



TABLE OF CONTENTS

1.0	ENGINEERING REPORTS	1
1.1	GENERAL	1
1.2	GEOTECHNICAL ASSESSMENT	1
1.3	HYDROLOGIC AND HYDRAULIC ASSESSMENT	1
1.3.1	<i>Objective</i>	1
1.3.2	<i>Standard</i>	1
1.3.3	<i>General</i>	1
1.3.4	<i>Plans and Figures</i>	2
1.3.5	<i>Cross Sections and Longitudinal Sections</i>	2
1.3.6	<i>Model Schematisations</i>	3
1.3.7	<i>Report Structure</i>	3
1.3.8	<i>Mathematical Models</i>	4
1.3.9	<i>Manual Calculations</i>	5
1.3.10	<i>Resubmissions</i>	5
2.0	DRAWINGS	6
2.1	GENERAL	6
2.2	STANDARDS	6
2.2.1	<i>General</i>	6
2.2.2	<i>Sheet Sizes</i>	6
2.2.3	<i>Scales</i>	7
2.2.4	<i>Survey Datum</i>	7
2.2.5	<i>Dimensioning</i>	7
2.3	FUNCTIONAL TRAFFIC LAYOUT	8
2.4	STREET NAMING AND NUMBERING	9
2.5	LANDSCAPE MANAGEMENT AND SITEWORKS PLAN	9
2.6	TRAFFIC SIGNS AND PAVEMENT MARKING	11
2.7	LEADING DRAWING	14
2.8	EARTHWORKS	14
2.9	ROADS	14
2.9.1	<i>Layout</i>	14
2.9.2	<i>Longitudinal Section</i>	15
2.9.3	<i>Cross Section</i>	15
2.9.4	<i>Details</i>	16
2.10	STORMWATER DRAINAGE	17
2.10.1	<i>Layout</i>	17
2.10.2	<i>Longitudinal Section</i>	17
2.10.3	<i>Details</i>	18
2.11	ASSET REGISTER	20

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1.0 ENGINEERING REPORTS

1.1 GENERAL

This section is intended to provide guidance to Developers and Consultants in the preparation of engineering reports as part of the submission to support the development application.

Prior to any engineering assessment, it is recommended that the terms of reference be discussed with Council to establish a clear understanding of issues, methodologies, and report objectives. A suitably qualified Registered Professional Engineer Queensland (RPEQ) should certify all engineering submissions.

Unless noted otherwise, Council submission should comprise:

- Three (3) sets of hardcopy reports and supporting plans.
- If required, a digital copy (floppy diskette or CD-ROM) of mathematical modelling input and output files.

1.2 GEOTECHNICAL ASSESSMENT

The report should cover stability and erodility issues including but not limited to:

- Visual aspects of the site.
- Conditions of the area.
- Soil characterisation.
- Probability of slip failure.
- Factor of safety.
- Impacts of development on surface water runoff.
- Measures to mitigate soil movement.
- Recommendations.

1.3 HYDROLOGIC AND HYDRAULIC ASSESSMENT

1.3.1 Objective

Hydrologic and hydraulic submissions should demonstrate that the proposed development would not adversely impact on flooding to upstream, downstream or adjacent properties. The reliability of the assessment approach should be proven together with the accuracy of the base data used.

1.3.2 Standard

The hydrologic and hydraulic assessment report should be of standard that address the requirements set out in subsequent [Sections 1.3.3 to 1.3.10](#).

1.3.3 General

Application details

Report should include property address, development name (if applicable) and development application reference number.

Report certification

Report should include author's name and qualifications and signed/certified by an RPEQ suitably qualified in the field of drainage/hydraulic investigations. The date and



version number of the report should be clearly presented on a Document Control page at the start of the report.

Transfer of copyright

All reports submitted to Council should state that both the report and associated computer data files may be used by the Brisbane City Council in the future, for whatever purposes the Council requires.

1.3.4 Plans and Figures

Every report should include:

- A locality plan.
- A catchment plan detailing internal and external drainage catchments and their respective areas.
- A site plan describing the site in its existing state.
- A proposal plan describing the proposed works generally, including staging.
- Where applicable, the details of drainage easements associated with underground drainage, open channel drainage or overland flow paths should be clearly presented. In the case of overland flow paths, finished ground surface levels should be shown.
- Where applicable, a comparison of existing and proposed extents of flood inundation should be presented.
- Where applicable, detailed plans for any proposed waterway structures, which are signed/certified by an RPEQ.

Catchment plans, site plans and proposal plans should be drawn to scale. Site plans and proposal plans should show and clearly distinguish between existing and proposed ground levels and surface treatments. The source of ground survey data should be clearly identified. Generally, only certified survey from a registered surveyor will be accepted. Extents of existing and proposed structures should be included.

The level of detail required to describe proposed works may vary depending on the level of development approval sought. All reports submitted in support of Applications for Operational Works and/or Building Work should specifically refer to engineering drawings that define the proposed works. The drawings should show the proposed extent and levels of filling and excavation relative to cadastral boundaries. Waterway Corridors, if present, should be shown. For dams and retention basins, plans should include cross sections of embankments, spillways and any other inlet and/or outlet structures.

