Johannesburg Roads Agency SOC Limited (JRA)

ROADS & STORMWATER
MANUAL

VOLUME 1
CODE OF PROCEDURE

Joburg
a world class African city

JRA

DISCLAIMER

This document is subject to change as and when required.

It is important to bear in mind that, when a development is the subject of the application of material contained in this document, each proposed development will be assessed on merit and site specific conditions.

CONTENTS

(Contents continued)

(Contents continued)

(Contents continued)

(Contents continued)

(Contents continued)

(Contents continued)

Subject **Page**

(Contents continued)

FIGURES:

(Contents continued)

(Contents continued)

DEFINITIONS

In this Code, unless the context indicates otherwise, the following terms have the meanings shown:

TERM	DEFINITION
A	
Adjacent Property	Means a property which has one or more common boundaries with another property regardless of whether such properties have separate owners, were acquired in ownership at different times, are situated in different catchment areas or municipal areas or are separated from each other by a private road or private right of way.
Agency	Means the Johannesburg Roads Agency (Pty) Ltd
Amendment Scheme	Means an Amendment Scheme as defined by the Town Planning and Township Ordinance (1986) or any other procedure whereby effect is given to implement a **development.**
Applicant	Means any person or entity legally empowered to apply for a **development**, as defined by relevant legislation.
Approved Township	Means an Approved Township as defined in the Town Planning and Township Ordinance (1986) or any other **development** established in terms of any other law that will result in a **development** that complies with the definition of "township" in terms of the Ordinance.
Assessor	Means the professional engineer or technologist who undertakes a traffic assessment on behalf of the Applicant. Such professional must have the qualifications as prescribed by COTO in TMH16.
Attenuation Facility	Means any drainage facility designed to store stormwater for gradual release of that stormwater by infiltration into the soil or into an existing drainage system.
Authorised agent	An agent authorised by Council to perform specified services.
Authorised person	(a) a **wayleave holder**; (b) a licensee who has submitted notice in accordance with the requirements of the By-Laws.
B	
Backfill	Approved compacted material to replace excavated material up to ground level or the underside of pavement layer works, whichever is lesser.
Best Management Practice	Means any physical, structural or managerial practice tht, when used singly or in combination with any other such practice, prevents or reduces pollution of stormwater, erosion or sedimentation which may be caused by stormwater, and which has been approved by the Council
Boundary Service	Means an engineering service at or on a boundary of a township, subject to TMH15.

TERM	DEFINITION
Buffer	Means an area or strip of land on a development site or property which is to be or is utilised for the management of stormwater or conservation of riparian habitat as defined in section 1 of the National Water Act, 1998 (Act No 36 of 1998).
C	
Catchment Area	Means an area of land in its natural state, from which stormwater runoff originates.
Catchment Area Plan	Means a plan and all implementing rules and procedures relating to such plan, including land use management for managing surface water and stormwater quality, any facility for managing the quantity of such water and any drainage feature within a catchment area.
Connection	Means the connection between two services. In the case of roads, this is the junction or intersection between different roads.
Contractor	A company, authority or person carrying out work within the road reserve.
Council	Means: (a) the Metropolitan Municipality of the City of Johannesburg established by Provincial Notice No 6766 dated 1 October 2000, as amended, exercising its legislative and executive authority through its municipal Council; or (b) its successor in title; or (c) a structure or person exercising a delegated power or carrying out an instruction, where any power (in By-Laws) has been delegated or sub-delegated, or an instruction given, as contemplated in section 59 of the Local Government: Municipal Systems Act, 2000 (Act No 32 of 2000).
D	
Design Storm Event	Means a theoretical storm event which generates stormwater, of a given frequency interval and duration, used in the analysis and design of a stormwater facility.
Detention Facility	Means a stormwater facility designed to store stormwater, gradually releasing it at a pre-determined controlled rate, and includes any appurtenance associated with its design function, maintenance or security.
Developed Property	Means the condition of a property following completion of a development, or if a property is developed in phases, any phase of development on that property.
Developer	Means any person undertaking or proposing to undertake a development and includes the developer of a township.
Development	Means any lawful procedure whereby a township is established, a property is subdivided, a property is consolidated, the lawful land use of a property is changed or a combination of one or more of the foregoing.
Development Site	Means the whole or portion of any property or township which it is proposed to develop or is in the process of being developed.

TERM	DEFINITION
E	
Ecosystem	A dynamic complex of plant, animal and micro-organism communities and their non-living environment, interacting as a functional unit.
Engineering Services	Means the provision of water, electricity and sewerage (essential engineering services) and the provision and construction of streets, roads and stormwater drainage systems.
Engineering Service Contribution Policy	Means the engineering service contribution policy of the Municipality.
Environment	The surroundings within which humans exist and that are made up of: (a) land, water atmosphere of the earth; (b) micro-organisms, plant and animal life; (c) any part or combination of the above, and the interrelationships between them; and (d) the physical, chemical, aesthetic and cultural properties and conditions of the above that influence health and well-being.
Environmental Impact Assessment (EIA)	a process by which the environmental consequences of a proposed activity or project are evaluated and alternatives are analysed. EIA is an integral part of the planning and decision-making processes.
F	
Footway	see Sidewalk
G	
H	
I	
Inspector	a person designated by the Johannesburg Roads Agency to supervise, inspect and approve work within a road reserve.
J	
JRA	Means the Johannesburg Roads Agency
K	

TERM	DEFINITION
L	
Lane Rental	The rental which is paid to the JRA by an authorised person whose work in the road reserve results in time delay costs (TDC) being incurred by the users of the road reserve.
M	
Municipal Road	Means any public road as defined in terms of a Municipal Ordinance, and includes all works or things of whatever nature which form part of or connected to a road, roadway, road reserve, sidewalks, cycle tracks, traffic circles, traffic islands, kerbing, embankments or cuttings, culverts, drains, parapets, bridges, fences, causeways or fords, road traffic signs, distance indicators and any diversion or portion of a road.
N	
O	
P	
Pavement (layers)	the selected layers, subbase, base and surfacing comprising a roadway, sidewalk or cycle track.
Precautionary Principle	a principle of national and international environmental law that states that lack of full scientific certainty must not be used as a reason for postponing cost-effective measures to prevent environmental degradation.
Prior Development Area	is a geographic area defined and/or adopted by the Municipality where bulk services have already been installed or where provision has been made in the Integrated Development Plan for bulk services in that area or any area designated as such in terms of the statutory powers of the Municipality and where a budget has been made available for the provision of such services.
Q	

TERM	DEFINITION
R	
Reinstatement	work necessary to restore the road reserve and all features contained within it to the same or a better state than existed before the activities which altered the original state.
Road	includes streets, roads, lanes or any other public thoroughfare such as bridges, causeways, fords, shoulders, sidewalks and cycle tracks for the use of vehicular or pedestrian traffic.
Road Contribution Account	Is a capital account (or vote) within the Capital Replacement Reserve of the municipality that is utilised for the purposes of funding engineering services.
Road Reserve	land registered as road reserve in cadastral diagrams, or any other erven, servitudes or remainders which are registered or vested in the name of the road authority and which are used or reserved for road purposes; this excludes non-road servitudes, nature trails or recreational areas except where they lie within a road reserve (see work within the road reserve).
Road Authority	
S	
Services	the generation, supply, distribution, transmission, transportation, storage of electricity, signals, liquids or gasses for the consumption, use or other benefit of others.
Sidewalk	a formally constructed paved strip or area within a road reserve for use by pedestrians (this may be shared with cyclists when designated by the appropriate regulatory road traffic sign).
Site Development Plan (SDP)	plan that a municipality requires of a land owner intending to erect or alter any building or structure on a site.
Site Traffic Assessment (STA)	the assessment of accesses, the site circulation system and transportation facilities proposed in a Site Development Plan or during Township Establishment.
Sustainable Development	the integration of social, economic and environmental factors into planning, implementation and decision making so as to ensure that development serves present and future generations.
T	
Time Delay Costs	

TERM	DEFINITION
Township Establishment	The establishment of a township in terms of the relevant legislation.
Traffic	The movement of vehicles, bicycles and pedestrians within a road reserve.
Traffic Accommodation	Specific safety measures put in place to protect the general public, including workers, during road construction and maintenance within a road reserve.
Traffic Impact Assessment (TIA)	The assessment of the impact of a proposed change in land use on the transportation system.
Trenchless Technology	Methods of installing pipes or sleeves under a road without disturbing the road surface structure using, but not limited to, boring, jacking horizontal directional grade and alignment control equipment.
Township Establishment	The establishment of a township in terms of the relevant legislation.
U	
V	
W	
Wayleave	formal approval to carry out works in the road reserve
Wayleave Holder	company to which a wayleave has been issued
Work within the road reserve	Includes work within property building line restrictions adjacent to a road reserve relevant to specific classes of road.
X	
Y	
Z	

ACRONYMS

In this Code and related material, unless the context indicates otherwise, the following acronyms have the derivations shown:

BAR	Basic Assessment Report (wrt EIA)
COTO	Committee of Transport Officials
DEA	Department of Environmental Affairs
DFA	Development Facilitation Act, 67 of 1995
DWA	Department of Water Affairs
EAP	Environmental Assessment Practitioner
ECA	Environmental Conservation Act, 73 of 1989
EIAR	Environmental Impact Assessment Report
EMP	Environmental Management Programme
IA	Impact Assessment
I&AP	Interested & Affected Party
MAP	Mean Annual Precipitation
MHI	Major Hazard Installation wrt Major Hazard Installation Regulations made under the Occupational Health & Safety Act, 85 of 1993
NEMA	National Environmental Management Act, 107 of 1998
NEMAA	National Environmental Management amendment Act,62/2008
NEM:AQA	National Environmental Management: Air Quality Act, 39/2004
NEMBA	National Environmental Management Biodiversity Act, 10/2004
NEM:WA	National Environmental Management: Waste Act, 59 of 2008
NHRA	National Heritage Resources Act, 25 of 1999
NWA	National Water Act, 59 of 2008
PAIA	Promotion of Access to Information Act, 2 of 2000
PAJA	Promotion of Administrative Justice Act, 3 of 2000
PPP	Public Participation Process
SAHRA	South African Heritage Resources Agency
SDF	Spatial Development Framework
SEA	Strategic Environmental Assessment
SR	Scoping Report
SEMA	Specific Environmental Management Act
TMH	Technical Methods for Highways (COTO manuals)
TOR	Terms of Reference

FORWARD

Although the JRA is solely responsible for its own road network, the value of other services in the road reserve are often more than that of the road itself and therefore require as much or more maintenance, rehabilitation and replacement. These activities, together with the work that has to be carried out on the road itself, result in considerable delays, inconvenience, danger and additional costs to the road users. Furthermore, any work which is done in the road reserve can have serious cost implications as a result of any of the following:

- Damage to roads and other services;
- Damage to vehicles;
- Injury to vehicle occupants, cyclists or pedestrians;
- Reduction in the effective life of the roadway, cycle track/lane, sidewalk, or any other services or facilities; and
- Time and social costs caused by delays.

