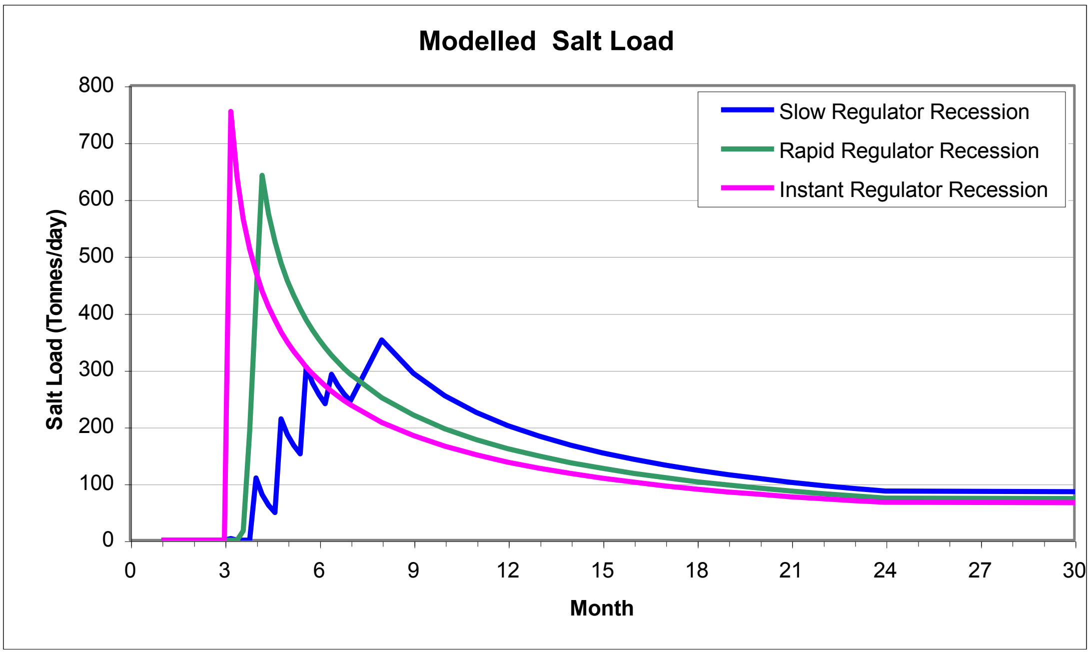


Figure 5. Modelled salt load for each scenario.

Figure 6 shows increasing salt load for all three scenarios.

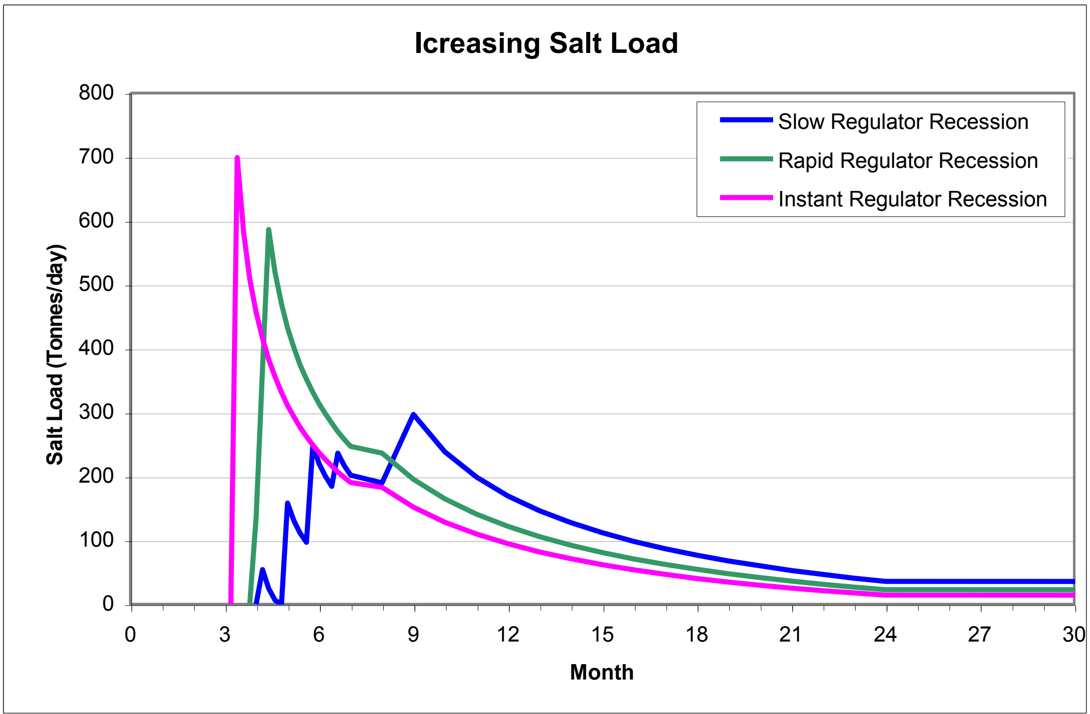


Figure 5. Modelled increasing salt load for each scenario.

Figure 7 shows that the additional salt into the anabranch creek system due to operating regulator. The value appears to be quite similar (~70 000 tonnes) from all three scenarios after 30 month. However, the main difference is timing of releasing the salt (immediately after flood or slowly).

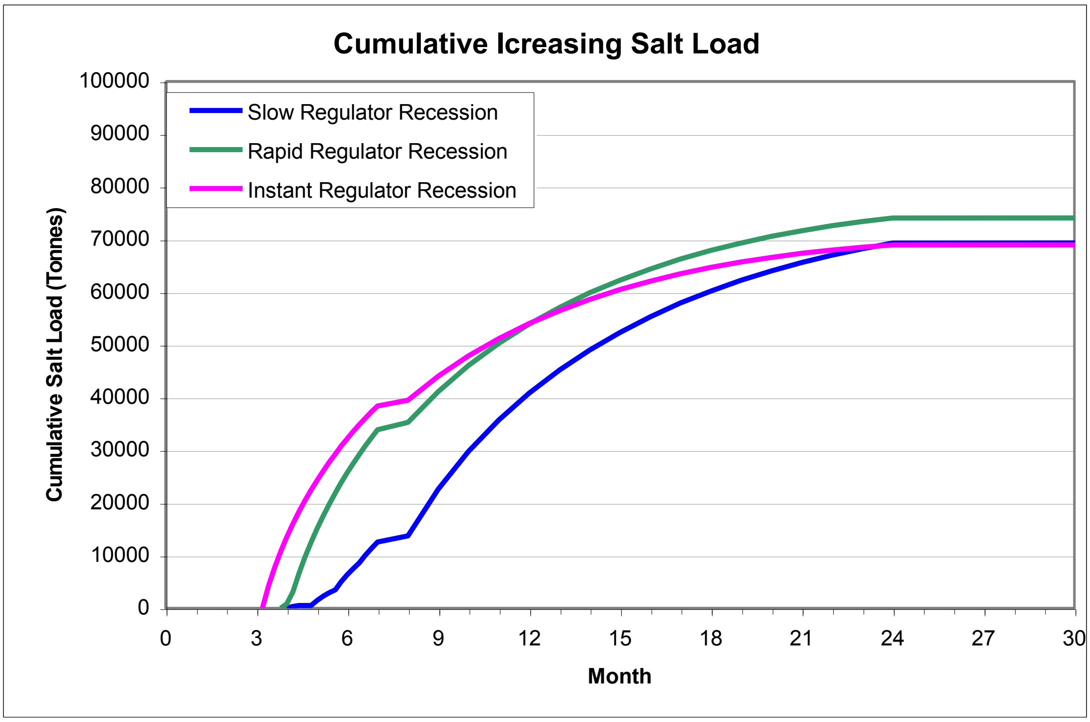


Figure 7. Cumulative increasing salt for each scenario.

Task 4 – Operation of Pipeclay and Slaney Creek Weirs

Purpose

Determine groundwater level changes associated with the operation of the upgraded weirs at Pipeclay and Slaney Creeks.

Scenarios

Basic assumptions are:

- Operating structures (weirs) at Pipeclay and Slaney (See Figure 1)
- No Chowilla Creek regulator in operation
- The river level at upstream Lock 6 maintains at 19.26 m AHD.

The proposed weirs operate at the various flows listed in Table 1, 2 and 3 below:

Table 1. Scenario 1 – Base case

Duration (months)	Flow to SA	Lock 6 height	Pipeclay flow	Slaney flow
24	Entitlement	19.25	500ML/day	300ML/day

Table 2. Scenario 2

Month	Flow to SA	Lock 6 height	Pipeclay flow (ML/day)	Slaney flow (ML/day)
Oct- Jan	Entitlement	19.25	1000	800
Feb-Apr	Entitlement	19.25	600	450
May- Jul	Entitlement	19.25	300	250
Aug- Sep	Entitlement	19.25	800	650
Oct- Jan	Entitlement	19.25	1000	800
Feb-Apr	Entitlement	19.25	600	450
May- Jul	Entitlement	19.25	300	250
Aug- Sep	Entitlement	19.25	800	650

Table 3. Scenario 3

Month	Flow to SA	Lock 6 height	Pipeclay flow (ML/day)	Slaney flow (ML/day)
Oct- Jan	Entitlement	19.25	2000	1250
Feb-Apr	Entitlement	19.25	1200	800
May- Jul	Entitlement	19.25	800	500
Aug- Sep	Entitlement	19.25	1000	650
Oct- Jan	Entitlement	19.25	2000	1250
Feb-Apr	Entitlement	19.25	1200	800
May- Jul	Entitlement	19.25	800	500
Aug- Sep	Entitlement	19.25	1000	650

Model Stress Period

Each scenario was run for two and half years with one month (30 day) time steps. The model results represent the water level changes at end of each time step.

Inputs

Creek levels for each operational scenario were provided by Water Tech in May 2008. Example of the actual data used of creek levels in Pipeclay and Slaney creeks for three scenarios are shown below (Figure 2 to 4):

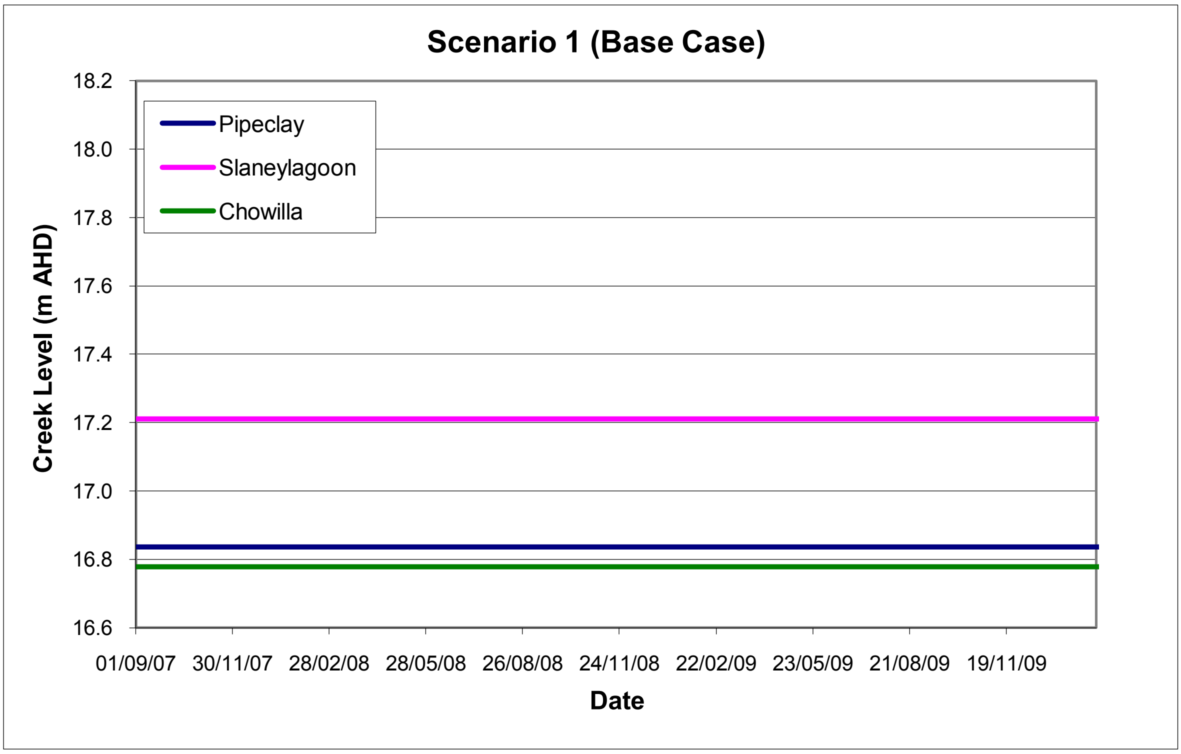


Figure 2 Example of average creek levels in Pipeclay, Slaney and upstream Chowilla (Scenario 1-Base case)

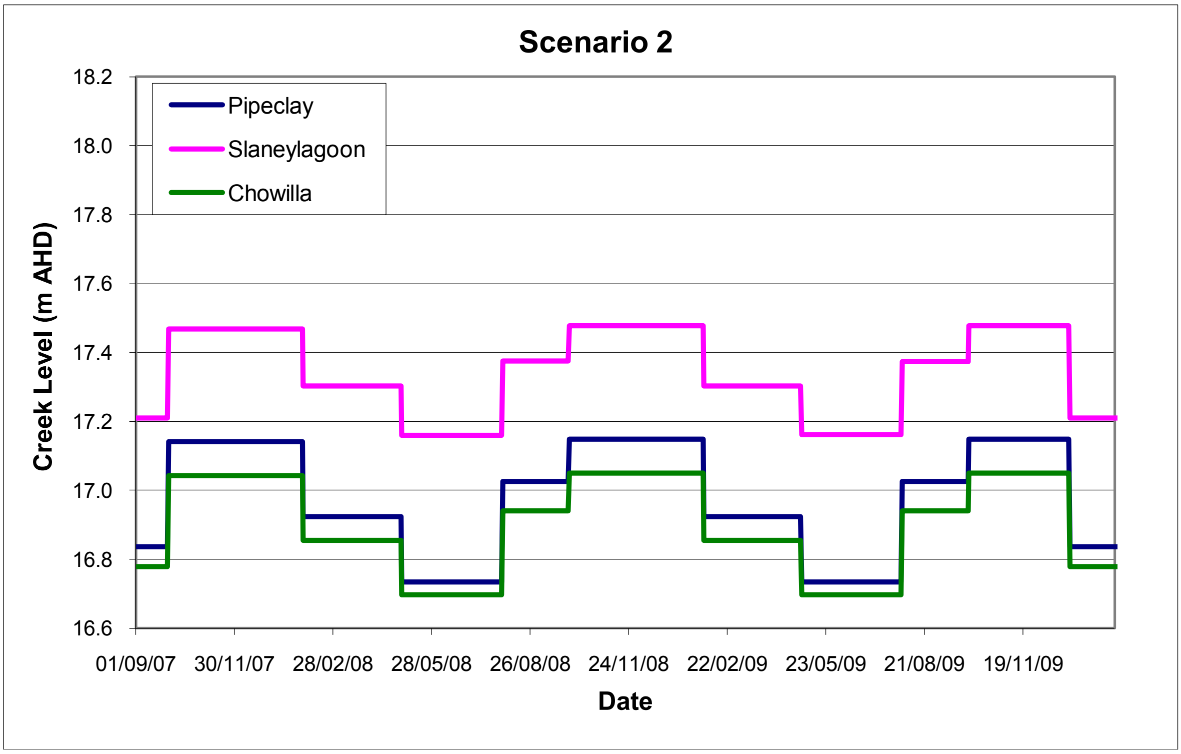


Figure 3 Example of average creek levels in Pipeclay, Slaney and upstream Chowilla (Scenario 2)

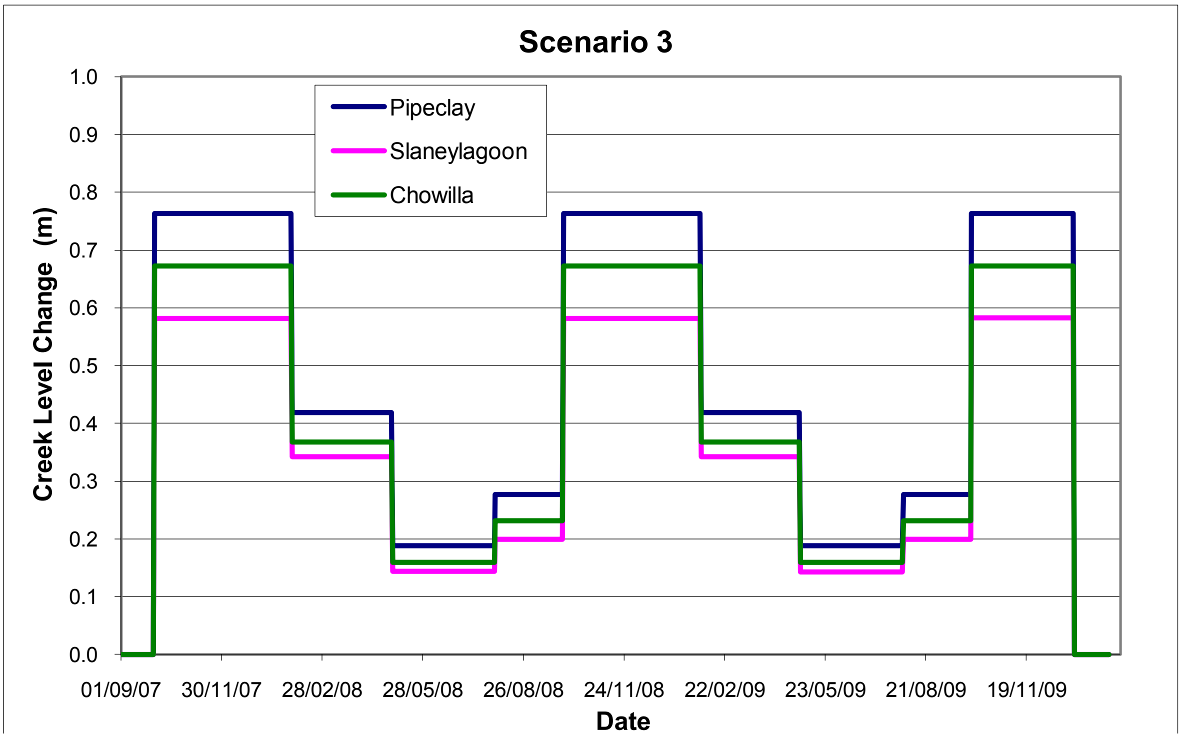


Figure 4 Example of average creek levels in Pipeclay, Slaney and upstream Chowilla (Scenario 3)

Inundation area (dark blue colour) for 6,000 ML/day event was estimated by Water Tech and shown in Figure 5. The figure shows that the area inundated at 6,000 ML/day flood is essentially the area permanently wet. It means that the increase in creek discharge will have no influence on area inundated, hence no vertical recharge was considered and only creek level changes were applied in the test.

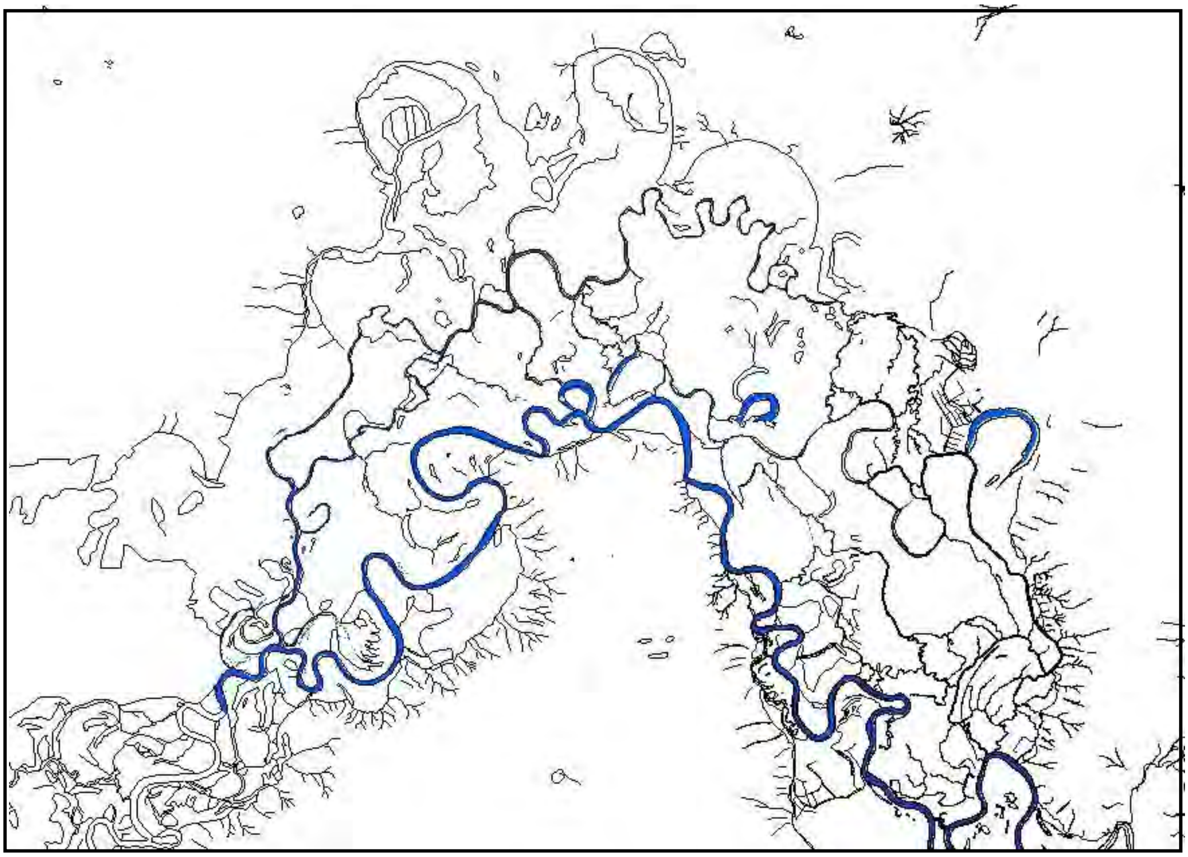


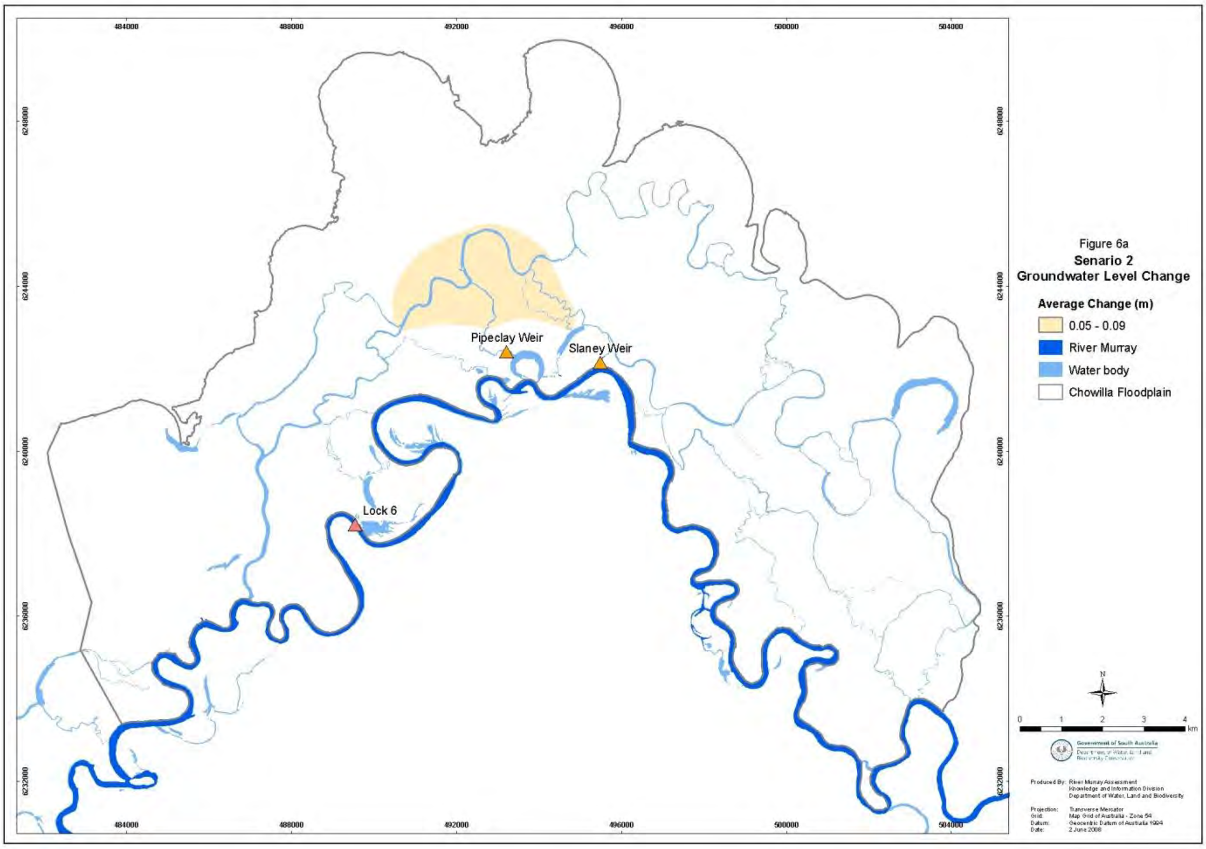
Figure 5 Modelled inundation area (6000 ML/day) (Water Tech 2008)

Results

The groundwater model produces groundwater level distributions at the end of each time step. The maximum and mean groundwater level change (associated with operation of the weirs) due to the temporally variable response of the aquifer system is a function of distance from anabranch creeks and creek elevation. The maximum and mean groundwater level change spatial distributions were calculated using GIS package outside of the Visual MODFLOW.