1.3.5 Cross Sections and Longitudinal Sections

Reports should include plots of cross sections for both the pre and post development cases. These plots should in some way enable the cross-referencing of ground coordinates on a cross section plot to the plan view of ground level contours (or spot levels) and the hydraulic model data files. For this reason, cross sections should be drawn to scale and include:

- Cadastral boundaries, or a survey traverse line of adequate dimensions, so as to allow the cross section coordinates to be accurately transcribed onto a plan, in relation to cadastral boundaries.
- At least two offset stations (x-value) shown within the cross section to facilitate comparison with the cross section coordinates within the model data files.



The report should also include plots of cross sections located downstream of the proposed development site, and particularly those which the analysis identifies as acting as flow controls. Such cross sections would usually be associated with culverts and bridges, weirs and causeway, and flow constrictions.

The supporting drawings should include a longitudinal section of all proposed drainage works. Starting tailwater levels used in the hydraulic grade line analysis are to be clearly shown.

1.3.6 Model Schematisations

Layouts of mathematical models should be clearly shown in the report. It is essential that the report include plans showing the locations of model cross sections for both the pre and post development cases. These plans should be to scale and include cadastral boundaries. Alternatively, a survey traverse line, which can be linked back to cadastral boundaries, may be included.

For major hydraulic studies involving extensive creek/river modelling, cross sections should be marked on an aerial photograph base. The plan should indicate on each section the extents of each roughness segment and the value of its roughness parameter. If there are construction works involved then the ultimate layout should also be shown on this plan, but in a contrasting colour so that scenarios can be compared.

1.3.7 Report Structure

The report should be structured to include:

- Objectives of the report.
- Reference to any previous or associated reports.
- Brief description of the development proposal and background details.
- How the relevant hydrologic, hydraulic and drainage issues are addressed.
- Clear description of the assessment methodology used, including justification and any limitations or assumptions.
- Discussion on the sensitivity analyses undertaken for the proposal, including identification and justification of the adopted parameters and/or results.
- Hydraulic results for should be summarised in clearly formatted tables. The results should include cross section reference, design discharges, water surface levels, energy grade lines, flow velocities, flow depths, depth velocity product, etc. The relative differences between the results of pre and post development scenarios should also be presented. Other modelling results should be included where these are needed to justify the acceptability of the proposal. Comprehensive modelling results should be incorporated into an appendix. Where possible, the results presented should be verified by other valid “quick check” methods such as hand calculations. For example, modelled head loss values may be verified using manual calculation methodologies outlined in the publication *Waterway Design: A Guideline to the Hydraulic Design of Bridges, Culverts and Floodways* (Austroads, 1994).
- Conclusions that summarise the analysis results/findings and any impacts created by the proposal. Conclusions should include a clear statement as to why the report/proposal should be approved.
- A listing of all references used. If the reference is obscure, photocopies of the relevant sections of the source material should be provided.



1.3.8 Mathematical Models

Modelling softwares

To enable timely assessment by Council within the nominated response timeframe, the following industry standard modelling softwares should be used. (Note: Where donated assets are involved, the softwares listed below should be used to enable integration with Council database system).

- Runoff routing hydrologic models: RAFTS, WBNM.
- Drainage analysis: DRAINS (ILSAX), XP-STORM (SP-UDD), PC-Drain.
- Steady state hydraulic model: HEC-RAS (developed by the US Army Corps of Engineers).
- Unsteady flow hydraulic model: MIKE-11 hydrodynamic model (developed by the Danish Hydraulic Institute).

Other mathematical modelling softwares may be accepted but this should be checked with Council prior to the commencement of any model simulations. As a minimum, the submission should be accompanied by:

- Basic parameters.
- Input data files.
- Output summary files.
- Relevant documentation relating to the program to enable deciphering and interpretation of the input and output files.
- Verification of models using industry standard techniques. For example, predicted peak discharges may be checked using the Rational Method, and predicted peak flood levels may be checked with a basic HEC-RAS backwater model.

Model setup

A general description of the model setup should be included in the report. The information provided should enable the reader to understand how the various characteristics of the site and/or catchment have been incorporated into the submitted model.

Model parameters and assumptions

The report should justify the basis of the values adopted for the hydrologic and hydraulic modelling parameters used in the analysis. Parameters to be considered include, but are not limited to:

- Rainfall loss values.
- Sub-catchment fraction imperviousness.
- Flow velocity estimates.
- Manning's 'n' roughness values.
- Flow contraction and expansion coefficients.
- Structure hydraulic headloss coefficients.
- Other hydraulic headlosses.

In presenting hydrologic calculations, the report should define the ultimate land uses of the upstream catchment and the waterway/overland flow treatments that act to characterise flow velocities and times of concentration.



Hydraulic calculations should include a description of downstream flow controls. The report should explain the basis for the values of the starting water levels adopted in a Hydraulic Grade Line calculation for pipe flow, or backwater analysis. The report should also explain the assumptions used in the analysis of waterway structures.

