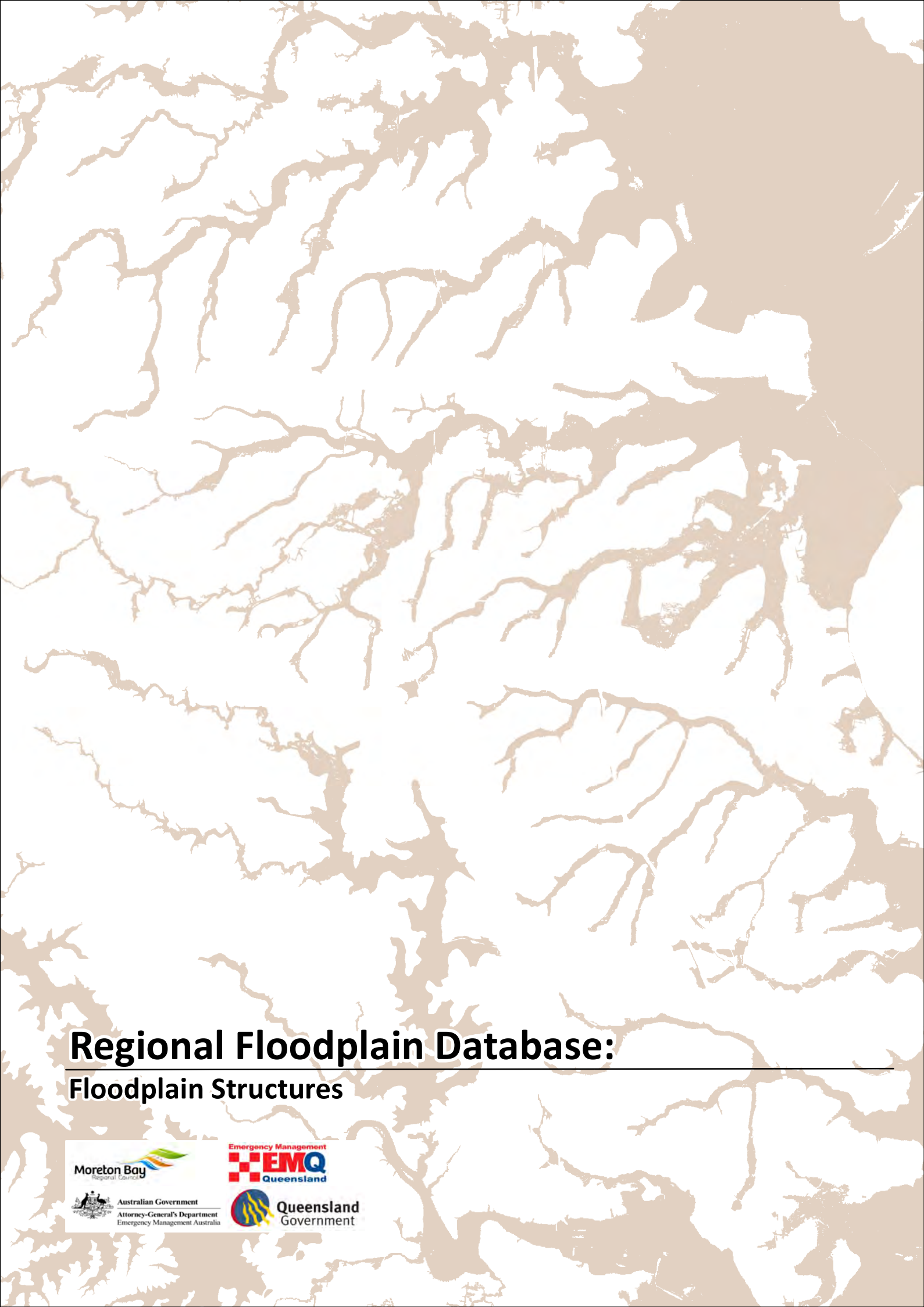

Regional Floodplain Database:

Floodplain Structures

Moreton Bay Regional Council

Emergency Management EMQ Queensland

Australian Government
Attorney-General's Department
Emergency Management Australia

Queensland Government

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Floodplain Structures

Regional Floodplain Database
Moreton Bay Regional Council

Report ref:
44528
21 July 2010
Revision 1

aurecon

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0	1 June 2010	Draft	CLS	TC	TDG	TDG
1	21 July 2010	Final incorporating MBRC comments	CLS	TC	TDG	TDG

Contents

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1. Introduction

Aurecon Pty Ltd (Aurecon) has been commissioned by Moreton Bay Regional Council (MBRC) to carry out an investigation into floodplain infrastructure as part of Council's Regional Floodplain Database Project (RFD Project).

The RFD Project involves a three year (three stage) program for the development of comprehensive flood mapping across the Moreton Bay Regional Council Local Government Area. A key focus for the project is the standardisation of methods and procedures so as to ensure consistency in the flood information produced. The Burpengary 'Minor Basin', incorporating Burpengary Creek, Little Burpengary Creek and Deception Bay has been selected as the Stage 1 pilot study catchment for development of these standardised methods and procedures.

This report documents the development of standard procedures for the identification and definition of floodplain structures within the Burpengary Minor Basin. Following test application, Council will consider extension of the procedures documented herein for Stage 2 of the project which will include detailed flood modelling and mapping for the region.

1.1 Scope

Aurecon was engaged to undertake the floodplain structures sub-projects. The aim of these sub-projects was to develop the standards and methods required for the floodplain structure datasets. The following five sub-projects were included:

- Sub-project 2C – Floodplain Structures (Culverts)
- Sub-project 2D – Floodplain Structures (Bridges)
- Sub-project 2F – Floodplain Structures (Trunk Underground Drainage)
- Sub-project 2G – Floodplain Structures (Detention Basins)
- Sub-project 2H – Floodplain Structures (Buildings)

Each sub-project included development of a data standard to be applied to capture and/or collation of data for the entire Regional Floodplain Database (RFD) project. The aim of these standards was to define a consistent approach to be applied across the entire RFD project. This approach was to ensure that both model files and additional supporting files were consistent across all catchments and could be readily integrated into Council's ArcGIS geodatabase. These standards covered the requirements of survey data collection and its subsequent collation, including production of datasets compatible with the adopted modelling platforms.

Also included in each sub-project was the development of the relevant data files for the Burpengary Creek investigation area.

1.2 Objectives

The key objectives of each of the floodplain structures sub-projects were to:

- Produce a data standard document
- Use the data standards to produce each of the recommended files for the Burpengary Creek pilot catchment

The GIS files developed for modelling of the Burpengary Creek pilot catchment included:

- A TUFLOW compatible 1d_nwk file for culverts
- A TUFLOW compatible 2d_zlr file containing handrail details for culverts
- A TUFLOW compatible 2d_lfcsh file for bridges
- A TUFLOW compatible 2d_lfcsh file for footbridges

- TUFLOW compatible files for trunk underground drainage, including separate 1d_nwk files for pits and pipes
- A TUFLOW compatible 2d_zlr file for detention basin embankments

Additional files developed for input to the modelling included:

- Elevation-storage relationships for each basin to be used as input to the WBNM modelling
- Elevation-discharge relationships for "special case" basins to be used as input to the TUFLOW modelling

Several GIS files containing supporting information were also to be prepared, including:

- A layer containing points at culvert locations, with additional culvert information to assist with model validation
- A layer defining the basin extents over which the WBNM elevation-storage relationships were developed
- Hyper-linked photograph databases for available photographs of each structure
- A layer containing building footprints and associated information for use in stage-damage calculations
- A layer containing point objects representing front and back yard elevations
- Layers containing fence locations and crest elevations

1.3 General approach

The following general approach was adopted across the range of floodplain structure sub-projects:

- Review of existing data provided by Council
- Identification of data gaps
- Identification of any additional structures not identified within Council's existing data
- Preparation of a survey brief for capture of additional data
- Incorporation of all relevant existing data and new survey data into a complete dataset
- Preparation of TUFLOW and WBNM required files/data
- Preparation of additional GIS layers with supporting information
- Preparation of a data standard which covers the data requirements and development of the required datasets
- Reporting

1.4 Related sub-projects

The following list presents the other sub-projects which are related to the floodplain structure sub-projects and a description of how they are related:

- Sub-project 2N – Floodplain Parameterisation

  The recommendations of the parameterisation sub-project provide guidance for selection of appropriate parameters within the following floodplain structure types, including:

  - Culverts: form loss, blockage, contraction, entry and exit losses
  - Bridges: form loss, blockage
  - Trunk underground drainage: culvert parameters
  - Detention basins: culvert parameters

- Sub-project 2E – 2009 DEM Task

  The DEM output from sub-project 2E is required to assist with preparation of the following sub-project datasets:

  - Culvert: DEM data is required as the basis for determining handrail levels
  - Detention Basins: DEM data is required for preparation of the storage-elevation relationships for each basin. This data is required as an input to the WBNM model
  - Buildings: DEM data is required to provide surface elevations for the front and rear yards of each identified property

2. Available data

The following sections describe the data which was provided by MBRC for use in undertaking the project. In addition to the data described below, survey was collected for a number of floodplain structures as described in Sections 3 and 4.

2.1 General data

GIS data which was used across all (or a number of) sub-projects included:

- Aerial photography: Burpengary Creek high resolution aerial imagery from 2007
- Digital elevation model (DEM): Burpengary Creek DEM from 2007
- Hydrography: Council's WBNM model layout for Burpengary Creek including catchments, reaches and junctions
- Preliminary modelling results: peak 100 year ARI depth grid for the Burpengary Creek catchment, 100 year ARI and PMF flood extents for the Burpengary Creek catchment
- Cadastral boundaries: for Burpengary Creek catchment
- Road, rail and footpath locations: for Burpengary Creek catchment

The following sections describe the sub-project specific data which was supplied by Council.

2.2 Sub-Project 2C – Culverts

A GIS layer containing all existing culvert information was supplied. The layer initially provided spatial identification of 113 culverts. Council's surveyors then sourced details for a large number of culverts and the GIS layer was updated and resupplied by Council. The culvert layer used as the basis for a gap analysis included spatial identification of 137 culverts within the Burpengary Creek catchment and, where available, the following attribute data:

- Culvert ID
- Number of cells, shape and dimensions
- Upstream and downstream invert levels
- Length
- Number of different structure types at each location (eg where there was a single structure with barrels of different shapes/dimensions)
- Crossing type, name and owner
- Data source

This dataset included detailed survey information as undertaken by Council's surveyors in December 2009. Details of culvert headwalls, as surveyed by Council's surveyors in December 2009, were also supplied.

2.3 Sub-Project 2D – Bridges

GIS layers containing spatial identification of bridge locations, including ten bridges and twenty-five footbridges, were supplied. Details including bridge name, location (eg waterway and street names), owner and crossing type we supplied as attributes within the two layers.

Design/as-constructed data was also supplied for the following bridges:

- Bruce Highway Eastern Service Road over Burpengary Creek
- Bruce Highway Southbound over Burpengary Creek
- Bruce Highway Northbound over Burpengary Creek
- Morayfield Road over Burpengary Creek
- Rail over Burpengary Creek

- Rowley Road over Burpengary Creek
- Oakey Flat Road over Burpengary Creek
- Rail over Lindsay Road

No existing design/as-constructed data was supplied for O'Brien Road over Burpengary Creek, the rail bridge over New Settlement Road or the footbridges.

Details of the sewer network were also provided to allow identification of sewer crossings over creeks.

2.4 Sub-Project 2F – Trunk Underground Drainage

For the purposes of the Regional Floodplain Database project, Trunk Underground Drainage was defined as an extended underground drainage system having a large open channel or stream feeding into it. Council's Hydrography dataset was accepted as a representation of the open channel and stream network.

GIS layers containing existing stormwater pipe network and pit information were supplied for the Burpengary Creek catchment.

2.5 Sub-Project 2G – Detention Basins

A GIS layer containing spatial extents for six detention basins was supplied. Culvert outlet details were included with the culvert data discussed in Section 2.2.

Existing ground survey information was supplied for the North Shore Drive basin. This included a detailed DTM of the basin upstream of North Shore Drive, cross-sections through the basin downstream of North Shore Drive and some details of the culvert structures beneath North Shore Drive, the lower embankment, Old Gympie Road, the Bruce Highway and the Eastern Service Road.

2.6 Sub-Project 2H – Buildings

A GIS layer containing the building footprints for buildings within the Burpengary Creek catchment was supplied.

No existing floor level data was supplied.

3. Methodology

The general approach presented in Section 1.3 was adopted across the five sub-projects. The data standards included as Appendices A to E present detailed descriptions of the process used in development of the outputs for each sub-project. The following sections provide a summary of the project-specific methodologies.

3.1 Sub-Project 2C – Culverts

Analysis of existing MBRC culvert data was undertaken to identify culverts requiring survey. Survey requirements were identified for:

- Culverts missing critical data (ie culvert shape, invert levels, dimensions and/or number of barrels)
- Hydraulically significant culverts – top 10% of culverts by total culvert area (where area accounts for the total opening area of all culvert barrels at a crossing, including culverts of different shapes/sizes)
- Hydraulically significant culverts – top 10% of culverts by ratio of total contributing catchment area to total culvert area (ie large catchment areas drained by small culverts)

A GIS based visual comparison of MBRC's existing culvert layer and aerial images, waterway hydrography, road and footpath locations was undertaken to confirm that all culverts were identified. Additional culverts were included in the survey scope. A survey brief was prepared to address the identified data gaps.

Upon receipt of the survey, the survey information was integrated with the existing data and GIS layers were prepared for:

- 1d_nwk – TUFLOW layer of culvert data
- 2d_zlr – TUFLOW layer containing handrail details
- Culvert points – layer of points at culvert locations to assist with model checking
- Photos – layer of geo-referenced points linked to photos

Handrail details were prepared for culverts where the 100 year ARI preliminary mapping peak depth over the structure was greater than 0.2 m and analysis of aerial images and Google Street View showed that handrails were present.

Culvert points data was generated for each culvert location. This data included crest elevations and total culvert area to assist with model verification.

The data standard presented in Appendix A was prepared in conjunction with development of the above datasets.

3.2 Sub-Project 2D – Bridges

Analysis of existing design and as-constructed plans was undertaken to identify bridges requiring survey. Survey requirements were identified where the following data was missing:

- Deck location, surface/obvert levels and thickness
- Pier locations, dimensions, orientation to flow and pile arrangements
- Handrail location, height and extent
- Cross-section of channel beneath bridge

Footbridges were reviewed to identify those which are considered hydraulically significant, including those which are:

- Perpendicular to the flow (ie cross a primary flowpath)
- Significantly constrictive to flows

These footbridges were included in the survey brief. A survey brief was prepared to address the identified data gaps.

Upon receipt of the survey, the survey information was integrated with the existing data and GIS layers were prepared for:

- 2d_lfcsh – TUFLOW layer of bridge data
- Photos – layer of geo-referenced points linked to photos

The bridge data standard presented in Appendix B was prepared in conjunction with development of the above datasets.

3.3 Sub-Project 2F – Trunk Underground Drainage

Analysis of existing trunk drainage data was undertaken to identify any systems which would be considered as trunk drainage.

A data standard, as presented in Appendix C, was prepared to assist with development of trunk drainage datasets.

3.4 Sub-Project 2G – Detention Basins

Two separate tasks were included in the detention basin analysis:

- Preparation of WBNM elevation-storage relationships
- Preparation of TUFLOW model input data and supporting GIS layers

The methodology used for each of these tasks is provided in the following sections.

3.4.1 WBNM elevation – storage relationships

The spatial extents over which elevation-storage (H-S) relationships were to be developed for each basin were defined using broad-scale model results for the 100 year ARI event. The likely peak water level for each basin was used to define the basin extents.

Elevation-storage relationships over the extents defined above were extracted from the LiDAR TIN data for each basin. These relationships were extracted at intervals sufficient to provide a reasonable representation of differences in storage between the basin invert level and the basin peak water level, with a minimum of 10 and a maximum of 50 intervals adopted.

The following files were generated:

- A GIS layer of basin extent polygons used in development of the height-storage relationship
- Elevation-storage relationships for each basin (supplied as an Excel spreadsheet)

3.4.2 TUFLOW inputs and supporting layers

Basins were individually assessed to determine whether the outlet structure could be adequately modelled within the adopted model grid size, given the following outcomes:

- Where the grid size was adequate the structure was modelled using a standard culvert and a topographic representation of the embankment crest level
- Where the grid size was inadequate the structure was represented by replacing the outlet structure with an elevation-discharge (H-Q) relationship defining the relationship between water level in the basin and discharge through the structure

Once a modelling approach for each structure was determined, a gap analysis of the existing data was undertaken. For basins which were modelled using a culvert and embankment representation, the culverts were analysed as part of the culvert sub-project. Where embankments were traversed by a road, it was assumed that the LiDAR data was sufficient to model the road crest. In other cases, where no existing data of the embankment was available these embankments were included in the survey brief.

Where it was identified that an elevation-discharge outlet relationship was required to adequately model the structure, a gap analysis of existing data was undertaken to identify whether the following data was available:

- A cross-section upstream of the structure
- Details of all weirs included in the outlet (other than the embankment crest)
- Details of any grates or trash screens included in the outlet
- Details of all culvert structures in the outlet

A survey brief was prepared to address the identified data gaps.

Upon receipt of the survey, the survey information was integrated with the existing data and GIS layers were prepared for:

- 2d_zlr – TUFLOW layer of embankment crest elevations
- Photos – layer of georeferenced points linked to photos

For the special case basins, HEC-RAS modelling was undertaken to develop an elevation-discharge relationship for the basin outlet. This relationship was supplied as an Excel spreadsheet.

The data standard presented in Appendix D was prepared in conjunction with development of the above datasets.

3.5 Sub-Project 2H – Buildings

The following process was used to identify buildings to be surveyed:

- Comparison of Council's building footprint layer to the preliminary mapping flood extents and identification of all buildings within the flood extents
- Removal of all buildings with a floor area of less than 80 m^2. This removed a large number of sheds and left mostly houses remaining in the dataset
- GIS based visual comparison of remaining buildings and aerial photography was undertaken to identify the primary building on each property (ie to remove sheds remaining in the dataset). This visual comparison also identified additional buildings in new areas of development for which no footprint existed in the dataset

- Setting of survey priority based upon the following classifications:
  - priority high = survey required and maximum 100 year ARI flood depth > 0.3 m
  - priority medium = survey required and maximum 100 year ARI flood depths < 0.3 m
  - priority low = buildings falling within the PMF flood extents but outside the 100 year ARI flood extents

A survey brief was prepared to address the identified data gaps.

Upon receipt of the survey, the survey information was integrated with the existing data and GIS layers were prepared for:

- Buildings within the 100 year ARI flood extents
  - Buildings – layer of building footprints and building information
  - Yard levels – layer of point objects representing front and back yard elevations
  - Fences – layer of fence locations and crest elevations (optional)
  - Photos – layer of geo-referenced points linked to photos (optional)

- Buildings outside the 100 year ARI flood extents but within the PMF flood extents
  - Buildings – layer of building footprints and building information

Additional detail for the above datasets was sourced as follows:

- Yard levels were sourced from the LiDAR data
- Classifications for the business/industrial properties were sourced from the Australia and New Zealand Standard Industrial Classification (2006)

The data standard presented in Appendix E was prepared in conjunction with development of the above datasets.

4. Results

This section presents the results of the data collection and collation task for the Burpengary Creek pilot catchment. The data standard task results are presented in Appendices A to E.

4.1 Sub-Project 2C – Culverts

4.1.1 Culverts

The data gap analysis showed that:

- Additional culverts were identified at four locations, of these Council identified two to be included in the modelling: at Delaney Road (BUR06_00167) and at Piccabeen Court (BUR06_03254)
- A total of 47 locations were identified in which survey was required. Of these locations:
  - Nine were identified as requiring survey based upon the ratio of total contributing catchment area to total culvert area. Six of these had been included in Council's survey of December 2009 and the remaining three contained existing data from Council's "Stormwater_Pipes" data, with the source specified as GPS (see below for description). It was decided not to include these culverts in the survey scope
  - Twelve were identified as requiring survey based upon the total culvert opening area. These had all been included in Council's survey of December 2009 and therefore it was decided not to resurvey these culverts
  - Two were included in the basin survey scope discussed in Section 4.4. Survey was required of the basin outlet structures at these locations and it was therefore considered appropriate to include the culvert survey for these locations in the basin survey scope
  - 24 remained in which survey was required. These culverts were missing critical details such as dimensions and invert levels

Aurecon's surveyors undertook survey of the 24 culverts identified. The final sources for culvert data were:

- Aurecon Jan 2010 RTKGPS survey: accuracy ± 30 mm horizontal and vertical
- MBRC Dec 2009 RTKGPS survey: accuracy ± 20 mm horizontal and ± 40 mm vertical
- MBRC's "Stormwater_Pipes" data with source specified as GPS: accuracy ± 30 mm horizontal and ± 40 mm vertical
- MBRC's "Stormwater_Pipes" data with source specified as ASC: accuracy ± 30 mm horizontal and ± 40 mm vertical
- MBRC's "Stormwater_Pipes" data with source specified as GIS: accuracy not quantifiable

Upon collation of the dataset, the culverts were rationalised and a number of culverts were removed/modified for the following reasons:

- Three "culverts" were stormwater system outlets (BUR14_00038, DEC04_00534a and DEC04_00534b) and were removed from the dataset
- In some locations multiple pipes (ie more than one pipe dimension or invert at a single crossing) were identified in Council's GIS data, whilst the survey showed that multiple pipes did not occur, or less occurred than were in the GIS data. The additional pipes were removed from the culverts layer (BUR16_01802b, LBC01_10161b, LBC12_00623b, LBC16_02778c and LBC20_02939b)
- Where a basin outlet which was replaced by a H-Q relationship (LBC02_00059) the culvert was removed
- In two locations separate culverts had been identified beneath two adjacent roads. Survey showed a single long culvert existed beneath both roads. The downstream culverts were removed from the culvert layer (BUR32_00724 and LBC01_07420) and the upstream culverts were extended (BUR32_00750 and LBC01_07444)

- The culvert identified as “LBC12_00443” was renamed to “LBC14_00000” as it was identified as being located on branch LBC_14_00000
- Culvert BUR01_20827 was identified as being unidirectional as it has flap gates on the downstream side

The final culvert layer contained 131 separate culverts in 102 locations, as presented in Figure 1. The culvert layer included the culvert outlets from five of the detention basins.

4.1.2 Handrails

Twenty culverts were identified as having handrails which required modelling. Survey data was only available for two of these culverts. Elevations and handrail extents for the remaining eighteen culverts were based upon the LiDAR data, aerial images and Google Street View. These twenty culverts are shown on Figure 1.

4.1.3 Photographs

Photographs were available for 23 of the culverts. Photographs which were considered to provide supporting details to assist with the modelling process were included in a hyper-linked GIS layer.