Modelled groundwater level distributions at the end of each time step were used to calculate the maximum and mean modelled groundwater level change resulting from operation of the weirs respectively. The results are shown in Figure 6a-b and Figure7a-b.

The results show greatest increase in groundwater level occur adjacent to Chowilla Ck rather than area near Pipeclay or Slaney creeks. It may be caused by the great change in water level height, less losses through high density large Gum Trees (as around Pipeclay or Slaney areas) and relatively good connections between creek and groundwater system in the area.



484000
488000
492000
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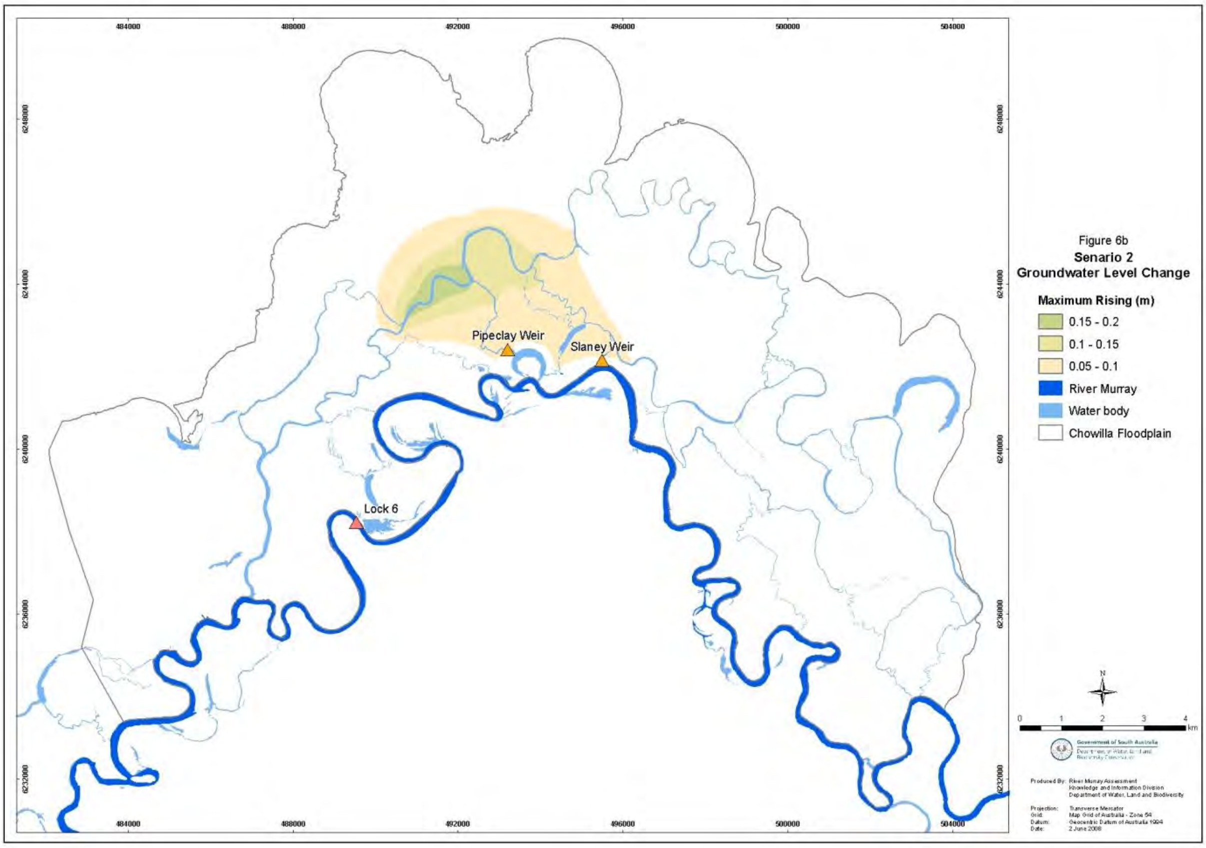
500000
504000
6248000
6244000
6240000
6236000
6232000
Pipeclay Weir
Slaney Weir
Lock 6
Figure 6a
Senario 2
Groundwater Level Change
Average Change (m)
0.05 - 0.09
River Murray
Water body
Chowilla Floodplain
N
0 1 2 3 4 km
Government of South Australia
Produced By: River Murray Assessment
Knowledge and Information Division
Department of Water, Land and Biodiversity
Projection: Transverse Mercator
Grid: Map Grid of Australia - Zone 54
Datum: Geocentric Datum of Australia 1994
Date: 2 June 2008



484000
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6248000
6244000
6240000
6236000
6232000
Pipeclay Weir
Slaney Weir
Lock 6
Figure 6b
Senario 2
Groundwater Level Change
Maximum Rising (m)
0.15 - 0.2
0.1 - 0.15
0.05 - 0.1
River Murray
Water body
Chowilla Floodplain
N
0 1 2 3 4 km
Government of South Australia
Produced By: River Murray Assessment
Knowledge and Information Division
Department of Water, Land and Biodiversity
Projection: Transverse Mercator
Grid: Map Grid of Australia - Zone 54
Datum: Geocentric Datum of Australia 1994
Date: 2 June 2008

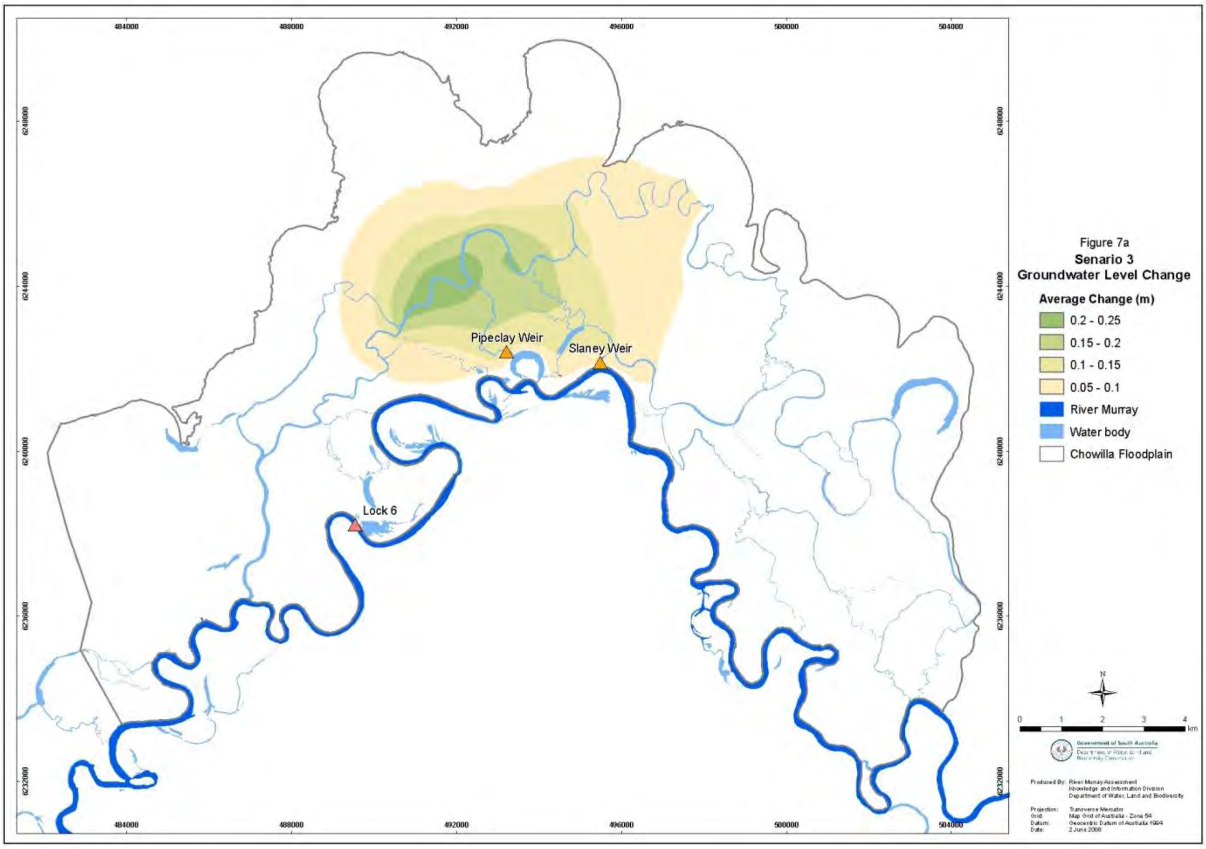
Figure 7a
Senario 3
Groundwater Level Change
Average Change (m)
0.2 - 0.25
0.15 - 0.2
0.1 - 0.15
0.05 - 0.1
River Murray
Water body
Chowilla Floodplain
Pipeclay Weir
Slaney Weir
Lock 6
484000
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Government of South Australia
Produced By: River Murray Assessment
Knowledge and Information Division
Department of Water, Land and Biodiversity
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Date: 2 June 2008

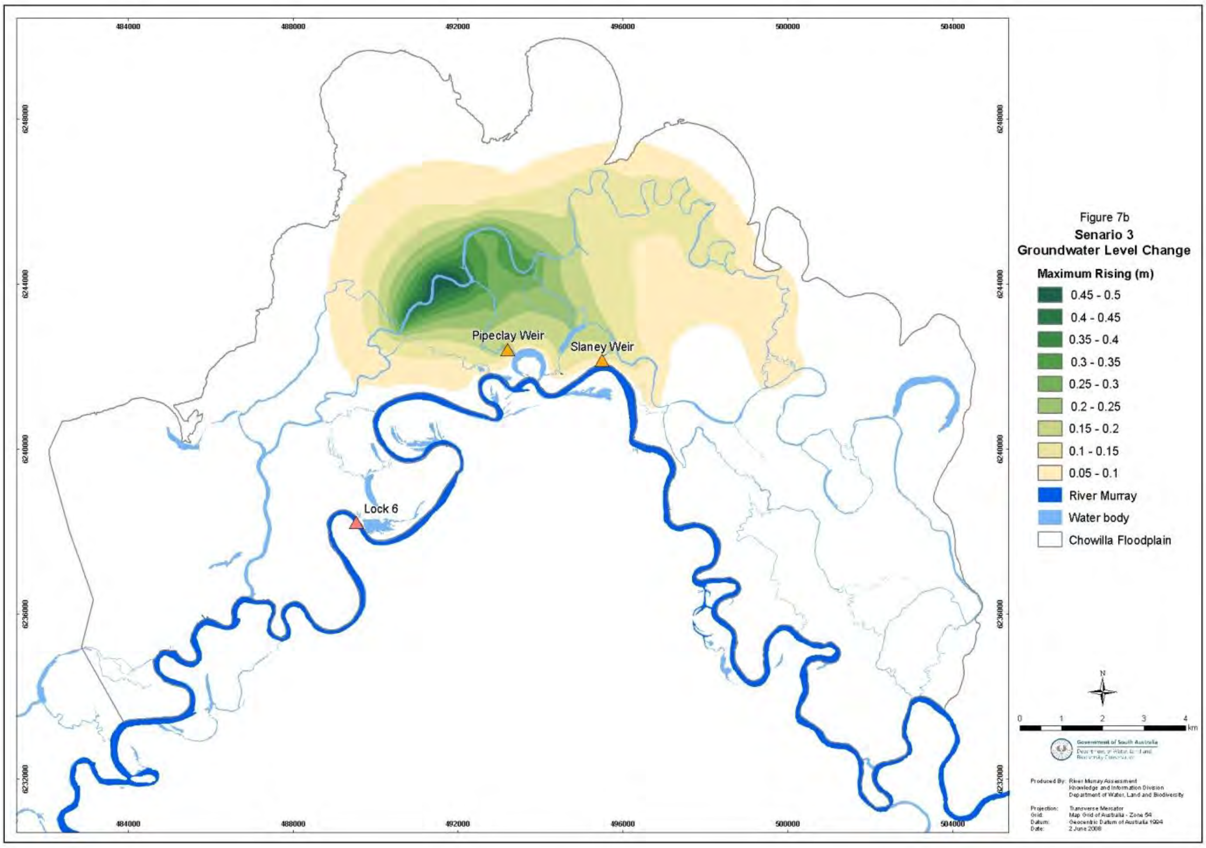
Figure 7b
Senario 3
Groundwater Level Change
Maximum Rising (m)
0.45 - 0.5
0.4 - 0.45
0.35 - 0.4
0.3 - 0.35
0.25 - 0.3
0.2 - 0.25
0.15 - 0.2
0.1 - 0.15
0.05 - 0.1
River Murray
Water body
Chowilla Floodplain
Pipeclay Weir
Slaney Weir
Lock 6
484000
488000
492000
496000
500000
504000
6248000
6244000
6240000
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km
Government of South Australia
Produced By: River Murray Assessment
Knowledge and Information Division
Department of Water, Land and Biodiversity
Projection: Transverse Mercator
Grid: Map Grid of Australia - Zone 54
Datum: Geocentric Datum of Australia 1994
Date: 2 June 2008

Task 5 – Operating Regulator Above 19.87 mAHD

Purpose

To assess the increase in salt loads induced by the operation of the proposed floodplain regulator and Lock 6 to different heights above the proposed maximum level (19.87 m AHD), using inundation data from Murray Darling Basin Commission (MDBC).

Scenarios

The scenarios assume that the proposed regulator and Lock 6 operate at the various heights listed below:

Scenario 1 – 19.87 m AHD (base case)
Scenario 2 - 20.0 m AHD
Scenario 3 - 20.5 m AHD
Scenario 4 - 21.0 m AHD

Assumptions

The first assumption is that three months of low flow will be followed by an operational period of three months. Low flow is assumed for 30 months after the operation (Figure 1). Each scenario was run for three years with a one month (30 day) time step. The model predicted the salt load at the end of each time step.

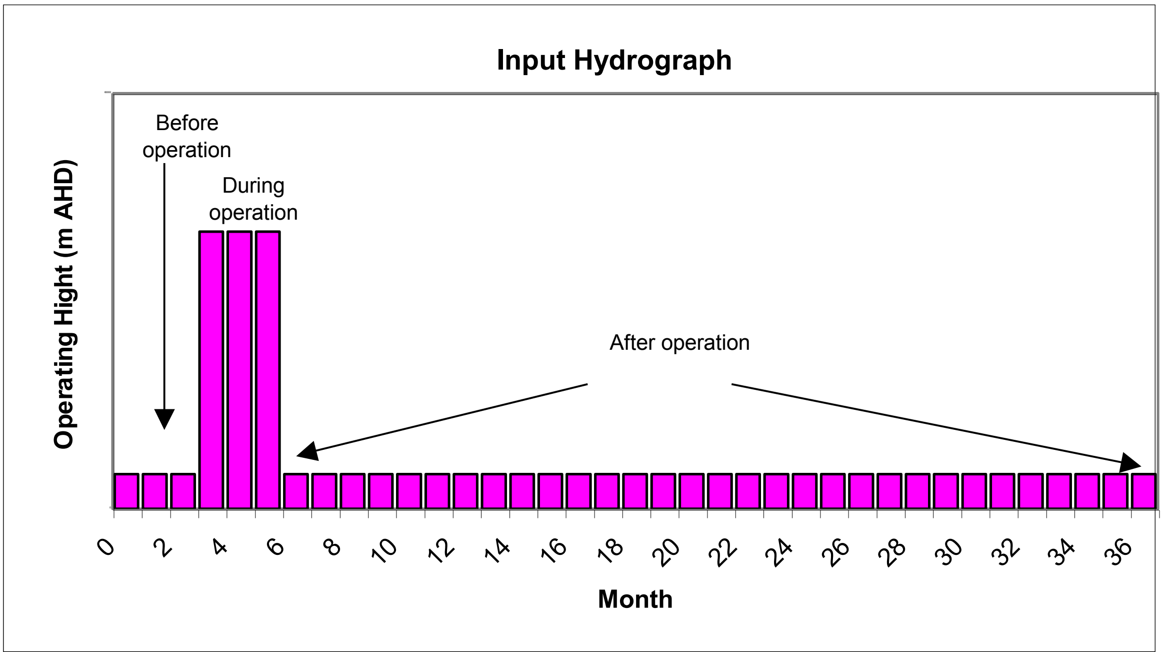


Figure 1. Example input hydrograph

The second assumption is that the water level in the whole anabranch creek system and inundated areas is the same as the regulator level during the operational period.

Inputs

Areas of inundation for each operational level were provided by MDBC in April 2008 (Figure 2), with potential recharge zones provided by CSRIO in 2004 (Figure 3

The model recharge zones were generated by combining the inundation area and potential recharge zones (Figures 4 to 7).

Results

Figure 8 shows modelled salt loads before, during and after the operational period. The results show peaks of salt load around 416, 445, 563 and 693 tonnes for the operating heights of 19.87, 20.0, 20.5 and 21.0 m AHD respectively. The results indicate that it may take up to 30 months for the salt loads to return to original levels.

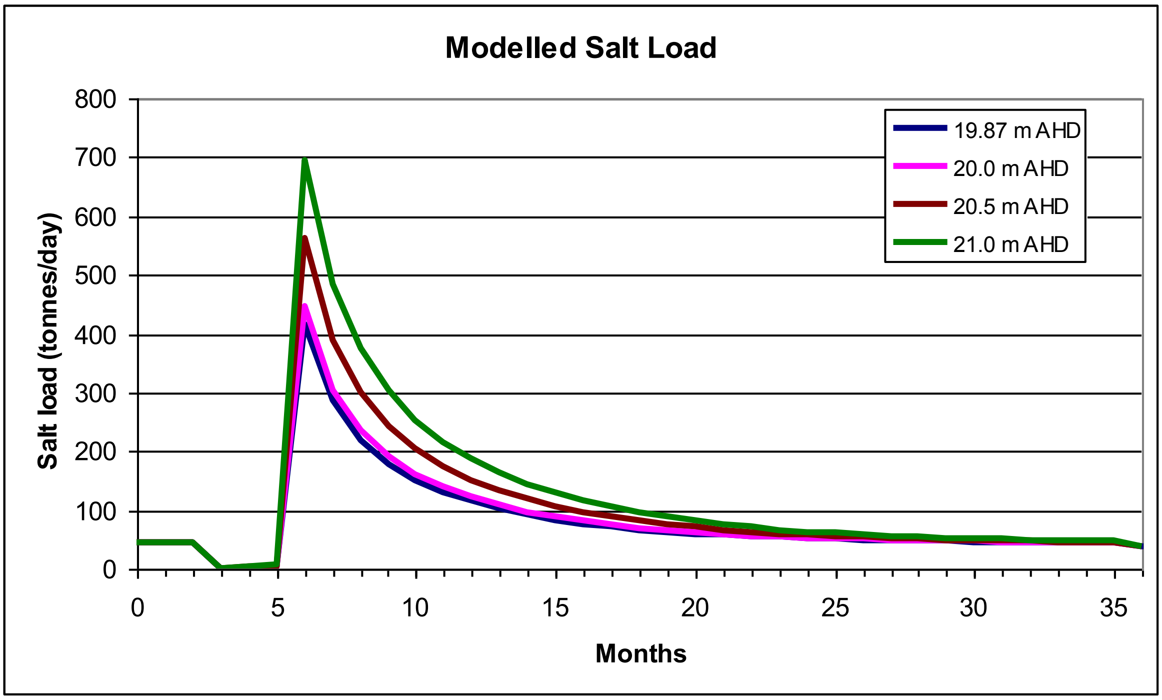


Figure 8. Modelled salt load

Figure 9 shows the estimated salt load increase above the load predicted with the regulator operating at 19.87 m AHD. The model results indicates that peak salt loads may increase by 29, 147 and 278 tonnes/day above 19.87 m salt load, at operational levels of 20.0, 20.5 and 21.0 m AHD respectively.