Exceptions to default parameters

Reports describing studies of extensive river systems and large catchments often involve a large amount of data and hence involve the estimation and incorporation of a large number of hydraulic parameters. It is not uncommon in such reports that the values of certain parameters are held constant over the entire analysis, effectively ascribing “default” values to these parameters. This may be acceptable, however, the report should clearly state where exceptions to these default values have been used. It is preferable that both the default values and these exceptions are summarised in the form of a table.

Model calibration

The demonstration of the calibration of a computer model (where required) should be presented in the form of a table of results. The table should compare modelled results with either recorded data or results obtained by other valid methods of calculation. Variations between the data sets should be explained and justified. Where appropriate, the results of a consistency check between hydrologic and hydraulic model discharges should be presented.

Computer model files

The report should include a comprehensive listing of the computer model files used in the hydraulic assessment together with an explanation as to what these files represent. Any naming conventions used should be clearly explained. Particular model execution parameters such as modelling timesteps, run durations, etc, should also be included.

1.3.9 Manual Calculations

Hand calculations should be legible and presented neatly in a logical and easy-to-follow format. Equations and/or information sources used in the analysis should be referenced, and if the reference is obscure, then photocopies of the relevant sections of the source material should be provided. The adopted analytical parameters should be substantiated with explanations.

1.3.10 Resubmissions

Major amendments

Major amendments generally have an impact over the entire report. These amendments may be required at such times following a change in the development proposal layout, changes in the approach to the analysis or modelling, or errors in the calculations and results. Major amendments should be reported by a full resubmission of the report, with a new Revision Letter shown on the Document Control page. Amended reports should be written so that the reader is not required to refer to previous reports or Council files in order to understand the report. Resubmissions should clearly reference the previously submitted reports.

Minor amendments

In cases where amendments are deemed to be minor, involving only the correction of a couple of pages, resubmission of only the amended pages may be satisfactory, provided that an updated Document Control page is also submitted showing the new Revision Letter for the report.



Additional information

In instances where additional information is provided in support of a report, the information may be provided as an Addendum Report or Appendix to the report. This is on the basis that the additional information is not based on a proposal layout, data, calculations, results or recommendations which conflict with the original report; and does not require further clarification of how this additional information relates to the original report.

An example of such information would be a table of results for an average recurrence interval storm different to that provided in the original report (provided that all underlying calculations are based on the same approach as that used in the original report).

2.0 DRAWINGS

2.1 GENERAL

This section is intended to provide guidance to Developers and Consultants in the preparation of engineering, architectural and landscape drawings as part of the submission to support the development or operational work applications. Drawings should reflect the intent of these guidelines and the professionalism of the Consultant in designing works that are fit for purpose.

All engineering drawings should be uniquely referenced and require the full signature of a suitably qualified engineer, registered with the Board of Professional Engineers, Queensland and the RPEQ number and date, in the title block.

Unless noted otherwise, Council submission should comprise five (5) sets of drawings in one of the following forms:

- Two sets of A1 and three sets of A3. Typically this applies to major subdivisions.
- Five sets of A3. Typically this applies to smaller developments where the resolution of the A3 is sufficient to depict the proposed works.

2.2 STANDARDS

2.2.1 General

The draftsmanship should be of a standard that is normally accepted in good civil engineering and architectural practice, generally in accordance with the requirements of *AS 1100 Technical Drawing*. Substandard drawings and poorly presented calculation tables may be rejected. In this instance, the applicant may be required to resubmit plans accompanied by any additional payable fees.

2.2.2 Sheet Sizes

The preferred sizes of drawing sheets are:

- A1 size (594 mm x 841 mm cut sheet dimensions).
- A3 size (297 mm x 420 mm cut sheet dimensions).



2.2.3 Scales

The chosen scale for a drawing should permit easy and clear interpretation of the information depicted. Where full size drawings are reduced, appropriate block/graduated or prefix scales should be provided to enable interpretation of dimensions specified in the reduction copies.

The preferred scales for use should generally conform to the recommendations of AS 1100. The recommended scales are 1:1, 1:2, 1:5 and multiplying the aforementioned scales by integral powers of 10. Multiples and submultiples of 10 for scales 1:25 and 1:125 are not preferred but may be accepted.

The following scales are suggested for particular uses but these may be varied as appropriate to the works concerned.

- Plans - 1:1000 or 1:500. Roofwater reticulation layout plans should be drawn in the 1:500 scale.
- Longitudinal Sections - Horizontal 1:1000 and Vertical 1:100 or Horizontal 1:500 and Vertical 1:50.
- Intersection Details - 1:200, 1:100 or 1:250.
- Cross Sections - 1:100.
- Engineering Details - 1:20 or 1:10.

2.2.4 Survey Datum

Level information should be referenced to the Australian Height Datum (AHD). Position coordinates should be tied to the GDA94 datum based on the Mapping Grid of Australia (MGA) coordinate system.