There is therefore a need to ensure careful control and co-ordination of all work in the road reserve. This is the duty of the road authority who is the custodian of all municipal road reserves. In order to fulfil this duty, the road authority has produced this document to ensure maximum co-ordination and co-operation between all the various service providers who share the road reserve to provide services to their customers and other persons who make use of the road reserve (such as outdoor advertising providers).

It is the aim of this document to minimise any negative effects of work in the road reserve to the benefit of all concerned, and in particular the ratepayers, road users (motorists and pedestrians), service providers and the road authority. Included are the procedures to apply, process and approve wayleaves, procedures to follow while doing the work and on completion of the work as well as specifications according to which the work must be done.

This initiative can only succeed if every agency, department, service provider and other person that works in the road reserve co-operates by working according to this Code of Practice and by providing feedback on how the system can be improved.

CHAPTER 1: DEVELOPMENT CONTROL

1.1 Introduction:

This Code of Procedure deals primarily with the planning and engineering requirements of the Development Control Unit within the Planning Department, and the Traffic Engineering Department, in terms of their functions within the Johannesburg Roads Agency (JRA).

This chapter gives a brief description of development control processes whilst traffic engineering is covered in Chapter 6. The processes involved in these two areas of JRA activity are covered by detailed Standard Operating Procedures (SOP's). The SOP for Development Application Procedures is given in full in Appendix A1.1.

1.2 Development Control Unit:

The Development Control Unit (DCU) is responsible for advising applicants and processing and commenting on development applications from private and public developers, including:

- Township;
- Rezoning;
- Subdivisions;
- Any other development related application.

It is also a function of the DCU to ensure that roads and stormwater drainage systems are constructed in compliance with appropriate standards.

The elements of the Development Control SOP include the following:

1. Revision History;
2. Purpose/Objectives;
3. Scope;
4. Responsibilities;
5. Procedure/Process;
6. Flowchart;
7. Records Management;
8. Approval, Amendment and Review of Procedure/Process;
9. References;
10. Definitions.

The following Figure 1.1.1 is a repeat of the detail included in Appendix A1.1.

Appendix A1.2 illustrates an example of a typical development control letter of approval, including specific requirements to be undertaken as conditions of the approval, for, in this instance a Detail Design Drawing.

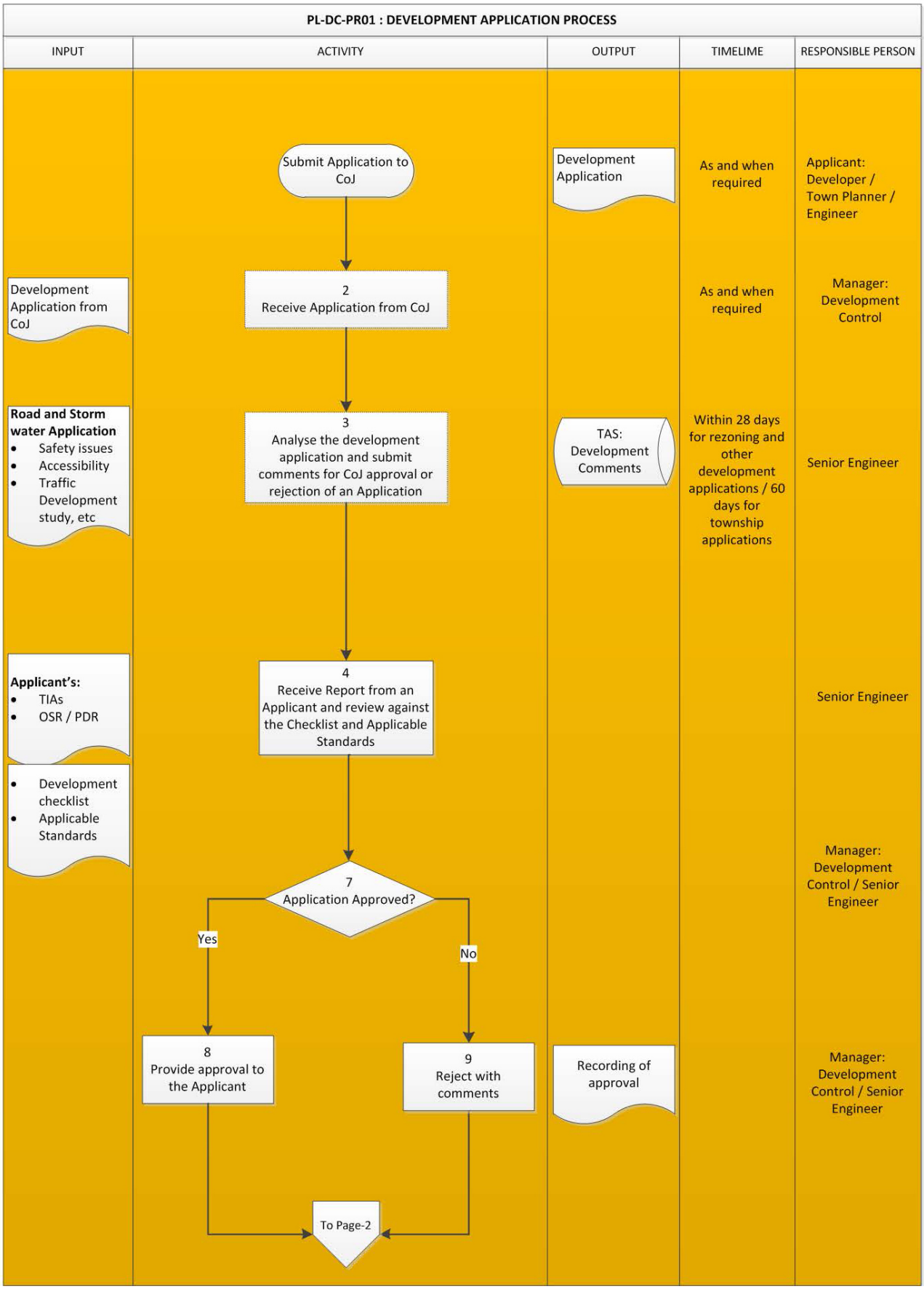
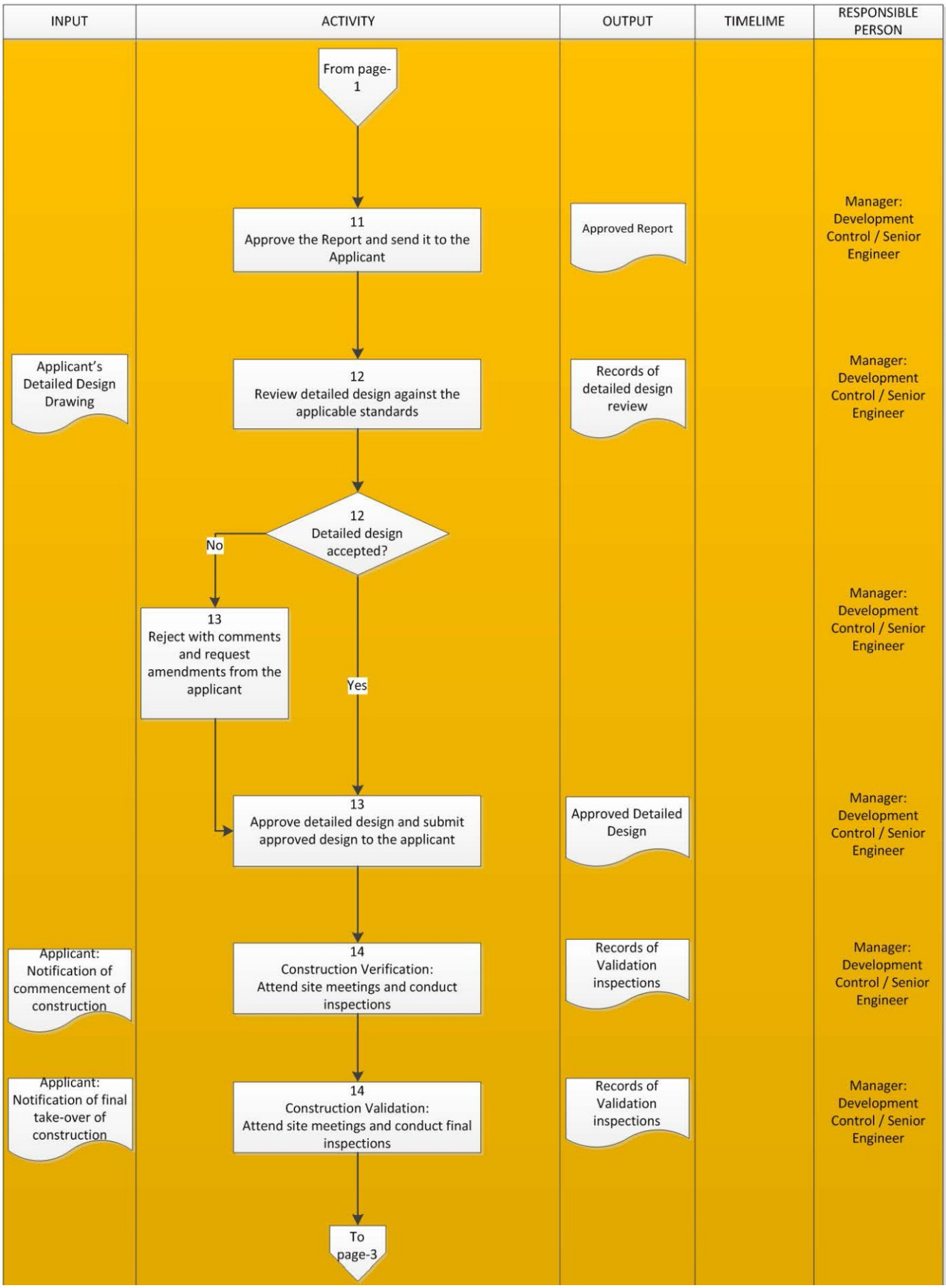
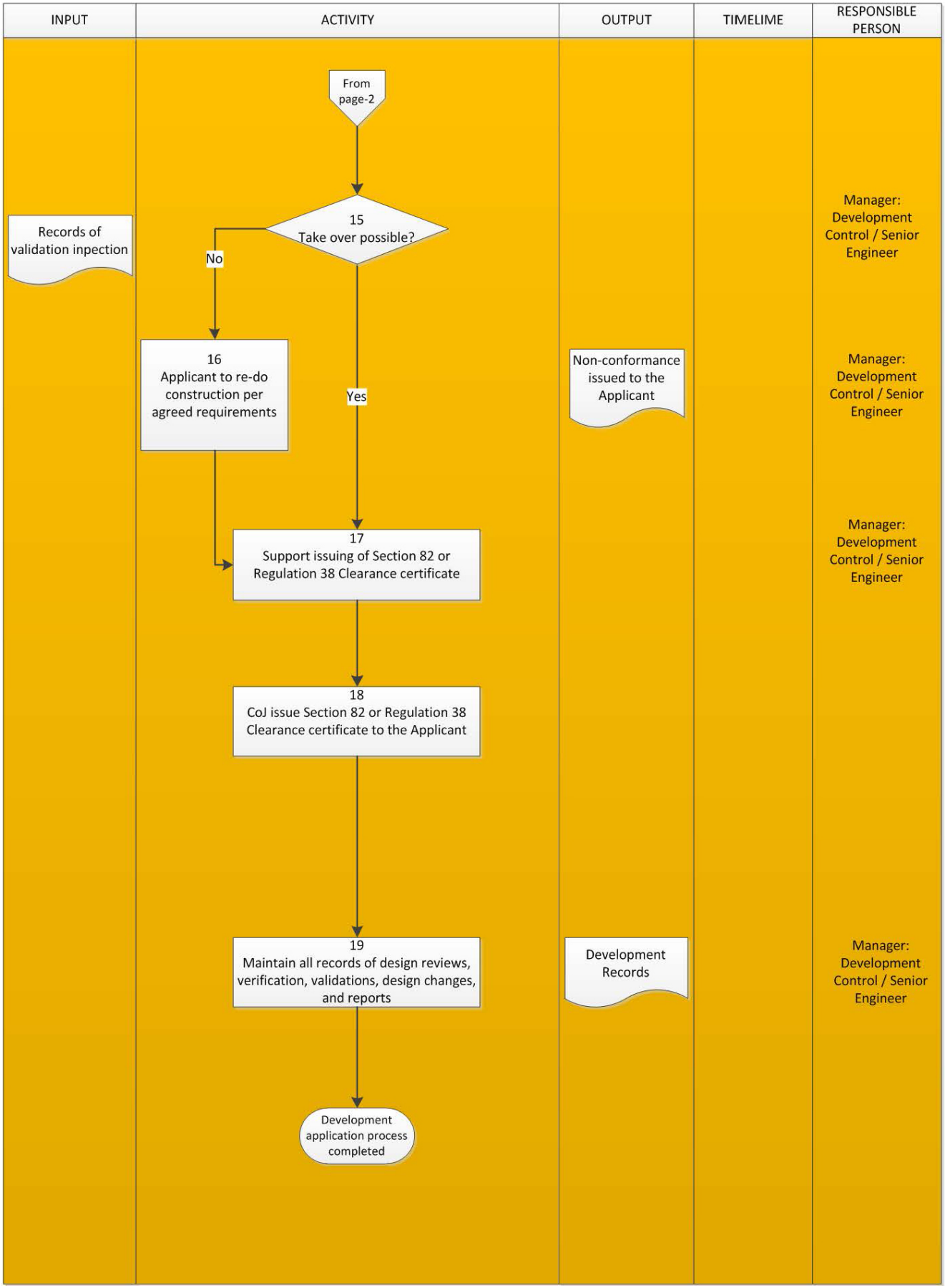