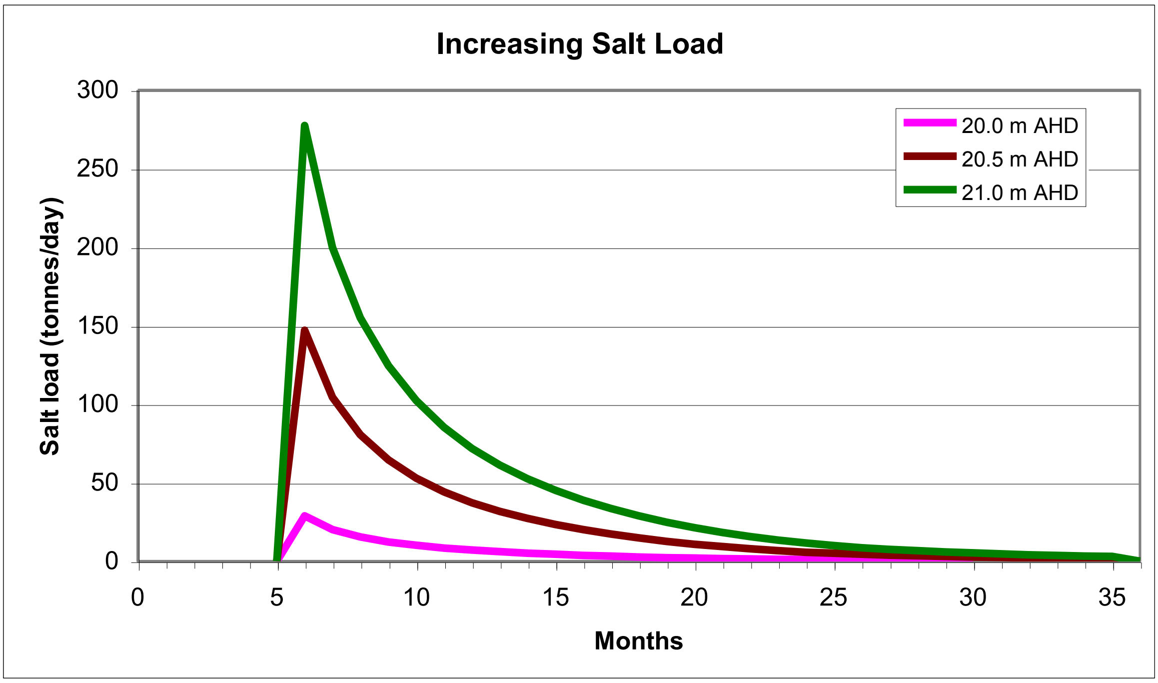


Figure 9. Modelled increase in salt load compared with 19.87 m AHD scenario

Task 5

Figure 10 shows the estimated additional increase in total salt load into the anabranch creek system due to operating the regulator above 19.87 m AHD. Approximately 4000, 23 000 and 43 000 tonnes of additional salt could be transported into the River Murray through the anabranch system within 30 months with the regulator operating at levels of 20.0, 20.5 and 21.0 m AHD respectively. Although this salt load may have an impact on River Murray salinities, it also represents a permanent removal of salt from the floodplain.

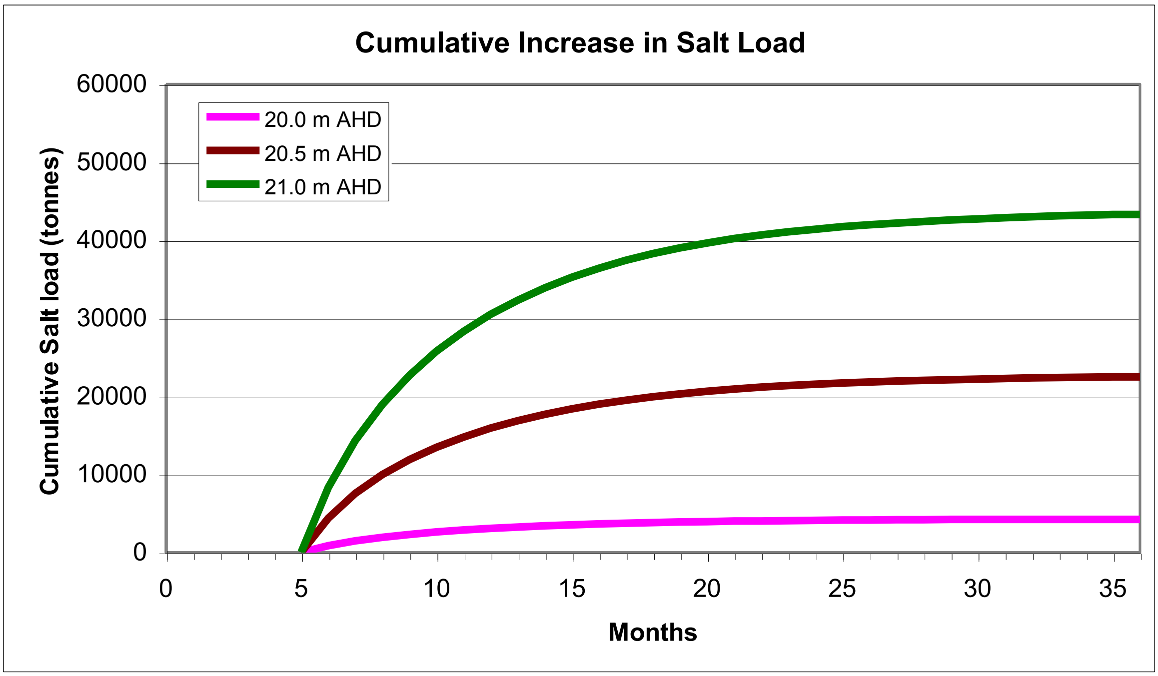


Figure 10. Cumulative increase in salt load compared with 19.87 m AHD scenario

A comparison between the results using the MDBC inundation area data and results using data from the DWLBC surface water model, shows that the Task 5 (19.87 m AHD) result is very similar to the Task 1 (10 000 ML/day three months operation) result.

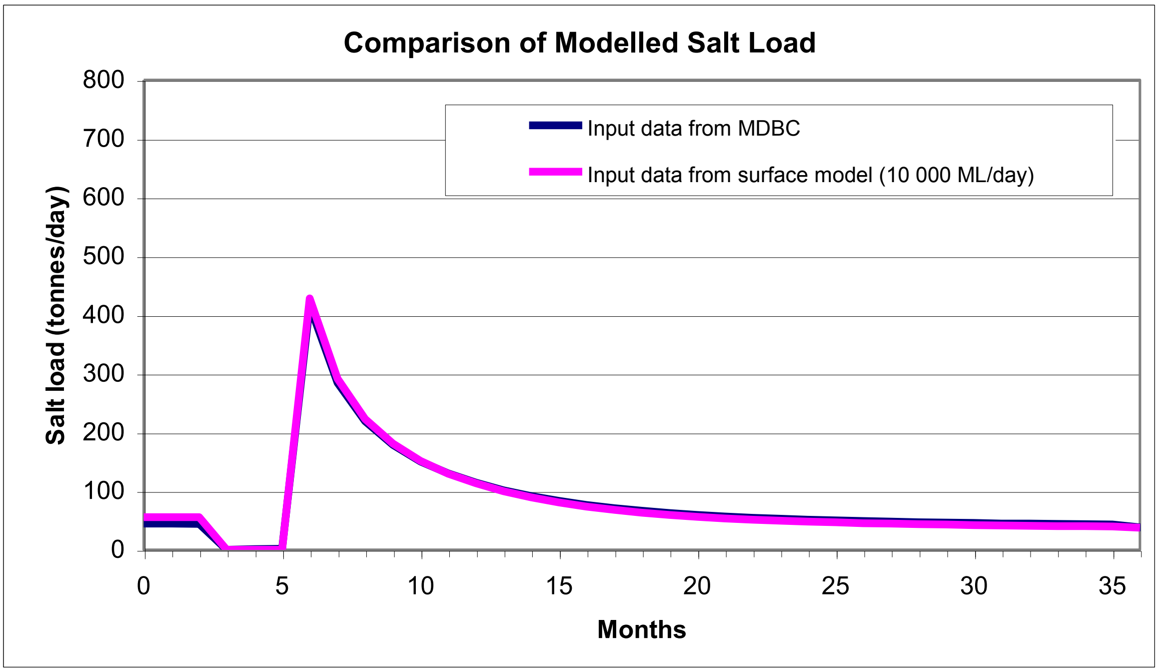


Figure 11. Comparison of different model's results

Summary

The model results indicate that the peak salt load, increased salt load and total increasing cumulative salt load vary proportionally with different operational heights (20.0, 20.5 and 21.0 m AHD) above the proposed maximum level (19.87 m AHD). A summary of the modelled results are given in Table 1 below.

Table 1. Summary of model results for all scenarios

	19.78 m AHD	**20.0 m AHD**	**20.5 m AHD**	**21.0 m AHD**
Peak Salt Load (tonnes/day)	416	445	563	693
Increase in Peak Salt Load (tonnes/day)		29	147	278
Total Increasing Cumulative Salt Load (tonnes)		4 000	23 000	43 000

Task 1 (2009) – Assessment of salt loads for intermediate regulator heights (Hydrodynamic Model Inputs)

Purpose

This task assesses the salt loads resulting from operation of the proposed regulator (at heights below the proposed operating level (19.87 m AHD), i.e. 18.50 m AHD, 19.25 m AHD and 19.50 m AHD) during a 10,000ML/day flood event. The results (salt load) are compared with results from Task 3 (2009) for the regulator operating at 19.87 m AHD.

Scenarios

The three scenarios assume that the regulator operates at the heights of:

- Scenario 1 - 18.50 m AHD
- Scenario 2 - 19.25 m AHD
- Scenario 3 - 19.50 m AHD

Assumptions

Each scenario assumes that three months of low flow will be followed by an operational period of three months, returning to low flow for a further 30 months after the operation (Figure 1). The scenarios were run for three years with a one month (30 day) time step. The model predicted the groundwater flux (salt load) entering the creeks at the end of each time step.

Simplifications were made for each scenario that assume:

- The recharge rates and the area of recharge zones (result of inundation) reach to the maximum level immediately during the operation period and return to zero immediately after the operation
- The water levels in anabranch creeks reach to the maximum level immediately during the operation period and return to pre-operation levels immediately after the operation
- Modelled flux entering the creeks and an average groundwater salinity value (25,000 mg/L) are used in the salt load calculation. The fresher water returning from the bank of the creeks post operation is not considered in the calculation of salt load.

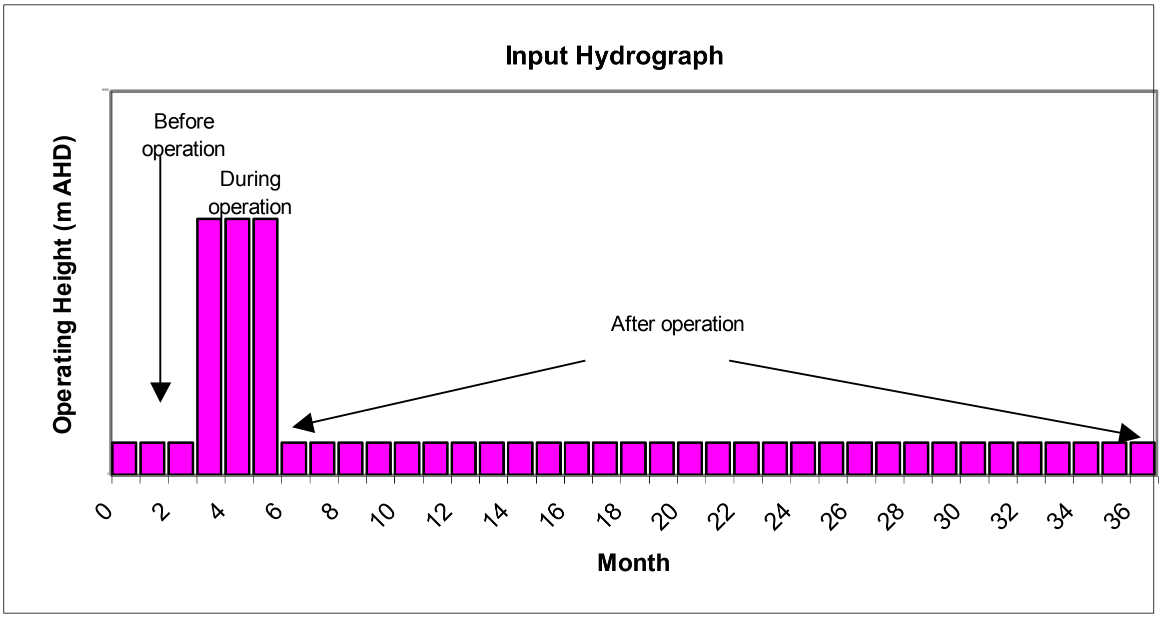


Figure 1. Example input hydrograph

Model Inputs (Recharge and creek levels)

The model input recharge zones were the result of combining the corresponding inundation area and potential recharge zones.

An inundation area (for operating level at 19.87 m AHD) was calculated by Water Tech using a hydrodynamic model in May 2009, as outlined within Task 3 (2009) (Figure 2). The inundation area for a regulator level of 18.50 m AHD, 19.25 m AHD and 19.50 m AHD were subsequently calculated by Water Tech using a hydrodynamic model in June 2009 (Figures 3 to 5).

Potential recharge zones and rates for the whole Chowilla Floodplain were provided by CSIRO in 2004 (Figure 6). The model input recharge zones (see Figures 7 to 9) were the result of combining the corresponding inundation areas (Figures 3 to 5) and potential recharge zones (Figure 6).

The water levels in anabranch creeks during the operation period differ depending upon location (Table 1).

Table 1. Water levels in anabranch creeks during regulator operation period for each scenario

River Cell ID No.	Scenario 1	Scenario 2	Scenario 3	Model Creek Name
5	18.72	19.52	19.67	Salt
6	18.74	19.56	19.70	Salt_ck2
7	18.68	19.50	19.66	Salt
8	18.67	19.49	19.66	Salt
9	18.65	19.47	19.64	Salt
10	18.65	19.45	19.64	Salt
11	18.64	19.45	19.63	Salt
12	18.64	19.44	19.63	Punkah1
13	18.64	19.44	19.63	Punkah
14	18.63	19.43	19.62	Punkah
16	18.62	19.40	19.60	Punkah
17	18.62	19.38	19.59	Punkah
18	18.61	19.37	19.59	Chowilla
19	18.60	19.36	19.57	Chowilla
20	18.54	19.29	19.53	Monoman
21	18.55	19.31	19.54	Chowilla
22	18.52	19.27	19.52	Chowilla
23	18.59	19.34	19.56	Boat
26	18.76	19.46	19.63	Pipeclay
27	19.19	19.76	19.81	Hyperna_island
28	18.71	19.53	19.68	Hyperna_creek
29	18.67	19.48	19.66	Hyperna_creek
30	18.63	19.43	19.63	Salt
31	18.62	19.40	19.61	Slaneylagoon

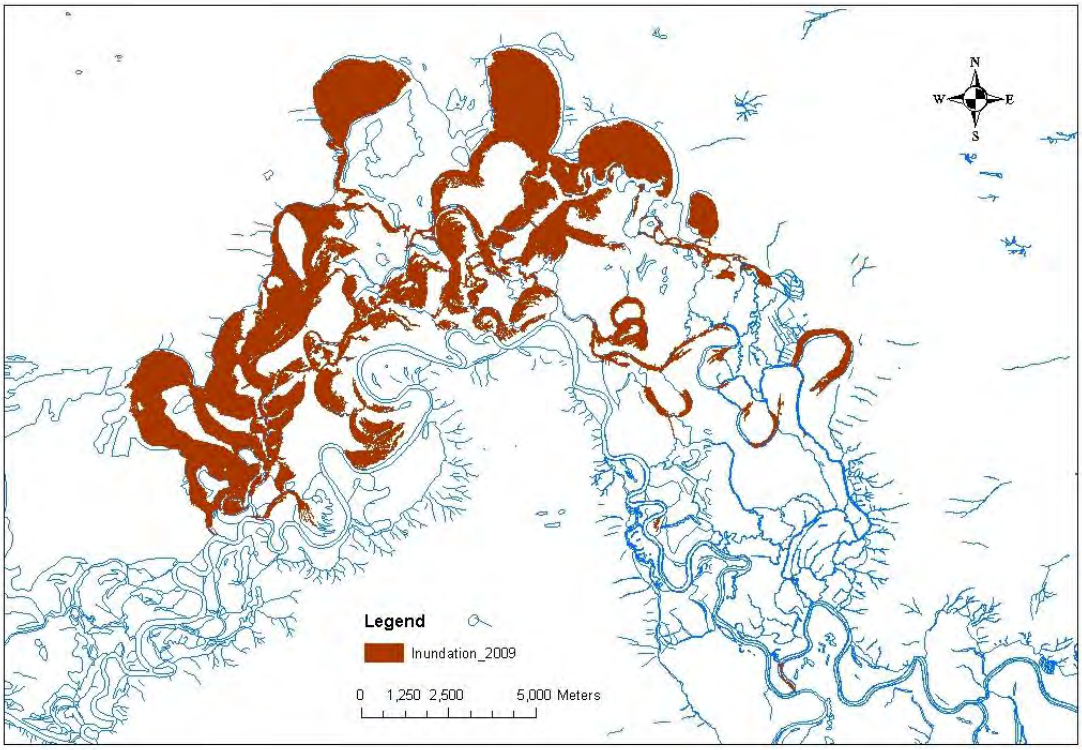


Figure 2. Inundation area for proposed regulator level 19.87 m AHD (May 2009 Water Tech Hydrodynamic model result)

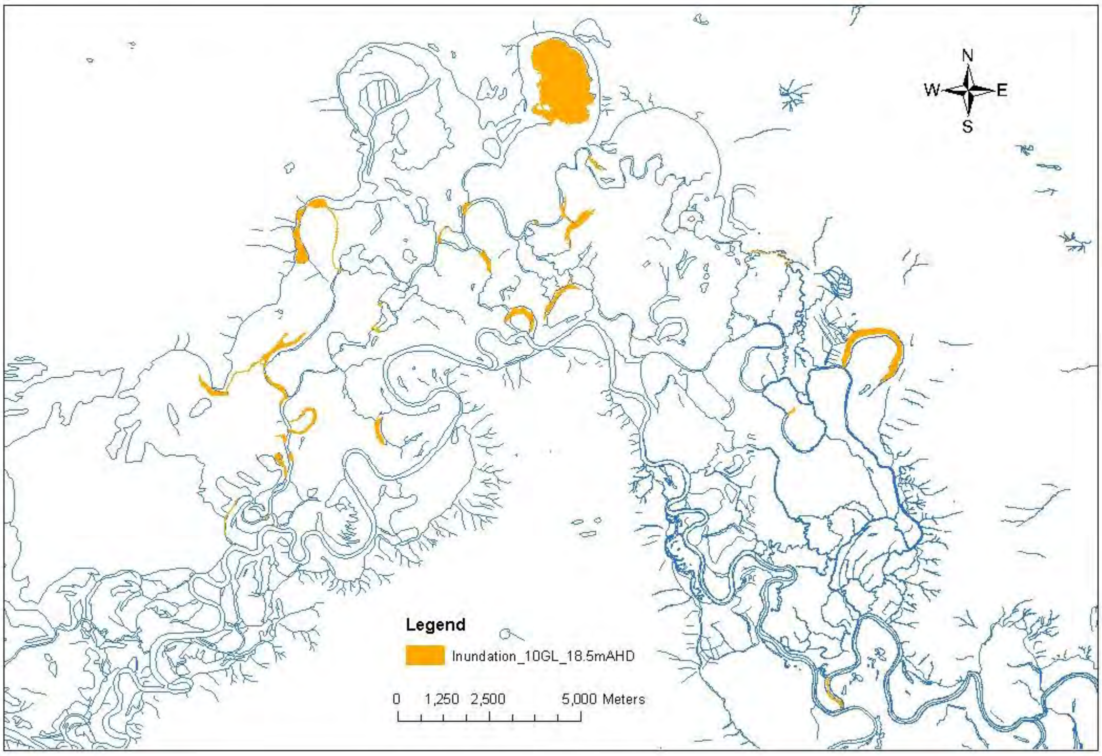


Figure 3. Inundation area for regulator level 18.5 m AHD (scenario 1) (June 2009 Water Tech Hydrodynamic model result)

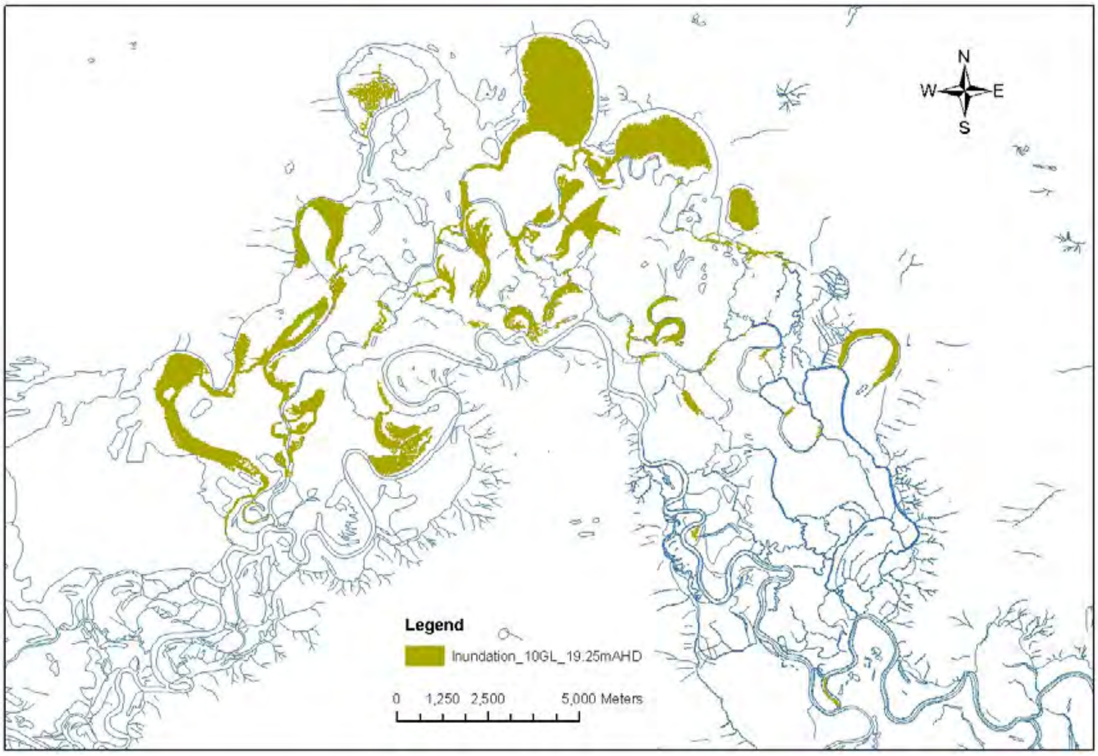


Figure 4. Inundation area for regulator level 19.25 m AHD (scenario 2) (June 2009 Water Tech Hydrodynamic model result)

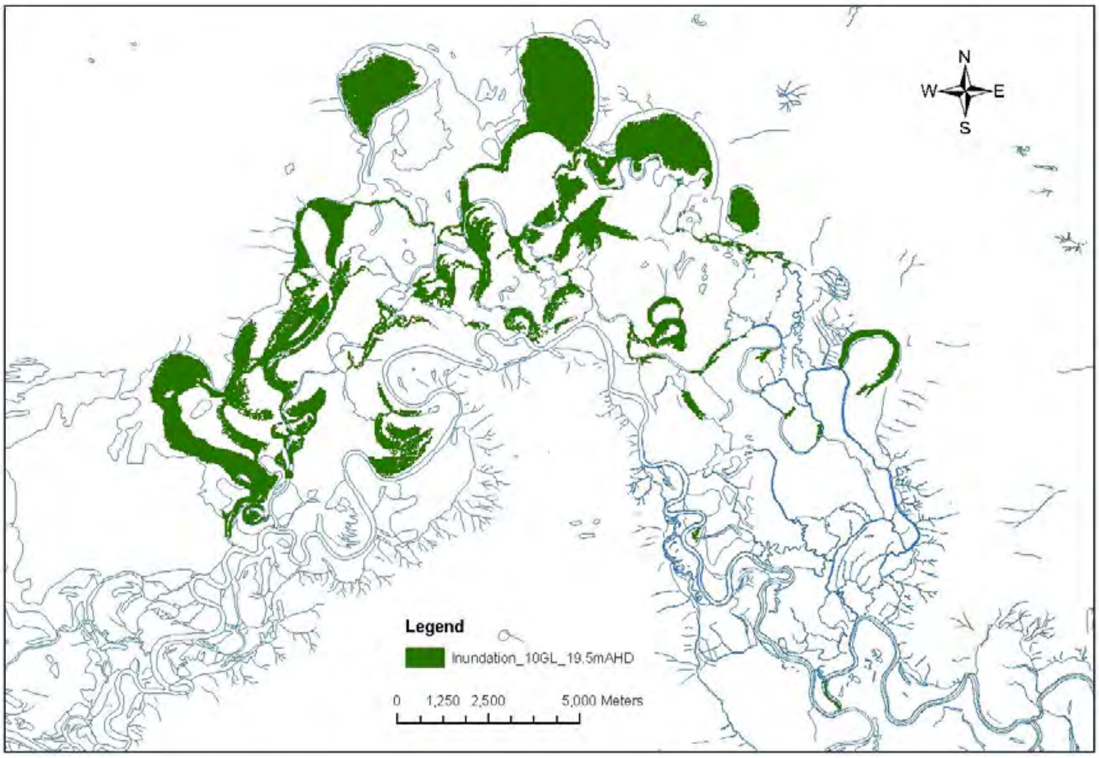


Figure 5. Inundation area for regulator level 19.50 m AHD (scenario 3) (June 2009 Water Tech Hydrodynamic model result)