2.2.5 Dimensioning

Units

All dimensions should be expressed in metric units. Linear dimensions on all roadworks plans should be in metres, with the exception of some detail plans of small structures (eg manholes) and some standard plans (eg kerb and channel), which may be in millimetres.

Levels

Reduced levels of benchmarks and reference pegs including permanent survey marks should be expressed to three decimal places eg 0.001 m. Reduced levels of roadworks and stormwater drainage may be expressed rounded to three decimal places eg 0.001 m.

Chainages

Chainages on plans should be expressed to three decimal places eg 0.001 m.

Cross section intervals

Road cross sections should be provided at 20.0 m intervals, with further subdivision of 10.0 m to 5.0 m intervals where necessary at horizontal or vertical curvatures.

Grades

Road and pipe grades should be shown to three significant figures eg 2.300%.



2.3 FUNCTIONAL TRAFFIC LAYOUT

To avoid the need for changes to detailed design of roadworks in respect of horizontal alignments, intersections, channelisations and the like, the functional layout plans should be submitted to Council for approval. **One (1) set of the approved subdivision layout plans should accompany the application before any assessment can proceed.** Once functional layouts are approved, the detailed engineering design can be undertaken.

Approved functional layout plans that also incorporate traffic signs and/or pavement markings does not obviate the need of the applicant to submit a separate application for the approval of traffic signs and pavement marking drawings (refer Section 2.6).

Functional layouts submitted by the applicant should show at least the following information:

1. Background information that includes:
 - Design philosophy or concept description.
 - Design speed for each road type.
 - Reasons for access arrangement.
2. A plan, drawn to scale, showing all relevant existing details, that includes:
 - Land use of adjacent sites and sites opposite the development.
 - Existing intersections and vehicular entrances in the vicinity.
 - Existing road layout.
 - Existing services which have an impact on the layout.
 - Existing pavement marking.
 - Existing trees.
3. Proposed roadworks/channelisation layout, drawn to scale, that includes:
 - Critical dimensions.
 - Proposed pavement marking, including lane marking with lane widths.
 - Relationship of work with other stages.
 - Limit of Brisbane City Council responsibility where other authorities are involved eg Queensland Department of Main Roads.
 - All allotments and property boundaries.
4. Any other information considered necessary by the Council to adequately assess the performance of the facility.

The 1:250 scale is recommended for intersections and 1:500 scale for more extensive roadworks. A North Point should be shown on all plans. If the development is at or near an intersection, a plan of the entire intersection is required ie showing all existing legs (not part of the intersection only).



2.4 STREET NAMING AND NUMBERING

Applications and plans for proposed street names and numbers should be lodged with Licensing Sealing & Certificates Unit, Development & Regulatory Services. **One (1) set of the approved subdivision layout plans and one (1) set of the approved functional layout plans should accompany the application before any assessment can proceed.** Eight (8) sets of street naming and numbering plans, preferably in A3 sizes, should be submitted. It is recommended that this application be lodged for approval as soon as possible after functional layout plan approval to avoid any delay in sealing the survey plan in the event that the street names applied for are not approved and need to be resubmitted.

2.5 LANDSCAPE MANAGEMENT AND SITEWORKS PLAN

Landscape Management & Siteworks Plans¹ are generally submitted as part of the operational works application. The plans should be prepared by a suitably qualified Landscape Architect or Designer.

Street planting

Where the Developer elects to undertake landscaping of the road reserve instead of paying a monetary contribution, detailed landscape plans showing at least the following information should be submitted:

1. Road layout with property boundaries and lot numbers.
2. Road names.
3. Landscaping and tree planting within road reserve including roundabouts, speed control devices, and traffic islands.
4. All features relating to the landscaping such as concrete footpaths, mowing strips, retaining walls, fences, etc.
5. Location of trees, shrubs, etc with names and spacings.
6. A schedule of plant species with botanical and common names.
7. Any existing trees on site that will be retained.
8. The exact location of water meters and taps, if required.
9. Position of temporary irrigation system for the duration of the maintenance period.
10. Typical detail of planting hole which should include mulch type and depth, location of weed mat, depth and type of soil mix, root barrier, detail of drainage layers, etc.
11. The area (m²) of landscaping should be shown on the asset register.
12. Any landscaping associated with acoustic fencing, entrance features, street furniture, etc.

¹ Landscape Management & Siteworks Plan is the accepted Council terminology, but the plan can be referred to by other names such as a Landscape Plan.