4.2 Sub-Project 2D – Bridges

The gap analysis showed that:

- No cross-section data was available for Rowley Road bridge over Burpengary Creek
- No details were available for O’Brien Road over Burpengary Creek
- No details were available for the rail bridge over New Settlement Road
- The design/as-constructed plans provided for the remaining bridges (as defined in Section 2.3) provided sufficient detail to develop the required GIS data

The rail bridge over New Settlement Road was excluded from the survey scope and modelling as this bridge it is located towards the top of a catchment and is not hydraulically constrictive. The primary function of this bridge is to provide an underpass for cars on New Settlement Road.

A review of the footbridges showed that 19 footbridges were located perpendicular to the primary flow direction (ie crossed the flowpath). Of these 19 footbridges Council identified four to include in the modelling:

- The Esplanade footpath over branch DEC_06_00061, near Maine Terrace
- The Esplanade footpath over branch DEC_04_00028, near Balmoral Street
- The footbridge over branch DEC_04_00340, near the corner of Balmoral and Holburn Streets
- The Matthew Crescent footbridge over branch BUR_01_20827

Council’s selection of these footbridges was based on an engineering assessment of the likely impact of these structures on flood behaviour (including site inspection at each site).

These footbridges were all included in the bridge survey scope, along with the O’Brien Road Bridge and the cross-section beneath the Rowley Road Bridge. This survey was undertaken by Council’s surveyors and provided to Aurecon in February 2010.

Two separate datasets were prepared, the first containing details for nine road and rail bridges and the second containing details for the four footbridges. These bridge locations are shown on Figure 2.

4.3 Sub-Project 2F – Trunk Underground Drainage

The existing stormwater network data was reviewed and compared to the identified culverts and the 2007 Burpengary Creek DEM. No trunk drainage was identified within the Burpengary Creek catchment.

4.4 Sub-Project 2G – Detention Basins

The six detention basins identified below were included in the modelling within the Burpengary Creek catchment. These basins were identified by Council and their locations were provided to Aurecon. These basins are shown on Figure 3.

- Forest Ridge Drive basin on branch BUR_06_03139
- Juniper Court basin on branch BUR_20_00613
- Guana Drive basin on branch LBC_02_00059
- Kimberley Drive basin on branch BUR_28_00034
- North Shore Drive Upper basin on branch BUR_24_02474
- North Shore Drive Upper basin on branch BUR_24_02474

4.4.1 WBNM data

A GIS layer of the basin polygon extents was prepared using the peak water levels from the preliminary 100 year ARI mapping and the 2009 LiDAR DEM. The peak water levels were used to define the approximate peak water level in the basin and the DEM was used to define the associated basin extents. These basin extent polygons were used within 12D to define an elevation-storage relationship. This data was provided as an Excel file for inclusion into the WBNM modelling.

4.4.2 TUFLOW data

Of the basins, the Forest Ridge Drive, Juniper Court, and North Shore Drive Upper basins outlet to culvert structures beneath roadways, with the road embankments acting as the basin outlet embankments. These outlets were included in the culvert dataset and it was assumed that the road crest elevations were adequately modelled via Sub-project 2E (2009 DEM Task).

The Kimberley Drive and North Shore Drive Lower basins outlet via culvert structures which were included in the culvert dataset. The embankments for these two basins are not traversed by roads and were therefore identified as requiring survey. Detailed survey of the Kimberley Drive basin culvert outlet was also included in the survey scope.

The Guana Drive basin outlet structure was identified as being too detailed to be accurately modelled within the 5 m TUFLOW model grid spacing. The entire outlet structure, including the culverts, was identified as requiring detailed survey.

Upon receipt of the survey data, a 2d_zlr layer for the embankment crests of the Kimberley Drive and North Shore Drive basins was prepared.

A HEC-RAS model of the Guana Drive basin outlet structure was prepared and an H-Q relationship was developed for this outlet. This was provided as an Excel file for inclusion in the TUFLOW modelling.

4.5 Sub-Project 2H – Buildings

Using the process identified in Section 3.5, the identification of buildings to be surveyed showed:

- A total of 1000 buildings were identified as being within the 100 year ARI flood extents
- 326 buildings were removed from the buildings layer as they had a floor area of less than 80 m^2. One of these was later reinstated as it was a house

- Another 154 buildings were removed, including additional sheds with floor areas greater than 80 m^2 and houses within the house removal business property (the main office building was not removed)
- Four houses (included in the 1000) were not identified within Council's buildings footprint layer but were identified during the aerial photography inspection
- A total of 520 buildings were identified for survey, of these 159 were identified as being high priority based upon preliminary mapping flood depths of greater than 0.3 m and the remaining 361 were identified as being medium priority

For buildings inundated by the PMF event, but not by the 100 year ARI event:

- A total of 3087 buildings were identified
- 1266 of these were removed as they were sheds or other buildings types which would not need to be included in any stage-damage calculations (eg horse stables/shelters)
- 1821 buildings from Council's buildings layer were identified as needing to be included in the buildings layer
- An additional 156 properties were identified which have recently been developed but for which no building polygons existed
- A total of 1977 properties were included in the buildings layer

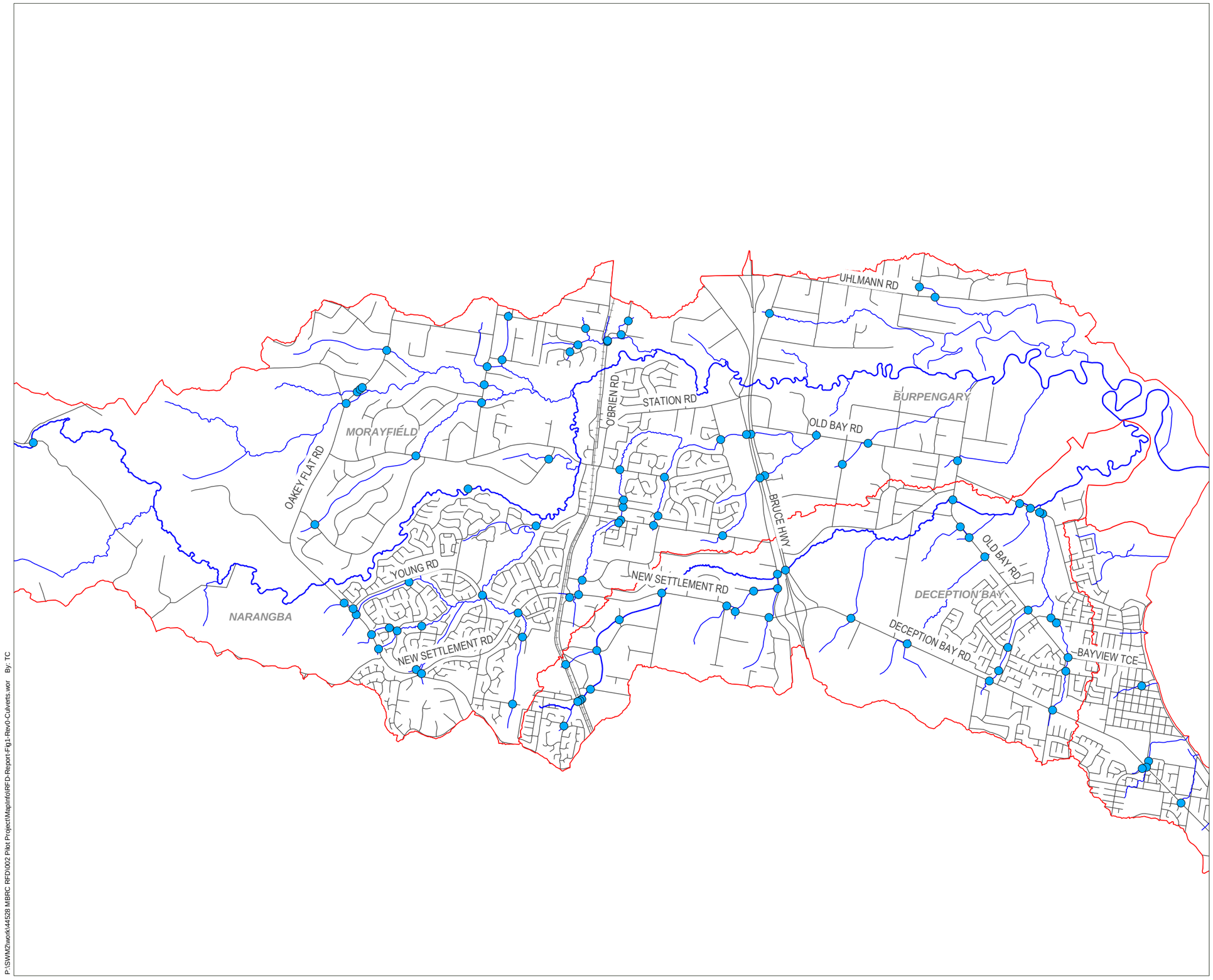
In conjunction with Council it was resolved to survey the high priority building floor levels within the 100 year ARI event floodplain (ie a total of 159 properties). This survey was undertaken by Council in accordance with the data standard (Appendix E). Some non-essential components of the data standard have been omitted at this stage and will be incorporated at a later time.

The final buildings layer contained 2497 buildings. Of these survey data was provided for 191 buildings, with survey undertaken by Council for 149 of these and data for the remaining 42 buildings coming from pre-existing data held by Council. The final buildings layer is shown on Figure 4.

4.6 Conversion tool

As an addition to the project, a tool has been developed for conversion of ArcGIS geodatabase and/or shape files to MID/MIF files (ie from ArcGIS to TUFLOW compatible format). This tool has been provided to Council as a toolbar button within an ArcMap template file. Details on the development of this tool are provided in Appendix F.

Figures



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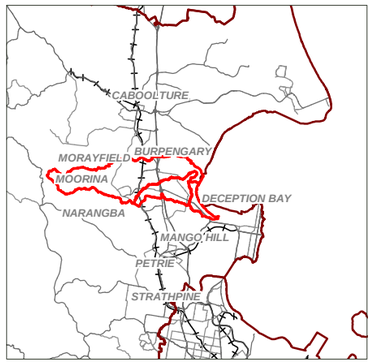
aurecon

Legend

- Road Centreline
- Railway Centreline
- Waterway Reach
- Catchment Boundary
- Culvert Location

LOCALITY PLAN



Notes:

Date: 01/06/2010 **Version: 0**

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Scale 1:50 000 (m) (@ A3 size)

Projection: MGA Zone 56

Regional Floodplain Database Moreton Bay Regional Council

Figure 1 - Burpengary Creek Culverts

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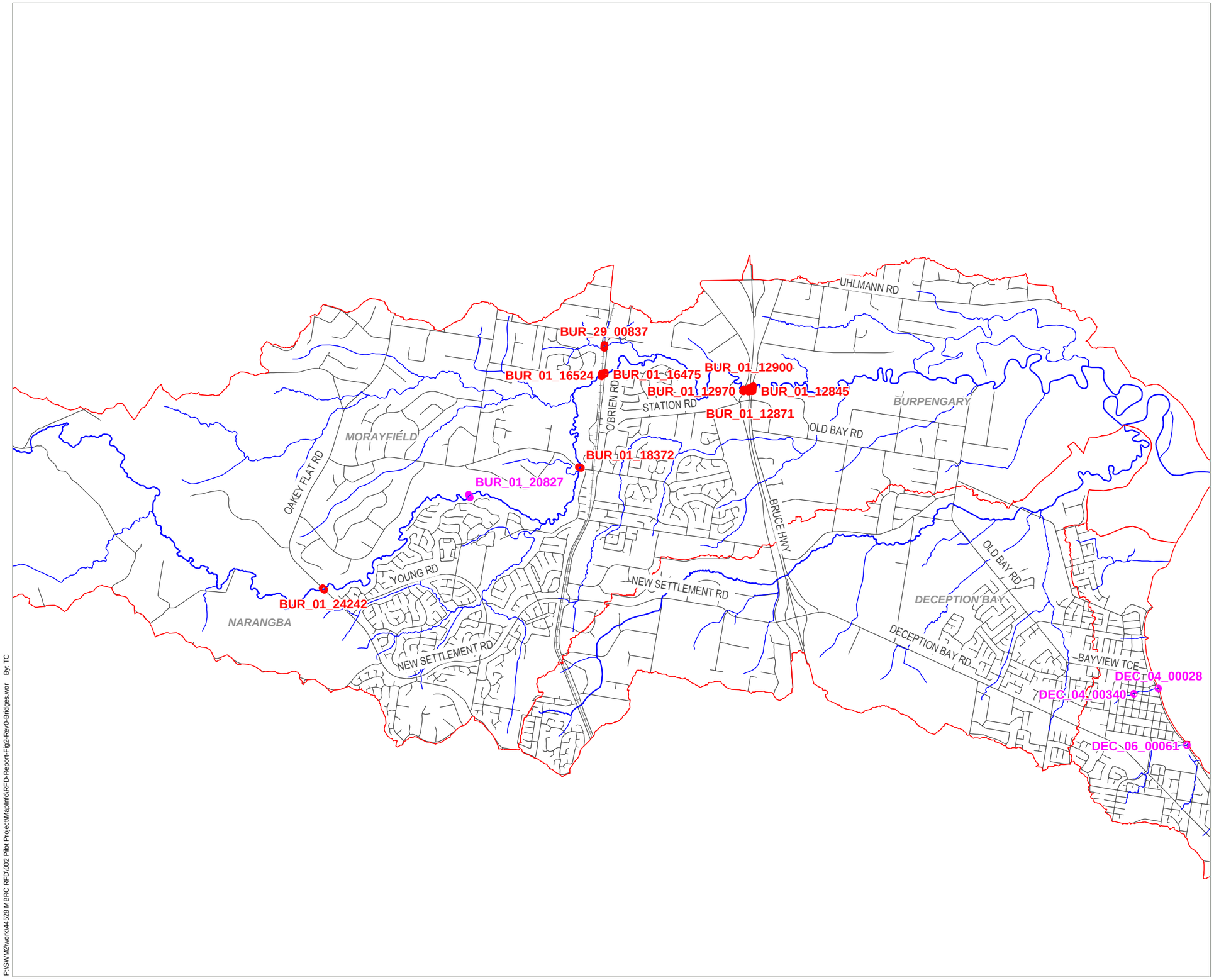

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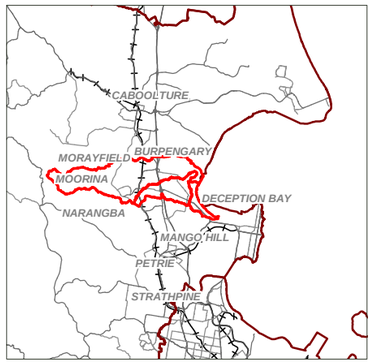
Legend

- Road Centreline
- Railway Centreline
- Waterway Reach
- Catchment Boundary
- Footbridge Location
- Bridge Location

LOCALITY PLAN



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Date: 01/06/2010 **Version: 0**

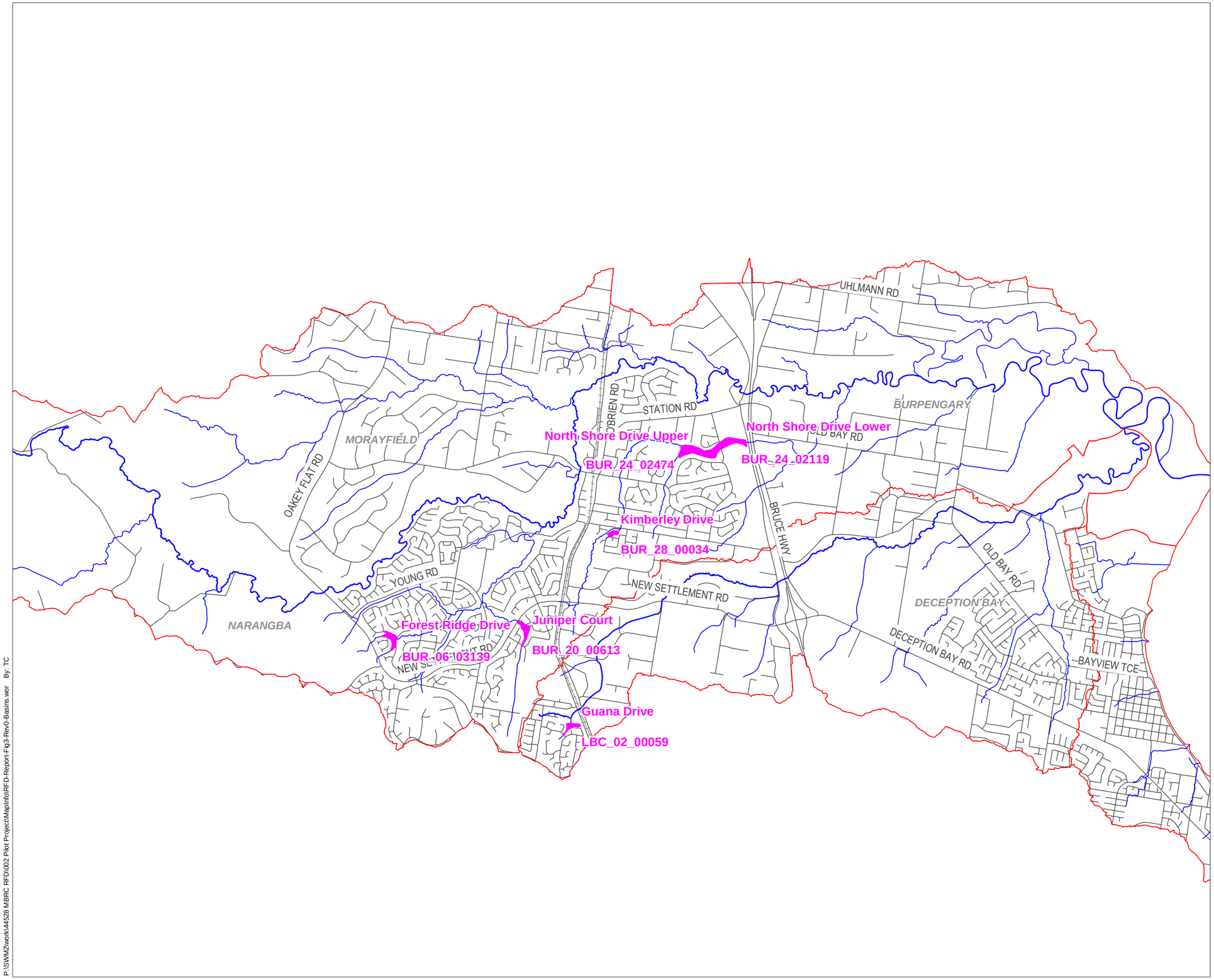
0 2.5 (km)

Scale 1:50 000 (m) (@ A3 size)

Projection: MGA Zone 56

Regional Floodplain Database Moreton Bay Regional Council

Figure 2 - Burpengary Creek Bridges and Footbridges

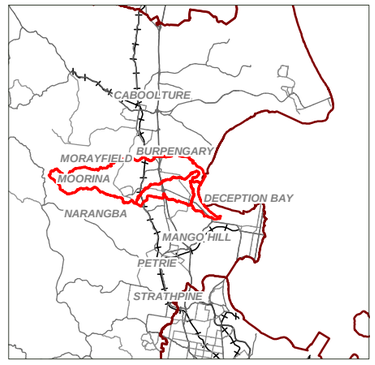


P:\SWM2\work\44528 MBRC RFD\002 Pilot Project\MapInfo\RFD-Report-Fig3-Rev0-Basins.wor By: TC

Legend

- Road Centreline
- Railway Centreline
- Waterway Reach
- Catchment Boundary
- Detention Basin Location

LOCALITY PLAN



Notes:

Date: 01/06/2010 **Version: 0**

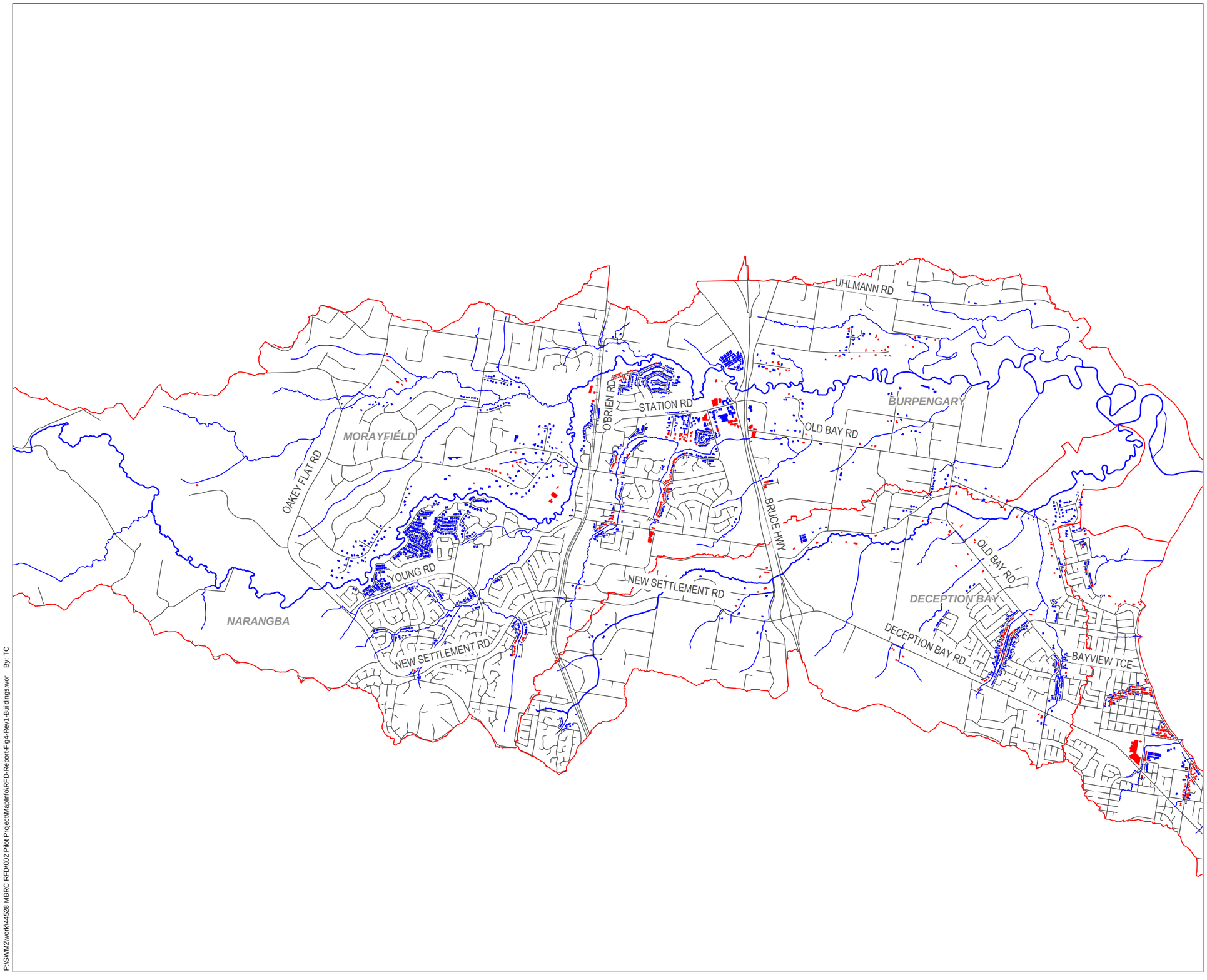
0 2.5 (km)

Scale 1:50 000 (m) (@ A3 size)

Projection: MGA Zone 56

Regional Floodplain Database Moreton Bay Regional Council

Figure 3 - Burpengary Creek Detention Basins



P:\SWM2\work\44528 MBRC RFD\002 Pilot Project\MapInfo\RFD-Report-Fig4-Rev1-Buildings.wor By: TC

aurecon

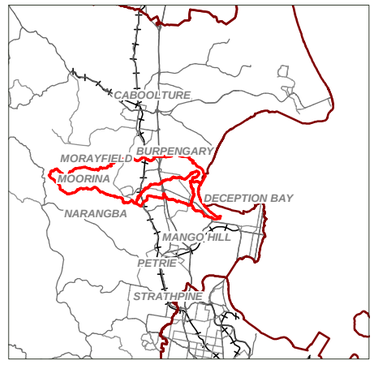
Legend

- Road Centreline
- Railway Centreline
- Waterway Reach
- Catchment Boundary

Flood Affected Buildings

- 100 Year ARI Event
- PMF Event

LOCALITY PLAN



Notes:

Date: 21/07/2010 **Version: 1**

0 2.5 (km)

Scale 1:50 000 (m) (@ A3 size)

Projection: MGA Zone 56

Regional Floodplain Database Moreton Bay Regional Council

Figure 4 - Burpengary Creek Flood Affected Buildings

Appendix A
Data Standard - Culverts

Data Standard - Culverts Regional Floodplain Database - Stage 2 Moreton Bay Regional Council

Report ref:
44528-002
21 July 2010
Revision 1

aurecon

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Document control

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Rev No	Date	Revision details	Typist	Author	Verifier	Approver
0	22 March 2010	First draft	CLS	TC	TDG	TDG
1	21 July 2010	Final	CLS	TC	TDG	TDG

Contents

List of Tables

1. Introduction

This data standard has been developed as part of a pilot study for Stage 2 of the Regional Floodplain Database project. It has been developed based upon the generation of the culvert layers for the Burpengary Creek pilot catchment. The aim of this data standard is to identify a consistent approach that can be applied to future studies/study components. The files generated using this standard are suitable for input to TUFLOW modelling and also for providing additional supporting information where available.