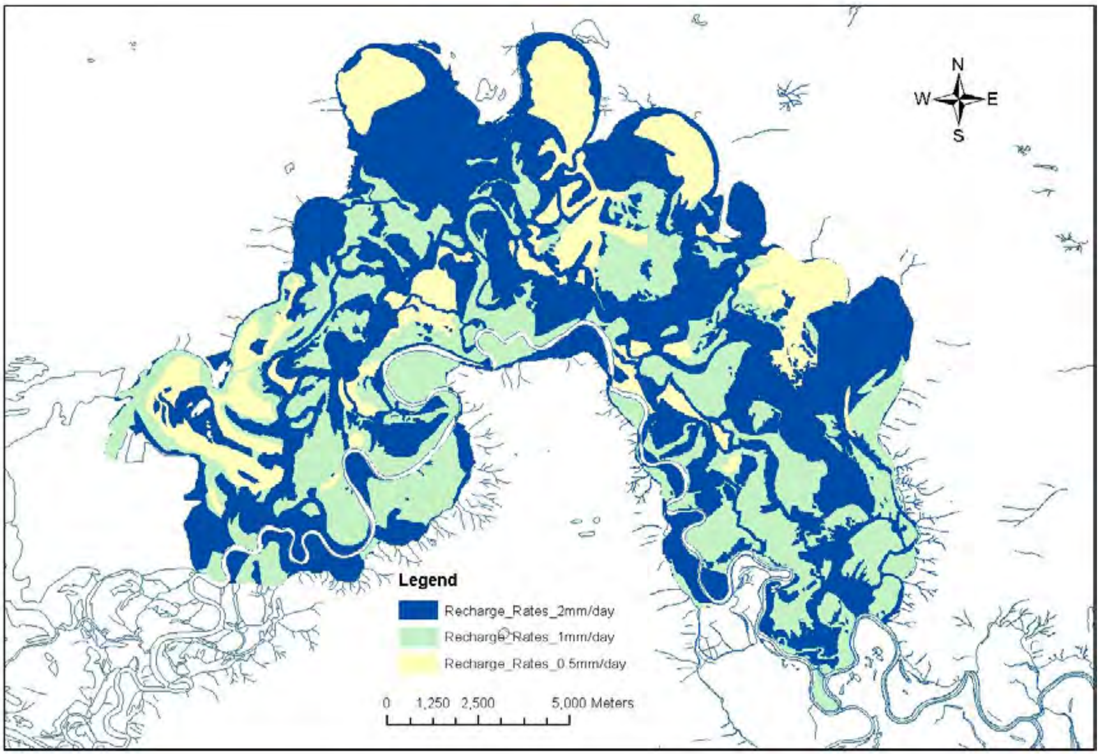


Figure 6. Estimated potential recharge zones and rates on Chowilla Floodplain (CSIRO 2004)

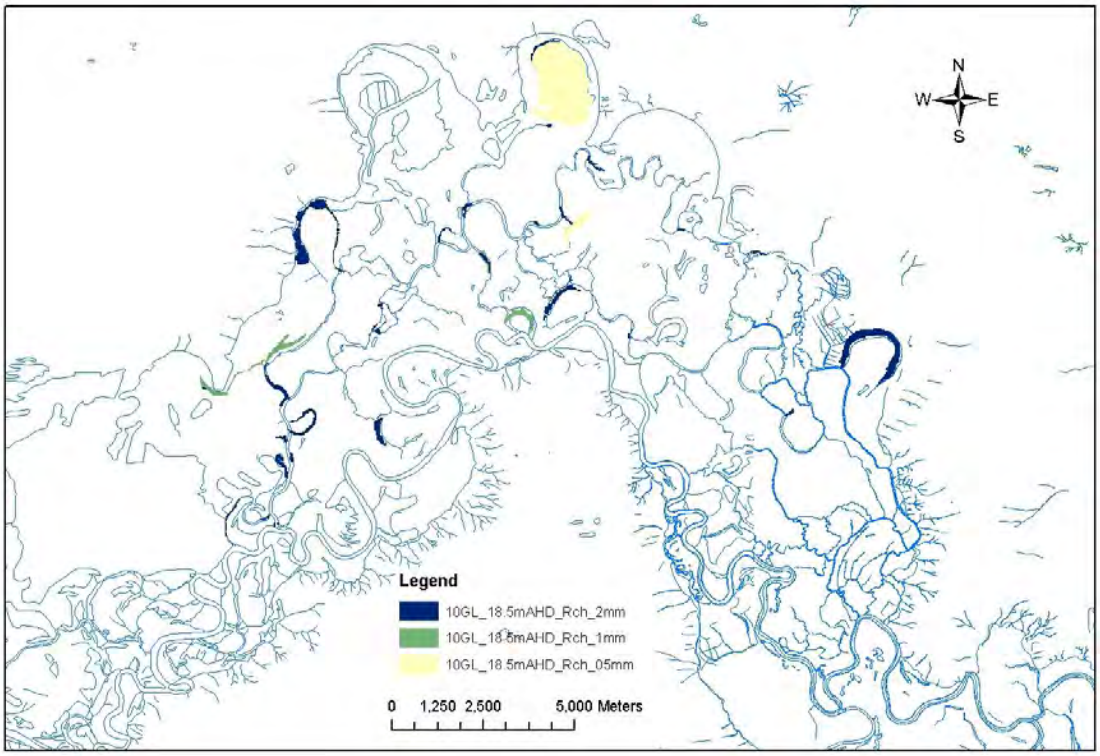


Figure 7. Model Input - recharge rates and zones in inundated areas for 18.5 m AHD regulator level (scenario 1)

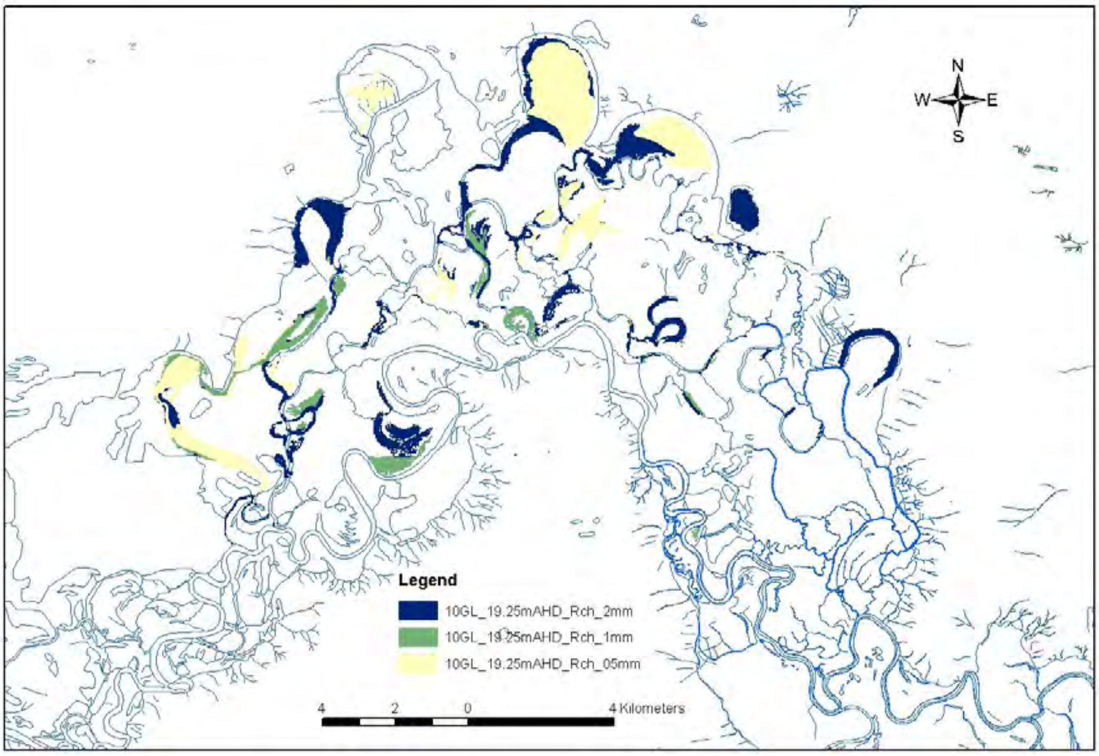


Figure 8. Model Input - recharge rates and zones in inundated areas for 19.25 m AHD regulator level (scenario 2)

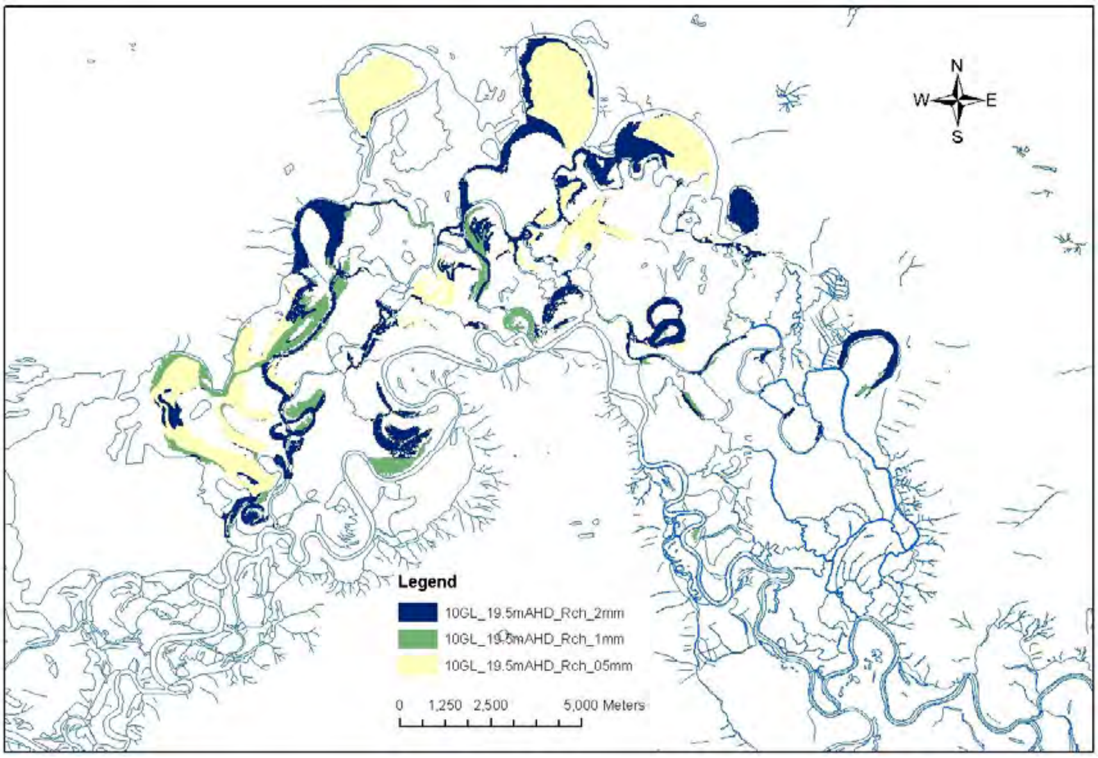


Figure 9. Model Input - recharge rates and zones in inundated areas for 19.5 m AHD regulator level (scenario 3)

Model Results

A comparison of the model results with results from Task 3 (2009) for the regulator operating at 19.87 m AHD shows that salt loads are decreasing when the regulator level is lowered (Figures 10).

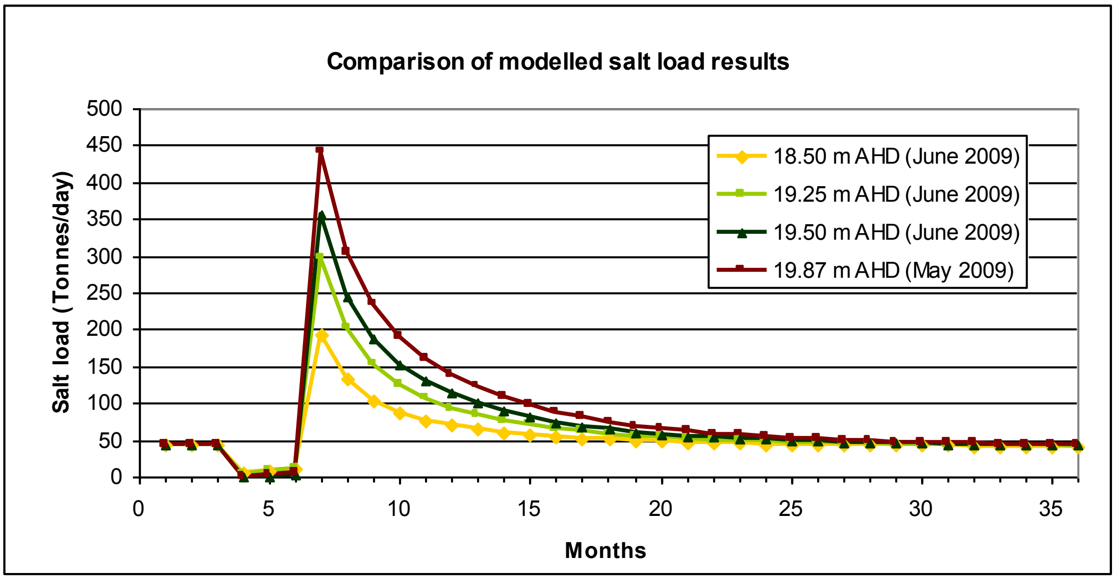


Figure 10. Comparison of modelled salt load results for inundation areas

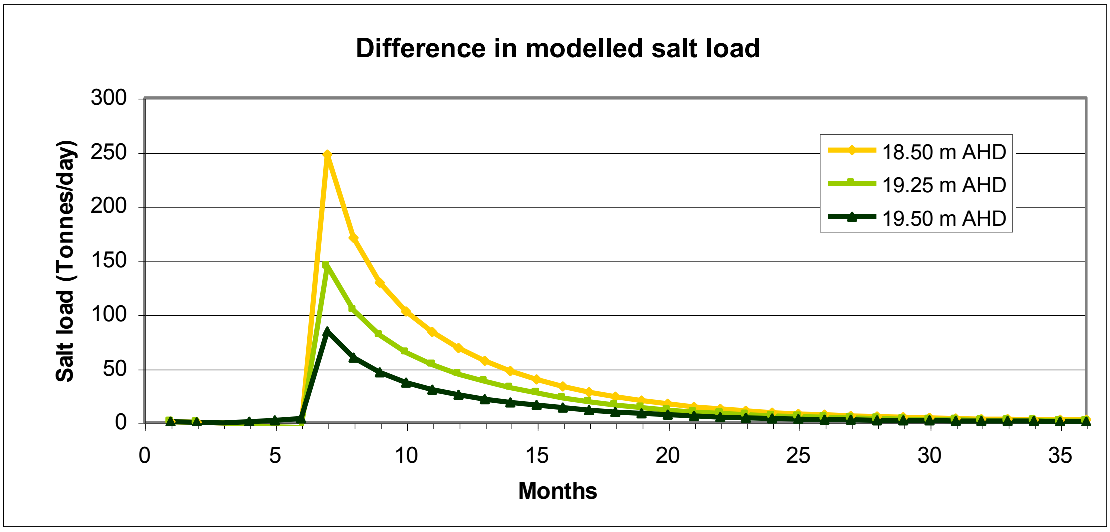


Figure 11. Difference in modelled salt load for each scenario when compared with the proposed 19.87 m AHD proposed regulator level

The peak salt load and difference in modelled peak salt loads for each scenario (Figure 11) when compared to the results from Task 3 (2009) for the regulator operating at 19.87 m AHD are summarised in Table 2.

Table 2. Summary of salt load (tonnes/day) for each scenario

Regulator level m AHD	Peak Salt load (tonnes/day)	Difference in peak salt load (tonnes/day) from 19.87 m AHD results
18.50 (Scenario-1)	194	247
19.25 (Scenario-2)	297	144
19.50 (Scenario-3)	357	84
19.87 (Task3 2009)	441	-

Task 2 (2009) – Reassessment of salt load using revised Lidar and DTM

Purpose

This is a scenario that was rerun (original Task 5 requested in 2008) using the new 19.87m AHD inundation area data from the corrected DEM. The results (salt load) are compared with original runs presented in the Task 5 (2008) report.

Assumptions

The scenario assumes that the proposed regulator and Lock 6 operate at the heights of 19.87 m AHD. It also assumes that three months of low flow will be followed by an operational period of three months, returning to low flow for a further 30 months after the operation (Figure 1). The scenario was run for three years with a one month (30 day) time step. The model predicted the groundwater flux (salt load) entering the creeks at the end of each time step.

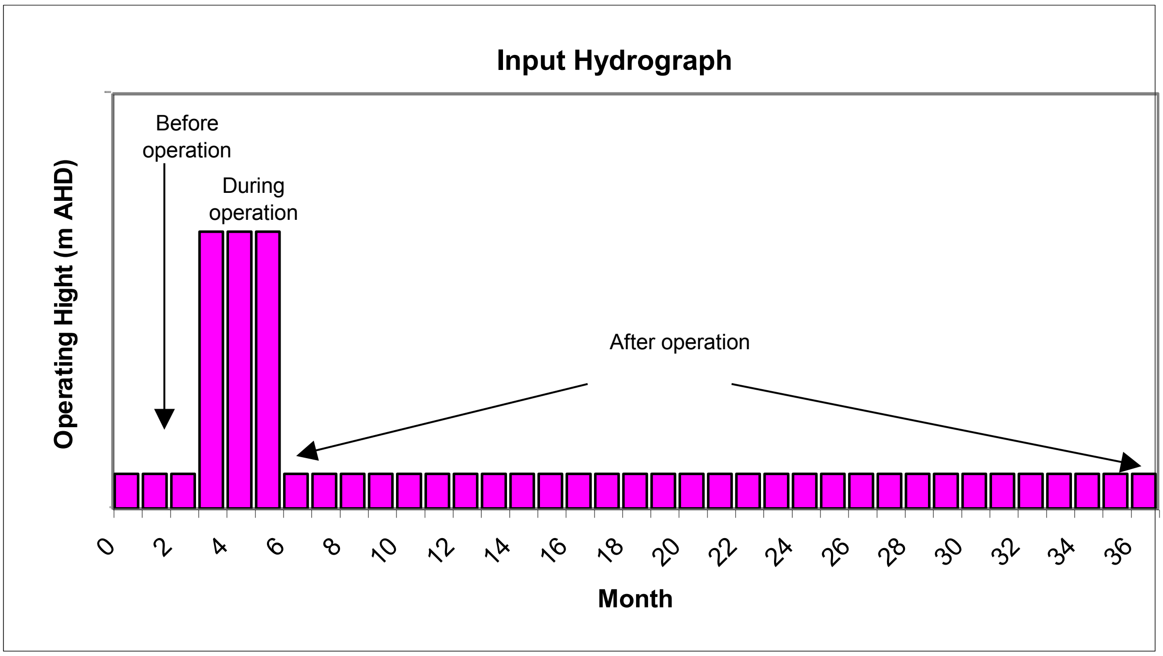


Figure 1. Example input hydrograph

Another assumption is that the water level in the whole anabranch creek system and inundated areas is the same as the regulator level during the operational period.

Model Inputs

A new area of inundation for operational level 19.87 m AHD was calculated by MDBC in January 2009 (Figure 2). Differences between the 2008 and 2009 inundation areas are shown by the dark red colour in Figure 3.

Potential recharge zones and rates were provided by CSRIO in 2004 (Figure 4). The model input recharge zones (see Figure 5) were the results of combining the inundation area (Figure 2) and potential recharge zones (Figure 4).