Park embellishment

Landscape plans pertaining to park embellishment are required to show existing and proposed details including but not limited to:

1. Plan/s and section/s.
2. Contours and levels.
3. Existing vegetation and vegetation protection and management provisions.
4. Existing natural features to be retained and protected (eg wetlands, waterways, rock formations, etc).
5. Details of proposed hard and soft landscape construction works (eg planting plan, plant species schedule, surface treatments, structures).
6. Details of manufacturer and/or type of park equipment to be used in construction, such as play equipment, furniture etc.
7. The location of any stormwater quality management infrastructure to be constructed in the park including maintenance access to the infrastructure.
8. Reports on innovative works or infrastructure that contributes to achievement of the Desired Environmental Outcomes outlined in Brisbane City Plan.
9. A list of all major structural components, plumbing, playgrounds and heritage management works, etc, requiring private certification, including works requiring Registered Professional Engineer Queensland (RPEQ) certification.
10. A program of proposed maintenance works during the maintenance period, including monthly inspection reports to be submitted to Council detailing compliance with maintenance requirements.
11. An estimate of value of all assets to be provided in the park (eg fencing, picnic shelters, shade structures) for future asset management purposes.
12. An estimate of the likely annual operational and maintenance costs once the park is established and handed over to Council, for park maintenance and life cycle budgeting purposes.
13. Names and contact numbers of the developer, including the developer's representative, the Landscape Architect/Designer, the engineers responsible for the design and private certification of any engineering works and the landscape contractor (if known at the time).

Council Delegate will only approve the Landscape Management and Siteworks Plan that demonstrates compliance with the following minimum park standards, as specified in **Chapter 8 of Part B** of this document.

- Construction of vehicle barriers/bollards to prevent unauthorised access.
- Provision of a 25 mm reticulated water service and water meter.
- Provision of an electricity supply pillar.
- Removal of all weeds.
- Provision of earthworks, levelling, topsoiling and grassing, with perennial grasses, suitable for mowing to all open ground.
- Removal of dead trees or branches that may present a public risk.
- Removal of all rubbish.



Details of other works proposed in the park, which do not form part of the Landscape Management & Siteworks Plan, should be referred to on the plan (eg Vegetation Management, Rehabilitation and Environmental Management plans). The design and management of the park should be incorporated into the Erosion and Sediment Control Plan (refer to conditions of Development Approval).

Specific written approval is required where ancillary works are proposed in existing parks, such as stormwater discharge through a park into a waterway. Approval for this work should be obtained prior to the operational works application stage.

2.6 TRAFFIC SIGNS AND PAVEMENT MARKING

Applications and plans for traffic signs and pavement markings should be lodged with Council for approval. The initial submission should comprise two (2) sets of hardcopy paper plans. **One (1) set of the approved road layout plans and one (1) set of the approved street naming and numbering plans should accompany the application, before any assessment can proceed.**

The 1:250 or 1:500 scale plans should be drawn using Brisbane City Council's standard templates such as title blocks and symbols. The plans should also incorporate the Consultant's logo (the applicant can elect to use Brisbane City Council or an external engineering consultant) and Council's designated traffic area identification number.

The plans will need to incorporate existing and proposed details including but not limited to:

1. Real property boundaries and kerb lines.
2. Driveways.
3. Pavement marking. Existing markings that will be retained and proposed markings should be fully dimensioned. Thin dashed line should be used for existing markings that will be removed. Refer typical example given in [Figure D.1.1](#).
4. Signs eg parking signs, street name signs, etc. Proposed traffic signs should be shown using the standard sign code eg ERECT R2-14(L) and not shown as pictorial signs. Refer typical example given in [Figure D1.1](#).
5. Power poles and service pits.
6. Traffic signals. Refer typical example given in [Figure D1.2](#).
7. The preferred future road layout where the proposed streets may be in the future loop roads of cul-de-sacs.
8. Locality plan (for jobs proposing new roads).

The final submission should comprise:

- One (1) A1 size hardcopy on film.
- Three (3) A1 size hardcopies on paper.
- Electronic digital file (preferably AutoCAD drawing file) on floppy disk or CD-ROM.