Figure 1.1.1: Development Control Application Process


INPUT
ACTIVITY
OUTPUT
TIMELIME
RESPONSIBLE PERSON
From page-1
11
Approve the Report and send it to the Applicant
Approved Report
Manager: Development Control / Senior Engineer
Applicant's Detailed Design Drawing
12
Review detailed design against the applicable standards
Records of detailed design review
Manager: Development Control / Senior Engineer
12
Detailed design accepted?
No
Yes
13
Reject with comments and request amendments from the applicant
Manager: Development Control / Senior Engineer
13
Approve detailed design and submit approved design to the applicant
Approved Detailed Design
Manager: Development Control / Senior Engineer
Applicant: Notification of commencement of construction
14
Construction Verification: Attend site meetings and conduct inspections
Records of Validation inspections
Manager: Development Control / Senior Engineer
Applicant: Notification of final take-over of construction
14
Construction Validation: Attend site meetings and conduct final inspections
Records of Validation inspections
Manager: Development Control / Senior Engineer
To page-3


INPUT
ACTIVITY
OUTPUT
TIMELIME
RESPONSIBLE PERSON
From page-2
15 Take over possible?
Records of validation inpection
No
Yes
Manager: Development Control / Senior Engineer
16 Applicant to re-do construction per agreed requirements
Non-conformance issued to the Applicant
Manager: Development Control / Senior Engineer
17 Support issuing of Section 82 or Regulation 38 Clearance certificate
Manager: Development Control / Senior Engineer
18 CoJ issue Section 82 or Regulation 38 Clearance certificate to the Applicant
19 Maintain all records of design reviews, verification, validations, design changes, and reports
Development Records
Manager: Development Control / Senior Engineer
Development application process completed

CHAPTER 2: WORK IN THE ROAD RESERVE

2.1 Introduction:

The contents of this chapter apply to employees of the Johannesburg Roads Agency (JRA), all other municipal departments, and all external organisations including service agencies, consultants and contractors who, for whatever purpose wish work to be undertaken within municipal road reserves.

It should be noted that the Code of Procedure does not apply to work in motorway reserves, or to work in provincial or national road reserves which occur within the Greater Johannesburg Metropolitan Area (GJMA).

2.2 Procedure:

The basic procedure which is required for work in the road reserve is as follows:

- Service providers and other persons, other than licensees, must obtain any permit, permission or approval which is required to be obtained from the Council in respect of the activity to be performed which necessitates works in the road reserve.

- A licensee must give notice to the Council in accordance with the procedures in the By-laws of any activity to be performed necessitating works in the road reserve.

- Any person, other than a licensee, who intends to perform works in the road reserve, must apply for a wayleave in accordance with this Code of Procedure, before the works in the road reserve can be carried out.

- If the wayleave application conforms to the requirements in this Code of Procedure, a wayleave will be issued by the JRA which allows for the work to be carried out.

- The JRA must be informed forty-eight (48) hours prior to the commencement of any works in the road reserve (including works to be performed by a licensee which have been notified to the City in terms of the procedures set out in the By-laws).

- The works in the road reserve must be carried out in accordance with the procedures and specifications in this Code of Procedure, the conditions under which the work was approved and any other requirement of every affected service provider.

- On completion of the works in the road reserve all trenches and excavations in the road reserve must be backfilled and reinstated according to the specifications contained in this Code of Procedure.

- On completion of the works in the road reserve and temporary or permanent reinstatement, as applicable, a completion notice must be sent to the road authority by the wayleave holder or licensee. A reinstatement order must accompany the completion notice if the road authority has to do the permanent reinstatement.

- The road authority will then carry out an inspection and issue a certificate of completion once all requirements have been met.

This Code of Procedure applies to every person who carries out work in municipal road reserves in the municipal area, such as internal municipal departments, external organisations, service agencies and contractors. It does not apply to work in motorway reserves or in national or provincial road reserves within the municipal area.

The JRA undertakes to inform the relevant service provider in writing before commencing with any work in the road reserve that may affect the services of the service provider in the road reserve.

2.3 Work in the Road Reserve:

Work in the road reserve can be divided into three categories:

- The first category is work in the installation or maintenance of underground or overhead services in the road reserve by public service providers, e.g. Eskom, Rand Water and Petronet. For this type of work a wayleave is required to be obtained but no separate approval is required to be obtained from the Council prior to applying for a wayleave to perform works in the road reserve.

- The second category is work in the installation or maintenance of underground or overhead services in the road reserve for which a wayleave is required to be obtained but which is also required to be approved or permitted by the Council in terms of the By-laws or any other by-law. Obtaining the necessary approval or permission, is a separate procedure to be completed before any application for a wayleave can be made or considered. The applicable approval or permission and any approved drawings must be submitted with the application for a wayleave.

- The third category is work in the installation or maintenance of electronic communications facilities by a licensee (including Telkom), which is required to be notified to the Council in terms of the Electronic Communications Act and the procedures in the By-laws and in respect of which a wayleave is not required.

The second category of work includes, but is not restricted to:

- The erection of structures that require approved building plans in terms of the National Building Regulations;
- The erection of advertising signs and structures that require approval in terms of the relevant by-laws;
- Roadworks, such as construction of new roads, road widening or accesses to developments, undertaken by developers;
- Connections to municipal services, such as water, sewers, electricity and stormwater drainage from developments;
- Erection of hoardings in the road reserve;
- The installation or construction of kerbing, paving, bollards, walls, gardens, etc. on sidewalks by property owners or occupiers;
- Road closures;
- Traffic calming devices.

The third category of work includes the installation of wires, cables, antennas and masts which will make up an electronic communications network. In order to install these types of facilities in a road reserve, a person is required to hold a licence to provide electronic communications network services in terms of the Electronic Communications Act or to be exempted in terms of that Act from the requirement to hold such a licence.

2.4 Wayleaves and Lane Rental:

2.4.1 Wayleaves:

The road authority has jurisdiction over the road reserve and no works in the road reserve may be done before a wayleave in respect thereof has been issued by the JRA or, in the case of a licensee, notice has been given to the Council in terms of the By-laws. A wayleave is permission ("leave") to cross the "way", i.e. the road.

To obtain a wayleave, a wayleave application form (see Appendix A) must be submitted, accompanied by three copies of the approved drawing showing details of the proposed work. Details required on the drawing are:

- A clear depiction of the proposed work;
- Where any service is to be installed, the depth of the every service below the level of the surface of the road;
- Distance of the service from the road reserve boundary (i.e. the property boundary);
- Position and extent of all structures including underground structures such as manholes, chambers, junction boxes, etc.;
- The location of all other services in the road reserve (see section 1.5).

Once all these requirements have been complied with, a wayleave will be issued by the road authority. An example of a wayleave appears in Appendix A.

The application for a wayleave must be submitted timeously to ensure that a wayleave can be issued before the work is programmed to start. **Work being carried out in the road reserve without a wayleave or, in the case of a licensee, where the required notice has not been given, will be stopped by the JRA**. A copy of the wayleave or notice (and acknowledgment of receipt) must therefore always be on site when works in the road reserve are being done.

The wayleave holder or licensee has full responsibility for all costs associated with the works in the road reserve, including any damage to any other service, the cost of relocation of any other service, backfilling and reinstatement, tests and any claim that may result from the work.

Only work may be done, as described in the wayleave or notice as the case may be, and only at the locations given in the wayleave or notice. The work described in a wayleave must commence within 90 days of date of issue of the wayleave, failing which the wayleave lapses and re-application is required. The works described in the notice given by a licensee must commence and be completed in accordance with the By-laws.

2.4.2 Lane Rental:

Lane rental refers to the rental in respect of a demarcated traffic lane in a road reserve which is payable to the JRA by an authorised person whose works in the road reserve results in time delay costs (TDC) being incurred by the users of the road reserve.

Lane rental is based on a cost per traffic lane (or part of a traffic lane) occupied per day (or part of a day). An occupied traffic lane is considered as being not longer than one street block. If a traffic lane is closed for two street blocks, for example, then the cost will be for two traffic lanes.

A prescribed fee is payable by an authorised person to the JRA and such fee may differentiate between different road categories.

The JRA and the authorised person must, before the commencement of the work, agree on the days that will be allowed during which the work must be completed. During the agreed days the service agency will pay a lane rental that is equal to 50% of the TDC. However, after the agreed completion date, the lane rental will be 100% of TDC. All costs will be based on average TDC's that have been calculated for each road category.