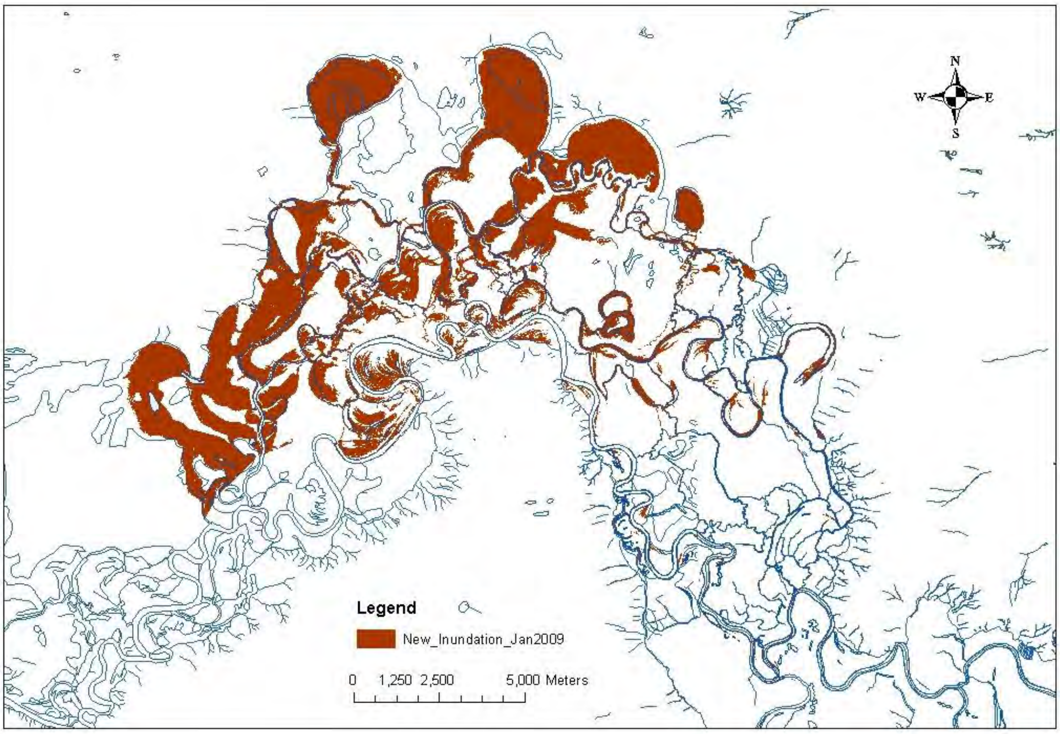


Figure 2. New inundation area (January 2009 MDBC)

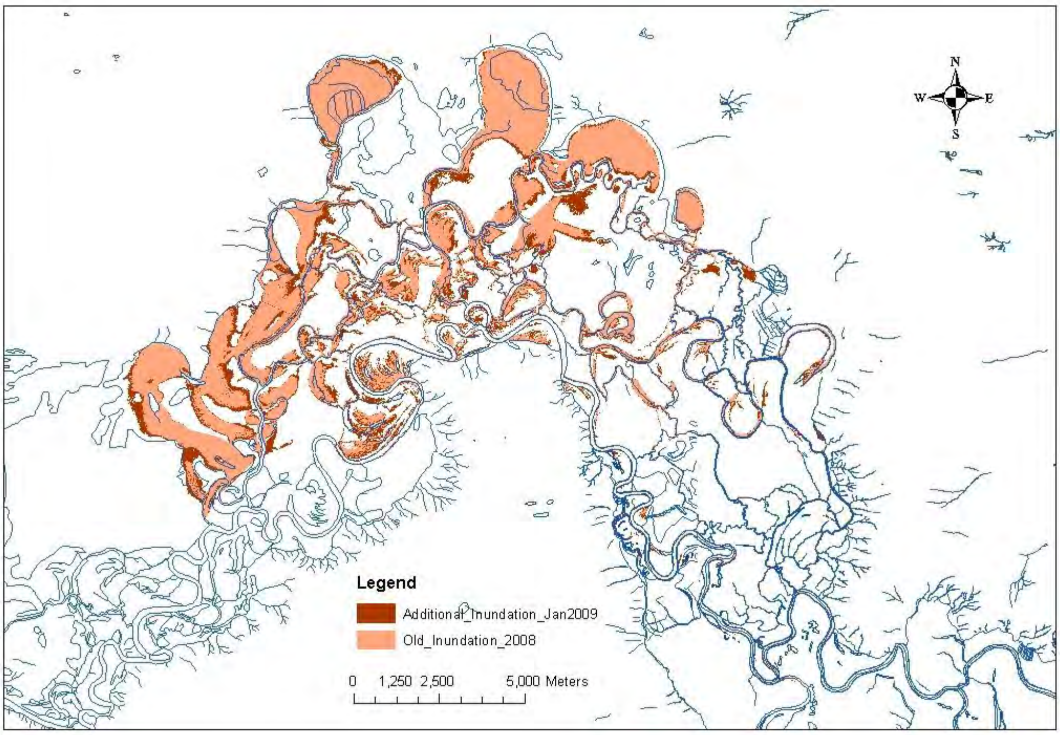


Figure 3. Comparison inundation areas between 2008 and 2009 DEM data

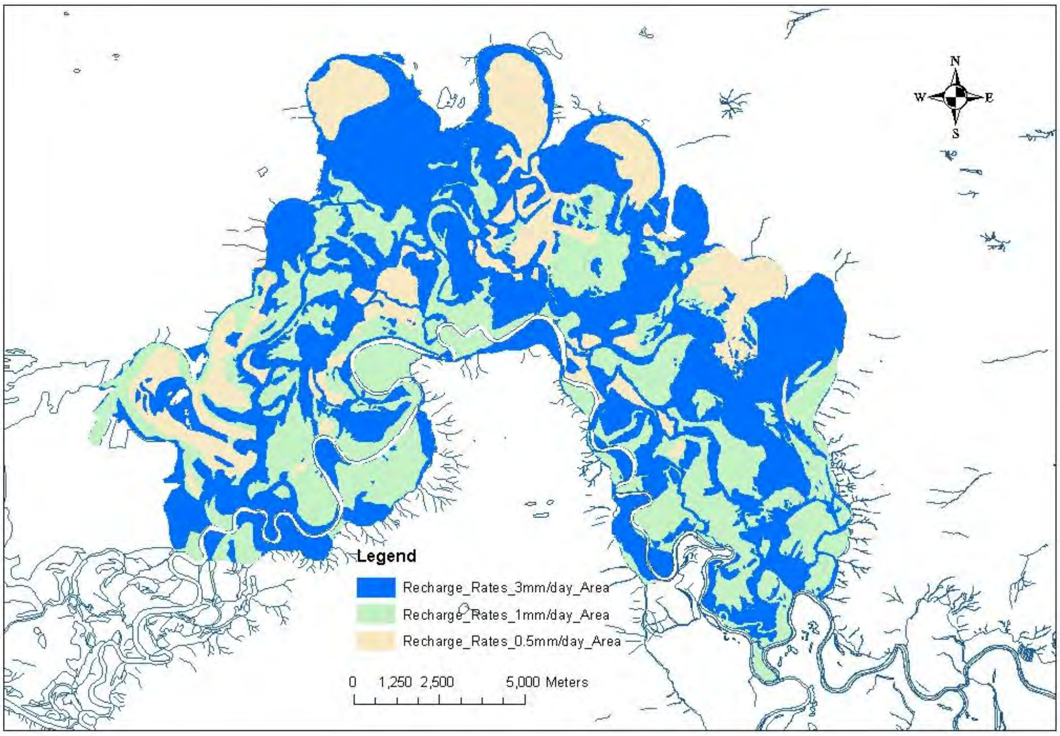


Figure 4. Estimated potential recharge rates and zones on Chowilla Floodplain (CSIRO 2004)

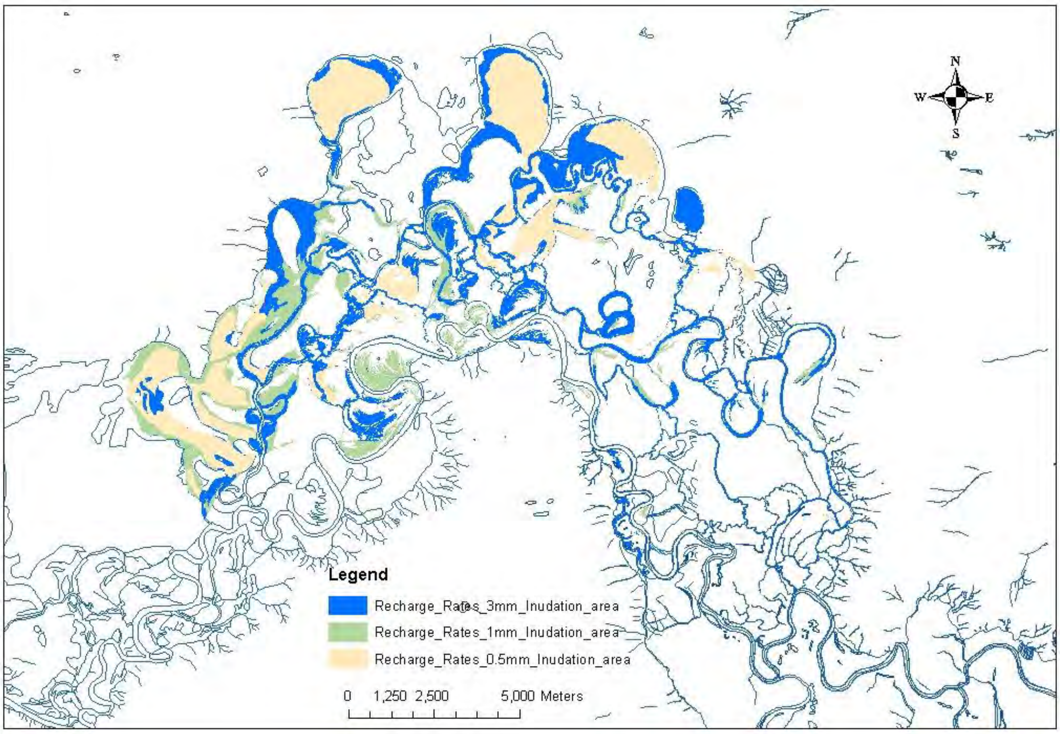


Figure 5. Model Input - recharge rates and zones in inundated areas (Jan 2009)

Model Results

A comparison of the results between the 2008 DEM data and 2009 DEM data shows that the new DEM results in higher salt loads result (Figure 6).

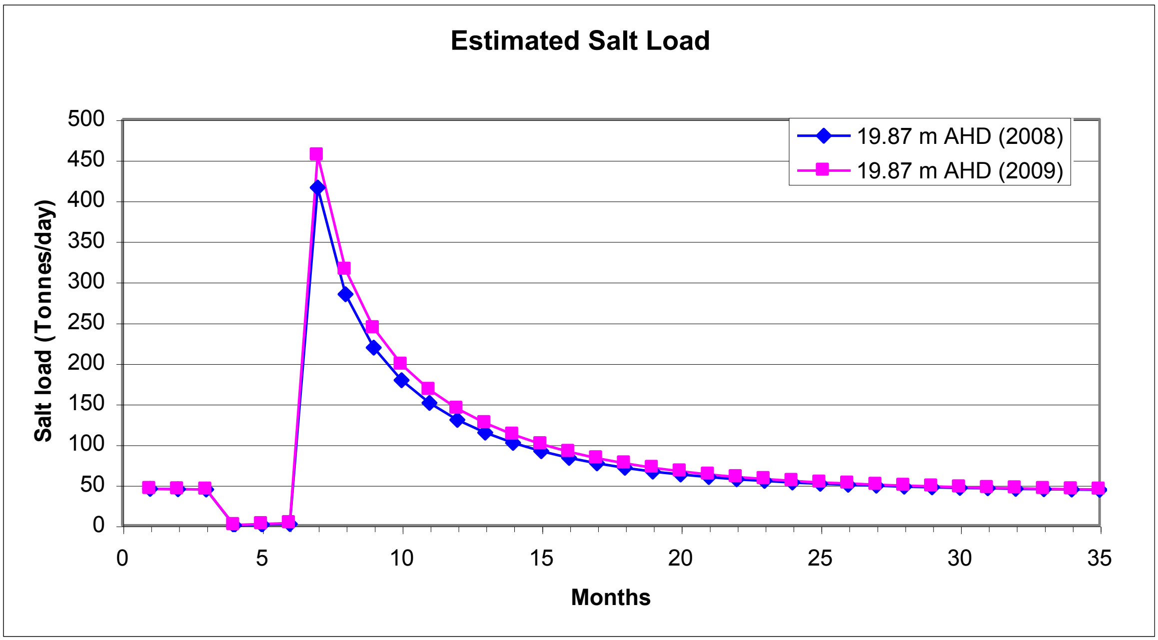


Figure 6. Modelled salt load

The result indicates that peak salt loads may increase by around 40 tonnes/day from 416 tonnes/day to 456 tonnes/day compared to the 2008 result (Figure 7).

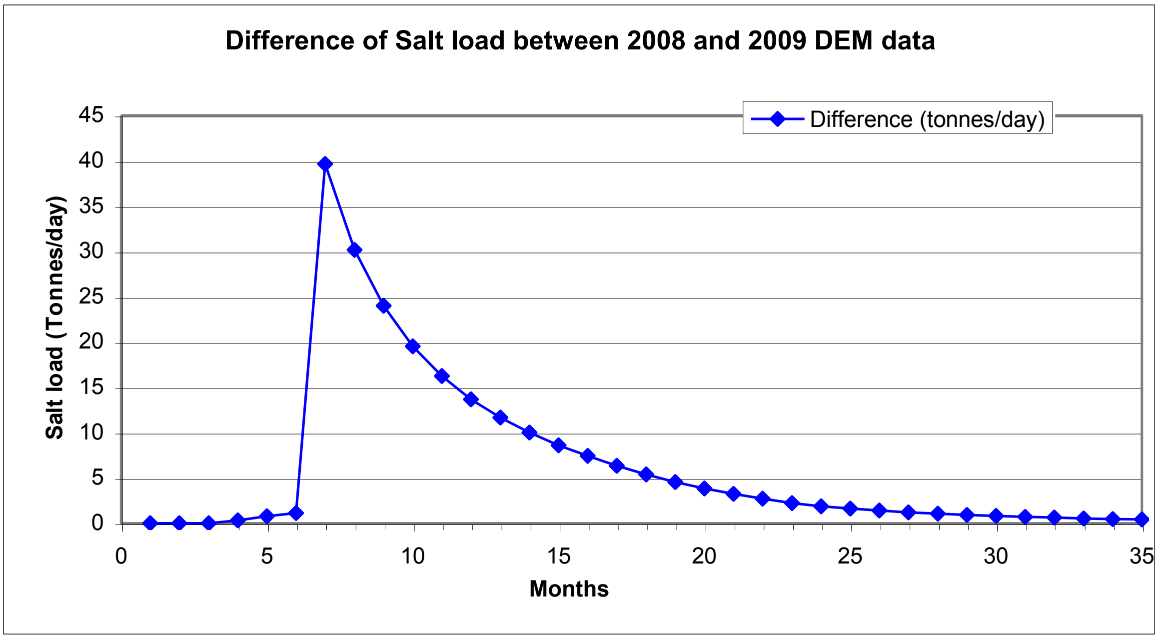


Figure 7. Modelled increase in salt load compared with new inundation area (DEM 2009)

Task 3 (May2009) – Reassessment of salt load using revised Lidar and DTM (Hydrodynamic Model Inputs)

Purpose ne

This is a scenario that was rerun (original Task 5 requested in 2008) using revised input data due to subsequent corrections to the DEM. The results (salt load) are compared with original runs presented in the Task 5 (2008) report.

Assumptions

The scenario assumes that the proposed regulator and Lock 6 operate at the heights of 19.87 m AHD. It also assumes that three months of low flow will be followed by an operational period of three months, returning to low flow for a further 30 months after the operation (Figure 1). The scenario was run for three years with a one month (30 day) time step. The model predicted the groundwater flux (salt load) entering the creeks at the end of each time step.

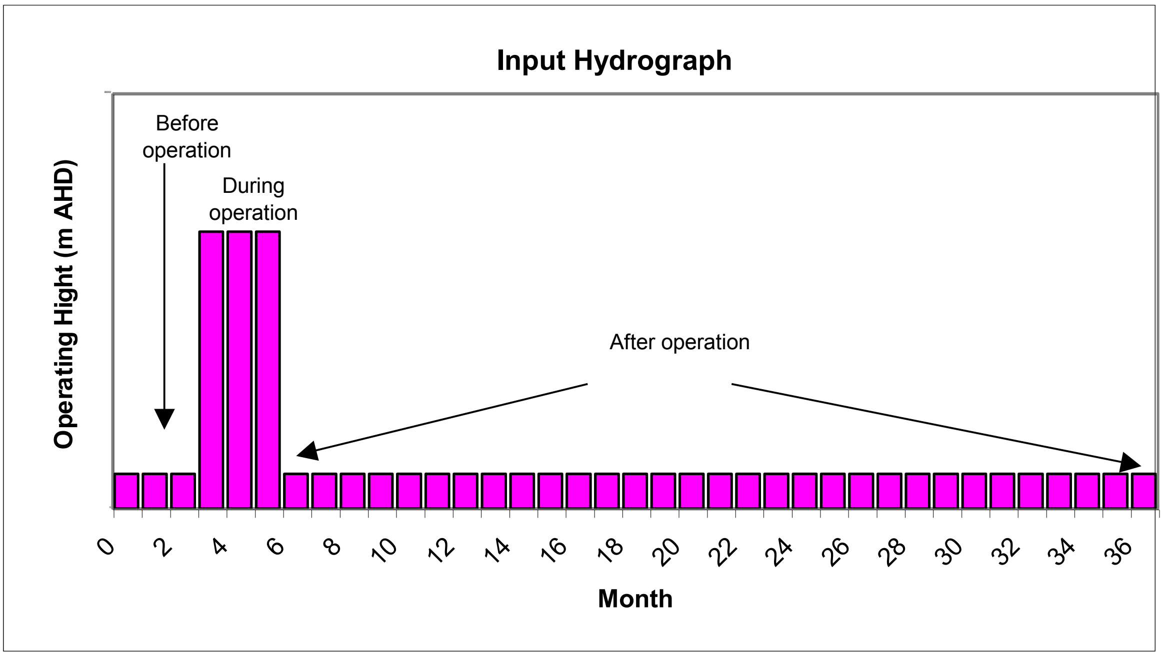


Figure 1. Example input hydrograph

Another assumption is that the water level in the whole anabranch creek system and inundated areas is the **maximum level** of the operational period.

Model Inputs

The revised inundation area was calculated by Water Tech using a hydrodynamic model in May 2009 (Figure 2). Differences between the 2008 and 2009 inundation areas are shown by the dark red colour in Figure 3.

Potential recharge zones and rates were provided by CSIRO in 2004 (Figure 4). The model input recharge zones (see Figure 5) were the results of combining the inundation area (Figure 2) and potential recharge zones (Figure 4).

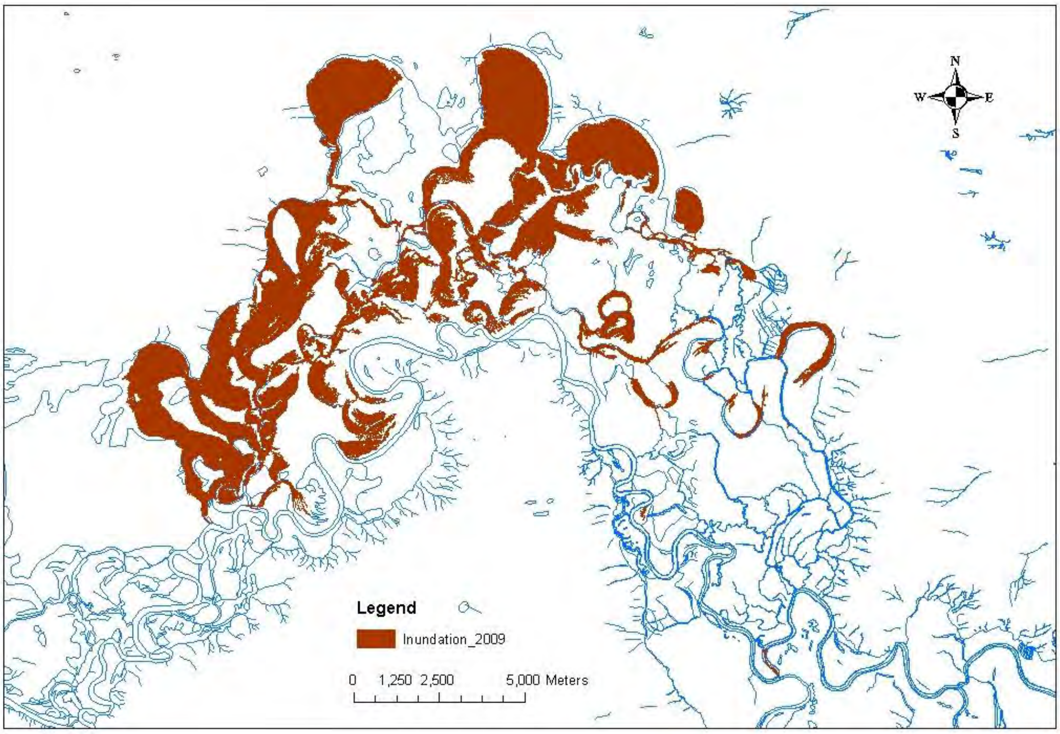


Figure 2. Inundation area (May 2009 Water Tech Hydrodynamic model result)

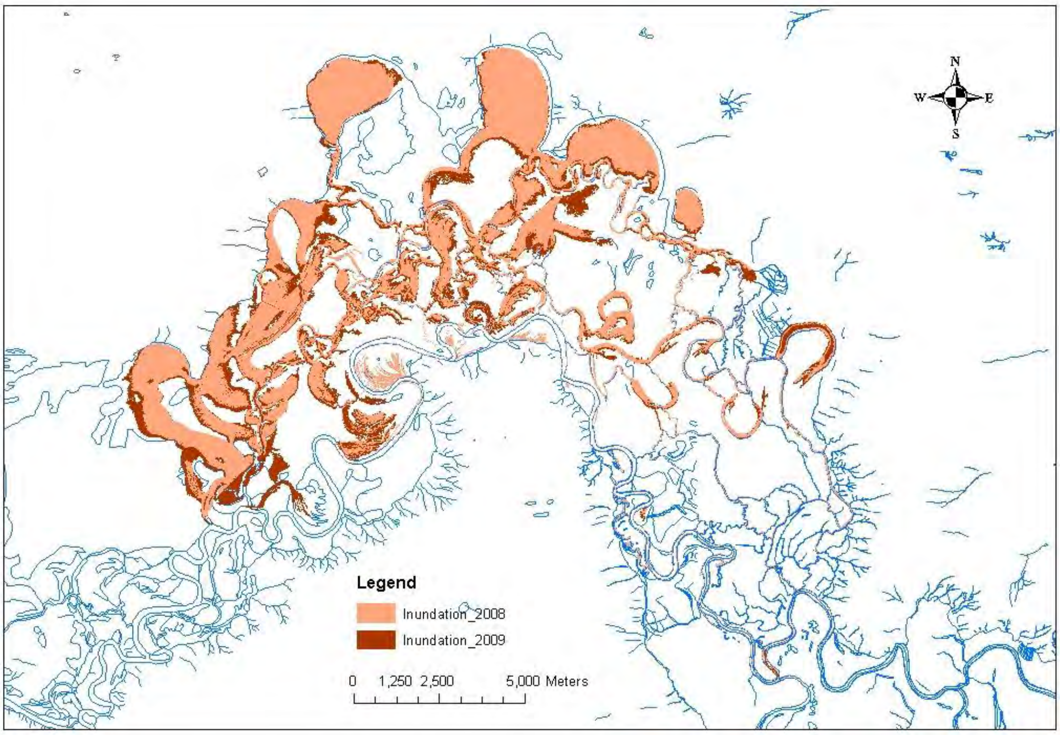


Figure 3. Comparison inundation areas between 2008 and May 2009 (Water Tech Hydrodynamic model result)

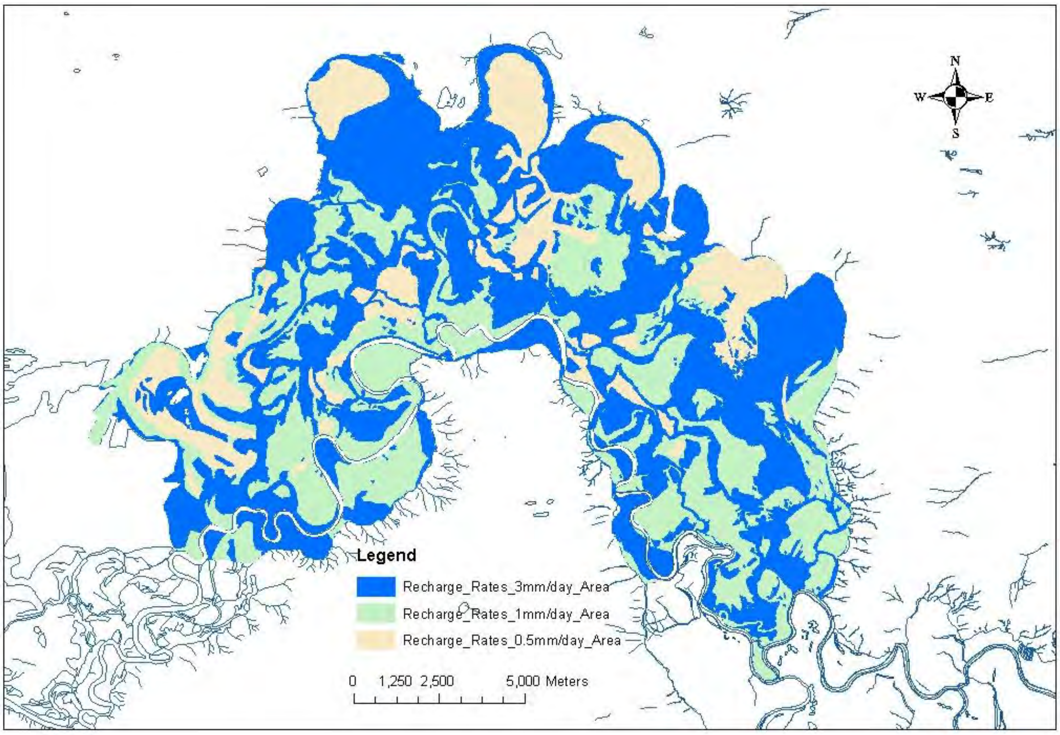


Figure 4. Estimated potential recharge rates and zones on Chowilla Floodplain (CSIRO 2004)

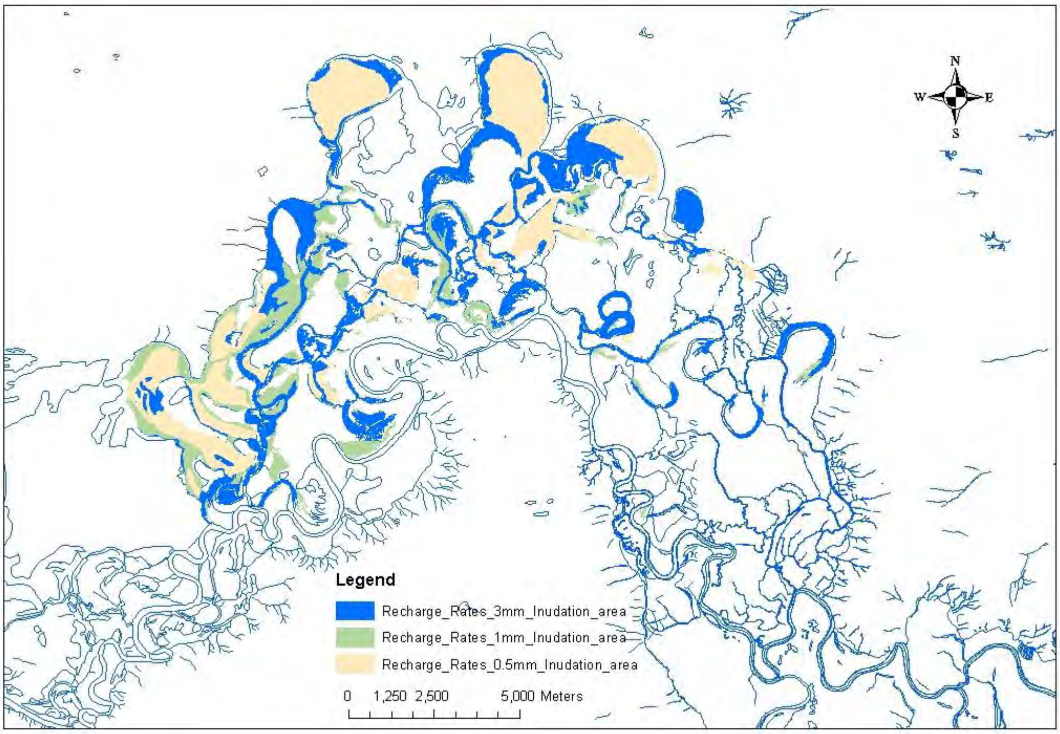


Figure 5. Model Input - recharge rates and zones in inundated areas based on May 2009 Water Tech Hydrodynamic model result and CSIRO 2004 recharge zones

Model Results

A comparison of the model results between using the 2008 DEM data and 2009 DEM data shows that the 2009 DEM results in higher salt loads (Figure 6).