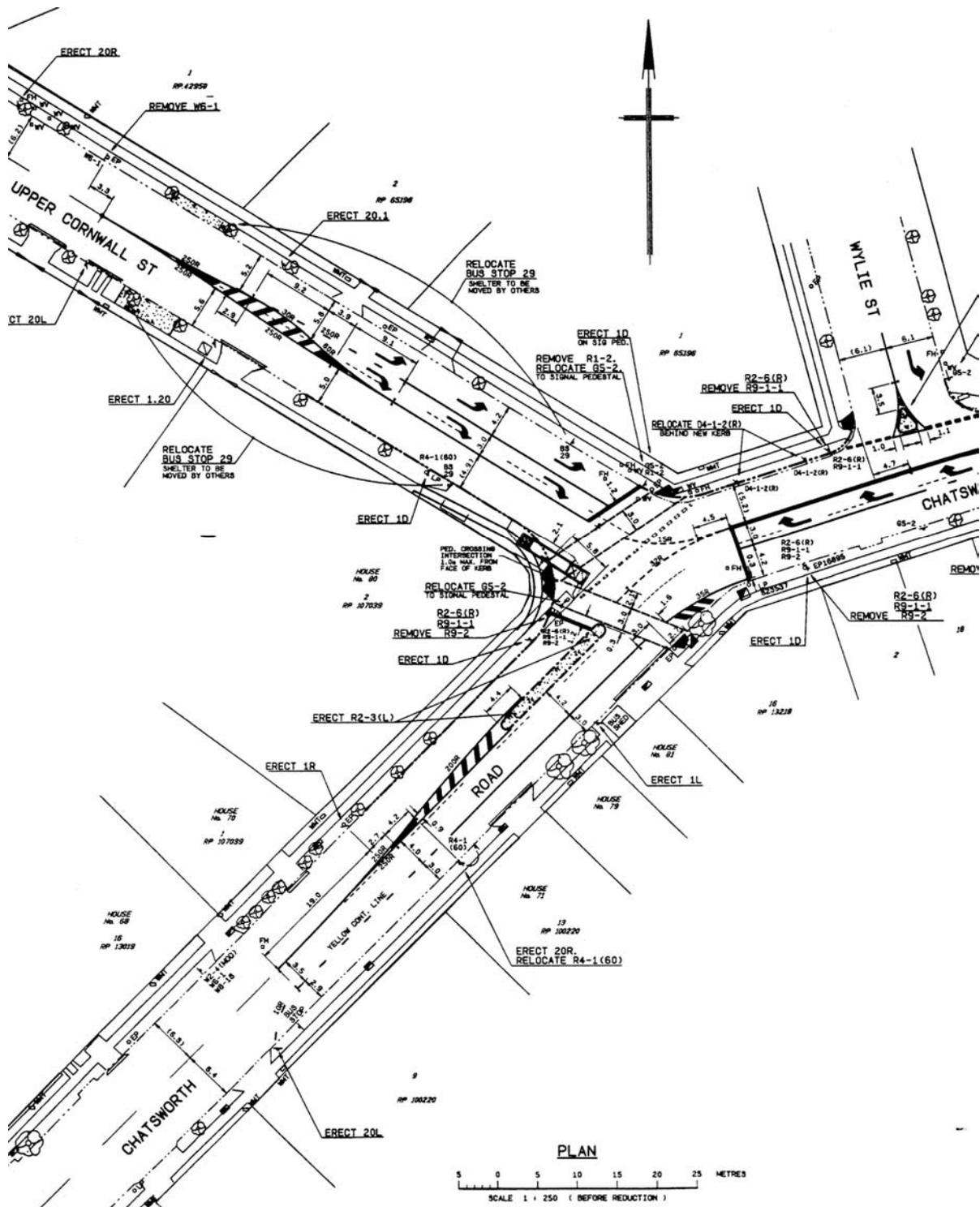


FIGURE D1.1
 TYPICAL EXAMPLE - SIGNS AND PAVEMENT MARKING PLAN



Urban Management Division
Subdivision and Development Guidelines
Part D Design & Construction Procedures