An authorised person is entitled to a reduced rate if works in the road reserve are undertaken after normal working hours, but precautions must be taken by the authorised person to avoid disturbance in any residential area. For every day that work is done after normal working hours and the lane is fully opened for all the normal working hours of the following day, the lane rental will only be 10% of TDC.

The JRA or any organisation working on behalf of the JRA is exempt from payment of lane rental when any construction, resurfacing, maintenance, improvement or rehabilitation work is being done on the road itself.

For the purpose of calculating lane rental, normal working hours will be considered as being between 06:00 and 19:00 on Monday to Friday and between 06:00 to 14:00 on Saturday. These times are not fixed and may change depending on local conditions and special events in the vicinity where works are to be undertaken.

During the days that have been agreed to in terms of the above, no lane rental will be payable if all traffic lanes are kept open at all times. If work continues after the agreed completion date, a lane rental of 25% of TDC will be charged if all traffic lanes are kept open. If a traffic lane is closed for any part of a day, normal lane rental for a full day will be charged (50% of TDC before the official completion date and 100 % thereafter).

Lane rental will also be charged if a footway is affected by work. If the footway is totally closed so that pedestrians are required to use a traffic lane, then lane rental will be payable in the normal way for the occupation of a traffic lane, since the traffic lane will not be available for vehicular traffic. If a footway is partially obstructed in such a way that it causes a delay for pedestrians, then 50% of the lane rental that is applicable for that road will be charged.

For the purpose of determining lane rental for footways, a footway will be considered that part of the verge that is normally used by pedestrians. For constructed footways the whole constructed width will be considered as footway.

2.5 Costs:

2.5.1 Processing Fee:

A processing fee is a fixed amount that is payable by the applicant when submitting a wayleave application form or, in the case of a licensee, notice in terms of the By-laws. This fee is to cover the cost of processing the wayleave application or notice and will be prescribed by the Council on the recommendation of the JRA, from time to time.

2.5.2 Reinstatement Cost:

When the JRA does the permanent reinstatement, the cost involved will be payable by the applicant to the JRA. The cost will be determined using the relevant reinstatement rates appearing on the wayleave application form and the prescribed form in which notice, as required by the By-laws, must be given to the Council. These rates are determined by the Council and will be reviewed from time to time.

In this case the wayleave application form or notice, as the case may be, must be accompanied by an official order for an amount based on the expected area to be reinstated. The final invoiced amount payable will be determined using the measured area of the final reinstatement as agreed between the JRA and the authorised person.

It is important to note that the decision on who does the permanent reinstatement lies with the JRA.

2.6 Existing Services in the Road Reserve:

An applicant for a wayleave or licensee, as the case may be, must obtain information from every service provider supplying a service within the municipal area on the location of its service. Every service must then be indicated on the drawings to be submitted with the wayleave application form or notice. Service providers may impose reasonable additional conditions relating to work in the vicinity of their services.

As part of the undertaking/indemnity on the wayleave application form or prescribed form for notice by a licensee, the applicant or licensee has to confirm that the necessary information has been obtained from every service agency and has to undertake to adhere to any additional condition imposed by any service agency.

2.7 Road Categories:

All roads are classified into one of the following categories as described below. The category of a road determines the nature of the specification for backfilling and reinstatement.

Every road has been categorised into one of those given in Table 2.7.1 by the JRA and this information can be obtained from JRA.

The following definitions apply for the road categories:

Table 2.7.1: Road Categories

Function	Category	Road Type	Administration
A (Class 1)	A1 A2 A3	National Roads Primary – (inter) provincial Urban Freeway/Motorways	SANRAL Gauteng DoT JRA
B (Class 2)	B2 B3	Primary – (inter) provincial Major (inter) urban arterials	Gauteng DoT JRA
C (Class 3)	C2 C3	(Inter) district connectors Minor (intra) urban arterials	Gauteng DoT JRA
D (Class 4)	D2 D3 D4	Intra district connectors (Intra) district collectors (Intra) district collectors & industrial roads	Gauteng DoT JRA JRA
E (Class 5)	E4	Urban distributors	JRA
F (Class 6)	F4	Local access roads	JRA
G (Class 7)	G5	Private roads / Culs de Sac	JRA / Residents

2.8 Protected Roads:

Over and above the four road categories, defined in section 2.7 of this Code of Procedure, certain roads are further classified as protected roads (no-dig roads).

A protected road is a road across which no digging of trenches is permitted. A road is protected if it has been designated a protected road by the JRA. A road is designated as protected when it is of particular strategic importance or if it poses special engineering difficulties. Every arterial is, for example, protected. Any road that has been newly constructed, overlayed or resurfaced will be protected for a period of seven years.

If a road is protected it will be indicated as such on the wayleave or in the acknowledgment of receipt from the Council in respect of notice given by a licensee. A protected road may only be crossed using a trenchless method. If a trenchless method cannot be used for some reason in a protected road, special permission to excavate must be obtained from the JRA.

For the purpose of planning work done by a service provider, category F4 and G5 roads may be regarded as unprotected unless a road has been newly constructed, overlayed or resurfaced and falls within the seven years protected period:

- Provided that the first 20 m from an intersection with any other class road is considered to be protected.

2.9 Traffic Signs & Barricading:

It is the responsibility of the authorised person to ensure that any law regarding traffic, safety, traffic signs and barricading is complied with.

The authorised person must take all necessary measures and provide all necessary facilities to ensure an adequately safe and easy passage for traffic and pedestrians through areas in which work is in progress, or is uncompleted.

Any traffic sign and barricading must be done according to the latest edition of the South African Road Traffic Signs Manual (SARTSM), Volume 2, Chapter 13. An extract from that document appears in Appendix A, Annexure A.2.

An authorised person may contact the relevant traffic authority to ensure that all requirements have been met for the particular location where the work is being done.

The importance of adequate traffic signs and barricading must be stressed. These measures are intended to ensure the maximum safety of motorists, cyclists, pedestrians and workers, and also the minimum disruption of vehicles, bicycles and pedestrians. Work sites must be properly barricaded and signed irrespective of how long the work will take.

2.10 Road Closures:

The granting of a wayleave or, in the case of a licensee, the giving of notice in terms of the By-laws does not give the authorised person the authority to close the road completely to traffic. Methods of construction and programmes of work must be determined on the basis that no road, or portion of road, may be completely closed to traffic for any appreciable period.

In exceptional circumstances permission will be granted for the closure of a road or portion of road to traffic, subject to the provision of any law. The authorised person must apply to the JRA separately for approval of such closure two weeks prior to the road being closed. Such a road closure will be approved for a specific period, i.e. from and to a specific time on a specific date and is only valid for this specific period. If the work is not completed in this specific period, an application for a new road closure will have to be made.

Work carried out on any arterial, major collector and CBD road will be restricted to outside the following periods, namely from 06:30 to 09:00 and 15:30 to 18:00, to ensure free flow of traffic during peak hours.

2.11 Excavations:

The area which is excavated must always be kept to a minimum. The width of the trench must be uniform in length and in depth, in other words the sides must be parallel and vertical. The top of the trench must be cut with a saw to ensure smooth, uniform edges.

The minimum depth that any service may be placed under a road is 800 mm measured from the level of the surfacing of the road to the top of the service. The minimum depth at any other place in the road reserve, e.g. on a verge, is also 800 mm measured from the level of the surfacing of the road and not from natural ground level. Any services not subject to being laid at a specific grade such as water pipes and cables should not be placed at a depth in excess of the 800 mm as this could interfere with a future service that has to be laid at a specific grade, such as sewers and stormwater pipes.

All excavated material and equipment must be placed and demarcated in such a way as to cause the minimum disruption to vehicles, bicycles and pedestrians. A safe passage must be kept open for pedestrians at all times.

The authorised person will be responsible for any damage to any existing service. Any service, indicated on the drawings or on site by a representative from any service provider, must be opened by careful hand digging. If the service cannot be found, the relevant service provider must be contacted again for further instructions. Under no circumstances may an authorised person dig with mechanical equipment before every known service have been found and marked. When found, a service must be marked and protected or supported as required by the service provider. If any service needs to be moved, instructions from the service provider must be followed carefully. The authorised person will be responsible for all reasonable expenses incurred in moving services costs. If any service is damaged during excavations, the relevant service provider must be contacted immediately.

Adequate preventative measures must be taken to ensure that no water (e.g. due to rain) flows into the open trenches since this will result in the weakening of the structural layers of the road. Any water that is present in a trench must be pumped out before backfilling. Water must be pumped into the stormwater system and not into a sewer manhole. Any material that has become wet must be removed from the bottom of the trench before backfilling.

The authorised person must prevent any foreign material from entering any drain and ensure that silting does not occur either from pumping operations or as a result of rain. If any silting or other contamination does occur, the authorised person must clean the drain or request the JRA to do it at the cost of the authorised person.

All re-usable material such as concrete blocks, slabs, kerbs, gutters, channels and stormwater inlets must be removed with care and re-used if possible.

If any street furniture (e.g. street names, traffic signs, bus shelters, etc.) has to be removed, arrangements must be made with the relevant authority for the removal, storage and re-erection.

If an excavation is made through entrances to properties, access must be maintained by using steel plates, planks or other temporary bridges of sufficient strength and properly secured against movement. The occupants of the properties must be kept informed at all times of how their access will be affected.

2.12 Trenchless Methods:

If a trenchless method is used, disruption of traffic flow and pedestrian movement can be reduced considerably or totally eliminated. However, it is important that the authorised person using such method must have all the necessary equipment and expertise to complete the work successfully. Trenchless methods can be used for all road categories, but must be used for all roads classified as protected in terms of section 2.7.

The position of every existing service must be located accurately. If any service is damaged, the authorised person will be responsible for all costs to repair such damage.

The depth to the top of any tunnel that is drilled for the installation of a new service must be at least 800 mm, measured from the level of the surfacing of the road.

2.13 Emergency Work:

As defined in the By-laws, emergency work is defined as any work which is required to prevent or end a dangerous situation, to prevent or end an unplanned interruption in the supply of a service, or to avoid any substantial losses.

The JRA must be informed of emergency work by the service provider concerned in writing within twenty-four (24) hours from commencing such work. If the JRA is not timeously informed, the work will be reinstated by the JRA and the cost thereof will be invoiced to the service provider at the increased tariff for work without wayleave permission.

2.14 Specifications for Backfilling and Reinstatement:

2.14.1 General:

Any trenching activity disturbs the structural integrity of a road or footway. Backfilling and reinstatement must therefore be done in such a way as to ensure that the reinstated trench and its immediate surroundings do not fail structurally, thus resulting in road user discomfort and increased costs.

As defined in the By-laws, backfilling refers to the replacement of the structural layers in the trench or excavation and includes the base, subbase, selected sudgrade and subgrade, but excludes the surfacing.

As defined in the By-laws, reinstatement refers to replacing the bituminous surfacing or paving blocks in the case of roads, or the paving blocks, paving slabs, bituminous surfacing or grass in the case of footways and verges.