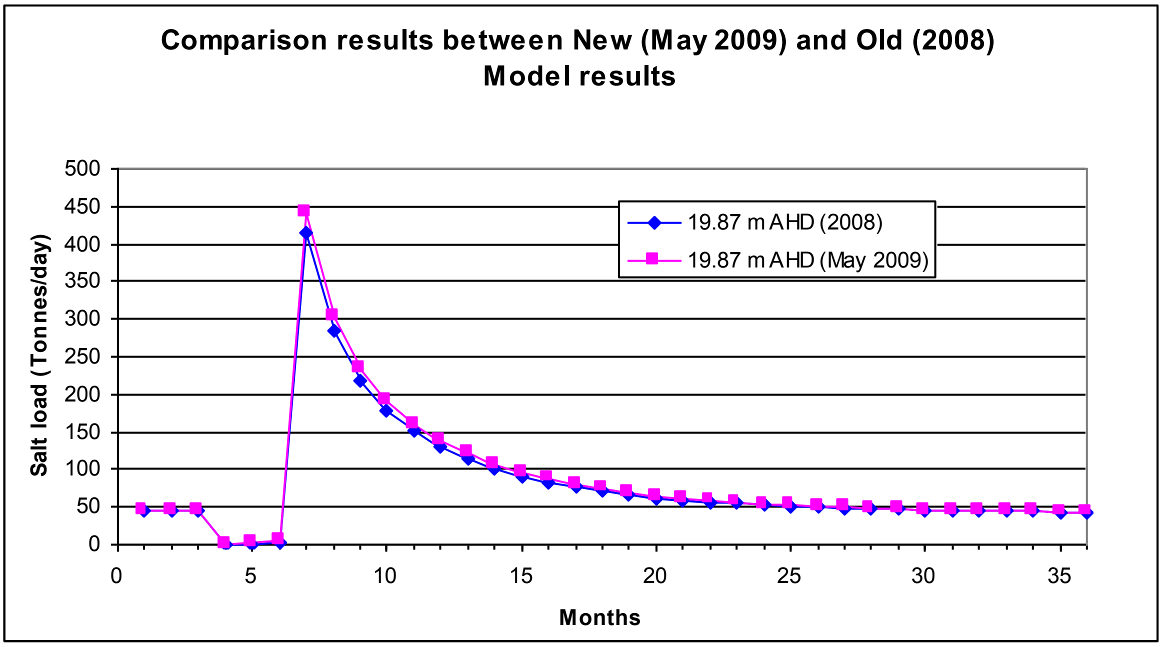


Figure 6. Comparison of modelled salt load

The model result indicates that peak salt loads may increase by around 25 tonnes/day from 416 tonnes/day to 441 tonnes/day compared to the 2008 result (Figure 7).

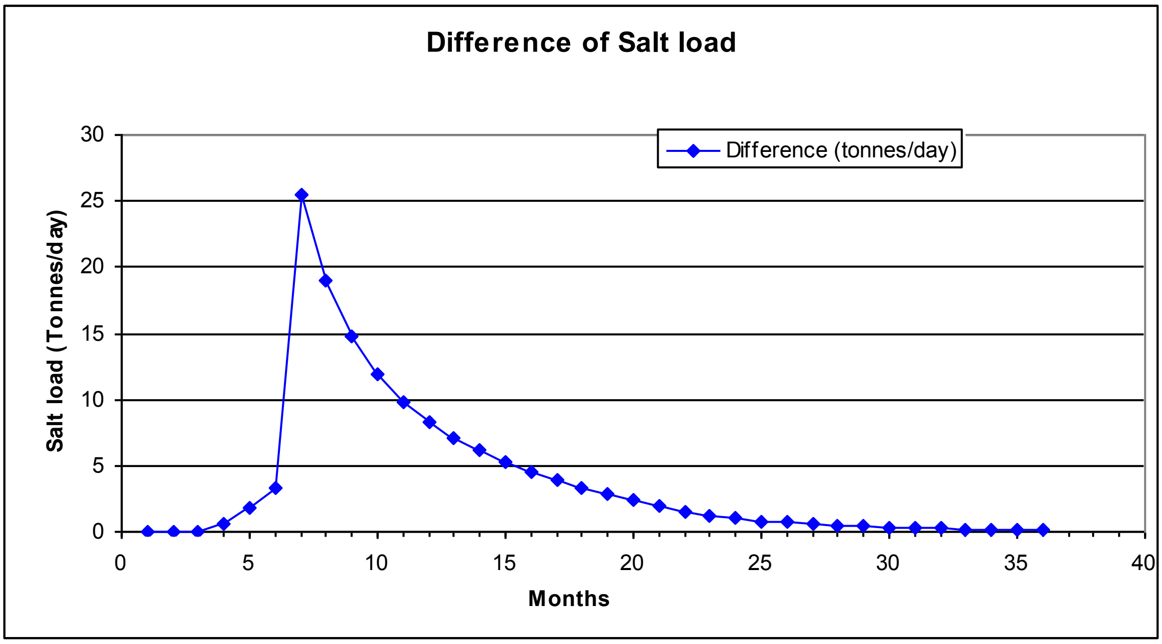


Figure 7. Modelled increase in salt load using the inundation area (DEM 2009)

Task 1 (May 2010) Chowilla real time salinity assessment

Purpose

This task assesses the salt loads entering the River Murray and Chowilla anabranch creeks resulting from 3 operating scenarios of the proposed Chowilla Creek Environmental Regulator during a 10,000ML/day flood event, at maximum operating heights of 19.25 m AHD, 19.0 m AHD and 18.75 m AHD. Note that Lock 6 is operated at 19.8 m AHD during each scenario. This information forms part of a broader salinity assessment undertaken by SKM (2010).

Scenarios

The three scenarios assume that the regulator operates at maximum heights of:

- Scenario 1 – 19.25 m AHD
- Scenario 2 – 19.0 m AHD
- Scenario 3 – 18.75 m AHD

Assumptions

For each scenario the three and a half months (105 days) of regulator operation being simulated consists of a period of gradual increase in water level, a period of steady water level (two scenarios include a shallow drawdown and refill in this period) and a period of gradual drawdown to starting water level conditions. The maximum operating heights are 19.25, 19.0 and 18.75 m AHD. During the operation period the Level of Lock 6 is also dynamic, with a maximum level of 19.8 m AHD (Figure 1). The River flow during the operating period was assumed 10,000 ML/day for all sections.

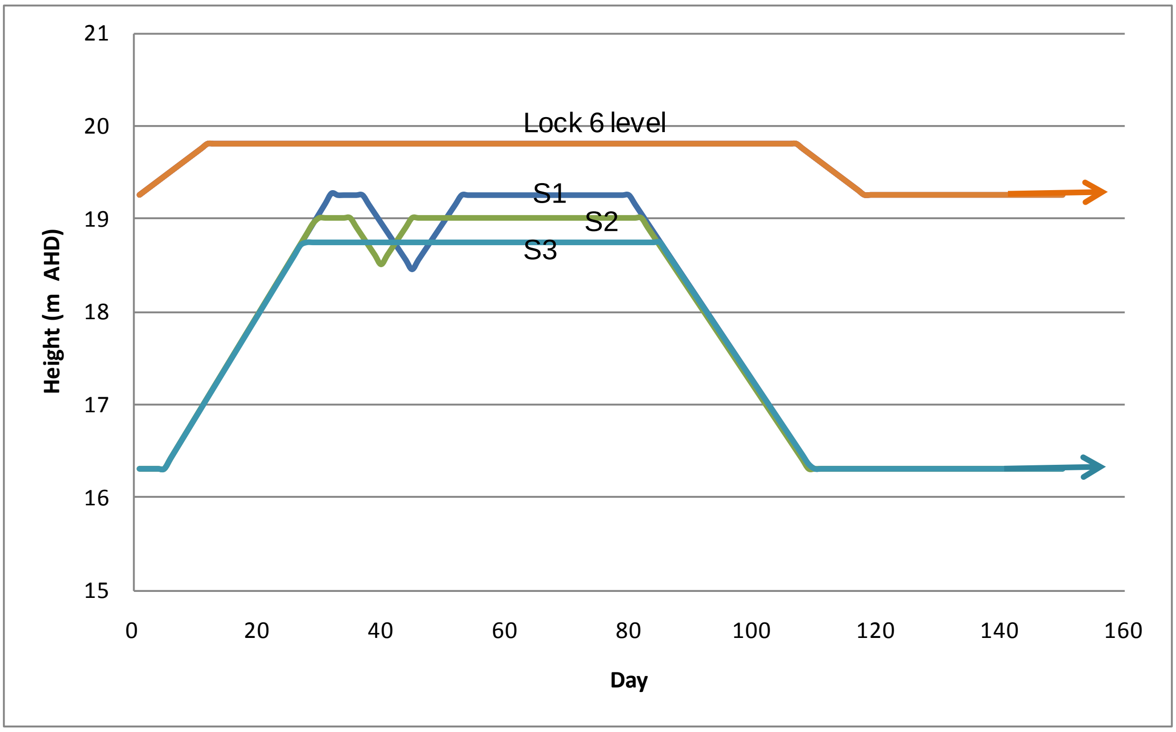


Figure 1. Example input hydrograph

The model was run for three years with a 5 to 30 day time step. The model results were groundwater flux (salt load) entering the anabranch creeks at the end of each time step.

Salt load was calculated using modelled flux and two sets of groundwater salinity values:

- An average groundwater salinity value of 25,000mg/L, which represents the average groundwater salinity condition next to the anabranch creeks after flood (Howe et al., 2007). This average value was used to calculate post flood salt load and has been confirmed using measured post flood salt load from the Chowilla anabranch system by Howe et al., (2007). Thus this figure is believed to be the most accurate estimate at a whole of anabranch scale and is consistent with the model calibration. However, it may not accurately represent local salt load fluxes in some parts of the anabranch.
- Salinity values based on values within Yan et al. (2004), which represent floodplain groundwater salinity near the anabranch creeks under base flow or 'dry' flow conditions (Figure 2). These base flow salinity values were measured in 2002 and 2003. The calculated base flow salt load in each section was confirmed using measured in-stream salt load in 2003 by Yan et al. (2004). These salinity values may represent an upper value as salinity close to the creeks can be expected to be substantially lower than these 'dry condition' values following an inundation event.

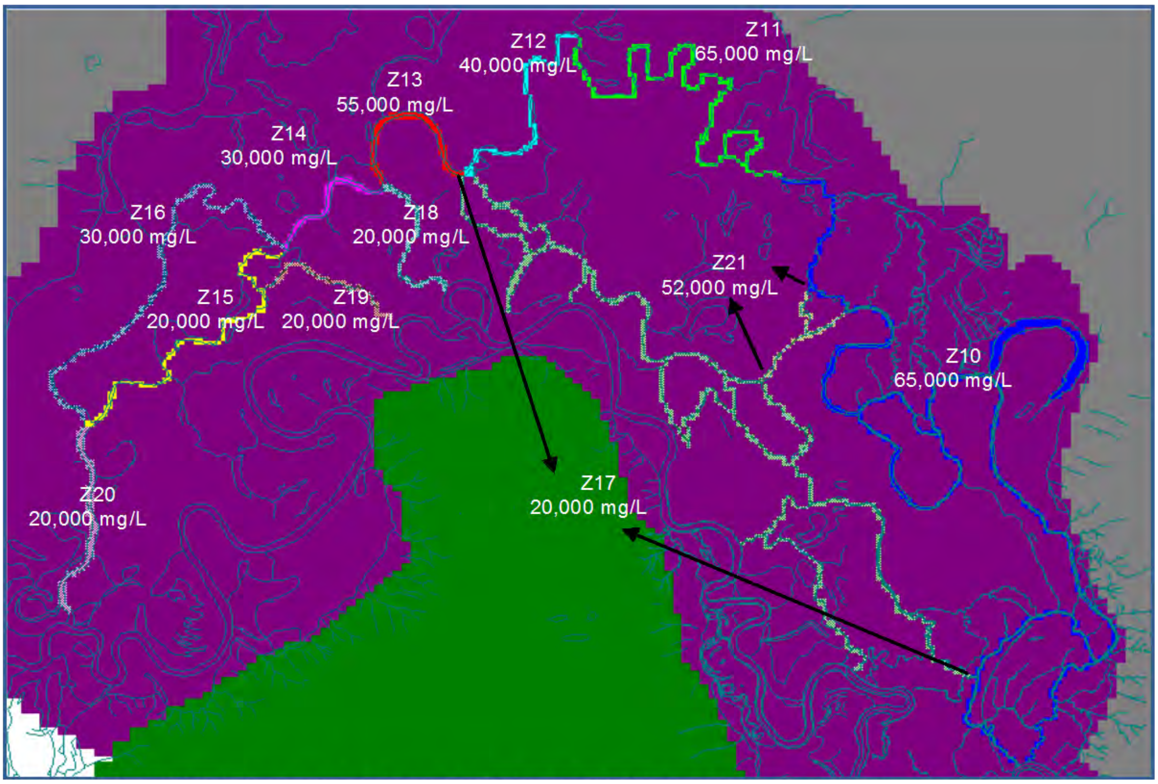


Figure 1 Salinity zones and values used in calculating salt load (Yan et al., 2004)

Figure 2. Salinity zones and values used in calculating salt load (Yan et al., 2004)

The impact of salt load to the river above Lock 6 is minor compared to the impact from anabranch creeks. For consistency with previous assessments this minor impact is not included into the calculation of salt load in this task.

Model Inputs (Recharge and creek levels)

The model input recharge zones were the result of combining the corresponding inundation area and potential recharge zones.

An inundation area at the end of each 5 day time step was calculated by Water Tech using a hydrodynamic model (within the MIKE FLOOD software) in April 2010 (B Tate [Water Tech] 2010, unpublished data 18 March 2010). Figures 3 to 5 show an example of the modelled inundation areas (for each scenario) at the time step of day 80, when inundation area is a maximum.

Potential recharge zones and rates for the whole Chowilla Floodplain were provided by CSIRO in 2004 (Figure 6) as subsequently documented by Overton et al. (2005). The model input recharge zones (see Figures 7 to 9) were the result of combining the corresponding inundation area (Figures 3 to 5) and potential recharge zones (Figure 6).

The water levels in anabranch creeks during the operation period differ depending upon location and time step for each scenario (see Appendix A).

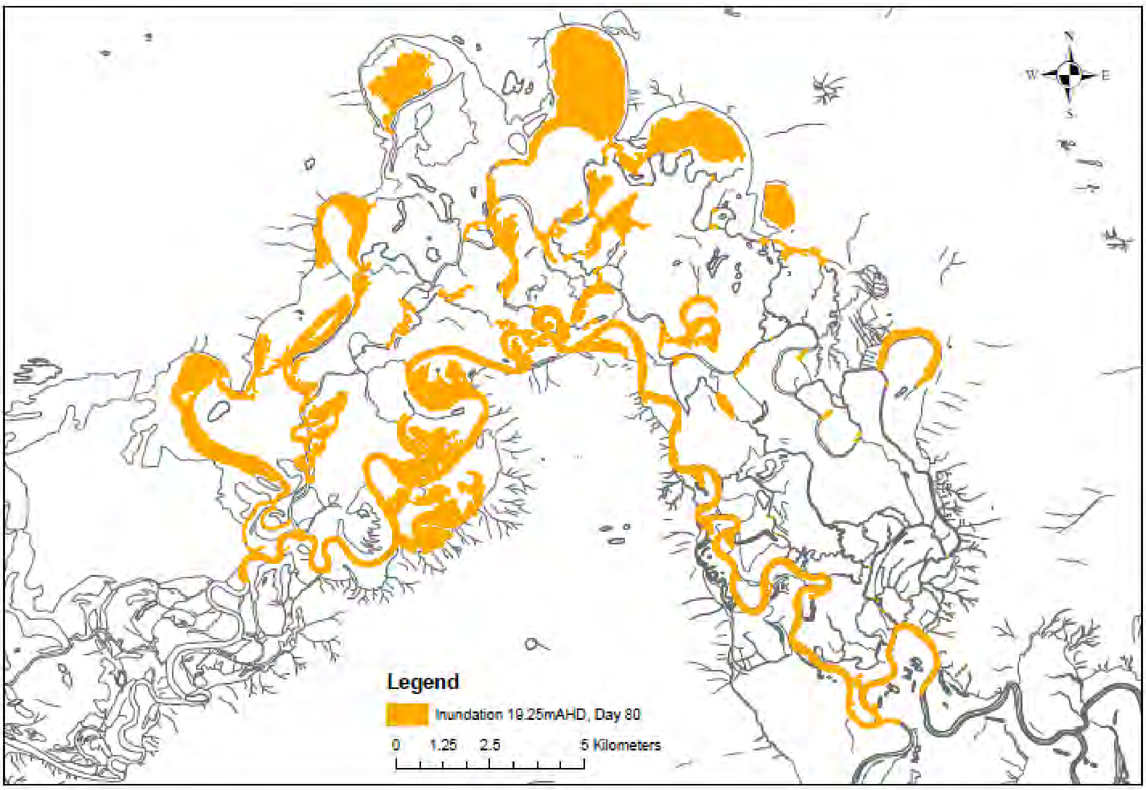


Figure 3 Inundation area at day 80 for regulator level 19.25 m AHD (scenario 1) (April 2010 Water Tech Hydrodynamic model result)

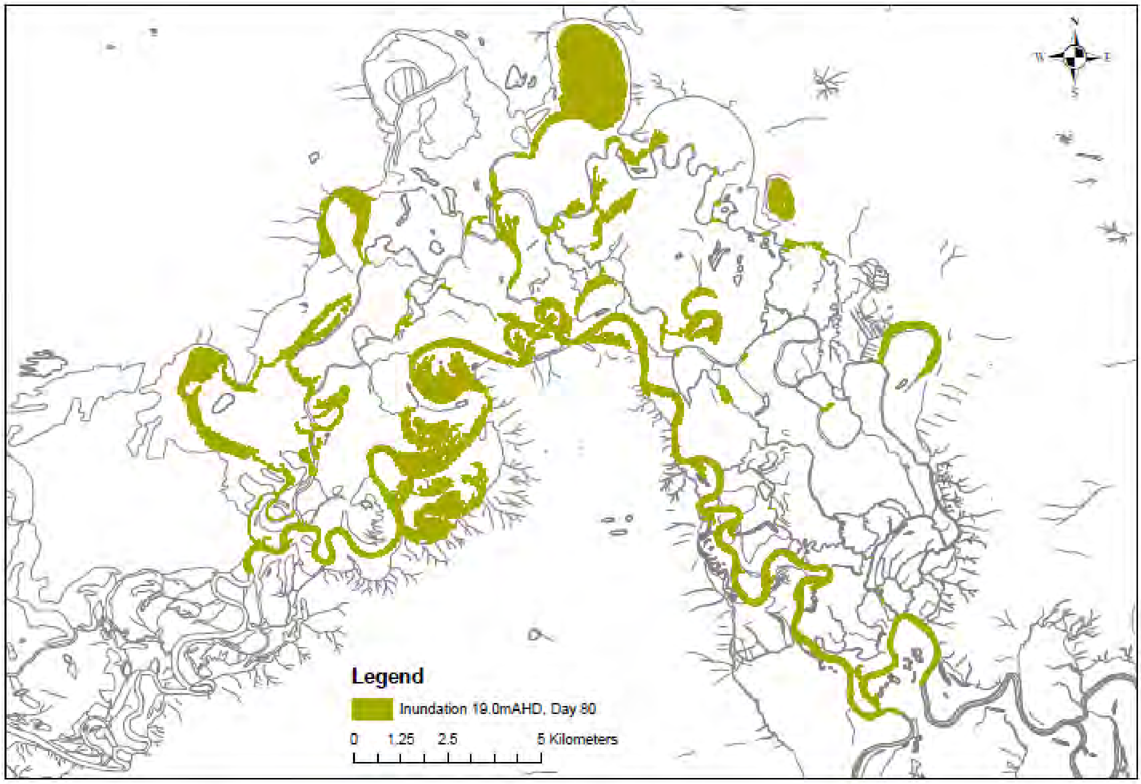


Figure 4 Inundation area at day 80 for regulator level 19.0 m AHD (scenario 2) (April 2010 Water Tech Hydrodynamic model result)