This data standard has been written based upon the assumption that GIS layers will be developed in ArcGIS and converted to MID/MIF for TUFLOW modelling purposes.

2. Initial data requirements

To assist with development of the culvert data, the following GIS layers are required from MBRC:

- Culvert layer containing all existing culvert information (dimensions, invert levels, number of barrels etc)
- Aerial photography
- Hydrography including waterway locations, identifications and total catchment area at culvert locations
- Road network including road locations and names
- Preliminary mapping peak depth results

In addition to GIS data, any other available culvert information will also be required. This includes culvert design or as-constructed plans and handrail details.

3. Datasets to be developed

Generation of four layers will provide the ultimate culvert dataset: two layers for input to the TUFLOW model and two layers containing additional information. These layers are:

- 1d_nwk – TUFLOW layer of culvert data
- 2d_zlr – TUFLOW layer containing handrail details
- Culvert points – layer of points at culvert locations to assist with model checking
- Photographs – layer of geo-referenced points linked to photographs

Dataset naming is to adhere to the following convention:

- Model domain/catchment identifier eg BUR
- Model generation number eg 001, 002, 003
- Sub-generation identifier eg a, b, c
- Scenario eg E, F, May09 (ie Existing, Future, Historic)
- File type eg 1d_nwk
- Other details eg photos

Example file names for the four datasets are:

- BUR_001a_E_1d_nwk_culv
- BUR_001a_E_2d_zlr_handrail - In ArcGIS this will be 2 separate files as it is not possible to have points and lines within the same layer:
  - BUR_001a_E_2d_zlr_handrail_pt
  - BUR_001a_E_2d_zlr_handrail_ln
- BUR_001a_E_culvert_points
- BUR_001a_E_culvert_photos

4. Gap analysis

Analysis of existing MBRC culvert data is necessary to identify culverts requiring survey. Survey will be required for:

- Culverts missing critical data (ie culvert shape, invert levels, dimensions and/or number of barrels)
- Hydraulically significant culverts – top 10% of culverts by total culvert area (area needs to account for the total opening area of all culvert barrels at a crossing, including culverts of different shapes/sizes)
- Hydraulically significant culverts – top 10% of culverts by ratio of total contributing catchment area to total culvert area (ie large catchment areas drained by small culverts)

A GIS based visual comparison of MBRC's existing culvert layer and aerial images, waterway hydrography, road and footpath locations is required to confirm that all culverts are identified. Any additional culverts will need to be included in the survey scope.

5. Survey brief

An example survey brief is presented in this section.

Table 1 Survey Data Capture Requirements

Item	Description	Data Type	Width	Decimals	Domain/Remark
Culvert type	Description of culvert type	Text	30	0	Pipe/Box/Slab-link box
Diameter or width	Diameter of pipe culvert or width of box or slab-link culvert	Double	12	3	
Height (box)	Internal height of box culvert	Double	12	3	
Height (slab)	Internal height under slab	Double	12	3	
No. barrels	Number of culvert barrels	Integer	4	0	
Inlet point	Coordinate of inlet point (centre of upstream headwall)	Double	12	3	
Outlet point	Coordinate of outlet point (centre of downstream headwall)	Double	12	3	
Length	Length of culvert	Double	12	3	
Upstream invert level	Upstream invert level	Double	12	3	
Downstream invert level	Downstream invert level	Double	12	3	

Item	Description	Data Type	Width	Decimals	Domain/Remark
Material type[1]	Culvert material type	Text	20	0	Concrete/Corrugated iron/Other
Wingwall material type[1]	Headwall and wingwall material type	Text	20	0	Concrete/Block/Rock/None/Other
Wingwall angle[2]	Angle between headwall and wingwall	Integer	4	0	
Pipe inlet details[1]	Description of pipe inlet	Text	30	0	Rounded/Square-edged/Other
Road elevation 1	RL at centre of structure on road crown if road is level; otherwise RL at higher end of structure on road crown if road has super-elevation	Double	12	3	
Road elevation 2	RL at lower end of structure on road crown if road not level if road has super-elevation; ignore otherwise	Double	12	3	
Handrail type[1]	Handrail material type	Text	30	0	None/Guardrail/ Galvanised Pipes/Galvanised Vertical Bars/Other
Handrail length	Length of handrail	Double	12	3	
Handrail elevation 1	Elevation at centre of handrail if level, otherwise elevation at higher end	Double	12	3	
Handrail elevation 2	Elevation at lower end of handrail	Double	12	3	
Photo georeference[3]	Coordinate of photo locations	Double	12	3	Minimum of 4

[1] *If "other" is specified then additional details will be required (ie field notes)*
[2] *Detailed survey of wingwall angle is not required – angle such as 100°, 135°, 150° etc is acceptable. Note angle should be 0° if no wingwalls are present (ie if headwall only)*
[3] *A minimum of 4 photographs is required. These are looking at the channel upstream and downstream of the culvert and looking at the upstream and downstream ends of culvert. Other photographs which validate the above information may also be required (especially with regards to headwall/wingwall setup, pipe inlet details, handrail details and where the Domain/Remark has been selected as "other")*

Please note that:

- All data is to be delivered in MGA coordinates with the origin of coordinates (PM number), coordinate values and estimated accuracy provided. Accuracy is to be 4th order or better
- All heights are to be on AHD datum with origin datum supplied. Accuracy is to be 4th order or better
- The data is to be supplied in ESRI shape file or csv format
- GPS (RTK) methods are acceptable and will achieve the desired accuracies. Ensure there are redundant checks to verify the accuracy

In addition to the text provided above:

- A figure showing the survey locations will need to be prepared
- A table indicating the approximate culvert survey locations is to be included. An example of the detail required is provided in Table 2

Table 2 Survey Data Locations

Culvert ID	Crossing Name	Crossing Type	Approx. Easting	Approx. Northing

6. TUFLOW 1d_nwk layer

6.1 Templates

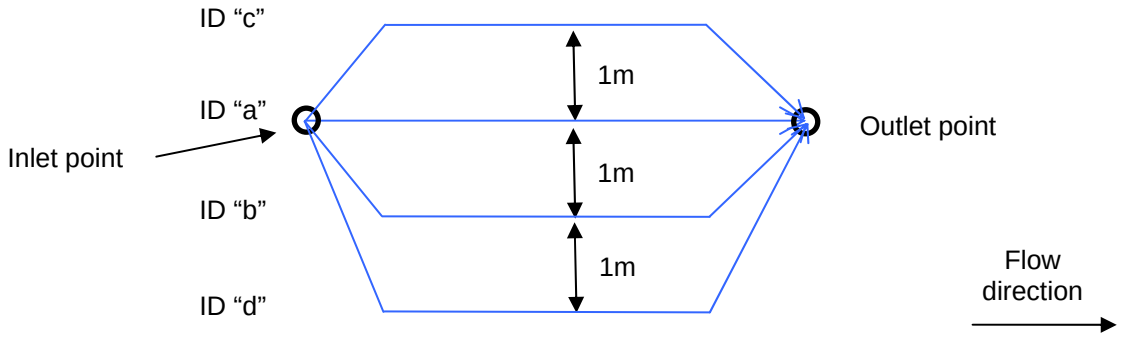
Geodatabase templates are available from Council for each of the GIS datasets to be developed. These databases have the layer attributes defined as specified in Sections 6.3 to 7.4 and may assist with generating these files correctly. These templates also have metadata attached with many sections of the metadata already completed.

Template layerfiles are also available to show the preferred styles to be adopted for each dataset.

The TUFLOW 1d_nwk layer is to be generated as defined in the following sections.

6.2 Spatial representation

- Culverts are to be represented by light blue lines with arrows showing the flow direction.
- Culverts must be digitised from upstream to downstream
- Where culvert survey has been obtained, the culvert polyline object is to join the inlet and outlet points
- Where detailed survey was not required, the culvert polyline object is to be digitised based upon headwall locations in the aerial photography
- Where a single crossing contains culverts with multiple shapes/sizes, the primary culvert (ie the culvert type with the largest waterway area) is to be digitised as above. The remaining culverts are to be offset from the primary by 1 m. A second structure is to be offset to the right, third to the left and so forth. These lines need to be snapped together at the inlet and outlet points as shown in the example below



6.3 Layer attributes

The layer attributes of the first 20 columns in the 1d_nwk layer are identified in the “1D Model Network (1d_nwk) Attribute Descriptions” table in the TUFLOW manual. Additional attribute fields are to be added to the end. The required TUFLOW attributes and their data source are described in Table 3. Table 4 presents the additional fields which are to be included in the 1d_nwk layer.

Table 3 Required TUFLOW Layer Attributes

Column	GIS Attribute*	Properties	Brief Description*	Source
1	ID	Text (12)	Unique identifier for culvert	From MBRC hydrography
2	Type	Text (4)	Culvert shape Options are C/R (circular/rectangular) Additional option is U where culvert is uni-directional (eg has flap gates)	From survey where available, otherwise from existing MBRC data
3	Ignore	Short Integer	Whether culvert is not included in run	Set to “0” (ie False)
4	UCS	Text (1)	Whether culvert channel storage is automatically calculated	Set to “T”
5	Len_or_ANA	Double	Culvert length	From survey where available, otherwise set to “-1” and length of GIS line will be used
6	n_or_n_F	Double	Culvert Manning’s n	Use material type from culvert survey where available, otherwise use standard assumption of concrete material (n=0.013)
7	US_Invert	Double	Upstream invert level	From survey where available, otherwise from existing MBRC data
8	DS_Invert	Double	Downstream invert level	From survey where available, otherwise from existing MBRC data
9	Form_Loss	Double	Additional form loss	Based on recommendations of parameterisation data standard
10	pBlockage	Double	Percentage blockage	Based on recommendations of parameterisation data standard
11	Inlet_Type	Text (12)	Attribute not used	
12	Conn_2D	Text (4)	Attribute not used	
13	Conn_No	Short Integer	Attribute not used	
14	Width_Dia (Width_or_ Dia)	Double	Pipe diameter or box culvert width	From survey where available, otherwise from existing MBRC data
15	Hght_or_WF (Height_or_ WF)	Double	Box culvert height for R culverts Attribute not used for C culverts	From survey where available, otherwise from existing MBRC data
16	Number_of	Short Integer	Number of barrels	From survey where available, otherwise from existing MBRC data
17	Hght_Cont	Double	Height contraction coefficient for orifice flow for R culverts Attribute not used for C culverts	Based on recommendations of parameterisation data standard Use pipe inlet details from survey where available, otherwise use standard assumption of square-edged culvert

Column	GIS Attribute*	Properties	Brief Description*	Source
18	Width_Cont	Double	Width contraction coefficient for inlet controlled flow	Based on recommendations of parameterisation data standard Use pipe inlet details from survey where available, otherwise use standard assumption of square-edged culvert
19	Entry_Loss	Double	Entry loss coefficient for outlet controlled flow	Based on recommendations of parameterisation data standard Use wingwall angle details from survey where available, otherwise use standard assumption of headwall only
20	Exit_Loss	Double	Exit loss coefficient for outlet controlled flow	Based on recommendations of parameterisation data standard Use wingwall angle details from survey where available, otherwise use standard assumption of headwall only

** For detailed information refer to table titled "1D Model Network (1d_nwk) Attribute Descriptions" in TUFLOW manual. Name displayed in brackets represents attribute name in TUFLOW manual.*

Table 4 Additional Culvert Attributes

Column	GIS Attribute*	Properties	Brief Description*	Source
21	WW_ID	Text (12)	Waterway identifier	From MBRC hydrography
22	Domain	Text (3)	Model domain identifier	From MBRC hydrography
23	Xing_Name	Text (40)	Name of structure (eg for basin) or road which structure crosses	From existing MBRC data where available or from road network
24	Xing_Type	Text (20)	Type of crossing eg Vehicle/Basin/Pedestrian	From existing MBRC data where available, otherwise from aerial photography analysis
25	Reliabilit	Short Integer	Index of data reliability	Integer relating to data source (see below)
26	Surv_Sourc	Text (20)	Company who collected survey data	Eg "MBRC"
27	Surv_Tech	Text (10)	Survey technique used	Eg "RTK GPS"
28	Surv_Date	Text (6)	Month and year of survey	Eg "Dec09"
29	No_Structs	Short Integer	Number of different culvert shapes/sizes at each location (ie for multiple culvert types)	From survey where available, otherwise from existing MBRC data
30	Culv_A_m2	Double	Culvert opening area (m^2)	Calculated based upon dimensions and number of barrels
31	Hndrl_Type	Text (20)	Type of handrail eg galvanised/guardrail/concrete barrier/none	From survey where available, otherwise from analysis of Google Street View images

Column	GIS Attribute*	Properties	Brief Description*	Source
32	Hndrl_Hght	Double	Height of handrail (m)	From survey where available, otherwise based on standard assumptions detailed in Section 7.1
33	Hndrl_Len	Double	Length of handrail (m)	From survey where available, otherwise leave blank
34	Wngwl_Type	Text (20)	Type of wingwall eg Conc Wing/ Flush Conc/Block/Rock etc	From survey where available, otherwise leave blank
35	Wngwl_Ang	Short Integer	Internal angle between headwall and wingwall	From survey where available, otherwise leave blank

The “Reliabilit” attribute relates to the integrity of the data used. The following rating is to be adopted:

- 1 – all required details sourced from survey
- 2 – critical culvert details sourced from survey (culvert shape, invert levels, dimensions and number of barrels) remaining details sourced from either existing MBRC data or assumed using standard assumptions
- 3 – all data sourced from pre-existing MBRC data or assumed using standard assumptions
- 4 – all data assumed

7. Additional GIS layers

7.1 TUFLOW 2d_zlr layer

The intention of this layer is to allow testing of the impacts of handrail blockage within the TUFLOW model. The culverts for which handrails are to be included can be identified based upon the preliminary model peak depth predictions. Handrail details are to be included where the peak depth over the structure is greater than 0.2m. Below 0.2m where flow over the road is shallow, it is believed that blockage will be less likely and the handrails will not significantly affect peak water levels.

The 2d_zlr layers (points and polylines) are to be generated as per the following sections.

7.1.1 Spatial representation

A TUFLOW 2d_zlr layer of handrails is to contain the following information for each modelled handrail:

- Point objects at each end of the handrail and additional point objects where the handrail changes elevation (these are to be displayed as grey stars)
- A polyline object joining, and snapped to, all the point objects (these are to be displayed as grey polylines)

Point object elevations are to be sourced from survey where it is available. In cases where survey is not available the handrail height can be assumed based upon either photographs or Google Street View. A list of handrail types and their typical heights is presented in Table 5. The ground level at the handrail location can be sourced from the LiDAR data and the handrail elevation can then be calculated.

Table 5 Standard Handrail Heights

Rail Type	Adopted Standard Height	Source of Adopted Standard
Pedestrian - Steel	1.0m	DTMR std dwg 1512
Cyclist - Steel	1.4m	DTMR std dwg 1511
Guardrail	0.845m	DTMR std dwg 1474, 1475
Guardrail (Thrie Beam Bullnose)	0.845m	DTMR std dwg 1488
Concrete Barrier (F Type)	0.82m	DTMR std dwg 1460
Concrete Barrier (Single Sloped)	1.1 - 2.0m	DTMR std dwg 1468, 1473

Polyline object locations are to be based upon survey where it is available. Where no survey is available, handrails are to be located using aerial photography and Google Street View.

7.2 Layer attributes

Table 6 presents the attributes which are to be included in the handrail dataset. The first column must contain elevation details for the TUFLOW modelling. The remaining attributes will provide additional information. Both the points and the lines layers need to contain the same attributes.

Table 6 Culvert Handrail Layer Attributes

Column	GIS Attribute	Properties	Brief Description	Source
1	Elev_mAHD	Double	Required elevation for TUFLOW	From survey where available, otherwise from handrail height added to LiDAR elevations
2	Culvert_ID	Text (12)	Culvert identifier (“a” culvert only where multiple culvert shapes/sizes occur)	From MBRC hydrography
3	WW_ID	Text (12)	Waterway identifier	From MBRC hydrography
4	Domain	Text (3)	Model domain identifier	From MBRC hydrography
5	Reliabilit	Short Integer	Index of data reliability	Integer relating to data source (see below)
6	Surv_Sourc	Text (20)	Company who collected survey data	Eg “MBRC”
7	Surv_Tech	Text (10)	Survey technique used	Eg “RTK GPS”
8	Surv_Date	Text (6)	Month and year of survey	Eg “Dec09”
9	Hndrl_Hght	Double	Height of handrail	From survey where available, otherwise from best estimate using existing information and Australian Standards

The “Reliabilit” field relates to the integrity of the data used. The following rating is to be adopted:

- 1 – all required details sourced from survey
- 2 – handrail elevations sourced from survey and locations assumed based upon aerial images
- 3 – handrail elevations assumed based upon handrail type and locations sourced from survey
- 4 – all data assumed

7.3 Culvert points

The intention of this layer is to provide information which can be used for model checking. For each culvert a single point object is to be provided along the road centreline in the centre of the culvert. Only one point object is required at each crossing location, even when multiple culvert shapes/sizes are present. These point objects are to be represented as light blue dots/circles.

The attributes presented in Table 7 are to be included in this layer.

Table 7 Culvert Points Layer Attributes

Column	GIS Attribute	Properties	Brief Description	Source
1	Culvert_ID	Text (12)	Culvert identifier ("a" culvert only where multiple culvert shapes/sizes occur)	From MBRC hydrography
2	WW_ID	Text (12)	Waterway identifier	From MBRC hydrography
3	Domain	Text (3)	Model domain identifier	From MBRC hydrography
4	Easting	Double	Easting of culvert point	From survey where available, otherwise from best estimate using existing information
5	Northing	Double	Northing of culvert point	From survey where available, otherwise from best estimate using existing information
6	Crest_Elev	Double	Elevation at which flows overtop the road/structure	From survey where available, otherwise from LiDAR
7	Tot_Culv_A	Double	Total culvert opening area of all culverts (including multiple shapes/sizes)	Calculated based upon dimensions, number of barrels and multiple culverts

7.4 Photographs

A GIS layer is to be developed in which point objects are linked to available photographs of the culvert. This intention of this layer is to provide the modeller with additional information to assist with model set up. The GIS layer is to include the attributes presented in Table 8.

Photograph point objects are to be represented as pink dots/circles.

Table 8 Photograph Layer Attributes

Column	GIS Attribute*	Properties	Brief Description*	Source
1	Struc_ID	Text (12)	Structure identifier	From MBRC hydrography
2	WW_ID	Text (12)	Waterway identifier	From MBRC hydrography
3	Domain	Text (3)	Model domain identifier	From MBRC hydrography
4	Struc_Name	Text (40)	Name of structure (eg for basin) or road which structure crosses	From existing MBRC data where available or from road network
5	Struc_Type	Text (12)	Type of structure	Basin/Culvert/Bridge/Trunk_ Drain/Building
6	File_Loc	Text (60)	Folder and file name of photo (for linking)	File name is to include structure ID and photo number (eg Photo1)

Column	GIS Attribute*	Properties	Brief Description*	Source
7	Easting	Double	Easting of location from which photo was taken	From survey where available, otherwise from best estimate using aerial photography
8	Northing	Double	Northing of location from which photo was taken	From survey where available, otherwise from best estimate using aerial photography
9	Desc_Direc	Text (60)	Description of photo (eg upstream side of culvert) or direction represented in photo (eg upstream from culvert)	From survey where available, otherwise from best estimate

8. Data storage

Data is to be stored as feature classes within a feature dataset titled “Floodplain_Structures”. An example feature dataset setup is provided in Figure 1.