Backfilling must in every case be done by the authorised person in accordance with the applicable specifications in sections 2.14.2 and 2.14.3. Permanent reinstatement (100 mm asphalt layer), as specified in section 2.14.4 and 2.14.5, can either be done by the JRA or by the authorised person, subject to permission having been granted by the JRA and provided the authorised person has the required expertise and experience. Permanent backfilling and reinstatement (100 mm asphalt layer) done by the authorised person, is subject to a guarantee period of one year based on the performance specifications described in section 2.14.8.

If the permanent reinstatement must be done by the JRA, the authorised person must do a temporary reinstatement as specified in section 2.14.7. The authorised person will then be charged for the permanent reinstatement at the applicable rates appearing on the wayleave application form and prescribed form for notice submitted by a licensee. A reinstatement order must in such case be submitted together with the completion notice. The temporary reinstatement will be

removed by the JRA and the backfilling will then be tested. If this does not comply with the applicable specifications, it will be replaced at the cost of the authorised person. These costs will be over and above the normal reinstatement costs.

Temporary reinstatement must also be done if the JRA abandons the site for a period not exceeding two months with the view of returning to complete the work. The authorised person must maintain this temporary reinstatement.

2.14.2 Preparation of the Bottom of the Trench and Backfilling Around Service:

The trench bottom must be prepared and compacted according to the requirements of the service provider concerned, to ensure that the service is not damaged. The same applies to the backfilling around the service. If any service with a diameter of more than 300 mm is installed, the subgrade material used for the reinstatement must be soilcrete (in-situ material mixed with 8% cement), placed with poker vibrators, up to a level of 300 mm above the top of the service.

2.14.3 Backfilling of Roads:

The minimum requirements of the JRA are that the structural layers of the backfilled trench, i.e. the base, subbase, selected subgrade and subgrade down to a depth of 800 mm below the level of the surfacing of the road, must have at least the same shear strengths as those of the adjacent undisturbed structural layers.

It should be noted that it is generally very difficult to obtain the same quality structural layers in the confinement of a narrow trench as that of the undisturbed adjacent structural layers when the same materials are re-used.

One of the following methods must therefore be used to ensure adequate shear strengths in trench backfill. The authorised person may use any one of the three methods for backfilling:

- Method A: Re-using Excavated Material:
  During excavation of the trench, the material from the top 400 mm of the excavation (or in the case of arterials, collectors and industrial roads, the top 550 mm) must be stockpiled separately from the rest of the material being excavated. This material must then be improved through chemical stabilisation with cement and used for the base and subbase layers during backfilling, and in the case of arterials, collectors and industrial roads also for the selected subgrade layers.

The requirements for this method are given in Figure 2.14.1, following on section 2.14.8.

If the material is not stockpiled separately during excavation, the road authority will require that material with the required properties be imported. Material which was originally stabilised cannot be re-used and must be discarded.

- Method B: Importing Material:
  Import a G5 gravel material and stabilise with 60 kg of cement per m^3 of material. Water must be uniformly mixed into the material. The material must then be placed in the trench in 75 mm to 100 mm layers and compacted to the required Mod. AASHTO densities as specified in Figure 2.14.1 to the Code. The final layer must be finished to a level of 100 mm below the level of the surrounding sound surface of the road.

- Method C: Low Strength Concrete: Specially Designed Concrete Mix (SDCM) for Trench Backfilling:

  All Road Trenches / Openings: Place 300 mm SDCM concrete of minimum 2.5 Mpa crushing strength (28 days) and manufactured to an approved manufacturer's specification. The SDCM concrete mix is to be placed 50 mm below the level of the surrounding sound surface of the road. The rest of the trench is backfilled with selected approved material compacted to 90% of MOD AASHTO density.

  All Sidewalk Trenches / Openings: Place 150 mm SDCM concrete of minimum 2.5 Mpa crushing strength (28 days) and manufactured to an approved manufacturer's specification. The SDCM concrete mix is to be placed 30 mm below the level of the surrounding sound surface of the road. The rest of the trench is backfilled with selected approved material compacted to 90% of MOD AASHTO density.

Quality control of the backfilled structural layers can be done by measuring the shear strengths of the adjacent structural layers as well as that of the backfilled layers. The shear strength can be measured with a dynamic cone penetrometer (DCP) or a rapid compaction control device (RCCD). Although the shear strengths of the backfilled layers will be measured against the undisturbed structural layers, an indication of probable acceptance on most roads can be obtained from the typical DCP and RCCD Penetration diagram shown on Figure 2.14.2 following on section 2.14.8.

2.14.4 Backfilling of Cycle Tracks & Sidewalks:

Any cycle track or sidewalk, where there is no possibility of vehicles crossing the footway, must be backfilled using the excavated material, placed in the trench in 150 mm layers and compacted to 90% Mod AASHTO density (maximum DCP penetration of 19 mm/blow) for all layers below the base and 93 % Mod AASHTO density (maximum DCP penetration of 14 mm/blow) for the base.

Any cycle track or footway where there is a possibility of light vehicles (cars and LDVs) crossing the cycle track or footway, typically where there is mountable kerbing, must be backfilled using Method A or Method B described in section 2.14.3 according to the standards for local streets specified in Figure 2.14.1 following on section 2.14.8.

Where any heavy vehicles make use of a cycle track or footway, such as loading zones in industrial areas, the cycle track or footway must be backfilled using Method A or Method B described in section 2.14.3 according to the standards for arterials, collectors and industrial streets on Figure 2.14.1 following on section 2.14.8.

Any excavation in an unconstructed verge must be backfilled in such a way that the verge is in the same condition after backfilling as it was before excavation. All excess material must be removed and not spread over the verge. Topsoil must be removed and stored separately and replaced as the final layer.

2.14.5 Permanent Reinstatement of Roads:

The same method of reinstatement must be used independent of the method of backfilling of the structural layers.

The permanent reinstatement of the surfacing must consist of 100 mm hot-mix asphalt. The lower 70 mm must be "blackbase" (26,5 mm nominal stone size, continuously graded) and the top 30 mm fine (4,75 mm nominal stone size, continuously graded). Cold mix may only be used for temporary reinstatement. Both these surfacing layers must be compacted to 95% Marshall Density.

The reinstated surfacing must be at least 100 mm wider than the trench on both sides to accommodate any edge break where saw cutting was not possible.

The material used for the reinstatement of the surfacing must comply with the relevant requirements of Section 4200: Asphalt Base and Surfacing of the Committee of Land and Transport Officials (COLTO) or any document which replaces it, Standard Specification for Road and Bridge Works.

In the case of any road surfaced with interlocking paving blocks, the general procedure would be to re-use the material removed during the excavation of the

trench. If new material has to be used, it must be of the same type and size as the existing material and must comply with the requirements of SABS 1058-1985, as amended or replaced from time to time.

2.14.6 Permanent Reinstatement of Cycle Tracks & Sidewalks:

The general procedure would be to re-use all the material removed during the excavation of the trench. If new material has to be used, it must comply with the following requirements.

(a) Precast concrete kerbs and channels: Any precast concrete kerbs and channel must comply with the requirements of Section 2300: Concrete Kerbing, Concrete Channelling, Open Concrete Chutes and Concrete Linings for Open Drains of the COLTO Standard Specification for Road and Bridge Works. All cast in-situ concrete must be Class 25/19.

(b) Concrete paving blocks: All concrete paving blocks must comply with the requirements of SANS 1058-2012, as amended or replaced from time to time.

(c) Cast In-situ concrete: All cast in-situ concrete must comply with the relevant requirements of Section 6400: Concrete for Structures of the COLTO Standard Specification for Roads and Bridge Works. All cast in-situ concrete must be Class 25/19.

(d) Precast concrete paving slabs: All concrete paving slabs must comply with the requirements of SANS 541-2004, as amended or replaced from time to time.

Any constructed footway must be reinstated with the same surfacing materials that existed originally (e.g. concrete blocks, slabs, etc.). Material may be re-used if undamaged, or else replaced with similar material.

If a private driveway and footway with non-standard materials are to be excavated, the owner of the property concerned must be informed in advance and in writing of the intended work. The owner must then supply/specify to the authorised person with the materials that are to be used for the reinstatement.

If any unconstructed verge has an established lawn, this must be removed, stored and replaced in sods in such a way that the lawn is in the same condition after reinstatement as it was before excavation. If the sods are allowed to dry out or become damaged in any way, they must be replaced with similar sods.

If an unconstructed verge has been planted with garden vegetation other than lawn, the owner of the adjacent property must be consulted before excavation, to obtain instructions on what to do with the plants that are affected. Every effort must be made to preserve all plants.

2.14.7 Temporary Reinstatements by the Wayleave Holder:

If the permanent reinstatement is to be done by the JRA, the authorised person must do temporary reinstatement with a suitable material that is compacted to an adequate density to ensure that it will carry the traffic for a period of at least fourteen (14) days without deforming or potholing. The temporary reinstatement must be maintained by the authorised person in a serviceable condition for a period of fourteen (14) days from the date on which the completion certificate has been issued by the JRA. After the fourteen (14) day period the maintenance will be taken over by the JRA.

It is recommended that cold mix asphalt be used for temporary reinstatement.

2.14.8 Performance Specifications:

The performance of any trench permanently reinstated by the authorised person will be monitored for twelve (12) months, during which period the authorised person will be held responsible for any remedial work that may be required.

The tests that were used for quality control (density or shear strength) will be used to determine whether or not the work was done according to specifications. The JRA may do additional tests if the quality control tests are not considered to be adequate.

Remedial work will be required if any of the following defects exist:

(a) Depressions;

(b) Humps (crowning);

(c) Edge depression (trips, vertical discontinuities) at the interface; or

(d) Cracking.

Any depression or hump will be measured with a straight edge across the reinstatement and will require remedial work if the following limits are exceeded over 100 mm or more of the length of the trench (see Table 2.14.2).

Remedial work will also be required if a depression results in standing water wider than 500 mm or exceeding one square metre, two hours after rain has stopped.

Any edge depression exceeding 10 mm over 100 mm or more of the length of the trench will require remedial work.

Any open crack wider than 3 mm and longer than 100 mm will require remedial work.