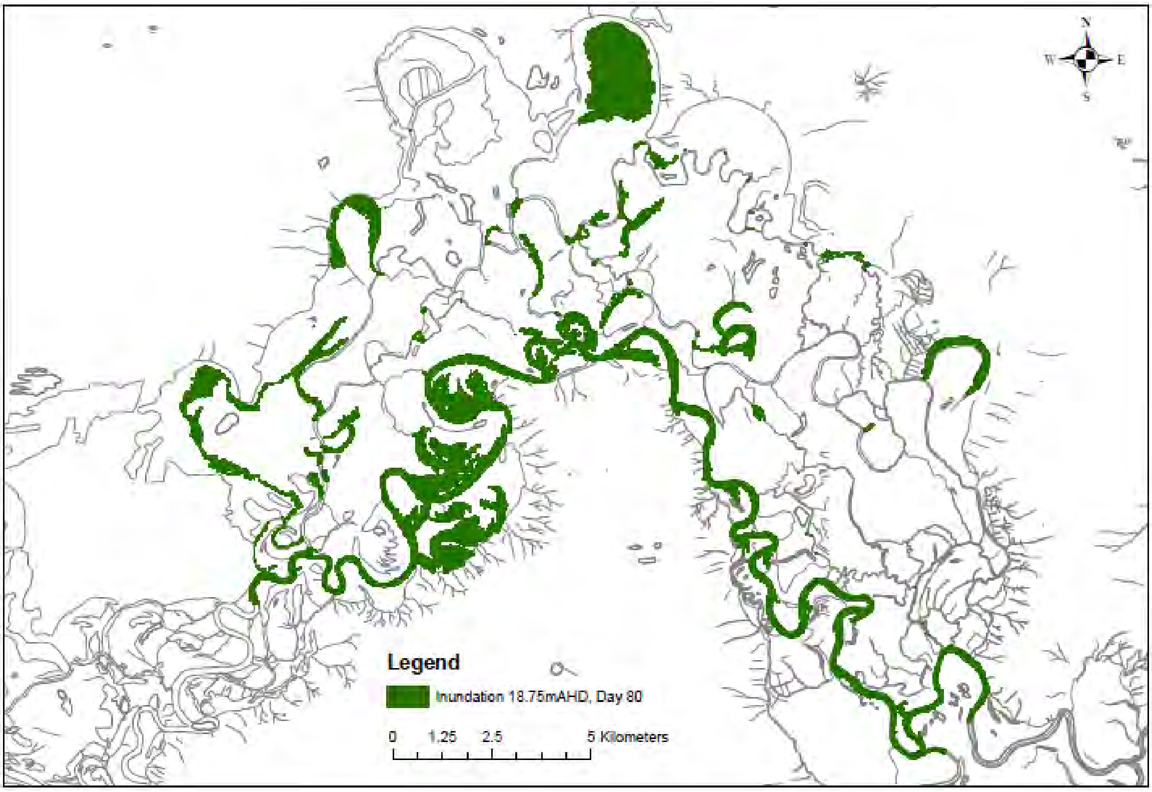


Figure 5 Inundation area at day 80 for regulator level 18.75 m AHD (scenario 3) (April 2010 Water Tech Hydrodynamic model result)

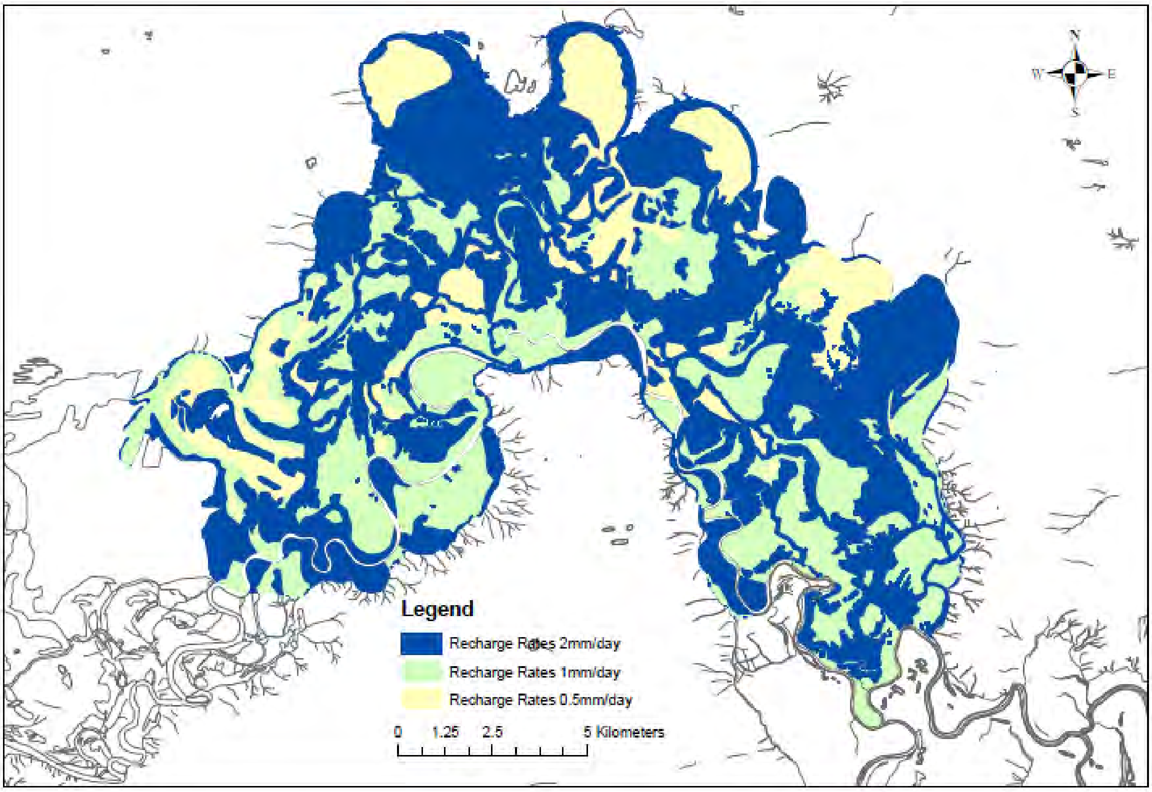


Figure 6 Estimated potential recharge zones and rates on Chowilla Floodplain (provided by CSIRO in 2004)

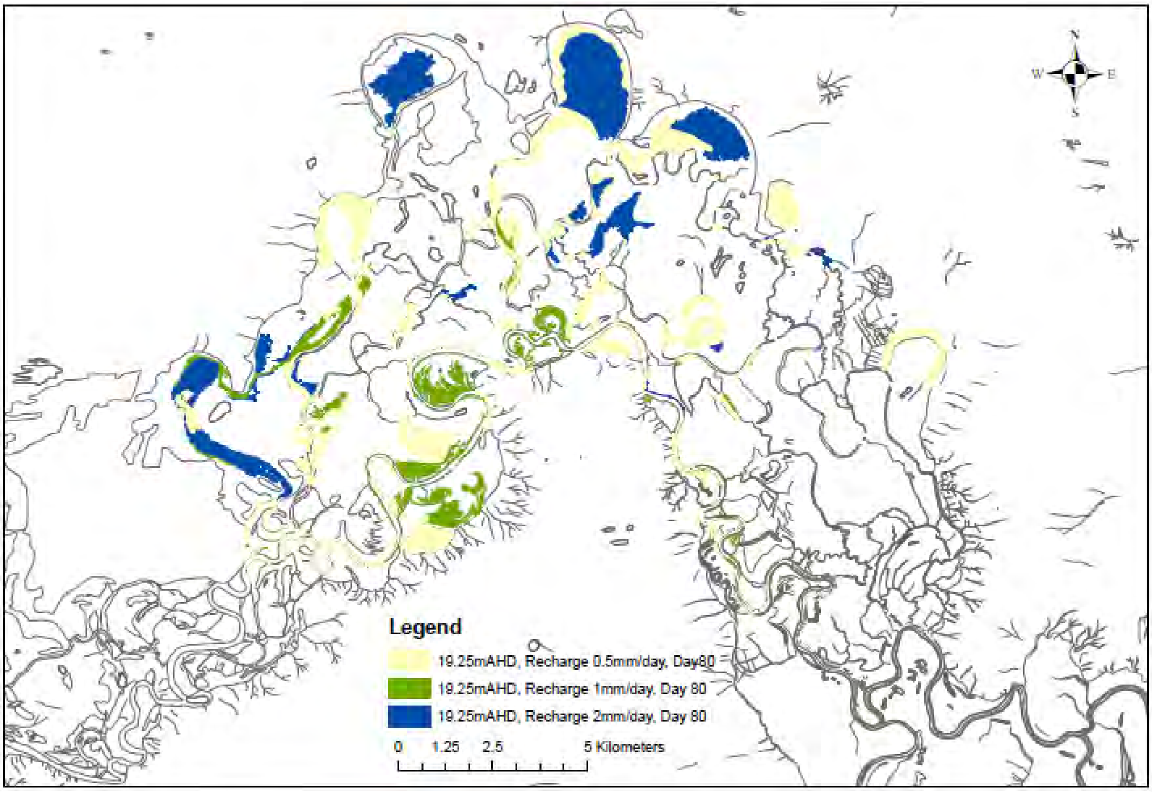


Figure 7 Model Input - recharge rates and zones in inundated areas at day 80 for 19.25 m AHD regulator level (scenario 1)

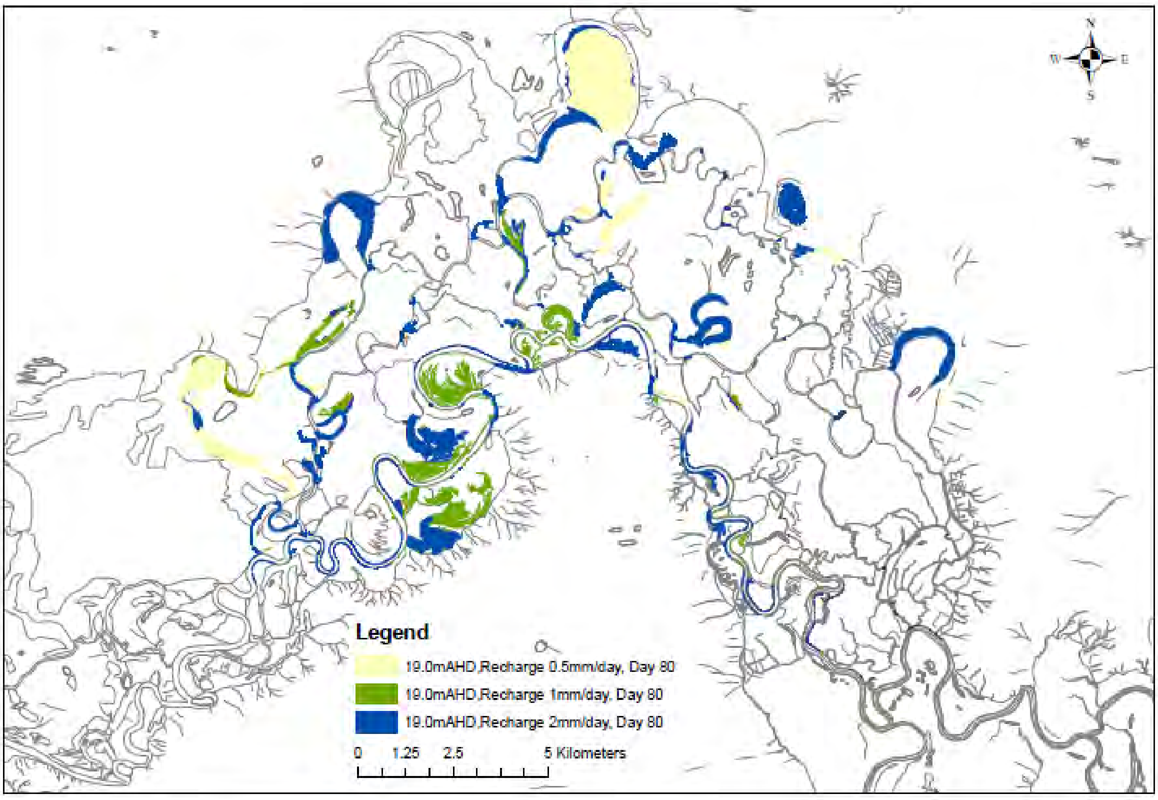


Figure 8 Model Input - recharge rates and zones in inundated areas at day 80 for 19.0 m AHD regulator level (scenario 2)

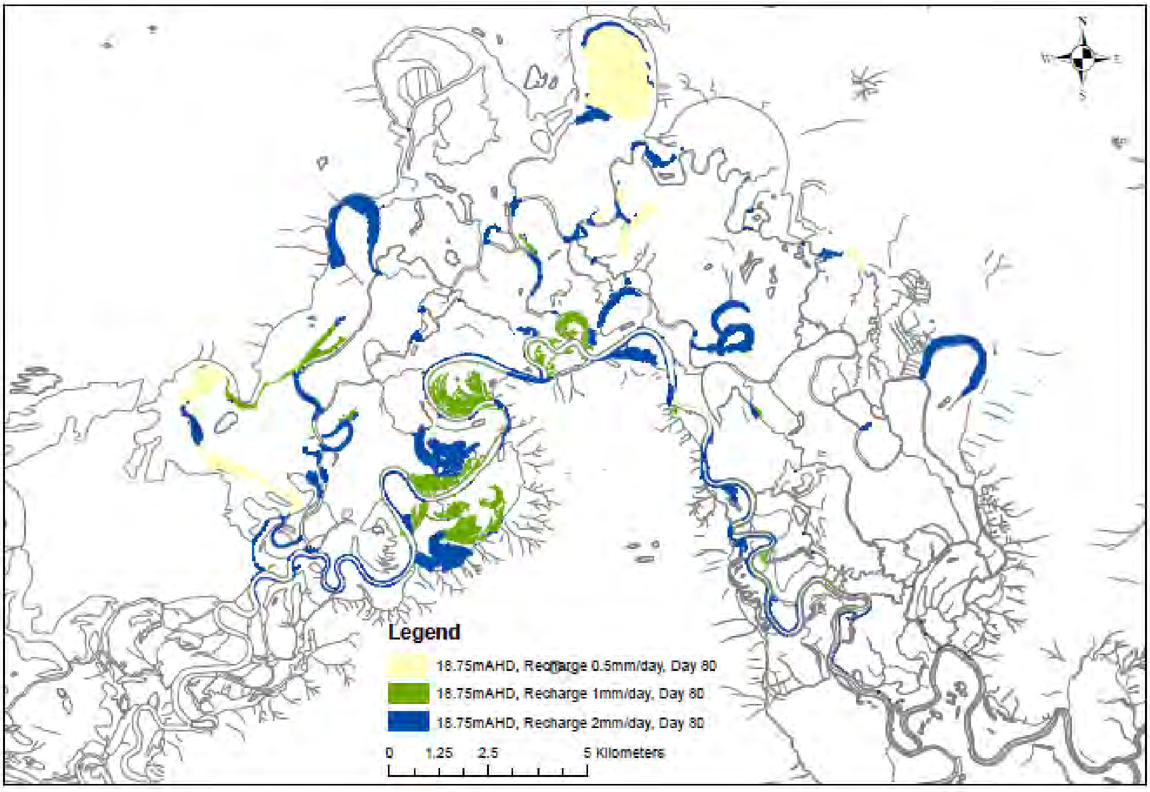


Figure 9 Model Input - recharge rates and zones in inundated areas at day 80 for 18.75 m AHD regulator level (scenario 3)

Model Results

Part 1. Using average salinity values of 25,000 mg/L

A comparison of the model results for each scenario shows that salt load peak is decreased when the regulator operating level is lower (Figure 9). The peak salt load for each scenario is summarised in Table 1. The salt load under natural conditions (without regulator operation and with Lock 6 at average levels of 19.25 m AHD), is also included within Table 1 to show the difference in modelled salt load caused by the management actions within each scenario.

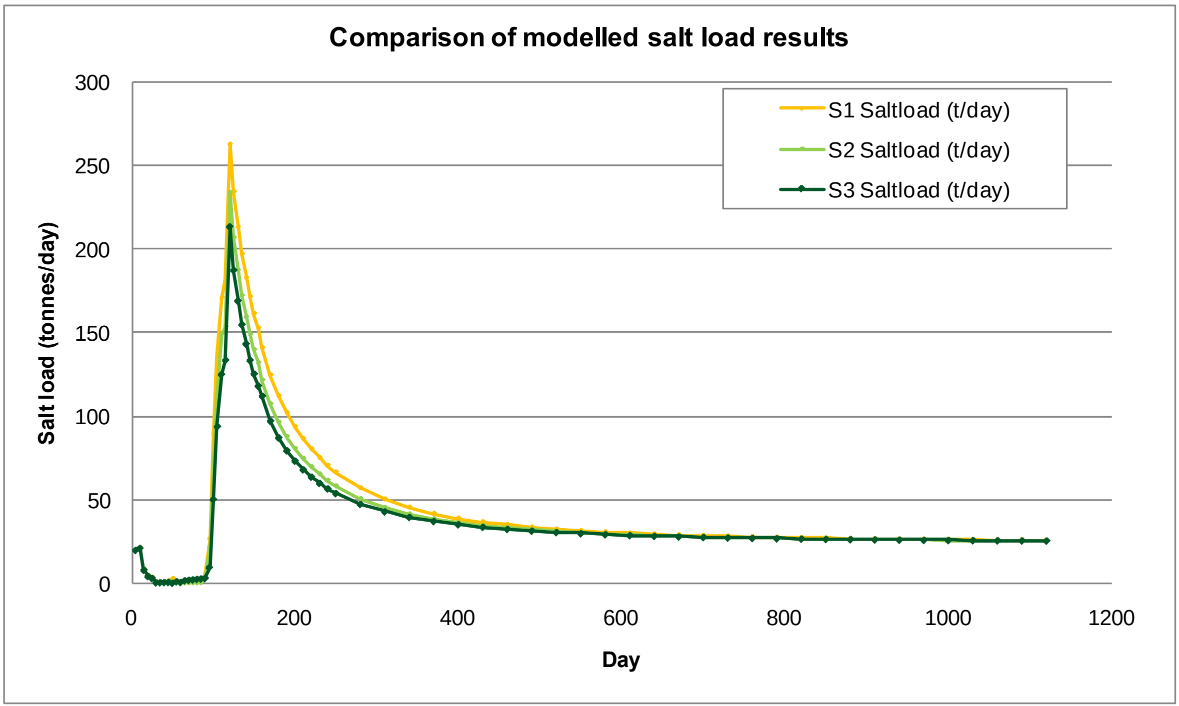


Figure 10 Comparison of modelled salt load results for inundation areas – using average salinity values of 25,000 mg/L

Table 1 Summary of salt load (tonnes/day) for each scenario

Regulator level m AHD	Peak Salt load (tonnes/day)
19.25 (Scenario-1)	262
19.0 (Scenario-2)	234
18.75 (Scenario-3)	213
Natural conditions	20

Part 2. Using base flow groundwater salinity in sections

In the second calculation of salt load, base flow (dry condition) groundwater salinity values were used to calculate salt load entering the anabranch creek. The sections and salinity values were based on floodplain groundwater salinity measurements near each section as reported by Yan et. al. (2004) and shown in Figure 10.

A comparison of the model results again shows that salt load peak is decreased when the regulator operating level is lower (Figure 11). The peak salt load for each scenario are summarised in Table 2. The salt load under natural conditions is also included in Table 2 to indicate the difference in modelled salt load caused by the management actions within each scenario.

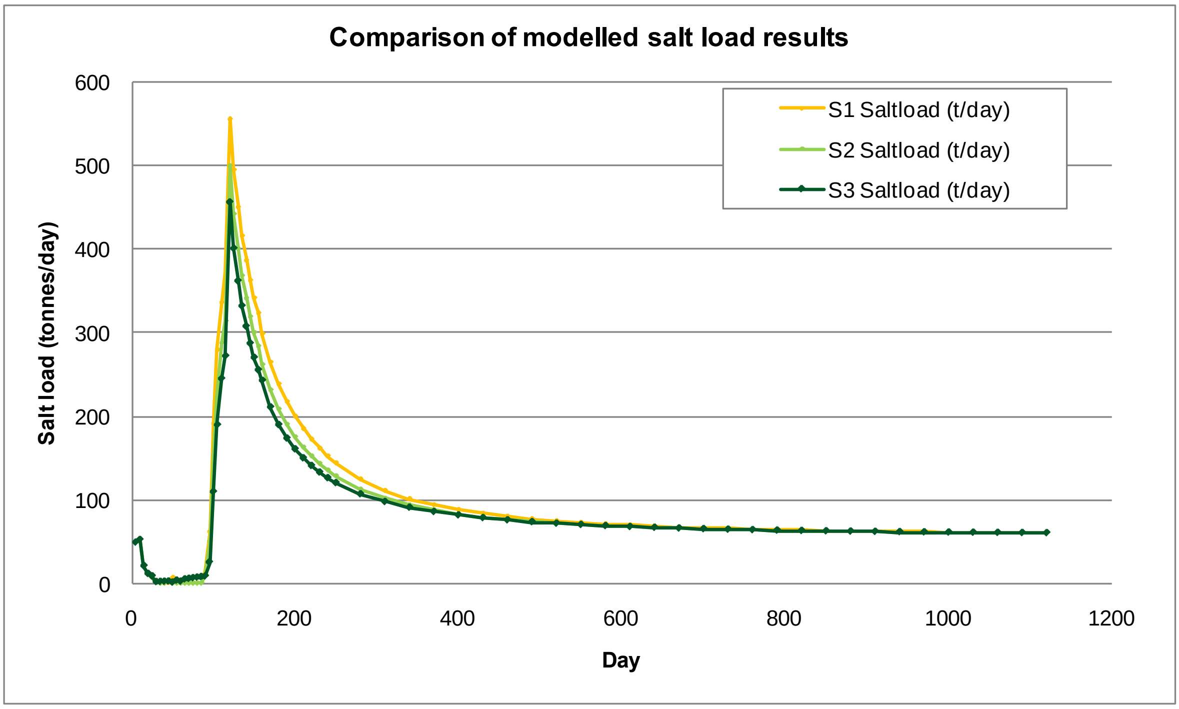


Figure 11 Comparison of modelled salt load results for inundation areas - using floodplain groundwater salinity measurements near each zone

Table 2 Summary of salt load (tonnes/day) for each scenario

Regulator level m AHD	**Peak Salt load (tonnes/day)**
19.25 (Scenario-1)	556
19.0 (Scenario-2)	499
18.75 (Scenario-3)	457
Natural conditions	49

Summary

The two sets of model results show a large difference. This difference is due to the use of two separate sets of salinity values. One set of salinity values represent regional groundwater in the floodplain under base flow or dry conditions. The other set of salinity values represent average groundwater salinity values near the creek bank after flood.

Use of the base flow groundwater salinity values results in higher salt load values. These results can be considered a worst case (conservative) result for management planning purposes. This is because using the base flow groundwater salinity values reflects the assumption that there is no fresh water entering the groundwater system during and after flood. Given freshwater does enter the system, it is reasonable to assume that the use of an average groundwater salinity value ie 25,000mg/L for each of the scenarios is likely to provide a more representative salt load from the whole anabranch system.