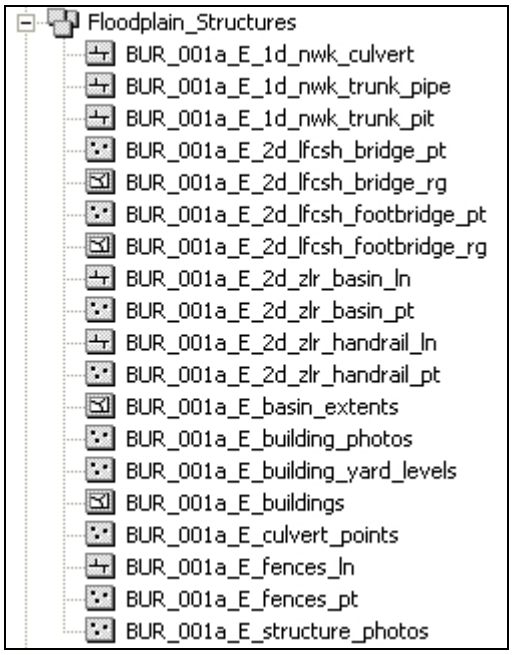


Figure 1 Feature Dataset Set-Up

9. TUFLOW layer generation

9.1 1d_nwk layer

TUFLOW modelling requires a single 1d_nwk MID/MIF file. In order to develop a TUFLOW compatible file from the Geodatabase files, the following tasks will be required:

- Conversion from geodatabase to shapefile
- Conversion from shapefile to MapInfo (.tab)
- Modification of the attribute properties for the following attributes:
  - “Ignore” attribute property is to be set to “Logical”. No information will be lost in this conversion as MapInfo recognises the 0 and 1 values as False and True respectively

  - "Conn_No" attribute property is to be set to "Integer". No information will be lost in this conversion
  - "Number_of" attribute property is to be set to "Integer". No information will be lost in this conversion
- Export from MapInfo to MID/MIF

9.2 2d_zlr layer

TUFLOW modelling requires a single 2d_zlr MID/MIF file. In order to develop the TUFLOW compatible file the following tasks will be required:

- Conversion from geodatabase to shapefile
- Conversion from shapefile to MapInfo (.tab)
- Consolidation of points and lines into a single layer
- Export from MapInfo to MID/MIF

The attribute properties are directly transferrable between Arc and MapInfo for the required TUFLOW fields (ie Double (Arc) = Float (MapInfo)).

10. Metadata

The Federal Geodetic Data Committee (FGDC) Metadata standard is to be used for metadata. As a minimum, the fields identified in each section below are to be filled out. Section 0 presents the fields which are to be filled out for all layers produced and Sections 10.3 to 10.5 present the fields specific to each layer which are to be filled out.

The geodatabase templates which are available from Council have a large portion of the metadata already filled out. Sections which are still to be completed are defined within these templates.

10.1 Standard fields

Table 9 Standard Metadata Requirements

Section	Field	Detail to Include
Identification	Citation - Originator	Name of company responsible for development of layer
	Citation - Publication Date	Date of data supply to MBRC or other organisation
	General - Abstract	Set to "Culvert information prepared for Stage XX of MBRC's Regional Floodplain Database project - XX catchment"
	General - Purpose	See layer specific details in following sections
	General - Supplemental Information	Set to "Refer to "Regional Floodplain Database Stage 2 - Data Standard - Culverts" and "Floodplain Structures Report - Regional Floodplain Database" for additional information"
	Time Period - Currentness Reference	Set to "Publication Date"
	Time Period - Calendar Date	Set to be the same as the publication date
	Status - Progress	Set to either "In Progress" or "Complete" depending upon status
	Status - Update Frequency	Set to "As Required"
	Spatial Domain - West Bounding Coordinate	Set to westernmost extent of catchment for which data is provided

Section	Field	Detail to Include
	Spatial Domain - East Bounding Coordinate	Set to easternmost extent of catchment for which data is provided
	Spatial Domain - North Bounding Coordinate	Set to northernmost extent of catchment for which data is provided
	Spatial Domain - South Bounding Coordinate	Set to southernmost extent of catchment for which data is provided
	Keywords - Theme	Set two keywords “Culvert” and “Floodplain”
	Point of Contact - Person	Name of person responsible for development of layer
	Point of Contact - Organisation	Name of company responsible for development of layer
	Point of Contact - Contact Voice Telephone	Contact telephone number for person responsible for development of layer
	Point of Contact - Contact Email Address	Contact email address for person responsible for development of layer
Data Quality		See layer specific details in Sections 10.2 to 10.5
Entity Attribute		See layer specific details in Sections 10.2 to 10.5
Metadata Reference	Contact Details - Person	Name of person who developed the metadata
	Contact Details - Organisation	Name of company who developed the metadata
	Contact Voice Telephone	Contact phone number for person who developed the metadata
	Contact Email Address	Contact email address for person who developed the metadata

10.2 1d_nwk layer

Table 10 1d_nwk Metadata Requirements

Section	Field	Detail to Include
Identification	General - Purpose	Set to “Line data of culvert locations. Intended use is for TUFLOW modelling of culverts. TUFLOW required fields are included. Additional culvert details are also included in supplementary fields”
	General - Supplemental Information	Set additional text to “For conversion to TUFLOW is it necessary to redefine the "Ignore" attribute as logical, and the "Conn_No" and "Number_of" attributes as integers once this file has been imported to MapInfo format”
Data Quality	Attribute Accuracy - Accuracy Report	Set to “Individual value within the RELIABILIT field relates to accuracy of the data. The meaning of these values is described below”
	Attribute Accuracy - Value	Set four values, 1-4

Section	Field	Detail to Include
	Attribute Accuracy - Explanation	Value 1 - Indicates that all required details were sourced from survey Value 2 - Indicates that critical culvert details were sourced from survey (culvert shape, invert levels, dimensions and number of barrels) and remaining details were sourced from either existing MBRC data or assumed using standard assumptions Value 3 - Indicates that all data was sourced from existing MBRC data or assumed using standard assumptions Value 4 - Indicates that all data was assumed
	Positional Accuracy - Horizontal Accuracy - Accuracy Report	Set to “Individual value within the RELIABILIT field relates to accuracy of the data. The meaning of these values is described below”
	Positional Accuracy - Horizontal Accuracy - Value	Set four values, 1-4
	Positional Accuracy - Horizontal Accuracy - Explanation	Value 1 - ±XXmm Value 2 - ±XXmm Value 3 - ± 30mm if survey technique is GPS or As-Con, Accuracy not quantifiable if survey technique is GIS Value 4 - Accuracy not quantifiable
	Positional Accuracy - Vertical Accuracy - Accuracy Report	Set to “Individual value within the RELIABILIT field relates to accuracy of the data. The meaning of these values is described below.”
	Positional Accuracy - Vertical Accuracy - Value	Set four values, 1-4
	Positional Accuracy - Vertical Accuracy - Explanation	Value 1 - ±XXmm Value 2 - ±XXmm Value 3 - ± 30mm if survey technique is GPS or As-Con, Accuracy not quantifiable if survey technique is GIS Value 4 - Accuracy not quantifiable
Entity Attribute	Attribute - General - Definition	Definition for each attribute can be sourced from the “Brief Description” fields in Table 3 and Table 4.
	Attribute - General - Definition Source	Definition source for each attribute can be sourced from the “Source” fields in Table 3 and Table 4

10.3 2d_zlr layer

Table 11 2d_zlr Metadata Requirements

Section	Field	Detail to Include
Identification	General - Purpose	For lines set to “Line data of handrail locations. Intended use is for TUFLOW modelling of handrail blockages. Line file is to be coupled with points file of the same file name” For points set to “Point data of handrail elevations. Intended use is for TUFLOW modelling of handrail blockages. Points file is to be coupled with line file of the same file name”
Data Quality	Attribute Accuracy - Accuracy Report	Set to “Individual value within the RELIABILIT field relates to accuracy of the data. The meaning of these values is described below”
	Attribute Accuracy - Value	Set four values, 1-4

Section	Field	Detail to Include
	Attribute Accuracy - Explanation	Value 1 - Indicates that all required details were sourced from survey Value 2 - Indicates that handrail elevations were sourced from survey and locations were assumed based upon aerial images Value 3 - Indicates that handrail elevations were assumed based upon handrail type and locations were sourced from survey Value 4 - Indicates that all data was assumed
	Positional Accuracy - Horizontal Accuracy - Accuracy Report	Set to “Individual value within the RELIABILIT field relates to accuracy of the data. The meaning of these values is described below”
	Positional Accuracy - Horizontal Accuracy - Value	Set four values, 1-4
	Positional Accuracy - Horizontal Accuracy - Explanation	Value 1 - ±XXmm Value 2 - Accuracy not quantifiable Value 3 - ±XXmm Value 4 - Accuracy not quantifiable
	Positional Accuracy - Vertical Accuracy - Accuracy Report	Set to “Individual value within the RELIABILIT field relates to accuracy of the data. The meaning of these values is described below”
	Positional Accuracy - Vertical Accuracy - Value	Set four values, 1-4
	Positional Accuracy - Vertical Accuracy - Explanation	Value 1 - ±XXmm Value 2 - ±XXmm Value 3 - Accuracy not quantifiable Value 4 - Accuracy not quantifiable
Entity Attribute	Attribute - General - Definition	Definition for each attribute can be sourced from the “Brief Description” field in Table 6
	Attribute - General - Definition Source	Definition source for each attribute can be sourced from the “Source” field in Table 6

10.4 Culvert points layer

Table 12 Culvert Points Metadata Requirements

Section	Field	Detail to Include
Identification	General - Purpose	Set to “Point data at centre of culverts. Intended use is for checking of TUFLOW model results. Layer includes details regarding total culvert opening area and crest elevation of road/rail/embankment”
Data Quality	Attribute Accuracy - Accuracy Report	Set to “Horizontal accuracy is not critical to this layer. Vertical accuracy relates to Crest_Elev only”
	Positional Accuracy - Horizontal Accuracy - Accuracy Report	Set to “Point object should be situated midway along the culvert. Exact location is not critical to this layer”
	Positional Accuracy - Vertical Accuracy - Accuracy Report	Set to “Vertical accuracy is dependent upon whether crest_elevation was sourced from survey information or from LiDAR data. Vertical accuracy of survey is ±XXmm and vertical accuracy of LiDAR is ±XXmm”
Entity Attribute	Attribute - General - Definition	Definition for each attribute can be sourced from the “Brief Description” field in Table 7

Section	Field	Detail to Include
	Attribute - General - Definition Source	Definition source for each attribute can be sourced from the “Source” field in Table 7

10.5 Photographs layer

Table 13 Photographs Metadata Requirements

Section	Field	Detail to Include
Identification	General - Purpose	Set to “Point data of floodplain structure photo locations. Intended use is to assist with TUFLOW modelling of floodplain structures”
Data Quality	Attribute Accuracy - Accuracy Report	Set to “Accuracy is not important to this layer”
Entity Attribute	Attribute - General - Definition	Definition for each attribute can be sourced from the “Brief Description” field in Table 8
	Attribute - General - Definition Source	Definition source for each attribute can be sourced from the “Source” field in Table 8

Appendix B
Data Standard - Bridges

Data Standard - Bridges Regional Floodplain Database - Stage 2 Moreton Bay Regional Council

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Revision 1

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Contents

List of Tables

1. Introduction

This data standard has been developed as part of a pilot study for Stage 2 of the Regional Floodplain Database project. It has been developed based upon the generation of the bridge layers for the Burpengary Creek pilot catchment. The aim of this data standard is to identify a consistent approach that can be applied to future studies/study components. The files generated using this standard are suitable for input to TUFLOW modelling and also for providing additional supporting information where available.

This data standard has been written based upon the assumption that GIS layers will be developed in ArcGIS and converted to MID/MIF for TUFLOW modelling purposes.

2. Initial data requirements

To assist with development of the bridge data, the following GIS layers are required from MBRC:

- Bridge layer identifying bridge locations
- Footbridge layer identifying footbridge locations
- Aerial photography
- Road network including road locations and names

In addition to GIS data, any available design or as-constructed drawings of the above bridges will also be required. These may need to be sourced from the Department of Transport and Main Roads or Queensland Rail.

3. Datasets to be developed

Generation of two datasets will provide the ultimate bridge details: a dataset for input to the TUFLOW model and a dataset containing additional photographic information. The ultimate layers to be developed are:

- 2d_lfcsh – TUFLOW layer of bridge data
- Photographs – layer of georeferenced points linked to photographs

Dataset naming is to adhere to the following convention:

- Model domain/catchment identifier eg BUR
- Model generation number eg 001, 002, 003
- Sub-generation identifier eg a, b, c
- Scenario eg E, F, May09 (ie Existing, Future, Historic)
- File type eg 1d_nwk
- Other details eg photos

Example file names for the datasets are:

- BUR_001a_E_2d_lfcsh_bridge - In ArcGIS this will be 2 separate files as it is not possible to have points and lines within the same layer:
  - BUR_001a_E_2d_lfcsh_bridge_rg
  - BUR_001a_E_2d_lfcsh_bridge_pt
- BUR_001a_E_bridge_photos

4. Gap analysis

Analysis of existing design or as-constructed plans is required to identify bridges requiring survey. Data which is required includes:

- Deck location, surface/obvert levels and thickness
- Pier locations, dimensions, orientation to flow and pile arrangements
- Handrail location, height and extent
- Cross-section of channel beneath bridge

Footbridges are to be reviewed to identify those which are hydraulically significant, including those which are:

- Perpendicular to the flow (ie cross a primary flowpath); and
- Significantly constrictive to flows.

These footbridges will also need to be included in the survey brief if the required data is not available from existing plans.

5. Survey brief

An example survey brief is presented in this section.

Table 1 Survey Data Capture Requirements

Item	Description	Data Type	Width	Decimals	Domain/Remark
No of spans	Number of bridge spans	Integer	4	0	
Length of spans[1]	Distance between pier centres	Double	12	3	
Deck point 1	Coordinate at corner of bridge deck – upstream, left hand side of deck when looking downstream	Double	12	3	
Deck level 1	Level at deck point 1	Double	12	3	
Deck point 2	Coordinate at corner of bridge deck – upstream, right hand side of deck when looking downstream	Double	12	3	
Deck level 2	Level at deck point 2	Double	12	3	
Deck point 3	Coordinate at corner of bridge deck – downstream, left hand side of deck when looking downstream	Double	12	3	
Deck level 3	Level at deck point 3	Double	12	3	
Deck point 4	Coordinate at corner of bridge deck – downstream, right hand side of deck when looking downstream	Double	12	3	
Deck level 4	Level at deck point 4	Double	12	3	
Deck point 5	Coordinate at highest point on bridge deck	Double	12	3	
Deck level 5	Level at deck point 5	Double	12	3	
Deck thickness	Thickness of deck from top of deck to soffit (ie top of headstock)	Double	12	3	

Item	Description	Data Type	Width	Decimals	Domain/Remark
No of piers	Number of piers	Integer	4	0	
No of piles per pier	Number of separate piles in each pier	Integer	4	0	
Pile shape[2]	Shape of each pile	Text	30	0	Round/Square/ H-I/Oblong/Other
Pile width	Width of pile in flow direction	Double	12	3	
Pier orientation[3]	Orientation of piers to bridge deck	Integer	4	0	
Handrail type[2]	Handrail material type	Text	30	0	None/Guardrail/ Galvanised Pipes/Galvanised Vertical Bars/Other
Handrail length	Length of handrail	Double	12	3	
Handrail elevation 1	Elevation at centre of upstream handrail if level, otherwise elevation at higher end	Double	12	3	
Handrail elevation 2	Elevation at lower end of upstream handrail	Double	12	3	
Bridge cross-section[4]	Cross section of channel below bridge from top of abutment to top of abutment	Double	12	3	
Photo georeference[5]	Coordinate of photo locations	Double	12	3	Minimum of 4

[1] *If span lengths differ then additional details will be required (ie field notes)*
[2] *If "other" is specified then additional details will be required (ie field notes)*
[3] *Detailed survey of pier angle is not required – angle such as 10°, 45°, 60° etc is acceptable*
[4] *Points to be surveyed at locations in which the grade changes*
[5] *A minimum of 4 photographs is required. These are looking upstream and downstream from the bridge and looking at the upstream and downstream sides of the bridge. Other photographs which validate the above information may also be required (especially with regards to pier details, handrail details and where the Domain/Remark has been selected as "other")*

Please note that:

- All data is to be delivered in MGA coordinates with the origin of coordinates (PM number), coordinate values and estimated accuracy provided. Accuracy is to be 4th order or better
- All heights are to be on AHD datum with origin datum supplied. Accuracy is to be 4th order or better
- The data is to be supplied in ESRI shape file format
- GPS (RTK) methods are acceptable and will achieve the desired accuracies. Ensure there are redundant checks to verify the accuracy

In addition to the text provided above:

- A figure showing the survey locations will need to be prepared
- A table indicating the approximate bridge survey locations is to be included. An example of the detail required is provided in Table 2

Table 2 Survey Data Locations

Bridge ID	Crossing Name	Crossing Type	Approx. Easting	Approx. Northing

6. TUFLOW 2d_lfcsh layer

6.1 Templates

Geodatabase templates are available from Council for each of the GIS datasets to be developed. These databases have the layer attributes defined as specified in Sections **Error! Reference source not found.** to **Error! Reference source not found.** and may assist with generating these files correctly. These templates also have metadata attached with many sections of the metadata already completed.

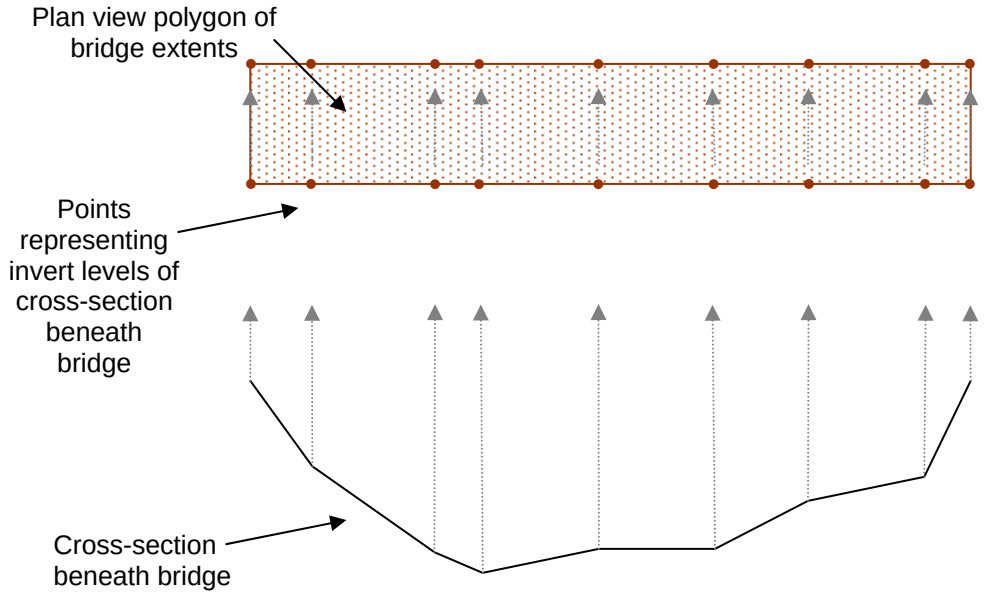
Template layerfiles are also available to show the preferred styles to be adopted for each dataset.

The TUFLOW 2d_lfcsh layer is to be generated as defined in the following sections.

6.1.1 Spatial representation

Bridges are to be represented by a single brown polygon covering the same extents as the bridge structure. Vertices need to be snapped to each point object as identified below.

The cross-section beneath the bridge needs to be represented using point objects at each change in grade of the cross-section as shown in the example below. These point objects should be the same on both the upstream and downstream sides of the bridge.



6.1.2 Layer attributes

The layer attributes of the first 13 columns in the 2d_lfcsh layer are identified in the "Layered Flow Constriction Shape (2d_lfcsh) Attribute Descriptions" table in the TUFLOW manual. Additional attribute fields are to be added to the end. The required attributes and their data source are described in the Table 3. Table 4 presents the additional fields which are to be included in the 2d_lfcsh layer.

Table 3 TUFLOW Required Layer Attributes

Column	GIS Attribute*	Properties	Brief Description	Source
1	Invert	Double	Invert level of bridge	For polygon set to -99,999 and for points set to level of cross-section. Levels to be based upon survey where available or on cross-section shown on design or as-constructed drawings
2	dZ	Double	Attribute required but not used	
3	Shp_Width (Shape_Width _or_Dmax)	Double	Attribute required but not used	
4	Shp_Opts (Shape_ Options)	Text (20)	Source of invert levels	Set to "NO MERGE"
5	L1_Obvert	Double	Obvert of bridge deck	From survey where available, otherwise from design or as-constructed drawings
6	L1_pBlock (L1_ pBlockage)	Double	Blockage of bridge below deck	Based on recommendations of parameterisation data standard
7	L1_FLC	Double	Form loss coefficient below bridge deck	Based on recommendations of parameterisation data standard
8	L2_Depth	Double	Depth of bridge deck	From survey where available, otherwise from design or as-constructed drawings
9	L2_pBlock (L2_ pBlockage)	Double	Blockage of bridge deck	Set to 100%
10	L2_FLC	Double	Form loss coefficient of bridge deck	Set to 0
11	L3_Depth	Double	Depth of handrail	From survey where available, otherwise from design or as-constructed drawings
12	L3_pBlock (L3_ pBlockage)	Double	Attribute not used	Based on recommendations of parameterisation data standard
13	L3_FLC	Double	Attribute not used	Based on recommendations of parameterisation data standard

** For detailed information refer to table titled "Layered Flow Constriction Shape (2d_lfcsh) Attribute Descriptions" in TUFLOW manual. Name displayed in brackets represents attribute name in TUFLOW manual.*

Table 4 Additional Bridge Attributes

Column	GIS Attribute	Properties	Brief Description	Source
14	Bridge_ID	Text (12)	Unique identifier for bridge	From MBRC hydrography
15	WW_ID	Text (12)	Waterway identifier	From MBRC hydrography
16	Domain	Text (3)	Model domain identifier	From MBRC hydrography
17	Xing_Name	Text (40)	Name of structure or road which structure crosses	From existing MBRC data where available or from road network
18	Xing_Type	Text (20)	Type of crossing eg Vehicle/Pedestrian	From existing MBRC data where available, otherwise from aerial photography analysis
19	Reliabilit	Short Integer	Index of data reliability	Integer relating to data source (see below)
20	Surv_Sourc	Text (20)	Company who collected survey data	Eg “MBRC”
21	Surv_Tech	Text (10)	Survey technique used	Eg “RTKGPS”
22	Surv_Date	Text (6)	Month and year of survey	Eg “Dec09”

The “Reliabilit” field relates to the integrity of the data used. The following rating is to be adopted:

- 1 – all required details sourced from survey
- 2 – mixture of details sourced from survey and design or as-constructed plans
- 3 – all data sourced from design or as-constructed plans
- 4 – all data assumed

6.2 Photographs

A GIS layer is to be developed in which point objects are linked to available photographs of the culvert. This intention of this layer is to provide the modeller with additional information to assist with model set up. The GIS layer is to include the attributes presented in Table 5.

Photograph point objects are to be represented as pink dots/circles.