Table 2.14.2: Depression or Hump Reinstatement

Reinstatement Width (mm)	Height of Deformation or Hump as measured with straight edge (mm)
Up to 400	10
400 to 500	12
500 to 600	14
600 to 700	17
700 to 800	19
800 to 900	22
Over 900	25

Layer	Treatment		Layer Thickness (mm)	Depth (mm)
Surfacing	**Temporary Surfacing** Material from top 400 (550) mm 4% OPC 98% Mod AASHTO	**Permanent Surfacing** 300 mm Bitumen hot-mix fine 70 mm Bitumen hot-mix BTB	100	
Base	Material from top 400 (550) mm stockpile Stabilize with 4% OPC Compact to 98% Mod AASHTO		150	100
Subbase	Material from top 400 (550) mm stockpile Stabilize with 4% OPC Compact to 95% Mod AASHTO		150	250
Selected Subgrade	**Local Streets** Compact to 93% Mod AASHTO	**Arterials, Collectors And Industrial Streets** Material from top 550 mm stockpile Stabilize with 4% OPC Compact to 93% Mod AASHTO	150	400
Subgrade	Compact to 90% Mod AASHTO		250	550
				800

Figure 2.14.1: Recommended Method for Permanent Backfilling

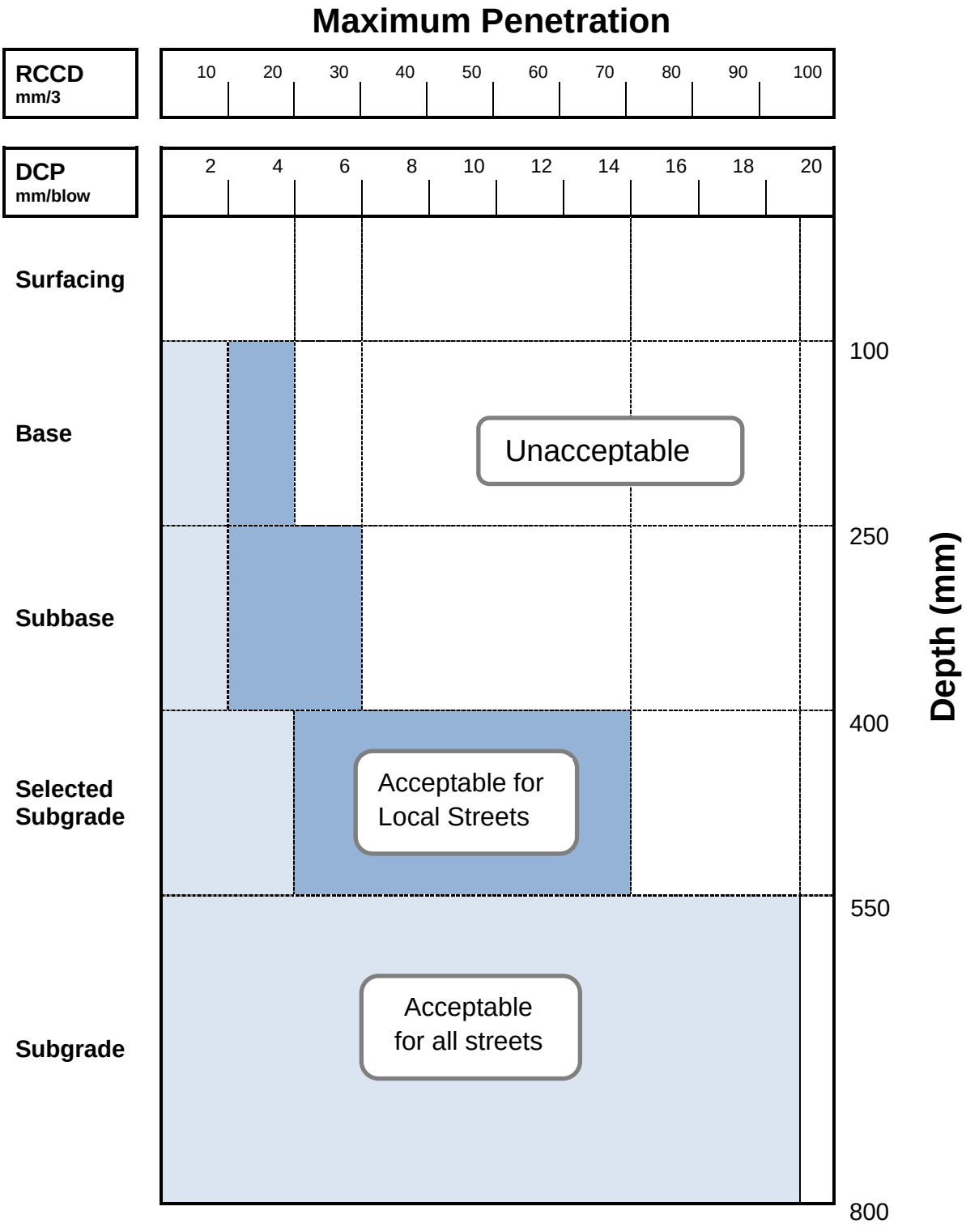


Figure 2.14.2: Typical RCCD and DCP Penetration Diagram

2.15 Completion Notice and Certificate of Completion:

On completion of the work concerned the authorised person must fill in a completion notice and return it to the road authority within twenty-four (24) hours (see Appendix A for an example of a completion notice). The road authority will then arrange a site meeting with the authorised person to do an inspection and to issue a certificate of completion if all requirements have been met. The twelve (12) month guarantee period for permanent reinstatement by the wayleave holder, or the fourteen (14) day maintenance period for temporary reinstatement by the authorised person, commences on the day after the date of issue of the certificate of completion.

Completion of the work means that all work has been completed and that all material, equipment and rubble have been removed and the site is completely cleared and cleaned and that either the permanent or temporary reinstatement, as applicable, has been done by the authorised person.

If work involves more than one street link (street block), a completion notice must be submitted after completion of each link.

CHAPTER 3: REPORT FORMATS

3.1 Introduction:

The object of this chapter is to provide assistance with the structure of reports to be submitted to the Johannesburg Roads Agency (JRA), in order that such reports are made in as uniform a manner as is practical.

The report types covered are:

- Project Reports;
- Design Reports;
- Traffic Impact Assessment (TIA) Reports;
- Site Traffic Assessment (STA) Reports; and
- Site Development Plan (SDP) Reports.

3.2 Project Reports:

Reports may be required for a very wide range of subjects and needs in the context of the operations of the Johannesburg Roads Agency (JRA). Such reports may be internal to the Agency, or may be submitted by a wide range of external organisations covering many subject areas which, in turn, may vary widely in their scope. In some cases an internal report may be generated relating to an external report which has been submitted to JRA.

Specific details of Design, Traffic Impact Assessment, Site Traffic Assessment and Site Development Plan Reports are given in the next sections of this chapter. The details below therefore represent a basic report structure relating to any internal or external report of a general nature. Since it is likely that many reports, either on one specific project, or on a specific type of project, will be prepared over time it is beneficial that they follow as standard a format as is practical.

Components of a Project Report should include, but are not limited to the following:

- ***Project Report Cover:***
  Comprising:
  - ❖ Name of organisation authoring report;
  - ❖ Type of report (subject group – development – parking etc.);
  - ❖ Township, town planning scheme number, development etc.;
  - ❖ Erf number(s), farm name, street or other location;
  - ❖ Date of report;
  - ❖ Name and address of author, plus:
    - o …….. Consultant/Applicant Signature;
    - o …….. PD/DD - JRA Receipt Signature
      (where PD is Prelim Design & DD is Detailed Design)
- ***Covering Letter:***
  Provided on the first page, and certifying internal or external processes.
- ***Executive Summary:***
  Optional for short reports – the executive summary should give a concise and clear overview of the entire report.
- ***Background or Introduction:***
  Provide the context for the subject of the report.
- ***Principles or Theory*** involved in the submission – optional.
- ***Specific Subject Design or Proposal:***
- ***Conclusion or Recommendation:***
- ***Appendices.***

3.3 Design Reports:

The content and format of the report shall be in accordance with the Employer's standard requirements and shall include, but not necessarily be limited to, the following, as may be relevant:

- ***Design Report Cover;***
  Comprising
  - ❖ Name of organisation authoring report;
  - ❖ Township, town planning scheme number, development etc.;
  - ❖ Date of report;
  - ❖ Name and address of author, plus:
    - o …….. Consultant/Applicant Signature;
    - o …….. PD/DD - JRA Receipt Signature
      (where PD is Prelim Design & DD is Detailed Design)

- ***Locality Plan;***

- ***Executive Summary;***

- ***Introduction;***
  - ❖ Terms of reference;
  - ❖ General description of the Project;
  - ❖ Objectives and strategies;
  - ❖ Scope of the investigations;

- ***Road Cross-Section;***
  - ❖ Standard Cross-Section (refer to Figures 7,3,2 and 7,3,3 for RISFSA and JRA standards);
  - ❖ Batter Slopes when applicable in fill or cut;

- ***Existing pavement (in the case of maintenance or rehabilitation);***
  - ❖ Pavement history;
  - ❖ Maintenance history;

- ***Existing pavement evaluation(in the case of maintenance or rehabilitation);***
  - ❖ Visual condition survey;
  - ❖ Instrument/mechanical surveys;
  - ❖ Test pit information;
  - ❖ DCP analysis;

- ***Traffic information;***
  - ❖ Available data;
  - ❖ Past traffic loading;
  - ❖ Future traffic growth;

- Recommended design loading;
- Traffic accommodation considerations;

- ***Structural analysis/New Pavement Design;***
  - Evaluation of pavement structural capacity;

- ***Geometric Design (see Volume 2, Parts 1 & 2 and UTG series);***
  - Horizontal alignment;
  - Vertical alignment;
  - Cross section development;

- ***Structures;***

- ***Hydraulic Capacity of Bridges and Major Culverts;***

- ***Traffic Accommodation;***

- ***Ancillary works;***
  All ancillary works over and above the main focus of the project should be included in this chapter:
  - Sub-soil drainage;
  - Surface drainage;
  - Shoulder make up;
  - Road traffic signs (road signs, road markings and traffic signals) etc.

- ***Environmental and OHS obligations and considerations;***

- ***Construction materials (project/commercial and their appropriate application with respect to OH&S obligations);***
  - Aggregate sources;
  - Sand sources;
  - Gravel sources;
  - Water sources;
  - Bituminous products;

- ***Estimated costs of alternative strategies;***
  - Construction programme;
  - Life cycle analyses;

- ***Conclusions & Recommendations;***

- ***Annexures.***

3.4 Traffic Impact Assessment Reports:

3.4.1 Background:

The procedures for the preparation of Traffic Impact Assessment reports and associated studies are detailed in the following Technical Methods for Highways (TMH) documents prepared by the Committee of Transport Officials (COTO), namely:

- TMH15:
  South African Engineering Services Contribution Manual for Municipal Road Infrastructure – Version 1.00, September 2012;

- TMH16 – Volume 1:
  South African Traffic Impact and Site Traffic Assessment Manual – Version 1.00, August 2012;

- TMH16 – Volume 2:
  South African Traffic Impact and Site Traffic Assessment Standards and Requirements Manual – Version 1.01, February 2014;

- TMH17 – Volume 1:
  South African Trip Data Manual – Version 1.0, September 2012.

The TIA is used as a tool to determine what the traffic impact of a proposed development will be, and thereby to assess whether the traffic generated by the development can be accommodated by the existing transportation system. In terms of the provisions of these recent TMH documents this assessment may include the relevance of public transport and non-motorised transport in the context of the development. The purpose of the TIA is therefore to protect the overall capacity of the transportation system and to support sustainable development.

Whilst a TIA may establish a need for road development external to a proposed development it does not establish a **responsibility on the developer** to provide for such needs. Such a responsibility is determined in terms of the Engineering Service Contribution Policy and the municipality's responsibilities in terms of the master planning needed to deal with development in general and for the provision of transportation systems required by the overall community.

Development and transportation master planning is therefore undertaken by the municipality and must be available before traffic impact assessments may be undertaken by applicant developers. TMH16 makes provision for the possibility that, if the necessary master planning is not available, an applicant may be permitted to undertake such planning on behalf of the municipality. Development applications should not be delayed by the lack of an available master plan.