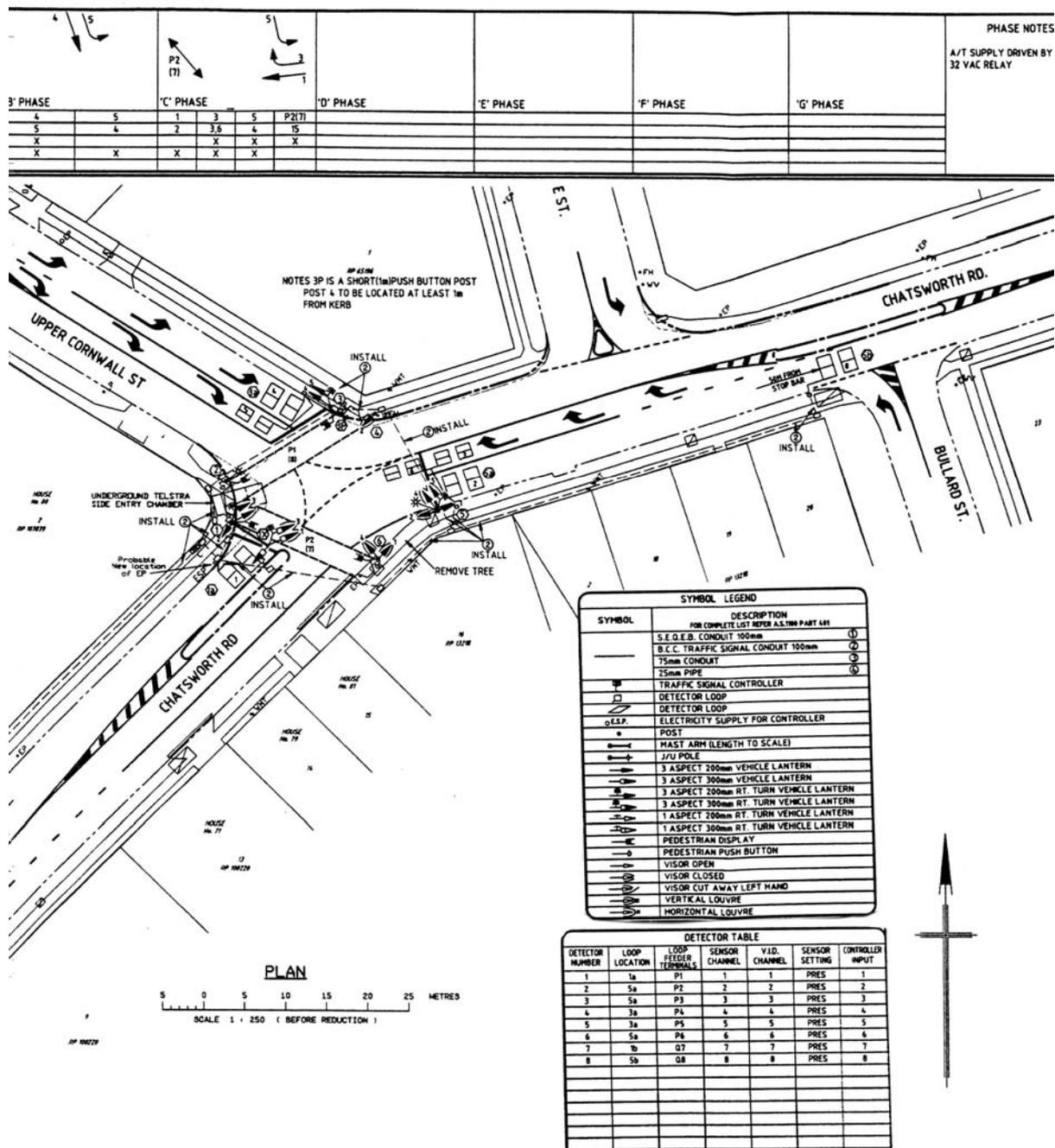


FIGURE D1.2
TYPICAL EXAMPLE – TRAFFIC SIGNALS PLAN



2.7 LEADING DRAWING

The leading drawing of the set of plans should contain the following information:

1. Council file reference number.
2. Site address (as per application).
3. Locality plan, clearly showing the stage boundary and adjacent stages if applicable.
4. Drawing index, including plans for other stages if applicable.
5. List of all Council standard drawings used.
6. List of all Consultant's standard drawings used (copies should be attached).
7. Full legend.
8. Asset register, refer [Section 2.11](#).

2.8 EARTHWORKS

Earthworks drawings are required to show all the following information:

1. Any contaminated soil areas.
2. Existing surface contours and/or levels.
3. Finished surface contours and/or levels.
4. Areas of cut.
5. Areas of fill and indicating any requirement for imported fill.
6. Slopes of cut batters and fill embankments.
7. Location and height of any earth retaining structures, such as boulder walls, concrete retaining walls, crib walls, etc.
8. Access to properties where crossfall of allotments is severe.
9. Details of minimum habitable floor levels should be clearly identified on the layout plan where allotments are filled to provide flood immunity.
10. Locations of soil stockpiles.
11. Indicate proposed methods for dust control.
12. Areas subject to Vegetation Protection Order.
13. Where cut and fill operations are near the boundary of adjoining private properties or public space, cross sections should be provided showing the finished levels and positions in relation to the property boundaries. Surface levels and any structures in the adjoining land should be shown. Also refer to [Chapter 3 of Part B of this document](#).
14. Details of proposed ground anchoring system. Refer to [Chapter 3 of Part B of this document](#) for requirements.

2.9 ROADS

2.9.1 Layout

One (1) set of the approved functional layout plans should accompany the road drawings before any assessment can proceed. Road layout plans are generally required to show the following information:

1. Legend.
2. Road reserve boundaries including any widening, and road identification.
3. Allotment boundaries with proposed lot number.
4. Road centreline, chainages, and bearings including chainages and centreline of intersecting streets.



5. Dimensioned road reserve, footpaths, pavement widths that are different from the standard cross section.
6. Location of existing services.
7. Proposed contours.
8. Proposed easements.
9. Stage boundaries.
10. Horizontal curve data.
11. Traffic islands.
12. Concrete footpaths.
13. Concrete bikeways.
14. Cut-off drains.
15. Vehicular crossings.
16. Areas of paver/stencil concrete treatment.
17. Side drains.
18. Location of guardrails and fences.
19. Pavement tapers.

2.9.2 Longitudinal Section

Road longitudinal section drawings are generally required to show the following information:

1. Chainages.
2. Existing surface levels.
3. Design road centreline.
4. Design kerb lip levels.
5. Cut and fill depths and/or volumes.
6. Grades.
7. Chainages and levels of grade intersection points.
8. Chainages and levels of tangent points of vertical curves.
9. Chainages and levels of crest and sag points.
10. Lengths and radii of vertical curves.
11. Superelevated curves.
12. Minimum or nominal asphalt surfacing and pavement thickness.
13. Scales.
14. Road names.
15. Datum.

2.9.3 Cross Section

Drawings of typical road cross sections are generally required to show all the following information, whereas items 10-12 are generally sufficient to depict the other sections.

1. Road reserve width.
2. Pavement widths.
3. Footpath widths.
4. Crossfall of pavement and footpath.
5. Pavement under kerb and channel, shoulder, traffic islands.
6. Existing services and proposed services.
7. Type of kerb and channel.



8. Subsoil drainage.
9. Road names.
10. Chainages.
11. Datum.
12. Natural surface and finished levels.
13. Position and size of concrete footpath/bikeway.
14. Traffic islands.