Table 5 Photograph Layer Attributes

Column	GIS Attribute*	Properties	Brief Description*	Source
1	Struc_ID	Text (12)	Structure identifier	From MBRC hydrography
2	WW_ID	Text (12)	Waterway identifier	From MBRC hydrography
3	Domain	Text (3)	Model domain identifier	From MBRC hydrography
4	Struc_Name	Text (40)	Name of structure (eg for basin) or road which structure crosses	From existing MBRC data where available or from road network
5	Struc_Type	Text (12)	Type of structure	Basin/Culvert/Bridge/Trunk_ Drain/Building
6	File_Loc	Text (60)	Folder and file name of photo (for linking)	File name is to include structure ID and photo number (eg Photo1)
7	Easting	Double	Easting of location from which photo was taken	From survey where available, otherwise from best estimate using aerial photography

Column	GIS Attribute*	Properties	Brief Description*	Source
8	Northing	Double	Northing of location from which photo was taken	From survey where available, otherwise from best estimate using aerial photography
9	Desc_Direc	Text (60)	Description of photo (eg upstream side of culvert) or direction represented in photo (eg upstream from culvert)	From survey where available, otherwise from best estimate

7. Data storage

Data is to be stored as a feature class within a feature dataset titled “Floodplain_Structures”. An example feature dataset setup is provided in Figure 1.

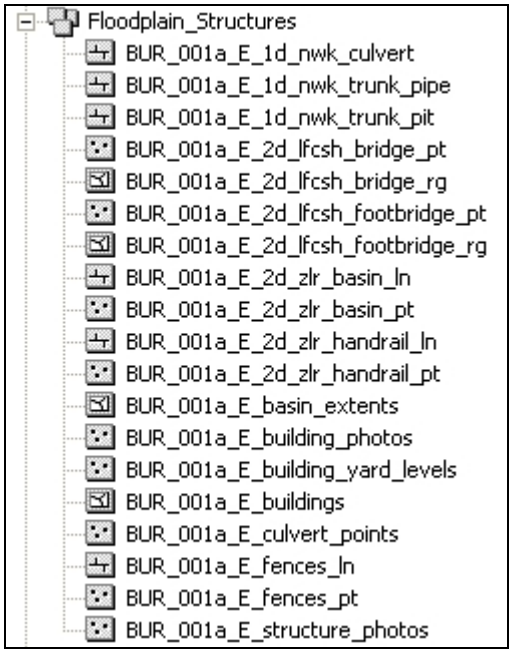


Figure 1 Feature Dataset Set-Up

8. TUFLOW layer generation

TUFLOW modelling requires a single 2d_lfcsh MID/MIF file. In order to develop a TUFLOW compatible file from the Geodatabase files the following tasks will be required:

- Conversion from geodatabase to shapefile
- Conversion from shapefile to MapInfo (.tab)
- Consolidation of points and regions into a single layer
- Export from MapInfo to MID/MIF

The attribute properties are directly transferrable between Arc and MapInfo for the required TUFLOW fields (ie Text (Arc) = Char (MapInfo), Double (Arc) = Float (MapInfo)).

9. Metadata

The Federal Geodetic Data Committee (FGDC) Metadata standard is to be used for metadata. As a minimum, the fields identified in each section below are to be filled out. Section 0 presents the fields which are to be filled out for all layers produced and Sections 0 and 9.3 present the fields specific to each layer which are to be filled out.

The geodatabase templates which are available from Council have a large portion of the metadata already filled out. Sections which are still to be completed are defined within these templates.

9.1 Standard fields

Table 6 Standard Metadata Requirements

Section	Field	Detail to Include
Identification	Citation - Originator	Name of company responsible for development of layer
	Citation - Publication Date	Date of data supply to MBRC or other organisation
	General - Abstract	Set to “Bridge information prepared for Stage XX of MBRC's Regional Floodplain Database project - XX catchment”
	General - Purpose	See layer specific details in following sections.
	General - Supplemental Information	Set to “Refer to "Regional Floodplain Database Stage 2 - Data Standard - Bridges" and "Floodplain Structures Report - Regional Floodplain Database" for additional information”
	Time Period - Currentness Reference	Set to “Publication Date”
	Time Period - Calendar Date	Set to be the same as the publication date
	Status - Progress	Set to either “In Progress” or “Complete” depending upon status
	Status - Update Frequency	Set to “As Required”
	Spatial Domain - West Bounding Coordinate	Set to westernmost extent of catchment for which data is provided
	Spatial Domain - East Bounding Coordinate	Set to easternmost extent of catchment for which data is provided
	Spatial Domain - North Bounding Coordinate	Set to northernmost extent of catchment for which data is provided
	Spatial Domain - South Bounding Coordinate	Set to southernmost extent of catchment for which data is provided
	Keywords - Theme	Set two keywords “Bridge” and “Floodplain”
	Point of Contact - Person	Name of person responsible for development of layer
	Point of Contact - Organisation	Name of company responsible for development of layer
	Point of Contact - Contact Voice Telephone	Contact telephone number for person responsible for development of layer
	Point of Contact - Contact Email Address	Contact email address for person responsible for development of layer

Section	Field	Detail to Include
Data Quality		See layer specific details in Sections 0 and 9.3
Entity Attribute		See layer specific details in Sections 0 and 9.3
Metadata Reference	Contact Details - Person	Name of person who developed the metadata
	Contact Details - Organisation	Name of company who developed the metadata
	Contact Voice Telephone	Contact phone number for person who developed the metadata
	Contact Email Address	Contact email address for person who developed the metadata

9.2 2d_lfcsh layer

Table 7 2d_lfcsh Metadata Requirements

Section	Field	Detail to Include
Identification	General - Purpose	For polygons set to “Polygon data of bridge locations. Intended use is for TUFLOW modelling of bridges. TUFLOW required fields are included. Additional bridge details are also included in supplementary fields. Polygon file is to be coupled with points file of the same name” For points set to “Point data of bridge cross-section elevations. Intended use is for TUFLOW modelling of footbridges. Points file is to be coupled with polygon file of same file name”
Data Quality	Attribute Accuracy - Accuracy Report	Set to “Individual value within the RELIABILIT field relates to accuracy of the data. The meaning of these values is described below”
	Attribute Accuracy - Value	Set four values, 1-4
	Attribute Accuracy - Explanation	Value 1 - Indicates that all required details were sourced from survey Value 2 - Indicates that details were sourced from a mixture of survey and design or as-constructed plans Value 3 - Indicates that all data was sourced from design or as-constructed plans Value 4 - Indicates that all data was assumed
	Positional Accuracy - Horizontal Accuracy - Accuracy Report	Set to “Individual value within the RELIABILIT field relates to accuracy of the data. The meaning of these values is described below”
	Positional Accuracy - Horizontal Accuracy - Value	Set four values, 1-4
	Positional Accuracy - Horizontal Accuracy - Explanation	Value 1 - ±XXmm Value 2 - ±XXmm Value 3 - ±XXmm Value 4 - Accuracy not quantifiable
	Positional Accuracy - Vertical Accuracy - Accuracy Report	Set to “Individual value within the RELIABILIT field relates to accuracy of the data. The meaning of these values is described below”
	Positional Accuracy - Vertical Accuracy - Value	Set four values, 1-4

Section	Field	Detail to Include
	Positional Accuracy - Vertical Accuracy - Explanation	Value 1 - ±XXmm Value 2 - ±XXmm Value 3 - ±XXmm Value 4 - Accuracy not quantifiable
Entity Attribute	Attribute - General - Definition	Definition for each attribute can be sourced from the "Brief Description" fields in Table 3 and Table 4
	Attribute - General - Definition Source	Definition source for each attribute can be sourced from the "Source" field in Table 3 and Table 4

9.3 Photographs layer

Table 8 Photographs Metadata Requirements

Section	Field	Detail to Include
Identification	General - Purpose	Set to "Point data of floodplain structure photo locations. Intended use is to assist with TUFLOW modelling of floodplain structures"
Data Quality	Attribute Accuracy - Accuracy Report	Set to "Accuracy is not important to this layer"
Entity Attribute	Attribute - General - Definition	Definition for each attribute can be sourced from the "Brief Description" field in Table 5
	Attribute - General - Definition Source	Definition source for each attribute can be sourced from the "Source" field in Table 5

Appendix C
Data Standard - Trunk Underground Drainage

Data Standard – Trunk Underground Drainage Regional Floodplain Database - Stage 2 Moreton Bay Regional Council

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Contents

List of Tables

1. Introduction

This data standard has been developed as part of a pilot study for Stage 2 of the Regional Floodplain Database project. It has been developed based upon the generation of the trunk underground drainage layers for the Burpengary Creek pilot catchment. The aim of this data standard is to identify a consistent approach that can be applied to future studies/study components. The files generated using this standard are suitable for input to TUFLOW modelling and also for providing additional supporting information where available.

This data standard has been written based upon the assumption that GIS layers will be developed in ArcGIS and converted to MID/MIF for TUFLOW modelling purposes.

2. Trunk Underground Drainage Definition

For the purposes of catchment wide flood modelling within the Regional Floodplain Database project, trunk drainage refers to extended underground drainage systems which have a large open channel or stream feeding into them (ie stormwater pipe networks which are intended to convey flows from a major storm event). Trunk drainage does not refer to the larger pipes within a typical minor storm event piped drainage network.

Trunk drainage would typically occur where filling of a natural overland flowpath/waterway has occurred and a pipe network has been installed to convey major event flows beneath the fill, between an upstream overland flowpath/waterway and a downstream overland flowpath/waterway.

The primary purpose of trunk drainage is flow conveyance, not local flow capture. The key function of the pits/junctions is to allow through-flow rather than inlet capacity. Whilst modelling of inlet capacity is still to be included, it is not the primary focus of the modelling.

The piped network shown in Figure 1 is an example of trunk underground drainage.

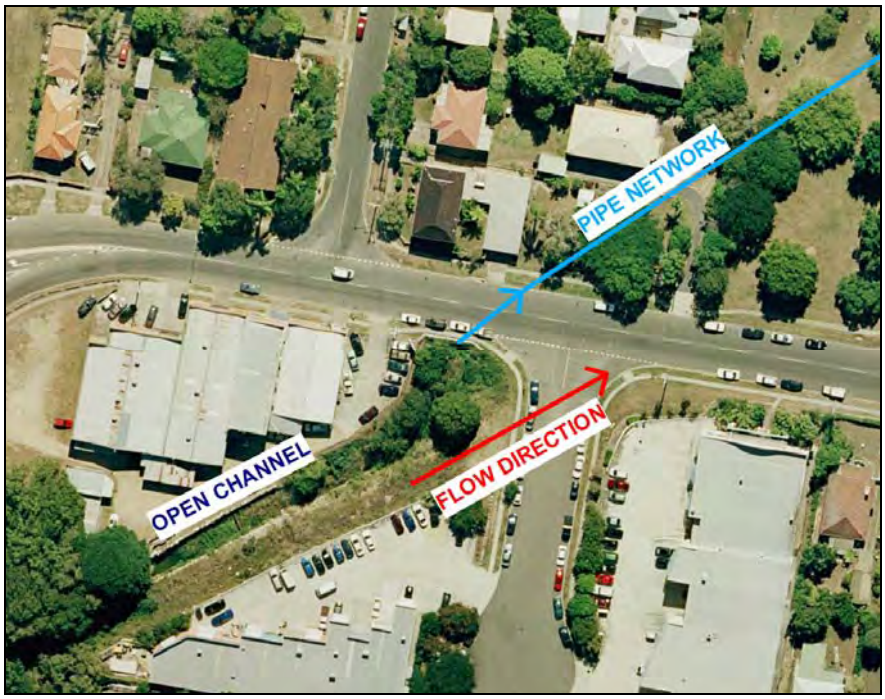


Figure 1 Example of Trunk Underground Drainage

3. Initial data requirements

To assist with development of the trunk underground drainage data, the following GIS layers are required from MBRC:

- Stormwater pipe layers containing all existing stormwater pipe information (dimensions, invert levels, number of barrels etc)
- Stormwater pit/junction layer containing all existing stormwater pit information (type, dimensions, invert levels etc)
- Culvert layer containing all existing culvert information (dimensions, invert levels, number of barrels etc)
- Aerial photography
- Hydrography including waterway locations and identifications

In addition to GIS data, any other available pipe/pit/culvert information will also be required. This includes design or as-constructed plans.

4. Datasets to be developed

Generation of three layers will provide the ultimate trunk drainage dataset: two layers for input to the TUFLOW model and a layer containing additional information. These layers are:

- 1d_nwk – TUFLOW layer of pipe data
- 1d_nwk – TUFLOW layer of pit/junction data
- Photographs – layer of geo-referenced points linked to photographs

Dataset naming is to adhere to the following convention:

- Model domain/catchment identifier eg BUR
- Model generation number eg 001, 002, 003
- Sub-generation identifier eg a, b, c
- Scenario eg E, F, May09 (ie Existing, Future, Historic)
- File type eg 1d_nwk
- Other details eg photos

Example file names for the three datasets are:

- BUR_001a_E_1d_nwk_trunk_pipe
- BUR_001a_E_1d_nwk_trunk_pit
- BUR_001a_E_trunk_drainage_photos

The pipe dataset is to be developed in accordance with the Regional Floodplain Database – Stage 2, Data Standard – Culverts. The standard for representation of the pits is presented in the following sections.

5. Gap analysis

Analysis of existing data is required to identify data gaps. Refer to the Regional Floodplain Database – Stage 2, Data Standard – Culverts for gap analysis of the pipe details.

Analysis of existing MBRC pit/junction data is necessary to identify pits/junctions requiring survey. Survey will be required for pits/junctions missing critical data including:

- Pit/junction chamber: type; shape; dimensions; invert level; surface level
- Inlet type: shape; dimensions

6. Survey brief

An example survey brief for pits is presented in this section. Note that the inlet details captured in this brief may not provide sufficient information to undertake detailed modelling of inlet pit capture. In the event that large inlet pits are used to capture flow and are an integral part of the trunk drainage system it may be necessary to review this survey brief to include additional inlet details.

Refer to Regional Floodplain Database – Stage 2, Data Standard – Culverts for an example pipe survey brief. This survey brief may need to be modified as information such as road and handrail details may not be required. This will need to be assessed on a case-by-case basis.

Table 1 Survey Data Capture Requirements

Item	Description	Data Type	Width	Decimals	Domain/Remark
Pit/junction type[1]	Description of pit/junction type	Text	12	0	Inlet/Junction/ Other
Chamber diameter or width[2]	Diameter or width of chamber	Double	12	3	
Chamber length	Length of chamber if box chamber	Double	12	3	
Invert level	Invert level of chamber	Double	12	3	
Surface level	Surface level of top of pit/junction	Double	12	3	
Easting	Easting at centre of pit chamber	Double	12	3	
Northing	Northing at centre of pit chamber	Double	12	3	
Material type[1]	Chamber material type	Text	20	0	Concrete/Other
Benching	Whether or not benching is present in the pit	Text	3	0	Yes/No
Inlet type[1]	Type of inlet if inlet pit	Text	20	0	Field/Side Entry/Grated Side Entry/Other
Grade type	Type of grade on which inlet sits	Text	12	0	On Grade/Sag
Grate width[3]	Width of grate if field or grated side entry pit	Double	12	3	
Grate length[3]	Length of grate if field or grated side entry pit	Double	12	3	
Lintel length	Length of lintel if side entry pit	Double	12	3	
Photo georeference[4]	Coordinate of photo locations	Double	12	3	Minimum of 3

[1] If "other" is specified then additional details will be required (ie field notes)
[2] If pit/junction is a box chamber then width is the dimension perpendicular to the primary flow direction and length is the dimension parallel to the primary flow direction
[3] Width is the dimension perpendicular to the primary flow direction and length is the dimension parallel to the primary flow direction
[4] A minimum of 3 photographs is required. These are looking at surface of the pit/junction and looking along the ground surface in the direction of the pipes. Additional photographs should be obtained looking along each inlet

and/or outlet pipe direction if there is more than one of each. Other photographs which validate the above information may also be required (especially where the Domain/Remark has been selected as "other")

Please note that:

- All data is to be delivered in MGA coordinates with the origin of coordinates (PM number), coordinate values and estimated accuracy provided. Accuracy is to be 4th order or better
- All heights are to be on AHD datum with origin datum supplied. Accuracy is to be 4th order or better
- The data is to be supplied in ESRI shape file or csv format
- GPS (RTK) methods are acceptable and will achieve the desired accuracies. Ensure there are redundant checks to verify the accuracy

In addition to the text provided above:

- A figure showing the survey locations will need to be prepared
- A table indicating the approximate pit/junction survey locations is to be included. An example of the detail required is provided in Table 2

Table 2 Survey Data Locations

Pit ID	Approx. Easting	Approx. Northing

7. TUFLOW layers

7.1 Templates

Geodatabase templates are available from Council for each of the GIS datasets to be developed. These databases have the layer attributes defined as specified in Sections 7.2 to 7.5 and may assist with generating these files correctly. These templates also have metadata attached with many sections of the metadata already completed.

Template layerfiles are also available to show the preferred styles to be adopted for each dataset.

7.2 1d_nwk_pipes

The 1d_nwk_pipes layer is to be developed in accordance with the Regional Floodplain Database – Stage 2, Data Standard – Culverts. The trunk underground drainage pipes are to be represented as dark blue lines, with details as specified in the culverts data standard.

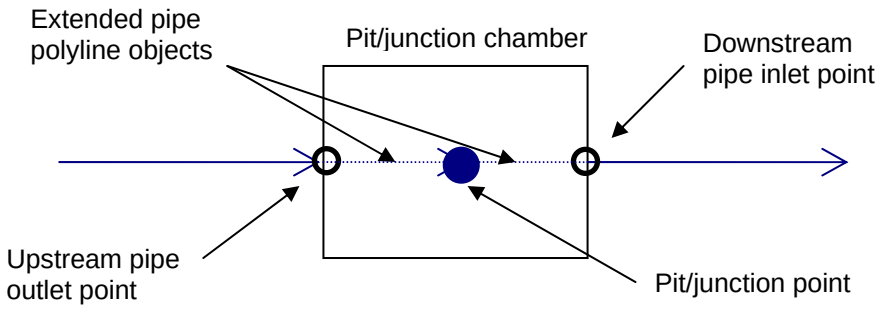
It will be necessary to ensure that the pit and pipe losses are adequately represented and that the model results are consistent with expected results. Verification of model predictions should be undertaken using either hand calculations (eg based on the recommendations within QUDM) or pipe network modelling software. Modification to the loss values (form loss, height contraction, width contraction, entry loss and exit loss) may be required to ensure losses within the pipe systems are modelled accurately.

7.3 1d_nwk_pits layer

The TUFLOW 1d_nwk pits layer is intended to provide representation of the pits/junctions within the trunk drainage system and allow modelling of the pit losses. Pits/junctions which require modelling will need to be assessed on a case-by-case basis. As a guide, where the following situations occur the pit losses may considered negligible and it is not necessary to model the pit:

- No chamber is present and pipes are directly connected to each other
- Where the pit chamber and inlet/outlet pipe configuration prevents significant contraction and/or expansion of the flow between the two pipes eg. where benching occurs within the pit and the inlet and outlet pipe(s) are of the same dimensions, or where the outlet pipe(s) is larger than the inlet pipes

A single point object is required at each pit/junction location to be modelled (represented as dark blue dots/circles). These point objects need to be snapped to the ends of the pipes in the 1d_nwk_pipes layer. It may be necessary to extend the pipe polyline objects into the centre of the pit to meet at a single point where the pit object is located, as shown in the example below.



7.4 Layer attributes

For pits/junctions which are to be modelled, the attributes will need to be determined on a case-by-case basis. Due to the large number of possible pit configurations and the low volume of trunk drainage structures within the Moreton Bay Regional Council area this data standard does not specify the range of possible attribute values to be used.

It will be necessary to ensure that the pit and pipe losses are adequately represented and that the model results are consistent with expected results. Verification of model predictions should be undertaken using either hand calculations (eg based on the recommendations within QUDM) or pipe network modelling software. Modification to the loss values (form loss, height contraction, width contraction, entry loss and exit loss) may be required to ensure losses within the pipe systems are modelled accurately.

The layer attributes of the first 20 columns in the 1d_nwk_pits layer are identified in the “1D Model Network (1d_nwk) Attribute Descriptions” table in the TUFLOW manual. Additional attribute fields are to be added to the end. The required TUFLOW attributes and their data source are described in Table 3. Table 4 presents the additional fields which are to be included in the 1d_nwk_pits layer. The specified attributes in these tables are consistent with those of the 1d_nwk_culverts and 1d_nwk_pipes layers to allow integration of the datasets if required.

Table 3 Required TUFLOW Layer Attributes

Column	GIS Attribute*	Properties	Brief Description*	Source
1	ID	Text (12)	Unique identifier for pit	From MBRC hydrography Pit name is to be consistent with downstream pipe name
2	Type	Text (4)	Pit shape - options are C/R (circular/rectangular) If inlet pit then pit type Q can be used	Use of this attribute is to be determined on a case-by-case basis
3	Ignore	Short Integer	Whether pit is not included in run	Set to “0” (ie False)
4	UCS	Text (1)	Attribute not used	
5	Len_or_ANA	Double	Additional nodal storage area	Set to “0”
6	n_or_n_F	Double	Attribute not used	
7	US_Invert	Double	Surface level of pit	From survey where available, otherwise from LiDAR DEM
8	DS_Invert	Double	Invert level of pit	From survey where available, otherwise from existing MBRC data
9	Form_Loss	Double	Additional form loss	Use of this attribute is to be determined on a case-by-case basis
10	pBlockage	Double	Attribute not used	
11	Inlet_Type	Text (12)	Inlet Pit Database inlet type for Q pits	Use of this attribute is to be determined on a case-by-case basis
12	Conn_2D	Text (4)	Type of connection to 2D domain	Use of this attribute is to be determined on a case-by-case basis
13	Conn_No	Small Integer	Number of 2D cells to connect to	Use of this attribute is to be determined on a case-by-case basis
14	Width_Dia (Width_or_ Dia)	Double	Pit diameter or width	From survey where available, otherwise from existing MBRC data Use of this attribute is to be determined on a case-by-case basis
15	Hght_or_WF (Height_or_ WF)	Double	Pit length Attribute not used for C pits	From survey where available, otherwise from existing MBRC data Use of this attribute is to be determined on a case-by-case basis
16	Number_of	Short Integer	Number of pits	Set to “1” unless there are multiple inlet pits being modelled Use of this attribute is to be determined on a case-by-case basis
17	Hght_Cont	Double	Height contraction coefficient for R pits Attribute not used for C culverts	Use of this attribute is to be determined on a case-by-case basis

Column	GIS Attribute*	Properties	Brief Description*	Source
18	Width_Cont	Double	Width contraction coefficient	Use of this attribute is to be determined on a case-by-case basis
19	Entry_Loss	Double	Entry loss coefficient	Use of this attribute is to be determined on a case-by-case basis
20	Exit_Loss	Double	Exit loss coefficient	Use of this attribute is to be determined on a case-by-case basis

* For detailed information refer to table titled “1D Model Network (1d_nwk) Attribute Descriptions” in TUFLOW manual. Name displayed in brackets represents attribute name in TUFLOW manual.