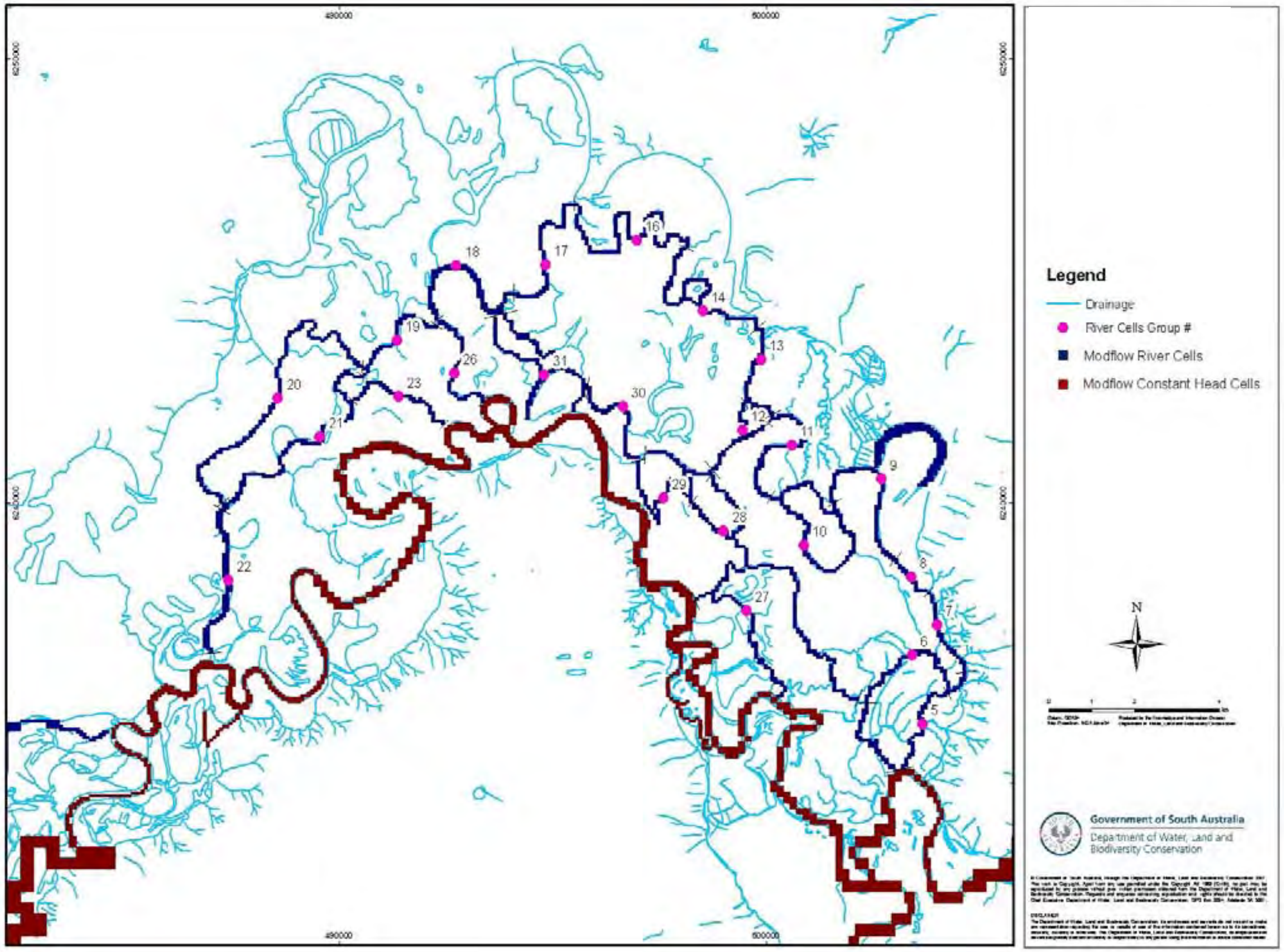
References

Howe, B, Yan, W and Stadter, M 2007, *Groundwater impact assessment of the proposed Chowilla regulator using the Chowilla numerical groundwater model: Report 1*, Report DWLBC 2007/28, Department of Water, Land and Biodiversity Conservation, Adelaide

Overton, IC, Rutherford, JC and Jolly, ID 2005, *Flood extent, groundwater recharge and vegetation response from operation of a potential weir in Chowilla Creek, South Australia*, Report to SA Department of Water, land and Biodiversity Conservation, CSIRO Land and Water Client report

Yan, W, Howles, SR and Marsden, Z 2004, *Chowilla floodplain numerical groundwater model*, Report DWLBC 2004/65, Department of Water, Land and Biodiversity Conservation, Adelaide

APPENDIX A



Anabranch creeks sections within the groundwater model corresponding to WaterTech creek level hydrographs

Creek levels for Scenario 1

Model Creek Name		SALT	SALT_CK2	SALT	SALT	SALT	SALT	SALT	PUNKAH1	PUNKAH	PUNKAH	PUNKAH	PUNKAH	CHOWILLA	CHOWILLA	MONOMAN	CHOWILLA	CHOWILLA	BOAT	PIPECLAY	HYPERNA_ISLAND	HYPERNA_CREEK	HYPERNA_CREEK	SALT	SLANEYLAGOON
River Cell ID. No.		**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**26**	**27**	**28**	**29**	**30**	**31**
Start (day)	**Stop (day)**																								
0	**5**	18.8	18.8	18.5	18.5	18.3	18.1	18.0	18.0	17.9	17.9	17.5	17.1	16.9	16.9	16.6	16.7	16.6	17.8	17.2	19.4	18.6	18.3	17.9	17.6
5	**10**	18.8	18.8	18.5	18.5	18.3	18.1	18.0	18.0	17.9	17.9	17.5	17.1	16.9	16.9	16.6	16.7	16.6	17.8	17.2	19.4	18.6	18.3	17.9	17.6
10	**15**	18.9	19.0	18.7	18.7	18.5	18.3	18.3	18.3	18.2	18.1	17.7	17.4	17.3	17.2	17.0	17.1	17.0	18.0	17.4	19.6	18.9	18.6	18.1	17.8
15	**20**	19.0	19.1	18.8	18.8	18.6	18.5	18.4	18.4	18.3	18.3	18.0	17.8	17.7	17.7	17.5	17.6	17.5	18.1	17.8	19.6	19.0	18.7	18.3	18.0
20	**25**	19.0	19.1	18.9	18.8	18.7	18.6	18.6	18.5	18.5	18.5	18.3	18.2	18.2	18.2	18.1	18.1	18.1	18.3	18.2	19.6	19.0	18.8	18.5	18.3
25	**30**	19.1	19.2	19.0	19.0	18.9	18.9	18.8	18.8	18.8	18.8	18.7	18.7	18.7	18.7	18.6	18.6	18.6	18.7	18.7	19.6	19.1	19.0	18.8	18.7
30	**35**	19.3	19.4	19.3	19.3	19.3	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.7	19.3	19.3	19.2	19.2
35	**40**	19.4	19.5	19.4	19.4	19.4	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.2	19.2	19.2	19.3	19.3	19.7	19.4	19.4	19.3	19.3
40	**45**	19.2	19.3	19.2	19.2	19.1	19.1	19.1	19.1	19.1	19.0	19.0	18.9	18.9	18.9	18.9	18.9	18.8	18.9	18.9	19.7	19.2	19.2	19.0	19.0
45	**50**	19.1	19.2	19.0	19.0	18.9	18.8	18.8	18.8	18.8	18.8	18.7	18.6	18.6	18.6	18.6	18.6	18.6	18.7	18.6	19.6	19.1	18.9	18.8	18.7
50	**55**	19.3	19.3	19.2	19.2	19.2	19.2	19.2	19.1	19.1	19.1	19.1	19.1	19.1	19.1	19.1	19.1	19.1	19.1	19.1	19.7	19.3	19.2	19.1	19.1
55	**60**	19.4	19.5	19.4	19.4	19.4	19.4	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.2	19.3	19.2	19.3	19.3	19.7	19.4	19.4	19.3	19.3
60	**65**	19.4	19.5	19.4	19.4	19.4	19.4	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.2	19.3	19.2	19.3	19.3	19.7	19.4	19.4	19.3	19.3
65	**70**	19.4	19.5	19.4	19.4	19.4	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.2	19.2	19.2	19.3	19.3	19.7	19.4	19.4	19.3	19.3
70	**75**	19.4	19.4	19.4	19.4	19.4	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.2	19.2	19.2	19.3	19.3	19.7	19.4	19.4	19.3	19.3
75	**80**	19.4	19.5	19.4	19.4	19.4	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.2	19.2	19.2	19.3	19.3	19.7	19.4	19.4	19.3	19.3
80	**85**	19.4	19.4	19.4	19.4	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.2	19.2	19.2	19.2	19.2	19.1	19.2	19.2	19.7	19.4	19.3	19.3	19.3
85	**90**	19.1	19.2	19.1	19.1	19.0	18.9	18.9	18.9	18.9	18.9	18.8	18.8	18.7	18.7	18.7	18.7	18.7	18.8	18.8	19.7	19.2	19.0	18.9	18.8
90	**95**	19.0	19.1	18.9	18.9	18.8	18.7	18.7	18.7	18.6	18.6	18.4	18.3	18.3	18.3	18.2	18.2	18.2	18.4	18.3	19.6	19.0	18.8	18.6	18.4
95	**100**	19.0	19.1	18.8	18.8	18.6	18.5	18.5	18.5	18.4	18.4	18.1	17.9	17.8	17.8	17.7	17.7	17.7	18.1	17.9	19.6	19.0	18.7	18.3	18.1
100	**105**	19.0	19.1	18.8	18.8	18.6	18.5	18.4	18.4	18.3	18.3	17.9	17.6	17.4	17.4	17.2	17.3	17.1	18.1	17.5	19.7	19.0	18.7	18.2	17.9
105	**110**	19.0	19.1	18.8	18.8	18.6	18.4	18.4	18.4	18.3	18.2	17.8	17.4	17.1	17.1	16.7	16.9	16.7	18.0	17.3	19.6	18.9	18.7	18.2	17.9
110	**115**	18.8	18.9	18.7	18.6	18.5	18.3	18.2	18.2	18.1	18.1	17.7	17.3	17.1	17.0	16.7	16.8	16.7	17.8	17.3	19.5	18.7	18.5	18.0	17.8
115	**120**	18.7	18.7	18.5	18.4	18.3	18.0	18.0	17.9	17.9	17.8	17.5	17.1	16.9	16.9	16.6	16.7	16.6	17.7	17.2	19.3	18.5	18.2	17.8	17.6
120	**1120**	18.7	18.7	18.5	18.4	18.3	18.0	18.0	17.9	17.9	17.8	17.5	17.1	16.9	16.9	16.6	16.7	16.6	17.7	17.2	19.3	18.5	18.2	17.8	17.6

Creek levels for scenario 2

Model Creek Name		SALT	SALT_CK2	SALT	SALT	SALT	SALT	SALT	PUNKAH1	PUNKAH	PUNKAH	PUNKAH	PUNKAH	CHOWILLA	CHOWILLA	MONOMAN	CHOWILLA	CHOWILLA	BOAT	PIPECLAY	HYPERNA_ISLAND	HYPERNA_CREEK	HYPERNA_CREEK	SALT	SLANEYLAGOON
River Cell ID. No.		**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**26**	**27**	**28**	**29**	**30**	**31**
Start (day)	**Stop (day)**																								
0	**5**	18.8	18.8	18.5	18.5	18.3	18.1	18.0	18.0	17.9	17.9	17.5	17.1	16.9	16.9	16.6	16.7	16.6	17.8	17.2	19.4	18.6	18.3	17.9	17.6
5	**10**	18.8	18.8	18.5	18.5	18.3	18.1	18.0	18.0	17.9	17.9	17.5	17.1	16.9	16.9	16.6	16.7	16.6	17.8	17.2	19.4	18.6	18.3	17.9	17.6
10	**15**	18.9	19.0	18.7	18.7	18.5	18.3	18.3	18.3	18.2	18.1	17.7	17.4	17.3	17.2	17.0	17.1	17.0	18.0	17.4	19.6	18.9	18.6	18.1	17.8
15	**20**	19.0	19.1	18.8	18.8	18.6	18.5	18.4	18.4	18.3	18.3	18.0	17.8	17.7	17.7	17.5	17.6	17.5	18.1	17.8	19.6	19.0	18.7	18.3	18.0
20	**25**	19.0	19.1	18.9	18.8	18.7	18.6	18.6	18.5	18.5	18.5	18.3	18.2	18.2	18.2	18.1	18.1	18.1	18.3	18.2	19.6	19.0	18.8	18.5	18.3
25	**30**	19.1	19.2	19.0	19.0	18.9	18.9	18.8	18.8	18.8	18.8	18.7	18.7	18.7	18.7	18.6	18.6	18.6	18.7	18.7	19.6	19.1	19.0	18.8	18.7
30	**35**	19.3	19.3	19.2	19.2	19.2	19.2	19.1	19.1	19.1	19.1	19.1	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.7	19.3	19.2	19.1	19.1
35	**40**	19.3	19.3	19.2	19.2	19.1	19.1	19.1	19.1	19.1	19.1	19.0	19.0	19.0	19.0	18.9	18.9	18.9	19.0	19.0	19.7	19.3	19.2	19.1	19.0
40	**45**	19.1	19.2	19.0	19.0	18.9	18.9	18.8	18.8	18.8	18.8	18.7	18.7	18.7	18.6	18.6	18.6	18.6	18.7	18.7	19.6	19.1	19.0	18.8	18.7
45	**50**	19.3	19.3	19.2	19.2	19.2	19.1	19.1	19.1	19.1	19.1	19.1	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.7	19.3	19.2	19.1	19.1
50	**55**	19.3	19.3	19.2	19.2	19.2	19.2	19.1	19.1	19.1	19.1	19.1	19.1	19.0	19.0	19.0	19.0	19.0	19.1	19.1	19.7	19.3	19.2	19.1	19.1
55	**60**	19.3	19.3	19.2	19.2	19.2	19.2	19.1	19.1	19.1	19.1	19.1	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.7	19.3	19.2	19.1	19.1
60	**65**	19.3	19.3	19.2	19.2	19.2	19.2	19.1	19.1	19.1	19.1	19.1	19.0	19.0	19.0	19.0	19.0	19.0	19.1	19.0	19.7	19.3	19.2	19.1	19.1
65	**70**	19.3	19.3	19.2	19.2	19.2	19.2	19.1	19.1	19.1	19.1	19.1	19.1	19.0	19.0	19.0	19.0	19.0	19.1	19.1	19.7	19.3	19.2	19.1	19.1
70	**75**	19.3	19.3	19.2	19.2	19.2	19.2	19.1	19.1	19.1	19.1	19.1	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.7	19.3	19.2	19.1	19.1
75	**80**	19.3	19.3	19.2	19.2	19.2	19.2	19.1	19.1	19.1	19.1	19.1	19.1	19.0	19.0	19.0	19.0	19.0	19.1	19.1	19.7	19.3	19.2	19.1	19.1
80	**85**	19.3	19.3	19.2	19.2	19.2	19.2	19.1	19.1	19.1	19.1	19.1	19.1	19.0	19.0	19.0	19.0	19.0	19.1	19.1	19.7	19.3	19.2	19.1	19.1
85	**90**	19.1	19.2	19.0	19.0	19.0	18.9	18.9	18.9	18.9	18.9	18.8	18.7	18.7	18.7	18.6	18.6	18.6	18.7	18.7	19.7	19.1	19.0	18.9	18.8
90	**95**	19.0	19.1	18.9	18.9	18.8	18.7	18.6	18.6	18.6	18.5	18.4	18.3	18.2	18.2	18.1	18.1	18.1	18.4	18.3	19.6	19.0	18.8	18.5	18.4
95	**100**	19.0	19.1	18.8	18.8	18.6	18.5	18.5	18.5	18.4	18.3	18.1	17.9	17.8	17.8	17.6	17.7	17.6	18.1	17.8	19.6	19.0	18.7	18.3	18.1
100	**105**	19.0	19.1	18.8	18.8	18.6	18.5	18.4	18.4	18.3	18.3	17.9	17.6	17.4	17.4	17.1	17.2	17.1	18.1	17.5	19.6	19.0	18.7	18.2	17.9
105	**110**	19.0	19.1	18.8	18.8	18.6	18.4	18.4	18.4	18.3	18.2	17.8	17.4	17.1	17.0	16.7	16.8	16.6	18.0	17.3	19.6	18.9	18.7	18.2	17.9
110	**115**	18.8	18.9	18.7	18.6	18.5	18.3	18.2	18.2	18.1	18.1	17.7	17.3	17.1	17.0	16.7	16.8	16.7	17.8	17.3	19.5	18.7	18.5	18.0	17.8
115	**120**	18.7	18.7	18.5	18.4	18.3	18.0	18.0	17.9	17.9	17.8	17.5	17.1	16.9	16.9	16.6	16.7	16.6	17.7	17.2	19.3	18.5	18.2	17.8	17.6
120	**1120**	18.7	18.7	18.5	18.4	18.3	18.0	18.0	17.9	17.9	17.8	17.5	17.1	16.9	16.9	16.6	16.7	16.6	17.7	17.2	19.3	18.5	18.2	17.8	17.6

Creek levels for scenario 3

Model Creek Name		SALT	SALT_CK2	SALT	SALT	SALT	SALT	SALT	PUNKAH1	PUNKAH	PUNKAH	PUNKAH	PUNKAH	CHOWILLA	CHOWILLA	MONOMAN	CHOWILLA	CHOWILLA	BOAT	PIPECLAY	HYPERNA_ISLAND	HYPERNA_CREEK	HYPERNA_CREEK	SALT	SLANEY LAGOON
River Cell ID. No.		5	6	7	8	9	10	11	12	13	14	16	17	18	19	20	21	22	23	26	27	28	29	30	31
Start (day)	Stop (day)																								
0	5	18.8	18.8	18.5	18.5	18.3	18.1	18.0	18.0	17.9	17.9	17.5	17.1	16.9	16.9	16.6	16.7	16.6	17.8	17.2	19.4	18.6	18.3	17.9	17.6
5	10	18.8	18.8	18.5	18.5	18.3	18.1	18.0	18.0	17.9	17.9	17.5	17.1	16.9	16.9	16.6	16.7	16.6	17.8	17.2	19.4	18.6	18.3	17.9	17.6
10	15	18.9	19.0	18.7	18.7	18.5	18.3	18.3	18.3	18.2	18.1	17.7	17.4	17.3	17.2	17.0	17.1	17.0	18.0	17.4	19.6	18.9	18.6	18.1	17.8
15	20	19.0	19.1	18.8	18.8	18.6	18.5	18.4	18.4	18.3	18.3	18.0	17.8	17.7	17.7	17.5	17.6	17.5	18.1	17.8	19.6	19.0	18.7	18.3	18.0
20	25	19.0	19.1	18.9	18.8	18.7	18.6	18.6	18.5	18.5	18.5	18.3	18.2	18.2	18.2	18.1	18.1	18.1	18.3	18.2	19.6	19.0	18.8	18.5	18.3
25	30	19.1	19.2	19.0	19.0	18.9	18.9	18.8	18.8	18.8	18.8	18.7	18.7	18.7	18.7	18.6	18.6	18.6	18.7	18.7	19.6	19.1	19.0	18.8	18.7
30	35	19.1	19.2	19.1	19.1	19.0	19.0	19.0	19.0	18.9	18.9	18.8	18.8	18.8	18.8	18.7	18.8	18.7	18.8	18.8	19.7	19.2	19.0	18.9	18.9
35	40	19.1	19.2	19.1	19.1	19.0	19.0	19.0	19.0	18.9	18.9	18.8	18.8	18.8	18.8	18.7	18.8	18.7	18.8	18.8	19.7	19.2	19.1	18.9	18.9
40	45	19.1	19.2	19.1	19.1	19.0	19.0	19.0	18.9	18.9	18.9	18.8	18.8	18.8	18.8	18.7	18.8	18.7	18.8	18.8	19.6	19.2	19.0	18.9	18.9
45	50	19.2	19.2	19.1	19.1	19.0	19.0	19.0	19.0	18.9	18.9	18.9	18.8	18.8	18.8	18.8	18.8	18.7	18.8	18.8	19.7	19.2	19.1	18.9	18.9
50	55	19.1	19.2	19.1	19.1	19.0	19.0	19.0	18.9	18.9	18.9	18.8	18.8	18.8	18.8	18.7	18.8	18.7	18.8	18.8	19.6	19.2	19.0	18.9	18.9
55	60	19.2	19.2	19.1	19.1	19.0	19.0	19.0	19.0	18.9	18.9	18.9	18.8	18.8	18.8	18.7	18.8	18.7	18.8	18.8	19.7	19.2	19.1	18.9	18.9
60	65	19.1	19.2	19.1	19.1	19.0	19.0	19.0	18.9	18.9	18.9	18.8	18.8	18.8	18.8	18.7	18.8	18.7	18.8	18.8	19.6	19.2	19.0	18.9	18.9
65	70	19.1	19.2	19.1	19.1	19.0	19.0	19.0	19.0	18.9	18.9	18.8	18.8	18.8	18.8	18.7	18.8	18.7	18.8	18.8	19.7	19.2	19.1	18.9	18.9
70	75	19.1	19.2	19.1	19.1	19.0	19.0	19.0	18.9	18.9	18.9	18.8	18.8	18.8	18.8	18.7	18.8	18.7	18.8	18.8	19.6	19.2	19.0	18.9	18.9
75	80	19.1	19.2	19.1	19.1	19.0	19.0	19.0	18.9	18.9	18.9	18.8	18.8	18.8	18.8	18.7	18.8	18.7	18.8	18.8	19.7	19.2	19.1	18.9	18.9
80	85	19.1	19.2	19.1	19.1	19.0	19.0	19.0	19.0	18.9	18.9	18.8	18.8	18.8	18.8	18.7	18.8	18.7	18.8	18.8	19.6	19.2	19.1	18.9	18.9
85	90	19.1	19.2	19.1	19.0	19.0	18.9	18.9	18.9	18.9	18.9	18.8	18.7	18.7	18.7	18.7	18.7	18.6	18.8	18.7	19.7	19.1	19.0	18.9	18.8
90	95	19.0	19.1	18.9	18.9	18.8	18.7	18.7	18.6	18.6	18.6	18.4	18.3	18.3	18.3	18.2	18.2	18.2	18.4	18.3	19.6	19.0	18.8	18.6	18.4
95	100	19.0	19.1	18.8	18.8	18.6	18.5	18.5	18.5	18.4	18.4	18.1	17.9	17.8	17.8	17.7	17.7	17.7	18.1	17.9	19.6	19.0	18.7	18.3	18.1
100	105	19.0	19.1	18.8	18.8	18.6	18.5	18.4	18.4	18.3	18.3	17.9	17.6	17.4	17.4	17.2	17.3	17.1	18.1	17.5	19.7	19.0	18.7	18.2	17.9
105	110	19.0	19.1	18.8	18.8	18.6	18.4	18.4	18.4	18.3	18.2	17.8	17.4	17.1	17.1	16.7	16.9	16.7	18.0	17.3	19.6	18.9	18.7	18.2	17.9
110	115	18.8	18.9	18.7	18.6	18.5	18.3	18.2	18.2	18.1	18.1	17.7	17.3	17.1	17.0	16.7	16.8	16.7	17.8	17.3	19.5	18.7	18.5	18.0	17.8
115	120	18.7	18.7	18.5	18.4	18.3	18.0	18.0	17.9	17.9	17.8	17.5	17.1	16.9	16.9	16.6	16.7	16.6	17.7	17.2	19.3	18.5	18.2	17.8	17.6
120	1120	18.7	18.7	18.5	18.4	18.3	18.0	18.0	17.9	17.9	17.8	17.5	17.1	16.9	16.9	16.6	16.7	16.6	17.7	17.2	19.3	18.5	18.2	17.8	17.6

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