2.9.4 Details

Intersections/road widening

Drawings are generally required to show the following information:

1. Road names.
2. Stormwater drainage.
3. Lip levels.
4. Curve radius.
5. Adjacent lot numbers, point chainage and offset.
6. Tangent.
7. Road reserve.
8. Pavement contours at sufficient intervals.
9. Channelisation works.
10. Surface treatments.
11. Concrete footpath crossings/bikeway crossings.

Speed control devices

Drawings are generally required to show the following information:

1. As per intersections/road widening above.
2. Island geometry and levels.
3. Product code of devices.
4. Radii, chainage and offsets.
5. Island kerb.
6. Landscape area.

Pavers

Drawings are generally required to show the following information:

1. Restraints.
2. Pavements.
3. Drainage.
4. Type of paver eg colour, size, material, product code, manufacturer, etc.



2.10 STORMWATER DRAINAGE

2.10.1 Layout

Stormwater drainage layout plans are generally required to show the following information:

1. Legend.
2. Road reserve boundaries and road identification.
3. Allotment boundaries with proposed lot number.
4. Location of stormwater and roofwater lines (including size), manholes, gullies, outlets, inlets, roofwater inspection pits, etc.
5. Location of existing services.
6. Existing and proposed contours.
7. Proposed easements.
8. Stage boundaries.
9. Concrete footpaths.
10. Concrete bikeways.
11. Cut-off drains.
12. Vehicular crossings.
13. Side drains.
14. Location of flood regulation lines.
15. Position of the waterway eg centreline and top of bank.
16. Extents of overland flow path including cross sectional details.
17. Roofwater kerb adaptors in the kerb and channel.
18. Drawings should incorporate note that outlets in public space and waterways should be inspected before construction. Stormwater outlets in any public space (existing or newly created Council asset) should be addressed at the initial application (conceptual design) stage and not be deferred to the operational works assessment stage, as the method of stormwater conveyance and treatment could influence the development's design, layout and cost. Also refer to Chapter 6 of Part B of this document.

2.10.2 Longitudinal Section

Stormwater drainage longitudinal section drawings are generally required to show the following information:

1. Chainages.
2. Existing surface levels.
3. Design finished surface levels.
4. Pipe invert levels.
5. Manhole chainages.
6. Distance between manholes.
7. Grade of pipes.
8. Pipe capacity.
9. Pipe size.
10. Diameter of pipes.
11. Pipe class eg Class 2.
12. Pipe installation type eg H2 trench.



13. Trench construction method eg excavator wheel load, wacker packer, etc.
14. Hydraulic grade line including the corresponding water levels at junctions.
15. Design storm frequency.
16. Manhole diameters.
17. Invert levels of inlets/outlets. Details should be extended to include the free outlet or creek bed.
18. Gully numbers.
19. Depth to invert at manholes.
20. Datum.
21. Type of gully and size of lintel.
22. Service crossing.

2.10.3 Details

Manholes

Drawings are generally required to show the following information:

1. Connecting pipes.
2. Manhole/chamber size.
3. Identification number.
4. Location chainage.

Inlets/outlets

Drawings are generally required to show the following information:

1. Identification number
2. Thickness of walls and floor.
3. Reinforcing.
4. Type of treatment to prevent scour, eg energy dissipator.
5. Water quality management devices eg gross pollutant trap, sedimentation basin.
6. Type of grate – galvanised.
7. Surrounding levels eg waterway bed and banks.
8. Position in relation to waterway, property boundary, flow direction, flow velocity, etc.
9. Invert levels.
10. Surge structures.

Catchment plan

Drawings are generally required to show the following information:

1. Tabulation of catchment areas, slopes, runoff coefficient, design discharges, etc.
2. Layout with gully catchments.
3. Full external catchment with contours extending beyond the limits of the site.
4. Existing and proposed contours.

Stormwater drainage calculation sheet

Refer template outlined in [Supplement to QUDM, Chapter 2 of Part B of this document](#).



Open channel

Drawings are generally required to show the following information:

1. Top and toe of batters.
2. Cross sections.
3. Design levels.
4. Existing surface levels either by contours or spot levels, on the subject site and on the adjoining properties or road reserves.
5. Proposed spot levels and contours.
6. Proposed development and habitable floor levels.
7. Maintenance and/or safety berms.
8. Longitudinal section.
9. Landscaping details.

Detention/retention basin

Drawings are generally required to show the following information:

1. As per Open Channel above.
2. Side batters.
3. Spillway.
4. Low flow pipes.
5. Floor subsoil drainage.

Culverts

Drawings are generally required to show the following information:

1. Full structural details.
2. Handrails.
3. Scour protection.

Overland flow paths

Drawings are generally required to show the following information:

1. Existing surface levels, either by contours or spot levels, on the subject site and on the adjoining properties or road reserves or waterways.
2. Finished surface levels on the subject sites.
3. Proposed habitable floor and development levels.
4. Overland flow path widths and levels, and cross sections along the flow path for the design flows.
5. Existing drainage structures, including pipe sizes and levels, especially at the proposed discharge point.
6. Overland flow paths for the design storm other than in road reserves should be shown on separate drawings.