Table 4 Additional Pit Attributes

Column	GIS Attribute*	Properties	Brief Description*	Source
21	WW_ID	Text (12)	Waterway identifier	From MBRC hydrography
22	Domain	Text (3)	Model domain identifier	From MBRC hydrography
23	Xing_Name	Text (40)	Name of structure (eg for basin) or road which structure crosses – may not be applicable to underground trunk drainage	From existing MBRC data where available or from road network
24	Xing_Type	Text (20)	Type of crossing eg Vehicle/Basin/Pedestrian – may not be applicable to underground trunk drainage	From existing MBRC data where available, otherwise from aerial photography analysis
25	Reliabilit	Short Integer	Index of data reliability	Integer relating to data source (see below)
26	Surv_Sourc	Text (20)	Company who collected survey data	Eg “MBRC”
27	Surv_Tech	Text (10)	Survey technique used	Eg “RTK GPS”
28	Surv_Date	Text (6)	Month and year of survey	Eg “Dec09”
29	No_Structs	Short Integer	Not applicable to pits	
30	Culv_A_m2	Double	Not applicable to pits	
31	Hndrl_Type	Text (20)	Not applicable to pits	
32	Hndrl_Hght	Double	Not applicable to pits	
33	Hndrl_Len	Double	Not applicable to pits	
34	Wngwl_Type	Text (20)	Not applicable to pits	
35	Wngwl_Ang	Short Integer	Not applicable to pits	

The “Reliabilit” attribute relates to the integrity of the data used. The following rating is to be adopted:

- 1 – all required details sourced from survey
- 2 – critical pit/junction details sourced from survey (type, shape, invert and surface levels, and dimensions) remaining details sourced from either existing MBRC data or assumed
- 3 – all data sourced from pre-existing MBRC data or assumed
- 4 – all data assumed

7.5 Photographs

A GIS layer is to be developed in which point objects are linked to available photographs of the culvert. This intention of this layer is to provide the modeller with additional information to assist with model set up. The GIS layer is to include the attributes presented in Table 5.

Photograph point objects are to be represented as pink dots/circles.

Table 5 Photograph Layer Attributes

Column	GIS Attribute*	Properties	Brief Description*	Source
1	Struc_ID	Text (12)	Structure identifier	From MBRC hydrography
2	WW_ID	Text (12)	Waterway identifier	From MBRC hydrography
3	Domain	Text (3)	Model domain identifier	From MBRC hydrography
4	Struc_Name	Text (40)	Name of structure (eg for basin) or road which structure crosses	From existing MBRC data where available or from road network
5	Struc_Type	Text (12)	Type of structure	Basin/Culvert/Bridge/Trunk_ Drain/Building
6	File_Loc	Text (60)	Folder and file name of photo (for linking)	File name is to include structure ID and photo number (eg Photo1)
7	Easting	Double	Easting of location from which photo was taken	From survey where available, otherwise from best estimate using aerial photography
8	Northing	Double	Northing of location from which photo was taken	From survey where available, otherwise from best estimate using aerial photography
9	Desc_Direc	Text (60)	Description of photo (eg upstream side of culvert) or direction represented in photo (eg upstream from culvert)	From survey where available, otherwise from best estimate

8. Data storage

Data is to be stored as a feature class within a feature dataset titled “Floodplain_Structures”. An example feature dataset setup is provided in Figure 2.

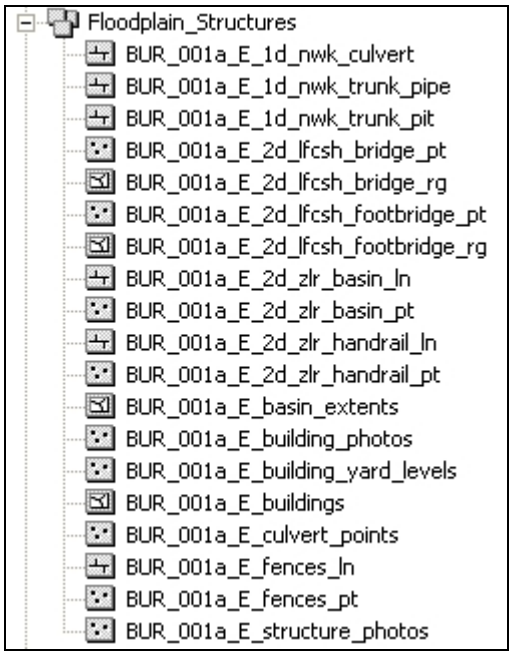


Figure 2 Feature Dataset Set-Up

9. TUFLOW layer generation

TUFLOW modelling requires a single or multiple 1d_nwk MID/MIF file(s). In order to develop a TUFLOW compatible file from the Geodatabase files, the following tasks will be required:

- Conversion from geodatabase to shapefile
- Conversion from shapefile to MapInfo (.tab)
- Modification of the attribute properties for the following attributes:
  - "Ignore" attribute property is to be set to "Logical". No information will be lost in this conversion as MapInfo recognises the 0 and 1 values as False and True respectively.
  - "Conn_No" attribute property is to be set to "Integer". No information will be lost in this conversion
  - "Number_of" attribute property is to be set to "Integer". No information will be lost in this conversion
- Export from MapInfo to MID/MIF

10. Metadata

The Federal Geodetic Data Committee (FGDC) Metadata standard is to be used for metadata. As a minimum, the fields identified in each section below should be filled out. Section 0 presents the fields which are to be filled out for all layers produced and Sections 10.2 to 10.3 present the fields specific to each layer which are to be filled out.

The geodatabase templates which are available from Council have a large portion of the metadata already filled out. Sections which are still to be completed are defined within these templates.

10.1 Standard fields

Table 6 Standard Metadata Requirements

Section	Field	Detail to Include
Identification	Citation - Originator	Name of company responsible for development of layer
	Citation - Publication Date	Date of data supply to MBRC or other organisation
	General - Abstract	Set to “Trunk underground drainage information prepared for Stage XX of MBRC's Regional Floodplain Database project - XX catchment”
	General - Purpose	See layer specific details in following sections
	General - Supplemental Information	Set to “Refer to "Regional Floodplain Database Stage 2 - Data Standard - Trunk Underground Drainage" and "Floodplain Structures Report - Regional Floodplain Database" for additional information”
	Time Period - Currentness Reference	Set to “Publication Date”
	Time Period - Calendar Date	Set to be the same as the publication date
	Status - Progress	Set to either “In Progress” or “Complete” depending upon status
	Status - Update Frequency	Set to “As Required”
	Spatial Domain - West Bounding Coordinate	Set to westernmost extent of catchment for which data is provided
	Spatial Domain - East Bounding Coordinate	Set to easternmost extent of catchment for which data is provided
	Spatial Domain - North Bounding Coordinate	Set to northernmost extent of catchment for which data is provided
	Spatial Domain - South Bounding Coordinate	Set to southernmost extent of catchment for which data is provided
	Keywords - Theme	Set two keywords “Trunk Underground Drainage” and “Floodplain”
	Point of Contact - Person	Name of person responsible for development of layer
	Point of Contact - Organisation	Name of company responsible for development of layer
	Point of Contact - Contact Voice Telephone	Contact telephone number for person responsible for development of layer
	Point of Contact - Contact Email Address	Contact email address for person responsible for development of layer
Data Quality		See layer specific details in Sections 10.2 to 10.3
Entity Attribute		See layer specific details in Sections 10.2 to 10.3
Metadata Reference	Contact Details - Person	Name of person who developed the metadata
	Contact Details - Organisation	Name of company who developed the metadata

Section	Field	Detail to Include
	Contact Voice Telephone	Contact phone number for person who developed the metadata
	Contact Email Address	Contact email address for person who developed the metadata

10.2 1d_nwk_trunk_pits and 1d_nwk_trunk_pipes layer

Table 7 1d_nwk Metadata Requirements

Section	Field	Detail to Include
Identification	General - Purpose	For pipes layer set to “Line data of pipe locations. Intended use is for TUFLOW modelling of trunk drainage pipes. TUFLOW required fields are included. Additional pipe details are also included in supplementary fields” For pits layer set to “Point data of pit/junction locations. Intended use is for TUFLOW modelling of trunk drainage pits/junctions. TUFLOW required fields are included. Additional pit/junction details are also included in supplementary fields”
	General - Supplemental Information	Set additional text to “For conversion to TUFLOW is it necessary to redefine the "Ignore" attribute as logical, and the "Conn_No" and "Number_of" attributes as integers once this file has been imported to MapInfo format”
Data Quality	Attribute Accuracy - Accuracy Report	Set to “Individual value within the RELIABILIT field relates to accuracy of the data. The meaning of these values is described below”
	Attribute Accuracy - Value	Set four values, 1-4
	Attribute Accuracy - Explanation	Value 1 - Indicates that all required details were sourced from survey Value 2 - Indicates that critical pipe/pit/junction details were sourced from survey (shape, invert levels, dimensions and number of barrels etc) and remaining details were sourced from either existing MBRC data or assumed Value 3 - Indicates that all data was sourced from existing MBRC data or assumed Value 4 - Indicates that all data was assumed
	Positional Accuracy - Horizontal Accuracy - Accuracy Report	Set to “Individual value within the RELIABILIT field relates to accuracy of the data. The meaning of these values is described below”
	Positional Accuracy - Horizontal Accuracy - Value	Set four values, 1-4
	Positional Accuracy - Horizontal Accuracy - Explanation	Value 1 - ±XXmm Value 2 - ±XXmm Value 3 - ± 30mm if survey technique is GPS or As-Con, Accuracy not quantifiable if survey technique is GIS Value 4 - Accuracy not quantifiable
	Positional Accuracy - Vertical Accuracy - Accuracy Report	Set to “Individual value within the RELIABILIT field relates to accuracy of the data. The meaning of these values is described below”
	Positional Accuracy - Vertical Accuracy - Value	Set four values, 1-4

Section	Field	Detail to Include
	Positional Accuracy - Vertical Accuracy - Explanation	Value 1 - ±XXmm Value 2 - ±XXmm Value 3 - ± 30mm if survey technique is GPS or As-Con, Accuracy not quantifiable if survey technique is GIS Value 4 - Accuracy not quantifiable
Entity Attribute	Attribute - General - Definition	Definition for each attribute can be sourced from the "Brief Description" fields in Table 3 and Table 4 or from the corresponding tables in the Data Standard - Culverts
	Attribute - General - Definition Source	Definition source for each attribute can be sourced from the "Source" fields in Table 3 and Table 4 or from the corresponding tables in the Data Standard - Culverts

10.3 Photographs layer

Table 8 Photographs Metadata Requirements

Section	Field	Detail to Include
Identification	General - Purpose	Set to "Point data of floodplain structure photo locations. Intended use is to assist with TUFLOW modelling of floodplain structures"
Data Quality	Attribute Accuracy - Accuracy Report	Set to "Accuracy is not important to this layer"
Entity Attribute	Attribute - General - Definition	Definition for each attribute can be sourced from the "Brief Description" field in Table 5
	Attribute - General - Definition Source	Definition source for each attribute can be sourced from the "Source" field in Table 5

Appendix D
Data Standard - Detention Basins

Data Standard - Detention Basins
Regional Floodplain Database - Stage 2
Moreton Bay Regional Council

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0	22 March 2010	First draft	CLS	TC	TDG	TDG
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Contents

List of Tables

1. Introduction

This data standard has been developed as part of a pilot study for Stage 2 of the Regional Floodplain Database project. It has been developed based upon the generation of the basin layers for the Burpengary Creek pilot catchment. The aim of this data standard is to identify a consistent approach that can be applied to future studies/study components. The files generated using this standard are suitable for input to TUFLOW modelling and also for providing additional supporting information where available.

This data standard has been written based upon the assumption that GIS layers will be developed in ArcGIS and converted to MID/MIF for TUFLOW modelling purposes.

2. Initial data requirements

To assist with development of the basin data, the following GIS layers are required from MBRC:

- Basin layer identifying basin locations
- Culvert layer containing all existing culvert information (dimensions, invert levels, number of barrels etc)
- Aerial photography
- Hydrography including waterway locations and identifications
- Any other available data which may include basin information eg embankment survey

LiDAR data or available detailed survey information in the basin locations is also required.

3. Datasets to be developed

Basin information is required for both WBNM and TUFLOW modelling. The following sections present the datasets to be developed for each type of model.

3.1 WBNM data

WBNM requires an elevation-storage relationship for each basin. Information to be generated includes:

- A GIS layer of basin extent polygons used in development of the height-storage relationship
- Elevation-storage relationships for each basin (supplied as an Excel spreadsheet)

Dataset naming is to adhere to the following convention:

- Model domain/catchment identifier eg BUR
- Model generation number eg 001, 002, 003
- Sub-generation identifier eg a, b, c
- Scenario eg E, F, May09 (ie Existing, Future, Historic)
- File type eg 1d_nwk
- Other details eg photos

Example file names for the datasets are:

- BUR_001a_E_basin_extents (GIS layer)
- BUR_001a_E_basin_H-S.xls

3.2 TUFLOW data

Basins will need to be assessed on a case-by-case basis dependent upon whether the outlet structure can be adequately modelled within the adopted model grid size. Two outcomes are possible:

- Where the gird size is adequate the structure can be modelled using a standard culvert and a topographic representation of the embankment crest level
- Where the grid size is inadequate the structure will need to be represented using an alternate technique. Appropriate modelling techniques will be dependent upon the basin outlet structure but should typically include replacement of the outlet structure with a H-Q relationship defining the relationship between water level in the basin and discharge through the structure

In the first case the Regional Floodplain Database – Stage 2, Data Standard – Culverts should be referred to for culvert modelling details. The standard for representation of the crest elevation is presented in the following sections.

In the case where the adopted grid spacing does not allow adequate representation of the outlet structure it may be necessary develop a height-discharge outlet relationship using either desktop calculations or a model (eg HEC-RAS) representing the outlet structure. The applicability of these techniques will need to be assessed on a case-by-case basis and no recommendations are presented in this data standard.

Dataset naming is to adhere to the convention presented in Section 3.1.

Example file names for the datasets are:

- BUR_001a_E_2d_zlr_basin - In ArcGIS this will be 2 separate files as it is not possible to have points and lines within the same layer:
  - BUR_001a_E_2d_zlr_basin_ln
  - BUR_001a_E_2d_zlr_basin_pt
- BUR_001a_E_basin_photos

4. Gap analysis

Analysis of existing data is required to identify data gaps. Refer to the Regional Floodplain Database – Stage 2, Data Standard – Culverts for gap analysis of the culvert outlet structure.

Where the basin outlet is a road embankment it can be assumed that the LiDAR data is sufficiently detailed to pick up the road crest. In other cases it may be necessary to obtain survey of the embankment crest elevations.

Where the basin is to be modelled using a special relationship, detailed information of the outlet structure may be necessary including:

- A cross-section upstream of the structure
- Details of all culvert structures included in the outlet
- Details of all weirs included in the outlet (other than the embankment crest)
- Details of any pit included in the outlet (refer to Regional Floodplain Database – Stage 2, Data Standard – Trunk Drainage for further information regarding pits)
- Details of any grates or trash screens included in the outlet

5. Survey brief

The survey brief for basins will need to be prepared on a case-by-case basis. Refer to Regional Floodplain Database – Stage 2, Data Standard – Culverts for an example culvert survey brief and Regional Floodplain Database – Stage 2, Data Standard – Trunk Underground Drainage for an example pit survey brief. Additional survey scope items may also be required to provide all the data necessary in preparing the basin datasets.

6. WBNM elevation-storage relationships

6.1 Templates

Geodatabase templates are available from Council for each of the GIS datasets to be developed. These databases have the layer attributes defined as specified in Sections **Error! Reference source not found.** to **Error! Reference source not found.** and may assist with generating these files correctly. These templates also have metadata attached with many sections of the metadata already completed.

Template layerfiles are also available to show the preferred styles to be adopted for each dataset.

The elevation-storage relationships are to be developed as per the following sections.

6.2 Spatial extents

The spatial extent over which the elevation-storage (H-S) relationship is to be developed for each basin needs to be defined as a polygon. Broad-scale model results for the 100 year ARI event can be used to assess the likely peak water level for each basin. This level can then be used to define the basin extents.

The attributes presented in Table 1 are to be included in the polygon layer. Each basin is to be represented using a hatched red polygon.

Table 1 Basin Polygon Layer Attributes

Column	GIS Attribute	Properties	Brief Description	Source
1	Basin_ID	Text (12)	Basin identifier	From MBRC hydrography
2	WW_ID	Text (12)	Waterway identifier	From MBRC hydrography
3	Domain	Text (3)	Model domain identifier	From MBRC hydrography
4	Basin_Name	Text (40)	Name of basin	From MBRC or from road network

6.3 Elevation-storage relationship

Elevation-storage relationships over the extents defined above should be extracted from the LiDAR TIN data for each basin. These relationships should be extracted at intervals sufficient to provide a reasonable representation of differences in storage between the basin invert level and the basin peak water level as defined above. A minimum of 10 and a maximum of 50 intervals are required.

7. TUFLOW 2d_zlr layer

The intention of this layer is to provide representation of the embankment crest elevation within the TUFLOW model. The 2d_zlr layers (points and polylines) are to be generated as per the following sections.

7.1 Spatial representation

A TUFLOW 2d_zlr layer of embankment crest elevations are to contain the following information for each modelled embankment:

- Point objects representing elevations along the embankment crest (these are to be displayed as red stars)
- A polyline object joining, and snapped to, the elevation points (these are to be displayed as red polylines)

Point object elevations are to be sourced from survey where it is available. In cases where survey is not available the embankment crest elevation can be based upon the LiDAR data.

Polyline object locations are to be based upon survey where it is available. Where no survey is available, analysis of the embankment crest location can be based upon the LiDAR data.

7.2 Layer attributes

The first column must contain elevation details for the TUFLOW modelling. The remaining attributes presented in Table 2 should be included to provide additional information.

Table 2 Embankment Layer Attributes

Column	GIS Attribute	Properties	Brief Description	Source
1	Elev_mAHD	Double	Required elevation for TUFLOW	From survey where available, otherwise from LiDAR DEM
2	Basin_ID	Text (12)	Basin identifier	From MBRC hydrography
3	WW_ID	Text (12)	Waterway identifier	From MBRC hydrography
4	Domain	Text (3)	Model domain identifier	From MBRC hydrography
5	Basin_Name	Text (40)	Name of basin	From MBRC or from road network
6	Reliabilit	Short Integer	Index of data reliability	Integer relating to data source (see below)
7	Surv_Sourc	Text (20)	Company who collected survey data	Eg “MBRC”
8	Surv_Tech	Text (10)	Survey technique used	Eg “RTK GPS”
9	Surv_Date	Text (6)	Month and year of survey	Eg “Dec09”

The “Reliabilit” field relates to the integrity of the data used. The following rating is to be adopted:

- 1 – all required details sourced from survey
- 2 – embankment elevations and location sourced from LiDAR
- 3 – N/A (not applicable to basins)
- 4 – all data assumed

7.3 Photographs

A GIS layer is to be developed in which point objects are linked to available photographs of the culvert. This intention of this layer is to provide the modeller with additional information to assist with model set up. The GIS layer is to include the attributes presented in Table 3.

Photograph point objects are to be represented as pink dots/circles.

Table 3 Photograph Layer Attributes

Column	GIS Attribute*	Properties	Brief Description*	Source
1	Struc_ID	Text (12)	Structure identifier	From MBRC hydrography
2	WW_ID	Text (12)	Waterway identifier	From MBRC hydrography
3	Domain	Text (3)	Model domain identifier	From MBRC hydrography
4	Struc_Name	Text (40)	Name of structure (eg for basin) or road which structure crosses	From existing MBRC data where available or from road network
5	Struc_Type	Text (12)	Type of structure	Basin/Culvert/Bridge/Trunk_ Drain/Building
6	File_Loc	Text (60)	Folder and file name of photo (for linking)	File name is to include structure ID and photo number (eg Photo1)
7	Easting	Double	Easting of location from which photo was taken	From survey where available, otherwise from best estimate using aerial photography
8	Northing	Double	Northing of location from which photo was taken	From survey where available, otherwise from best estimate using aerial photography
9	Desc_Direc	Text (60)	Description of photo (eg upstream side of culvert) or direction represented in photo (eg upstream from culvert)	From survey where available, otherwise from best estimate

8. Data storage

Data is to be stored as a feature class within a feature dataset titled “Floodplain_Structures”. An example feature dataset setup is provided in Figure 1.

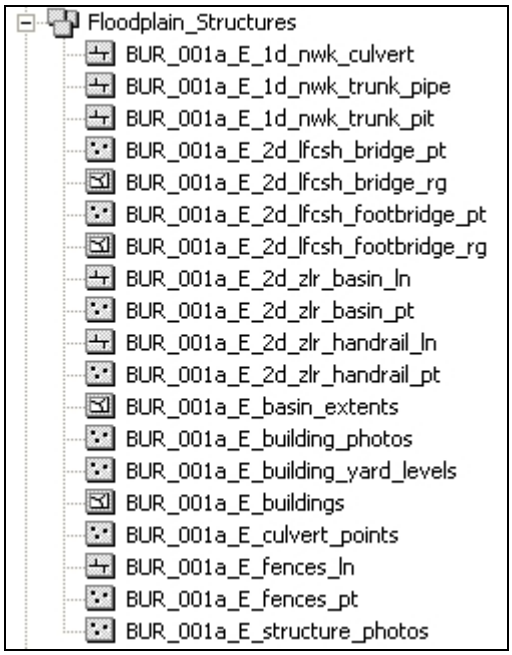

Figure 1 Feature Dataset Set-Up

9. TUFLOW layer generation

TUFLOW modelling requires a single 2d_zlr MID/MIF file. In order to develop the TUFLOW compatible file the following tasks will be required:

- Conversion from geodatabase to shapefile
- Conversion from shapefile to MapInfo (.tab)
- Consolidation of points and lines into a single layer
- Export from MapInfo to MID/MIF

The attribute properties are directly transferrable between Arc and MapInfo for the required TUFLOW fields (ie Double (Arc) = Float (MapInfo)).

10. Metadata

The Federal Geodetic Data Committee (FGDC) Metadata standard is to be used for metadata. As a minimum, the fields identified in each section below should be filled out. Section 0 presents the fields which are to be filled out for all layers produced and Sections 0 to 10.4 present the fields specific to each layer which are to be filled out.

The geodatabase templates which are available from Council have a large portion of the metadata already filled out. Sections which are still to be completed are defined within these templates.