3.4.2 Requirements for Traffic Impact Assessments:

*A Traffic Impact Assessment (TIA) shall be prepared and submitted when applying for a change in land use and when the **highest total additional** hourly vehicular trip generation, including by-pass and diverted trips, resulting from the proposed change exceeds 50 trips per hour.*

Applicants preparing TIA reports are encouraged to follow the sequence given below. Only relevant information should be provided and superfluous information should not be provided. The applicant can assume that the assessment will be reviewed by knowledgeable persons and can therefore dispense with detailed explanations of methodologies.

Any assumptions must be properly motivated and the study must be objective and avoid statements discrediting the requirements of TMH16 or other similar documents. Data should, whenever possible, be tabulated or illustrated by a diagram.

TIA's shall be prepared when an application to change land-use rights is made, and shall normally only be carried out for roads and transportation facilities under the jurisdiction of the relevant authority. However, internal township roads may be included if there is a concern that such roads may not be able to accommodate generated traffic.

Briefly the TIA Report shall comprise the following elements (for fuller information consult TMH16):

- ***TIA Cover:***
  Comprising:
  - ❖ Name of Municipality;
  - ❖ Type of assessment – TIA;
  - ❖ Township name or town planning scheme number;
  - ❖ Erf numbers and farm names;
  - ❖ Date of TIA;
  - ❖ Name and address of assessor and/or company.
- ***Cover Letter:***
  Provided on the first page, and certifying compliance with TMH16.
- ***Development Particulars:***
- ***Primary Study Area:***
- ***Secondary Study Area:***

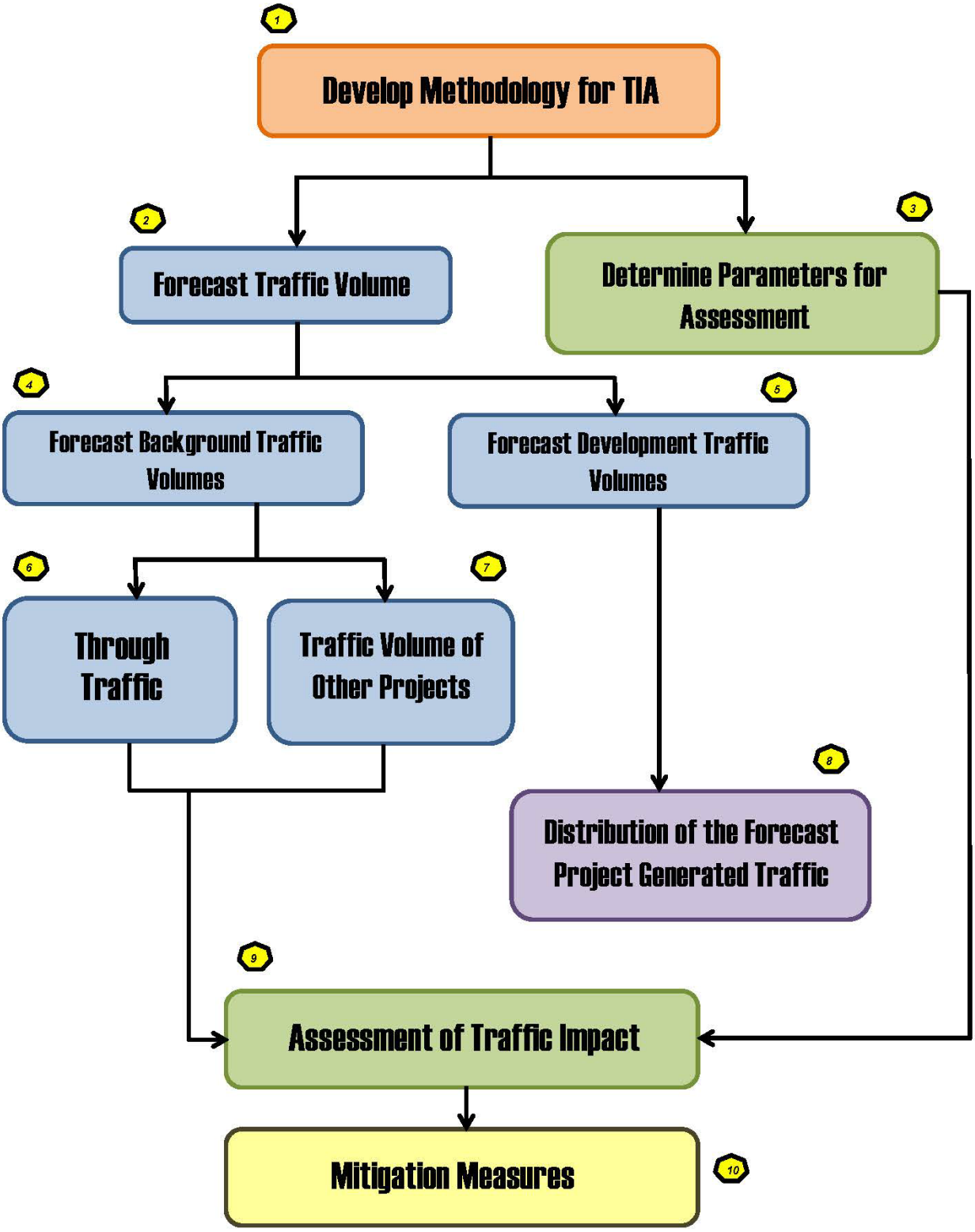


Figure 3.4.1: Typical Traffic Impact Assessment Procedure

- ***Background Information:***
- ***Site Investigations:***
- ***Traffic Demand Estimation:***
- ***Demand-side Mitigation:***
- ***Proposed Improvements:***
- ***Traffic Impact Assessment;***
- ***Improvement Costs (External Services):***
- ***Engineering Services Contributions:***
- ***Conclusions and Recommendations.***

3.5 Site Traffic Assessment Reports:

A Site Traffic Assessment (STA) shall be prepared and submitted whenever:

- *An application is submitted for the erection of a building or other structure (including roads and others) on a site for which a Site Development Plan (SDP) is required;*
- *Proposals are made for transportation facilities (including roads and others) in a township during Township Establishment.*

The purpose of an STA is to determine if transportation facilities contained in a Site Development Plan (SDP) or for a township during Township Establishment meet the standards and requirements of TMH16. SDP's are plans which landowners intending to erect or alter buildings, or other structures, on a development site are required to submit to the municipality.

The STA only involves the immediate site or township being developed and includes the site or township transportation facilities as well as accesses to the site or township. The principle objective of the STA is to evaluate proposals involving:

- Accesses;
- On-site roads;
- Parking;
- Loading facilities;
- Public transport facilities;
- NMT arrangements and other transport facilities.

An approved STA is only valid for 5 years from the date of the assessment.

NOTE: Single dwelling units are exempt from the basic STA requirements when access occurs from Class 5 road and is to the satisfaction of the municipality. The municipality may require an STA when there is concern over access safety.

Briefly the STA shall comprise the following (for fuller information consult TMH16):

- ***STA Cover:***
  Comprising:

  - ❖ Name of Municipality;
  - ❖ Type of assessment – STA;
  - ❖ Details of SDP or Township Establishment;
  - ❖ Erf numbers and farm names;
  - ❖ Date of STA;
  - ❖ Name and address of assessor and/or company.

- ***Cover Letter:***
  Provided on the first page, and certifying compliance with TMH16.
- ***Development Particulars:***
- ***Study Area:***
- ***Required Information:***
- ***Site Investigations:***
- ***Traffic Demand Estimation:***
- ***Site Traffic Assessment:***
- ***Conclusions and Recommendations.***

3.6 Site Development Plan Reports:

A Site Development Plan (SDP) Report shall be prepared and submitted whenever:

- *A developer wished to develop/build on a portion of a proclaimed "township" greater than a single dwelling unit, which forms part of an urban area;*
- *When such an area of land, zoned for one land use, is re-zoned (an "amendment scheme") and/or subdivided for a different land use or uses, and which in turn may require compliance with new or different town planning/development conditions;*
- *A land owner or developer wishes to subdivide land zoned for residential development of a greater density than single dwelling units and the subdivisions are intended to be smaller than adjacent single dwelling unit properties at the time of application to subdivide;*
- *The planning authority considers the development of a portion of land, or that what is proposed to be built, are sufficiently different from appropriate norms.*

Typically an SDP will be required for, but not limited to, the following types of development:

- Group housing and flats;
- Shopping centres/complexes;
- Business/office parks;
- Industrial parks/complexes;
- Certain types of development in conservation areas;
- Major developments which are likely to impact adjacent public environments e.g. conference centres, sports complexes, educational institutions etc.

A development application may require a number of SDP Reports on different aspects of the development, which may be submitted more or less simultaneously to different departments. **The details given below are primarily limited to roads and stormwater issues under JRA jurisdiction.**

3.6.1 Requirements for a SDP (or Outline Scheme) Report:

An SDP report should address at least the following requirements:

1. Check on the township application, proclamation/registration of the property and any approved rights;

2. The Site Development Plan Report should include the following:

    - ❖ A preliminary layout plan of the streets and stormwater, indicating the hierarchy of streets;

- Layout of roadways and stormwater drains, attenuation ponds (where required); and
- Roadway widths, grades etc.

3. There should be a statement of design criteria to be used; provision, if any, for adjoining land, land arrangements, existing intersections affected by the proposed development and limits of construction work.

4. The minor internal stormwater reticulation must be conveyed to the municipal system. The major overland flow must be discharged without damage to property. Developers may be required, at their expense, to lay 100 m of stormwater pipe, not exceeding 600 mm diameter, at the request of JRA.

5. Stormwater attenuation is required for an area ≥ 8 500 m^2.

6. The stormwater attenuation pond capacity should not be < 350 m^3/ha unless the supporting calculations can prove otherwise. The SDP Report should show the area taken up by the attenuation pond, and how it discharges.

7. The attenuation pond will be constructed and maintained by the developer until taken over by the future property owners (i.e. home owner's association).

8. A TIA Study/Statement may be required if:

   - Generated peak hour trips are:
     - < 50: no Study/Statement required;
     - 50 < peak hour trips < 150: Traffic Statement is required (special attention to the entrance design);
     - Peak hour trips > 150 TIA required;
   - Trip generation rate (am – 75% out; 25% – in; pm – 75% in; 25% out):

     Example: say area of development is 1,71 ha and 50 units/ha are allowed, SA trip generation rate is 1,5 trips per unit (higher income), then:

     The peak hour trips = 1,71 x 50 x 1,5
     = 128 x 0,75
     = 96 trips.

9. The developer will be responsible for any upgrading that may be required as per recommendations of the TIA. Details of the road structure should be provided.

10. The developer will be responsible for the construction of any service road within the township, the access road and the upgrading of the Council-owned road at any access intersections, where necessary.

11. The developer is to provide sidewalks along the frontage of the township as per the applicable JRA standard cross-section, or to match existing paving.
12. Roads and stormwater drainage that are to be taken over by JRA must be designed and constructed to JRA standards and must be approved by JRA.
13. JRA will only take over 450 mm diameter and larger stormwater pipes which are within the road reserve.
14. The detailed design drawings should only be submitted for approval once the SDP Report has been approved.
15. A cost estimate for the development is required for guarantee purposes.