10.1 Standard fields

Table 4 Standard Metadata Requirements

Section	Field	Detail to Include
Identification	Citation - Originator	Name of company responsible for development of layer
	Citation - Publication Date	Date of data supply to MBRC or other organisation
	General - Abstract	Set to “Detention basin information prepared for Stage XX of MBRC's Regional Floodplain Database project - XX catchment”
	General - Purpose	See layer specific details in following sections
	General - Supplemental Information	Set to “Refer to "Regional Floodplain Database Stage 2 - Data Standard – Detention Basins" and "Floodplain Structures Report - Regional Floodplain Database" for additional information”
	Time Period - Currentness Reference	Set to “Publication Date”
	Time Period - Calendar Date	Set to be the same as the publication date
	Status - Progress	Set to either “In Progress” or “Complete” depending upon status
	Status - Update Frequency	Set to “As Required”
	Spatial Domain - West Bounding Coordinate	Set to westernmost extent of catchment for which data is provided
	Spatial Domain - East Bounding Coordinate	Set to easternmost extent of catchment for which data is provided
	Spatial Domain - North Bounding Coordinate	Set to northernmost extent of catchment for which data is provided
	Spatial Domain - South Bounding Coordinate	Set to southernmost extent of catchment for which data is provided
	Keywords - Theme	Set two keywords “Detention Basin” and “Floodplain”
	Point of Contact - Person	Name of person responsible for development of layer
	Point of Contact - Organisation	Name of company responsible for development of layer
	Point of Contact - Contact Voice Telephone	Contact telephone number for person responsible for development of layer
	Point of Contact - Contact Email Address	Contact email address for person responsible for development of layer
Data Quality		See layer specific details in Sections 0 to 10.4
Entity Attribute		See layer specific details in Sections 0 to 10.4
Metadata Reference	Contact Details - Person	Name of person who developed the metadata
	Contact Details - Organisation	Name of company who developed the metadata
	Contact Voice Telephone	Contact phone number for person who developed the metadata
	Contact Email Address	Contact email address for person who developed the metadata

10.2 2d_zlr layer

Table 5 2d_zlr Metadata Requirements

Section	Field	Detail to Include
Identification	General - Purpose	For lines set to “Line data of basin embankment locations. Intended use is for TUFLOW modelling of embankment crests. Line file is to be coupled with point file of the same file name” For points set to “Point data of basin embankment crest elevations. Intended use is for TUFLOW modelling of basin embankments. Point file is to be coupled with line file of the same file name”
Data Quality	Attribute Accuracy - Accuracy Report	Set to “Individual value within the “RELIABILIT” field relates to accuracy of the data. The meaning of these values is described below”
	Attribute Accuracy - Value	Set three values, 1, 2 and 4
	Attribute Accuracy - Explanation	Value 1 - Indicates that all required details were sourced from survey Value 2 - Indicates that all required details were sourced from LiDAR data Value 4 - Indicates that all data was assumed
	Positional Accuracy - Horizontal Accuracy - Accuracy Report	Set to “Individual value within the “RELIABILIT” field relates to accuracy of the data. The meaning of these values is described below”
	Positional Accuracy - Horizontal Accuracy - Value	Set three values, 1, 2 and 4
	Positional Accuracy - Horizontal Accuracy - Explanation	Value 1 - ±XXmm Value 2 - ±XXmm Value 4 - Accuracy not quantifiable
	Positional Accuracy - Vertical Accuracy - Accuracy Report	Set to “Individual value within the “RELIABILIT” field relates to accuracy of the data. The meaning of these values is described below”
	Positional Accuracy - Vertical Accuracy - Value	Set three values, 1, 2 and 4
	Positional Accuracy - Vertical Accuracy - Explanation	Value 1 - ±XXmm Value 2 - ±XXmm Value 4 - Accuracy not quantifiable
Entity Attribute	Attribute - General - Definition	Definition for each attribute can be sourced from the “Brief Description” fields in Table 2
	Attribute - General - Definition Source	Definition source for each attribute can be sourced from the “Source” field in Table 2

10.3 Basin polygons layer

Table 6 Basin Polygons Metadata Requirements

Section	Field	Detail to Include
Identification	General - Purpose	Set to “Polygon data defining the extents over which the basin H-S relationships for WBNM are derived”
Data Quality	Attribute Accuracy - Accuracy Report	Set to “Accuracy is not important to this layer”
Entity Attribute	Attribute - General - Definition	Definition for each attribute can be sourced from the “Brief Description” fields in Table 1
	Attribute - General - Definition Source	Definition source for each attribute can be sourced from the “Source” field in Table 1

10.4 Photographs layer

Table 7 Photographs Metadata Requirements

Section	Field	Detail to Include
Identification	General - Purpose	Set to “Point data of floodplain structure photo locations. Intended use is to assist with TUFLOW modelling of floodplain structures”
Data Quality	Attribute Accuracy - Accuracy Report	Set to “Accuracy is not important to this layer”
Entity Attribute	Attribute - General - Definition	Definition for each attribute can be sourced from the “Brief Description” field in Table 3
	Attribute - General - Definition Source	Definition source for each attribute can be sourced from the “Source” field in Table 3

Appendix E
Data Standard - Buildings

Data Standard - Buildings Regional Floodplain Database - Stage 2 Moreton Bay Regional Council

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aurecon

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0	21 July 2010	First draft	CLS	TC	TDG	TDG

Contents

List of Tables

1. Introduction

This data standard has been developed as part of a pilot study for Stage 2 of the Regional Floodplain Database project. It has been developed based upon the generation of the buildings layer for the Burpengary Creek pilot catchment. The aim of this data standard is to identify a consistent approach that can be applied to future studies/study components. The files generated using this standard are suitable for input to TUFLOW modelling and also for providing additional supporting information where available.

This data standard has been written based upon the assumption that GIS layers will be developed in ArcGIS.

2. Initial data requirements

To assist with development of the buildings data, the following GIS layers are required from MBRC:

- Buildings layer showing existing digitised building extents
- Aerial photography
- Preliminary mapping peak depth results for the 100 year ARI and PMF events

In addition to GIS data, any existing building information will be required, including pre-existing floor level survey.

3. Datasets to be developed

Generation of four layers will provide the ultimate building dataset. These layers are:

- Buildings – layer of building footprints and building information
- Yard levels – layer of point objects representing front and back yard elevations
- Fences – layer of fence locations and crest elevations
- Photographs – layer of geo-referenced points linked to photographs

Dataset naming is to adhere to the following convention:

- Model domain/catchment identifier eg BUR
- Model generation number eg 001, 002, 003
- Sub-generation identifier eg a, b, c
- Scenario eg E, F, May09 (ie Existing, Future, Historic)
- File type eg 1d_nwk
- Other details eg photos

Example file names for the two datasets are:

- BUR_001a_E_buildings
- BUR_001a_E_yard_levels
- BUR_001a_E_fences
- BUR_001a_E_building_photos

4. Gap analysis

Analysis of existing MBRC building data is necessary to identify buildings requiring survey. Survey will be required for buildings which are predicted to be inundated and for which no existing building floor level information is available.

The following process will allow identification of buildings to be surveyed:

- Comparison of the building layer to the flood extent layers and identification of all buildings which fall within the flood extents
- Removal of all buildings with a floor area of less than 80 m^2 (this should remove a large number of sheds and leave mostly houses remaining)
- GIS based visual comparison of remaining buildings and aerial photography to identify the primary building on each property (ie to remove sheds). This visual comparison should also ensure all buildings are identified, especially in areas of new development. Google Earth and NearMap may assist in some cases
- Review of available minimum habitable floor level data and identification of properties for which no information exists – these are the buildings requiring survey
- Setting of survey priority based upon the following classifications
  - priority high = survey required and maximum 100 yr ARI flood depth > 0.3 m
  - priority medium = survey required and maximum 100 year ARI flood depths < 0.3 m
  - priority low = survey required and inundated by PMF

It may be necessary to liaise with Council regarding some of the buildings identified in the process above. For example, buildings within special use areas may not require survey (eg treatment plant, equestrian centre etc). These buildings will need to be identified and discussed on a case-by-case basis.

Based upon the number of buildings identified, it will be necessary to liaise with Council to determine which priority levels are to be surveyed.

5. Survey brief

An example survey brief is presented in this section.

Table 1 Survey Data Capture Requirements

Item[1]	Description	Data Type	Width	Decimals	Domain/Remark
Property type	Type of property	Text	12	0	Residential/ commercial/ industrial
Residential building type	Type of building if residential property	Text	12	0	House/ townhouse/ unit block/shed/ other
Business/industry name	Name of business	Text	60	0	
No. of storeys	Number of storeys	Integer	4	0	

Item[1]	Description	Data Type	Width	Decimals	Domain/Remark
Construction material	Primary construction material type	Text	20	0	Timber/ double brick/ brick veneer/ masonry block/ concrete/stone/ fibro/steel/other
Foundations	Foundation construction type	Text	20	0	Slab on ground/ stumps/other
Condition	Building condition	Text	10	0	Good/average/ poor
Minimum habitable floor level	Level of lowest habitable floor	Double	12	3	
Garage floor level	If different to minimum habitable floor level	Double	12	3	
No. of buildings on property	Number of separate buildings on the property, including sheds	Integer	4	0	
Fence type[2]	Type of fence – particularly with regard to the capacity of the fence to pass water through	Text			None/solid/ partially open/ open/other
Fence material	Primary type of fencing material	Text	20	0	Barbed wire/ brush/timber/ metal/brick/ chain wire/ metal slats/other
Fence crest levels[3]	Survey of elevations along the top of fences	Double	12	3	
Photo georeference[4]	Coordinates of photo locations	Double	12	3	

[1] The details presented in Table 1 are required for each separate residential/business building upon a property (sheds are not required unless they are for a business). Where there are multiple residential/business buildings upon a property (eg townhouses), survey details are required for each building with a different floor level. If a number of buildings have the same floor level notes indicating the number of buildings of the same floor level are required.

[2] Partially open would relate to fences such as picket or paling fences, open would relate to fences such as barbed wire, chain wire or tubular metal slats

[3] A minimum of two survey points is required at each end of the fence. If the grade of the fence is not constant points are also required at each change in grade location.

[4] A minimum of 1 photo is required for each building surveyed. The photo(s) should show the condition of the building and the foundation type. Other photographs which validate the above information may also be required (especially with where the Domain/Remark has been selected as "other")

Please note that:

- All data is to be delivered in MGA coordinates with the origin of coordinates (PM number), coordinate values and estimated accuracy provided. Accuracy is to be 4th order or better
- All heights are to be on AHD datum with origin datum supplied. Accuracy is to be 4th order or better
- The data is to be supplied in ESRI shape file or csv format
- GPS (RTK) methods are acceptable and will achieve the desired accuracies. Ensure there are redundant checks to verify the accuracy

In addition to the text provided above:

- A figure showing the survey locations will need to be prepared
- A table indicating the building addresses is to be included. An example of the detail required is provided in Table 2. This table needs to be rationalised such that each address is only presented once

Table 2 Properties Requiring Survey

House Number	Road	Locality	Lot	Plan	Survey Priority	No. Buildings ID'd for Survey

6. GIS layers

6.1 Templates

Geodatabase templates are available from Council for each of the GIS datasets to be developed. These databases have the layer attributes defined as specified in Sections 6.2 to 6.5 and may assist with generating these files correctly. These templates also have metadata attached with many sections of the metadata already completed.

Template layerfiles are also available to show the preferred styles to be adopted for each dataset.

6.2 Buildings layer

The intention of the buildings layer is to provide sufficient information to undertake property stage-damage calculations.

The buildings layer is to be generated as defined in the following sections.

6.2.1 Spatial representation

Buildings are to be represented as a single hatched dark green polygon covering the extents of the building footprint. These extents are to be based upon the GIS layer provided by Council. Where additional buildings or building extensions are identified the extents of these are to be digitised based upon aerial photographs.

6.2.2 Layer attributes

The attributes presented in Table 3 are to be included in the buildings layer. These attributes should provide all information required to undertake stage-damage calculations.

Table 3 Buildings Layer Attributes

Column	GIS Attribute*	Properties	Brief Description*	Source
1	Domain	Text (3)	Model domain identifier	From MBRC hydrography
2	Locality	Text (40)	Suburb within which building sits	From MBRC cadastral database
3	Road	Text (40)	Street name of property upon which building sits	From MBRC cadastral database

Column	GIS Attribute*	Properties	Brief Description*	Source
4	House_No	Text (10)	Street number of property upon which building sits	From MBRC cadastral database
5	Lot	Text (10)	Lot number of property upon which building sits	From MBRC cadastral database
6	Plan	Text (20)	Plan ID of property upon which building sits	From MBRC cadastral database
7	Prop_Type	Text (12)	Type of property	Residential/commercial/ industrial
8	Res_Type	Text (12)	Type of building if residential property	House/townhouse/unit block/ shed/other
9	Bus_Name	Text (60)	Name of business if business/industrial property	From survey where available, otherwise from pre-existing information
10	Bus_Cat	Text (40)	Category of industry type	ANZSIC Standard Industrial Classification
11	Bldg_Area	Double	Building footprint area	Area of building polygon object
12	No_Storeys	Short Integer	Number of storeys	From survey where available, otherwise from pre-existing information
13	Bldg_Mat	Text (20)	Primary construction material type	Timber/ double brick/brick veneer/ masonry block concrete/stone/ fibro/steel/other
14	Found_Type	Text (20)	Foundation construction type	Slab on ground/stumps/other
15	Condition	Text (10)	Building condition	Good/average/poor
16	Min_Flr_El	Double	Elevation of lowest habitable floor	From survey where available, otherwise from pre-existing information
17	Grg_Flr_El	Double	If different to minimum habitable floor level	From survey where available, otherwise from pre-existing information
18	No_Bldgs	Short Integer	Number of separate buildings on the property, including sheds	From survey where available, otherwise from pre-existing information
19	Reliabilit	Short Integer	Index of data reliability	Integer relating to data source (see below)
20	Priority	Text (6)	Survey priority	Based upon ARI and depth of inundation – determined during gap analysis phase
21	Surv_Sourc	Text (20)	Company who collected survey data	Eg “MBRC”
22	Surv_Tech	Text (10)	Survey technique used	Eg “RTK GPS”
23	Surv_Date	Text (6)	Month and year of survey	Eg “Dec09”

The “Reliabilit” attribute relates to the integrity of the data used. The following rating is to be adopted:

- 1 – all required details sourced from survey
- 2 – building floor level sourced from survey and all other data assumed
- 3 – building floor level sourced from pre-existing data and all other data assumed
- 4 – building floor level sourced from LiDAR DEM and all other data assumed

6.3 Yard levels layer

The intention of this layer is to provide additional detail for Council to use in building assessment. The data in this layer will not directly impact upon the stage-damage calculations.

For each property identified as being inundated, two point objects are to be provided, one in the centre of the front yard and one in the centre of the rear yard. It is not necessary to locate these objects in the exact centre of the yard and approximate locations will be acceptable. These point objects are to be represented as dark green dots/circles.

The attributes presented in Table 4 are to be included in this layer.

Table 4 Yard Points Layer Attributes

Column	GIS Attribute	Properties	Brief Description	Source
1	Elev_mAHD	Double	Elevation in centre of yard	From LiDAR DEM
2	Domain	Text (3)	Model domain identifier	From MBRC hydrography
3	Locality	Text (40)	Suburb within which building sits	From MBRC cadastral database
4	Road	Text (40)	Street name of property upon which building sits	From MBRC cadastral database
5	House_No	Text (10)	Street number of property upon which building sits	From MBRC cadastral database
6	Lot	Text (10)	Lot number of property upon which building sits	From MBRC cadastral database
7	Plan	Text (20)	Plan ID of property upon which building sits	From MBRC cadastral database

6.4 Fence layer

The intention of this layer is to provide additional detail for Council to use in building assessment. The data in this layer will not directly impact upon the stage-damage calculations. If required, this layer will be useable within a TUFLOW model to test the impacts of fence blockage. In this case it will become a 2d_zlr layer. The organisation of this layer has been set out such that no additional manipulation will be required to produce the 2d_zlr layer.

Fence data is not required if no survey data of the fence has been obtained.

The fence layers (points and polylines) are to be generated as per the following sections.

6.4.1 Spatial representation

A layer of point objects along the fence lines will be required. As a minimum point objects are required at each end of the fence. Additional point objects are to be included along the fence at locations where survey was obtained. These point objects should be displayed as light green stars.

Point object elevations are to be sourced from survey where it is available. In cases where survey is not available at the end of the fence, the elevation can be calculated based upon the height of other sections of the fence and ground elevations from the LiDAR DEM.

Individual polyline objects joining, and snapped to, all the point objects along each fence will be required (these are to be displayed as light green polylines). Polyline object locations are to be based upon survey.

6.4.2 Layer attributes

Table 5 presents the attributes which are to be included in the fence dataset. The first column must contain elevation details so it can be used for TUFLOW modelling if required. The remaining attributes will provide additional information. Both the points and the lines layers need to contain the same attributes.

Table 5 Fence Layer Attributes

Column	GIS Attribute*	Properties	Brief Description*	Source
1	Elev_mAHD	Double	Elevation at point locations along the top of the fence	From survey where available, otherwise from LiDAR DEM and estimation of fence height
2	Domain	Text (3)	Model domain identifier	From MBRC hydrography
3	Fence_Type	Text (20)	Type of fence – particularly with regard to the capacity of the fence to pass water through	Solid/partially open/open/other
4	Fence_Mat	Text (20)	Primary type of fencing material	Barbed wire/brush/timber/ metal/brick/chain wire/metal slats/other
5	Reliabilit	Short Integer	Index of data reliability	Integer relating to data source (see below)
6	Surv_Sourc	Text (20)	Company who collected survey data	Eg “MBRC”
7	Surv_Tech	Text (10)	Survey technique used	Eg “RTK GPS”
8	Surv_Date	Text (6)	Month and year of survey	Eg “Dec09”

The “Reliabilit” field relates to the integrity of the data used. The following rating is to be adopted:

- 1 – all required details sourced from survey
- 2 – fence elevations sourced from survey and locations assumed based upon aerial images
- 3 – not used
- 4 – all data assumed

6.5 Photographs

A GIS layer is to be developed in which point objects are linked to available photographs of the buildings. This intention of this layer is to provide the calculator of stage-damages with additional information to assist with calculations. The GIS layer is to include the attributes presented in Table 6.

Photograph point objects are to be represented as pink stars.

Table 6 Photograph Layer Attributes

Column	GIS Attribute*	Properties	Brief Description*	Source
1	Domain	Text (3)	Model domain identifier	From MBRC hydrography
2	Locality	Text (40)	Suburb within which building sits	From MBRC cadastral database
3	Road	Text (40)	Street name of property upon which building sits	From MBRC cadastral database
4	House_No	Text (10)	Street number of property upon which building sits	From MBRC cadastral database
5	Lot	Text (10)	Lot number of property upon which building sits	From MBRC cadastral database
6	Plan	Text (20)	Plan ID of property upon which building sits	From MBRC cadastral database
7	File_Loc	Text (60)	Folder and file name of photo (for linking)	File name is to include structure ID and photo number (eg Photo1)
8	Easting	Double	Easting of location from which photo was taken	From survey where available, otherwise from best estimate using aerial photography
9	Northing	Double	Northing of location from which photo was taken	From survey where available, otherwise from best estimate using aerial photography
10	Desc_Direc	Text (60)	Description of photo (eg upstream side of culvert) or direction represented in photo (eg upstream from culvert)	From survey where available, otherwise from best estimate

7. Data storage

Data is to be stored as feature classes within a feature dataset titled “Floodplain_Structures”. An example feature dataset setup is provided in Figure 1.

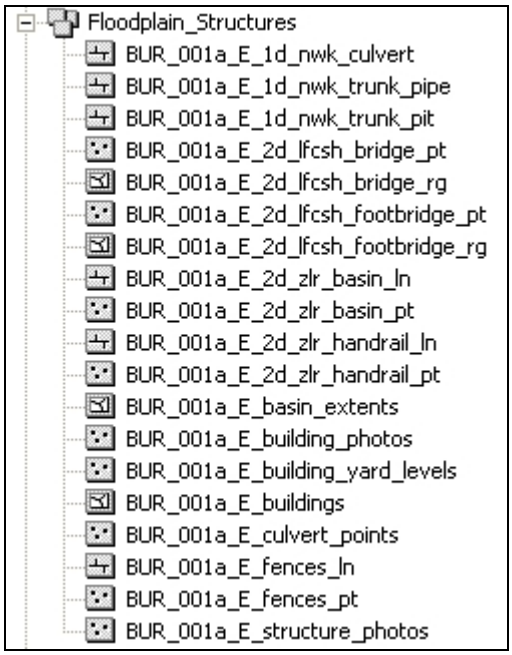


Figure 1 Feature Dataset Set-Up

8. TUFLOW layer generation

8.1 2d_zlr layer

If it is necessary to prepare a fence layer for modelling, TUFLOW requires a single 2d_zlr MID/MIF file. In order to develop the TUFLOW compatible file the following tasks will be required:

- Conversion from geodatabase to shapefile
- Conversion from shapefile to MapInfo (.tab)

- Consolidation of points and lines into a single layer
- Export from MapInfo to MID/MIF

The attribute properties are directly transferrable between Arc and MapInfo for the required TUFLOW fields (ie Double (Arc) = Float (MapInfo)).

9. Metadata

The Federal Geodetic Data Committee (FGDC) Metadata standard is to be used for metadata. As a minimum, the fields identified in each section below are to be filled out. Section 9.1 presents the fields which are to be filled out for all layers produced and Sections 0 to 9.5 present the fields specific to each layer which are to be filled out.

The geodatabase templates which are available from Council have a large portion of the metadata already filled out. Sections which are still to be completed are defined within these templates.

9.1 Standard fields

Table 7 Standard Metadata Requirements

Section	Field	Detail to Include
Identification	Citation - Originator	Name of company responsible for development of layer
	Citation - Publication Date	Date of data supply to MBRC or other organisation
	General - Abstract	Set to “Buildings information prepared for Stage XX of MBRC's Regional Floodplain Database project - XX catchment”
	General - Purpose	See layer specific details in following sections
	General - Supplemental Information	Set to “Refer to "Regional Floodplain Database Stage 2 - Data Standard - Buildings" and "Floodplain Structures Report - Regional Floodplain Database" for additional information”
	Time Period - Currentness Reference	Set to “Publication Date”
	Time Period - Calendar Date	Set to be the same as the publication date
	Status - Progress	Set to either “In Progress” or “Complete” depending upon status
	Status - Update Frequency	Set to “As Required”
	Spatial Domain - West Bounding Coordinate	Set to westernmost extent of catchment for which data is provided
	Spatial Domain - East Bounding Coordinate	Set to easternmost extent of catchment for which data is provided
	Spatial Domain - North Bounding Coordinate	Set to northernmost extent of catchment for which data is provided
	Spatial Domain - South Bounding Coordinate	Set to southernmost extent of catchment for which data is provided
	Keywords - Theme	Set two keywords “Building” and “Floodplain”
	Point of Contact - Person	Name of person responsible for development of layer
	Point of Contact - Organisation	Name of company responsible for development of layer
	Point of Contact - Contact Voice Telephone	Contact telephone number for person responsible for development of layer
	Point of Contact - Contact Email Address	Contact email address for person responsible for development of layer
Data Quality		See layer specific details in Sections 9.2 to 9.5
Entity Attribute		See layer specific details in Sections 9.2 to 9.5
Metadata Reference	Contact Details - Person	Name of person who developed the metadata
	Contact Details - Organisation	Name of company who developed the metadata
	Contact Voice Telephone	Contact phone number for person who developed the metadata
	Contact Email Address	Contact email address for person who developed the metadata

9.2 Buildings layer

Table 8 Buildings Metadata Requirements

Section	Field	Detail to Include
Identification	General - Purpose	Set to “Polygon data of building locations. Intended use is for stage-damage assessments of flooded buildings”
Data Quality	Attribute Accuracy - Accuracy Report	Set to “Individual value within the RELIABILIT field relates to accuracy of the data. The meaning of these values is described below”
	Attribute Accuracy - Value	Set four values, 1-4
	Attribute Accuracy - Explanation	Value 1 - Indicates that all required details were sourced from survey Value 2 - Indicates that building floor level was sourced from survey and all other details were assumed Value 3 - Not used Value 4 - Indicates that all data was assumed
	Positional Accuracy - Horizontal Accuracy - Accuracy Report	Set to “Individual value within the RELIABILIT field relates to accuracy of the data. The meaning of these values is described below”
	Positional Accuracy - Horizontal Accuracy - Value	Set four values, 1-4
	Positional Accuracy - Horizontal Accuracy - Explanation	Value 1 - ±XXmm Value 2 - ±XXmm Value 3 - Not used Value 4 - Accuracy not quantifiable
	Positional Accuracy - Vertical Accuracy - Accuracy Report	Set to “Individual value within the RELIABILIT field relates to accuracy of the data. The meaning of these values is described below.”
	Positional Accuracy - Vertical Accuracy - Value	Set four values, 1-4
	Positional Accuracy - Vertical Accuracy - Explanation	Value 1 - ±XXmm Value 2 - ±XXmm Value 3 - Not used Value 4 - Accuracy not quantifiable
Entity Attribute	Attribute - General - Definition	Definition for each attribute can be sourced from the “Brief Description” fields in Table 3
	Attribute - General - Definition Source	Definition source for each attribute can be sourced from the “Source” fields in Table 3

9.3 Yard levels layer

Table 9 Yard Levels Metadata Requirements

Section	Field	Detail to Include
Identification	General - Purpose	Set to “Point data at centre of front and rear yards. Intended use is to provide a detailed buildings dataset”
Data Quality	Attribute Accuracy - Accuracy Report	Set to “Horizontal accuracy is not critical to this layer. Vertical accuracy relates to Elev_mAHD only”
	Positional Accuracy - Horizontal Accuracy - Accuracy Report	Set to “Point object should be situated in the centre of the yard. Exact location is not critical to this layer”
	Positional Accuracy - Vertical Accuracy - Accuracy Report	Set to “Vertical accuracy is based upon vertical accuracy of LiDAR DEM and is ±XXmm”
Entity Attribute	Attribute - General - Definition	Definition for each attribute can be sourced from the “Brief Description” field in Table 4
	Attribute - General - Definition Source	Definition source for each attribute can be sourced from the “Source” field in Table 4

9.4 Fences layer

Table 10 Fences Metadata Requirements

Section	Field	Detail to Include
Identification	General - Purpose	For lines set to “Line data of fence locations. Intended use is to provide a detailed buildings dataset. Data may possibly be used for TUFLOW modelling. Line file is to be coupled with points file of the same file name” For points set to “Point data of fence elevations. Intended use is to provide a detailed buildings dataset. Data may possibly be used for TUFLOW modelling. Points file is to be coupled with line file of the same file name”
Data Quality	Attribute Accuracy - Accuracy Report	Set to “Individual value within the RELIABILIT field relates to accuracy of the data. The meaning of these values is described below”
	Attribute Accuracy - Value	Set four values, 1-4
	Attribute Accuracy - Explanation	Value 1 - Indicates that all required details were sourced from survey Value 2 - Indicates that fence level was sourced from survey location was based upon aerial photography Value 3 - Not used Value 4 - Indicates that all data was assumed
	Positional Accuracy - Horizontal Accuracy - Accuracy Report	Set to “Individual value within the RELIABILIT field relates to accuracy of the data. The meaning of these values is described below”
	Positional Accuracy - Horizontal Accuracy - Value	Set four values, 1-4

Section	Field	Detail to Include
	Positional Accuracy - Horizontal Accuracy - Explanation	Value 1 - ±XXmm Value 2 - Accuracy not quantifiable Value 3 - Not used Value 4 - Accuracy not quantifiable
	Positional Accuracy - Vertical Accuracy - Accuracy Report	Set to “Individual value within the RELIABILIT field relates to accuracy of the data. The meaning of these values is described below”
	Positional Accuracy - Vertical Accuracy - Value	Set four values, 1-4
	Positional Accuracy - Vertical Accuracy - Explanation	Value 1 - ±XXmm Value 2 - ±XXmm Value 3 - Not used Value 4 - Accuracy not quantifiable
Entity Attribute	Attribute - General - Definition	Definition for each attribute can be sourced from the “Brief Description” field in Table 5
	Attribute - General - Definition Source	Definition source for each attribute can be sourced from the “Source” field in Table 5

9.5 Photographs layer

Table 11 Photographs Metadata Requirements

Section	Field	Detail to Include
Identification	General - Purpose	Set to “Point data of floodplain structure photo locations. Intended use is to provide a detailed buildings dataset”
Data Quality	Attribute Accuracy - Accuracy Report	Set to “Accuracy is not important to this layer”
Entity Attribute	Attribute - General - Definition	Definition for each attribute can be sourced from the “Brief Description” field in Table 6
	Attribute - General - Definition Source	Definition source for each attribute can be sourced from the “Source” field in Table 6

Appendix A
Australian and New Zealand Standard Industrial Classifications

Appendix A – Australian and New Zealand Standard Industrial Classification

Categories in the following table are based upon information extracted from:

Australian and New Zealand Standard Industrial Classification (2006)

Released by Australian Bureau of Statistics and Statistics New Zealand, 28 February 2006.

ABS cat no. 1292.0

http://www.ausstats.abs.gov.au/Ausstats/subscriber.nsf/0/10AD7A6DDB4190BFCA257122001ACD9E/$File/12920_2006.pdf

Division Code	Division	Subdivision Code	Subdivision	Group Code	Group
A	Agriculture, Forestry and Fishing	01	Agriculture	011	Nursery and Floriculture Production
				012	Mushroom and Vegetable Growing
				013	Fruit and Tree Nut Growing
				014	Sheep, Beef Cattle and Grain Farming
				015	Other Crop Growing
				016	Dairy Cattle Farming
				017	Poultry Farming
				018	Deer Farming
				019	Other Livestock Farming
		02	Aquaculture	020	Aquaculture
		03	Forestry and Logging	030	Forestry and Logging
		04	Fishing, Hunting and Trapping	041	Fishing
				042	Hunting and Trapping
		05	Agriculture, Forestry and Fishing Support Services	051	Forestry Support Services
				052	Agriculture and Fishing Support Services
B	Mining	06	Coal Mining	060	Coal Mining
		07	Oil and Gas Extraction	070	Oil and Gas Extraction
		08	Metal Ore Mining	080	Metal Ore Mining
		09	Non-Metallic Mineral Mining and Quarrying	091	Construction Material Mining
				099	Other Non-Metallic Mineral Mining and Quarrying
		10	Exploration and Other Mining Support Services	101	Exploration
				109	Other Mining Support Services

Division Code	Division	Subdivision Code	Subdivision	Group Code	Group
C	Manufacturing	11	Food Product Manufacturing	111	Meat and Meat Product Manufacturing
				112	Seafood Processing
				113	Dairy Product Manufacturing
				114	Fruit and Vegetable Processing
				115	Oil and Fat Manufacturing
				116	Grain Mill and Cereal Product Manufacturing
				117	Bakery Product Manufacturing
				118	Sugar and Confectionery Manufacturing
				119	Other Food Product Manufacturing
		12	Beverage and Tobacco Product Manufacturing	121	Beverage Manufacturing
				122	Cigarette and Tobacco Product Manufacturing
		13	Textile, Leather, Clothing and Footwear Manufacturing	131	Textile Manufacturing
				132	Leather Tanning, Fur Dressing and Leather Product Manufacturing
				133	Textile Product Manufacturing
				134	Knitted Product Manufacturing
				135	Clothing and Footwear Manufacturing
		14	Wood Product Manufacturing	141	Log Sawmilling and Timber Dressing
				149	Other Wood Product Manufacturing
		15	Pulp, Paper and Converted Paper Product Manufacturing	151	Pulp, Paper and Paperboard Manufacturing
				152	Converted Paper Product Manufacturing
		16	Printing (including the Reproduction of Recorded Media)	161	Printing and Printing Support Services
				162	Reproduction of Recorded Media

Division Code	Division	Subdivision Code	Subdivision	Group Code	Group
C	Manufacturing	17	Petroleum and Coal Product Manufacturing	170	Petroleum and Coal Product Manufacturing
		18	Basic Chemical and Chemical Product Manufacturing	181	Basic Chemical Manufacturing
				182	Basic Polymer Manufacturing
				183	Fertiliser and Pesticide Manufacturing
				184	Pharmaceutical and Medicinal Product Manufacturing
				185	Cleaning Compound and Toiletry Preparation Manufacturing
				189	Other Basic Chemical Product Manufacturing
		19	Polymer Product and Rubber Product Manufacturing	191	Polymer Product Manufacturing
				192	Natural Rubber Product Manufacturing
		20	Non-Metallic Mineral Product Manufacturing	201	Glass and Glass Product Manufacturing
				202	Ceramic Product Manufacturing
				203	Cement, Lime, Plaster and Concrete Product Manufacturing
				209	Other Non-Metallic Mineral Product Manufacturing
		21	Primary Metal and Metal Product Manufacturing	211	Basic Ferrous Metal Manufacturing
				212	Basic Ferrous Metal Product Manufacturing
				213	Basic Non-Ferrous Metal Manufacturing
				214	Basic Non-Ferrous Metal Product Manufacturing
		22	Fabricated Metal Product Manufacturing	221	Iron and Steel Forging
				222	Structural Metal Product Manufacturing
				223	Metal Container Manufacturing

Division Code	Division	Subdivision Code	Subdivision	Group Code	Group
C	Manufacturing	22	Fabricated Metal Product Manufacturing	224	Sheet Metal Product Manufacturing (except Metal Structural and Container Products)
				229	Other Fabricated Metal Product Manufacturing
		23	Transport Equipment Manufacturing	231	Motor Vehicle and Motor Vehicle Part Manufacturing
				239	Other Transport Equipment Manufacturing
		24	Machinery and Equipment Manufacturing	241	Professional and Scientific Equipment Manufacturing
				242	Computer and Electronic Equipment Manufacturing
				243	Electrical Equipment Manufacturing
				244	Domestic Appliance Manufacturing
				245	Pump, Compressor, Heating and Ventilation Equipment Manufacturing
				246	Specialised Machinery and Equipment Manufacturing
				249	Other Machinery and Equipment Manufacturing
		25	Furniture and Other Manufacturing	251	Furniture Manufacturing
				259	Other Manufacturing
D	Electricity, Gas, Water and Waste Services	26	Electricity Supply	261	Electricity Generation
				262	Electricity Transmission
				263	Electricity Distribution
				264	On Selling Electricity and Electricity Market Operation
		27	Gas Supply	270	Gas Supply
		28	Water Supply, Sewerage and Drainage Services	281	Water Supply, Sewerage and Drainage Services
		29	Waste Collection, Treatment and Disposal Services	291	Waste Collection Services
				292	Waste Treatment, Disposal and Remediation Services

Division Code	Division	Subdivision Code	Subdivision	Group Code	Group
E	Construction	30	Building Construction	301	Residential Building Construction
				302	Non-Residential Building Construction
		31	Heavy and Civil Engineering Construction	310	Heavy and Civil Engineering Construction
		32	Construction Services	321	Land Development and Site Preparation Services
				322	Building Structure Services
				323	Building Installation Services
				324	Building Completion Services
				329	Other Construction Services
F	Wholesale Trade	33	Basic Material Wholesaling	331	Agricultural Product Wholesaling
				332	Mineral, Metal and Chemical Wholesaling
				333	Timber and Hardware Goods Wholesaling
		34	Machinery and Equipment Wholesaling	341	Specialised Industrial Machinery and Equipment Wholesaling
				349	Other Machinery and Equipment Wholesaling
		35	Motor Vehicle and Motor Vehicle Parts Wholesaling	350	Motor Vehicle and Motor Vehicle Parts Wholesaling
		36	Grocery, Liquor and Tobacco Product Wholesaling	360	Grocery, Liquor and Tobacco Product Wholesaling
		37	Other Goods Wholesaling	371	Textile, Clothing and Footwear Wholesaling
				372	Pharmaceutical and Toiletry Goods Wholesaling
				373	Furniture, Floor Covering and Other Goods Wholesaling
		38	Commission-Based Wholesaling	380	Commission-Based Wholesaling

Division Code	Division	Subdivision Code	Subdivision	Group Code	Group
G	Retail Trade	39	Motor Vehicle and Motor Vehicle Parts Retailing	391	Motor Vehicle Retailing
				392	Motor Vehicle Parts and Tyre Retailing
		40	Fuel Retailing	400	Fuel Retailing
		41	Food Retailing	411	Supermarket and Grocery Stores
				412	Specialised Food Retailing
		42	Other Store-Based Retailing	421	Furniture, Floor Coverings, Houseware and Textile Goods Retailing
				422	Electrical and Electronic Goods Retailing
				423	Hardware, Building and Garden Supplies Retailing
				424	Recreational Goods Retailing
				425	Clothing, Footwear and Personal Accessory Retailing
				426	Department Stores
				427	Pharmaceutical and Other Store-Based Retailing
		43	Non-Store Retailing and Retail Commission-Based Buying and/or Selling	431	Non-Store Retailing
				432	Retail Commission-Based Buying and/or Selling
H	Accommodation and Food Services	44	Accommodation	440	Accommodation
		45	Food and Beverage Services	451	Cafes, Restaurants and Takeaway Food Services
				452	Pubs, Taverns and Bars
				453	Clubs (Hospitality)
I	Transport, Postal and Warehousing	46	Road Transport	461	Road Freight Transport
				462	Road Passenger Transport
		47	Rail Transport	471	Rail Freight Transport
				472	Rail Passenger Transport

Division Code	Division	Subdivision Code	Subdivision	Group Code	Group
I	Transport, Postal and Warehousing	48	Water Transport	481	Water Freight Transport
				482	Water Passenger Transport
		49	Air and Space Transport	490	Air and Space Transport
		50	Other Transport	501	Scenic and Sightseeing Transport
				502	Pipeline and Other Transport
		51	Postal and Courier Pick-up and Delivery Services	510	Postal and Courier Pick-up and Delivery Services
		52	Transport Support Services	521	Water Transport Support Services
				522	Airport Operations and Other Air Transport Support Services
				529	Other Transport Support Services
		53	Warehousing and Storage Services	530	Warehousing and Storage Services
J	Communication Services	54	Publishing (except Internet and Music Publishing)	541	Newspaper, Periodical, Book and Directory Publishing
				542	Software Publishing
		55	Motion Picture and Sound Recording Activities	551	Motion Picture and Video Activities
				552	Sound Recording and Music Publishing
		56	Broadcasting (except Internet)	561	Radio Broadcasting
				562	Television Broadcasting
		57	Internet Publishing and Broadcasting	570	Internet Publishing and Broadcasting
		58	Telecommunications Services	580	Telecommunications Services
		59	Internet Service Providers, Web Search Portals and Data Processing Services	591	Internet Service Providers and Web Search Portals
				592	Data Processing, Web Hosting and Electronic Information Storage Services

Division Code	Division	Subdivision Code	Subdivision	Group Code	Group
J	Communication Services	60	Library and Other Information Services	601	Libraries and Archives
				602	Other Information Services
K	Financial and Insurance Services	62	Finance	621	Central Banking
				622	Depository Financial Intermediation
				623	Non-Depository Financing
				624	Financial Asset Investing
		63	Insurance and Superannuation Funds	631	Life Insurance
				632	Health and General Insurance
				633	Superannuation Funds
		64	Auxiliary Finance and Insurance Services	641	Auxiliary Finance and Investment Services
				642	Auxiliary Insurance Services
L	Rental, Hiring and Real Estate Services	66	Rental and Hiring Services (except Real Estate)	661	Motor Vehicle and Transport Equipment Rental and Hiring
				662	Farm Animal and Bloodstock Leasing
				663	Other Goods and Equipment Rental and Hiring
				664	Non-Financial Intangible Assets (Except Copyrights) Leasing
		67	Property Operators and Real Estate Services	671	Property Operators
				672	Real Estate Services
M	Professional, Scientific and Technical Services	69	Professional, Scientific and Technical Services (Except Computer System Design and Related Services)	691	Scientific Research Services
				692	Architectural, Engineering and Technical Services
				693	Legal and Accounting Services
				694	Advertising Services

Division Code	Division	Subdivision Code	Subdivision	Group Code	Group
M	Professional, Scientific and Technical Services	69	Professional, Scientific and Technical Services (Except Computer System Design and Related Services)	695	Market Research and Statistical Services
				696	Management and Related Consulting Services
				697	Veterinary Services
				699	Other Professional, Scientific and Technical Services
		70	Computer System Design and Related Services	700	Computer System Design and Related Services
N	Administrative and Support Services	72	Administrative Services	721	Employment Services
				722	Travel Agency and Tour Arrangement Services
				729	Other Administrative Services
		73	Building Cleaning, Pest Control and Other Support Services	731	Building Cleaning, Pest Control and Gardening Services
				732	Packaging Services
O	Public Administration and Safety	75	Public Administration	751	Central Government Administration
				752	State Government Administration
				753	Local Government Administration
				754	Justice
				755	Government Representation
		76	Defence	760	Defence
		77	Public Order, Safety and Regulatory Services	771	Public Order and Safety Services
				772	Regulatory Services
P	Education and Training	80	Preschool and School Education	801	Preschool Education
				802	School Education
		81	Tertiary Education	810	Tertiary Education

Division Code	Division	Subdivision Code	Subdivision	Group Code	Group
P	Education and Training	82	Adult, Community and Other Education	821	Adult, Community and Other Education
				822	Educational Support Services
Q	Health Care and Social Assistance	84	Hospitals	840	Hospitals
		85	Medical and Other Health Care Services	851	Medical Services
				852	Pathology and Diagnostic Imaging Services
				853	Allied Health Services
				859	Other Health Care Services
		86	Residential Care Services	860	Residential Care Services
		87	Social Assistance Services	871	Child Care Services
				879	Other Social Assistance Services
R	Arts and Recreation Services	89	Heritage Activities	891	Museum Operation
				892	Parks and Gardens Operations
		90	Creative and Performing Arts Activities	900	Creative and Performing Arts Activities
		91	Sports and Recreation Activities	911	Sports and Physical Recreation Activities
				912	Horse and Dog Racing Activities
				913	Amusement and Other Recreation Activities
		92	Gambling Activities	920	Gambling Activities
S	Other Services	94	Repair and Maintenance	941	Automotive Repair and Maintenance
				942	Machinery and Equipment Repair and Maintenance
				949	Other Repair and Maintenance
		95	Personal and Other Services	951	Personal Care Services
				952	Funeral, Crematorium and Cemetery Services

Division Code	Division	Subdivision Code	Subdivision	Group Code	Group
S	Other Services	95	Personal and Other Services	953	Other Personal Services
				954	Religious Services
				955	Civic, Professional and Other Interest Group Services
		96	Private Households Employing Staff and Undifferentiated Goods- and Service-Producing Activities of Households for Own Use	960	Private Households Employing Staff and Undifferentiated Goods- and Service-Producing Activities of Households for Own Use

Appendix F
Arc to MIF Conversion Tool

Appendix F – ArcGIS to MIF Conversion Tool

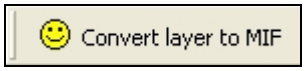
As an addition to the project, a tool has been developed for conversion of ArcGIS geodatabase and/or shape files to MID/MIF files (ie from ArcGIS to TUFLOW compatible format). This tool has been provided to Council as a toolbar button within an ArcMap template file.

This tool has been developed on the following basis:

- It assumes that the user has MapInfo's Universal Translator installed in the default directory (C:\Program Files\MapInfo\Professional\UT)
- It will convert files which are open in the ArcMap view to MID/MIF using Universal Translator. Files in the ArcMap view can be either geodatabase or shape files
- This tool will ask the user whether a "Short Integer" attribute type should be converted to "Logical". This is based upon the need to convert the "Ignore" attribute within a 1d_nwk file to a "Logical" attribute type for TUFLOW modelling

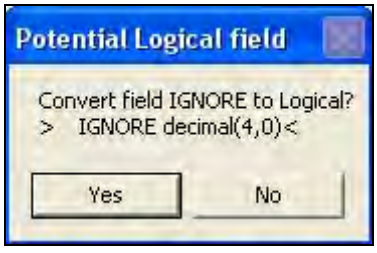
Steps

Steps for use of this tool include:

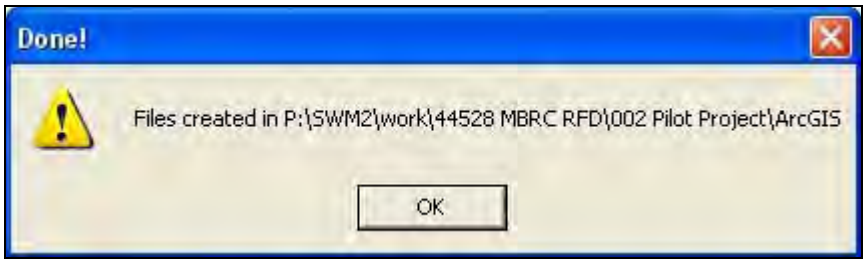
- Click on the toolbar button: 

- Select the file to be converted from the dropdown list of all files open in the ArcMap view. Also select the directory into which the output files should be written.

- Select whether any attributes need to be converted to a "Logical" attribute type in MID/MIF format (Should only apply to the "Ignore" attribute in a 1d_nwk)



- Once the process is complete a “Done!” window will appear.



Limitations

Limitations of the tool include:

- ArcGIS “Short Integer” type is converted to MID/MIF “Small Integer” type. The TUFLOW manual specifies that “Integer” type be used for some attributes (eg 1d_nwk “Conn_No” and “Number_of” attributes). Tests have shown that TUFLOW models will run with these attribute types set to either “Integer” or “Short Integer”
- Only one file is converted at a time
- This tool does not join polygons/lines/points layers into a single MID/MIF file – this still needs to be done manually

Further development of this tool could remove these limitations.