Ultimately it is the purpose of the SDP Report to demonstrate that the proposed development's stormwater management plan provides attenuation capable of handling 1 in 5 year as well as a 1 in 25 year storm events. The attenuation structure must also be capable of withstanding a 1 in 50 year storm event **(refer also to Ch8 – Stormwater Drainage)**. This involves investigating the pre-development peak stormwater run-off and comparing it to the estimated post-development peak runoff in order to assess any potential impact on the current stormwater infrastructure. Mitigation measures shall be developed for any additional stormwater loading identified.

3.6.2 Typical Structure for an SDP Report:

Briefly the SDP should comprise the following:

- ***SDP Cover:***
  Comprising:
  - ❖ Name of Municipality;
  - ❖ Type of assessment – SDP;
  - ❖ Details of SDP or Township Establishment;
  - ❖ Erf numbers and farm names;
  - ❖ Date of STA;
  - ❖ Name and address of assessor and/or company.
- ***Cover Letter:***
  To be provided on the first page.
- ***Requirements for an SDP Report;***
- ***Synopsis of Proposed Development;***
- ***Current and Proposed Zoning;***
- ***Purpose of the Report;***
- ***Drawings Included in the Report;***

- ***Location of Accesses to the Site;***
- ***Existing Site Development;***
- ***Proposed New Development of the Site;***
- ***Road Hierarchy and Stormwater Networks Surrounding the Site;***
- ***Topography, Overland Flow and servitudes Serving Adjacent Development;***
- ***TIA Report, Site Access and Internal Roads;***
- ***Pre- and Post-Development Stormwater Catchment Areas;***
- ***Design Criteria;***
- ***Pre-Development Runoff;***
- ***Post-Development Runoff, Attenuation and 1 in 25 Year Hydrographs;***
- ***Conclusions and Recommendations.***

In addition a number of annexures are likely to be required. The following are representative of such annexures (the order of presentation may vary according to the prior contents of the SDP Report):

- ***Annexure A:*** ***Site Plans;***
  - ❖ A site development plan at not less than 1/200 (unless the site is large) - no larger than A3 in size;
  - ❖ Access plan and the external road network;
  - ❖ An orthophoto showing stormwater flow routes to nearest water course.
- ***Annexure B:*** ***A Reference Statement on SDP Report Criteria;***
  This could be a statement on the lines of 3.5.1 above. If stormwater is discharged into a stream from the site the relevant elements of Section 9.3 could also be included.
- ***Annexure C:*** ***Current and Applied for Zoning Rights;***
- ***Annexure D:*** ***TIA Letter of Approval*** (when appropriate);
- ***Annexure E:*** ***Surveyor General Diagram of any Servitudes;***
- ***Annexure F:*** ***Stormwater Calculations and Hydrographs.***

CHAPTER 4: DRAWING STANDARDS

4.1 Introduction:

The Johannesburg Roads Agency (JRA) considers it essential that a high degree of conformity and standard of production be observed by those producing drawings within the Agency and externally by those intending to submit drawings for Agency approval.

The preferred standards are described in detail in Appendix “C” to this Code of Procedure. The information given in Appendix “C” can serve to:

- Provide training guidance for new or less experienced staff members;
- Standardise drawings and drawing methods used within all JRA departments.

Individuals and organisations who receive a copy of the Code of Procedure are encouraged to follow the principles covered in Appendix “C” when preparing drawings for submission to JRA for consideration and/or approval.

CHAPTER 5: INVESTIGATIONS

5.1 Introduction:

A wide range of civil engineering investigations may be necessary as a result of specific property developments and any included roads and stormwater provision. Such investigations may be limited to one particular sphere of civil engineering or may require the coordinated investigations of several interacting civil engineering disciplines.

These investigations may relate to some or all of the following activities:

- The subdivision of land into erf;
- The survey of the lie or "shape" of the land in the context of property development and the provision of services;
- The development of an understanding of the constituent material of the land from the perspective of building, road construction and stormwater management, including the provision of culverts and bridges over water courses;
- The condition of any stream or river courses within the area, together with long term flood lines and water table conditions;
- The effect of traffic generation and growth on existing and surrounding network to be assessed in terms of:

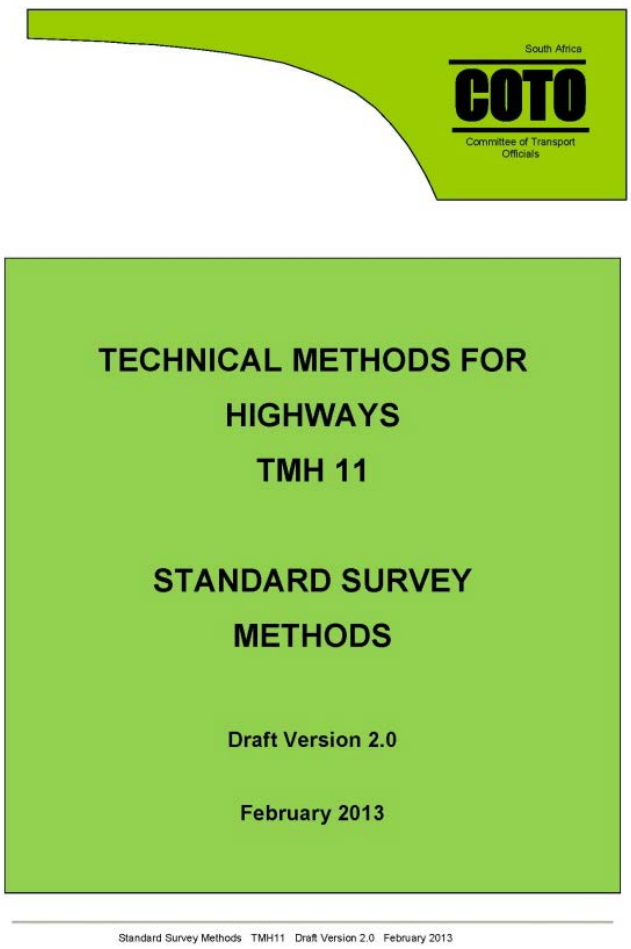
    - ❖ Road widths;
    - ❖ Traffic signals;
    - ❖ Public transport;
    - ❖ Parking;
    - ❖ Non-motorised transport – for pedestrians and cyclists.

Elements of these investigations are discussed in various chapters in this Code of Procedure. The following specific subjects are covered in this chapter:

5.2 Topographical Surveys;
5.3 Existing Services;
5.4 Geotechnical Investigations;
5.5 Materials Investigation.

5.2 Topographical Survey:

All survey work relating to Johannesburg Roads Agency requirements, whether by JRA staff, or by external surveyors employed by JRA directly, or by developers submitting development drawings to JRA for approval, shall conform to the provisions of the Committee of Transport Officials (COTO) TMH 11, Standard Survey Methods, unless specific instructions are given otherwise by JRA.



This Technical Methods for Highways (TMH) document, in Draft Version 2.0, February 2013 form, covers all elements of survey related to land development, road and rail routes, and bridges.

Whilst TMH11 covers the full spectrum of survey activities, the sections dealing with topographical surveys and reporting criteria are perhaps most relevant to this Code of Procedure.

COTO TMH 11 - February 2013

Figure 5.2.1:
TMH 11 – Standard Survey Methods

5.2.1 Reporting – Progress Reports:

It is a requirement of TMH 11 that survey reports for all surveys must be submitted on a weekly basis or as otherwise required by the client. Such reports shall note he progress with respect to the main functions of the survey project:

- Basic Survey;
- Digital Terrain Model;
- Detail Survey;
- Calculations;
- Cross Sections;
- CAD Work;
- Cadastral Compilation (when relevant).

5.2.2 Reporting - Technical Survey Reports:

A report dealing with all the technical aspects of the survey must be submitted on completion of the survey project. Such technical aspects include, but are not limited to, the following:

- Methodology used;
- Instruments used;
- Closures;
- Results;
- Name and height of level Datum Point;
- Results of accuracy checks;
- Any other significant details.

Annexure 1 to TMH 11 gives specific details of this closure Technical Survey Report.

TMH11 Annexures

5.2.3 Direction of Surveys to be used on Drawings:

Unless otherwise specified, all road surveys shall be displayed on drawings from left to right and in the direction of increasing route section numbers or stake values.

Unless otherwise specified, all other surveys shall be presented with the Nirth Direction towards the top of the drawing.

5.3 Existing Services:

Wayleave applications are to be submitted to the relevant City of Johannesburg departments, and other service organisations, to obtain information in relation to existing services. Section 2 of Appendix E7.1 indicates the range of service organisations that may require to be consulted.

In the event that information relating to existing services is not available, service detection shall be carried out to find any existing underground services.

5.4 Geotechnical Investigations:

Geotechnical investigations are usually required in the following situations:

- Foundation design of structures;
- Problem soils, e.g. clays, collapsible sands & dolomites; and
- Stability of embankments and cuts.

The British Standard Code of Practice B35930:1981 describes the objectives of a geotechnical investigation as the following:

- To assess the general suitability of the site for the proposed engineering works;
- To enable an adequate and economical design to be prepared;
- To foresee and provide against difficulties that may arise during construction owing to ground and other local conditions;
- To determine the causes and defects or failure in existing works and the remedial measures required; and
- To advise on the availability and suitability of local materials for construction purposes.

Wherever one, or a combination of the above situations arise, a professional geotechnical engineer shall be appointed to assess the situation. The geotechnical engineer shall, following the assessment, advise the client on investigations and/or surveys to be conducted.

The geotechnical engineer will under normal circumstances conduct his/her own investigations by means of test pits to investigate problems soils and also the stability of embankment and cuts. This is usually done in conjunction with a materials laboratory who will conduct any testing required.

However, where founding conditions of major structures, e.g. bridges, major culverts or multi-storey buildings need to be designed, the services of a drilling company is usually required. In this case, it is required to procure the services of such a company through open tendering. The consultant (geotechnical engineer) shall prepare a tender document based on the client's standard format. The specifications for these types of investigations are contained in *Standard Specifications for Subsurface Investigations, 2010*, or latest version available, produced by the South African National Roads Agency SOC Limited (SANRAL). **SANRAL Subsurface Investigations 2010**

The scope and extent of a geotechnical investigation shall be commensurate with the type and size of project, and it is the responsibility of the geotechnical engineer to ensure that the investigation provides sufficient detail for the purposes of design to reduce risk. The planning of such an investigation will be influenced by the following factors (*A Guide to Practical Geotechnical Engineering in Southern Africa, Franki, Edition 4, 2008*):

- The geology and geomorphology of the site;
- Access to and the remoteness of the site;
- The site topography, vegetation and drainage;
- The nature of adjacent developments;
- Knowledge of previous geotechnical investigations or foundation installations carried out in the area; and
- Evidence of problem soil conditions (expansive or collapsible soils, dolomites, dispersive soils, soft clays).

Typical field and laboratory tests are given below in Table 5.4.1.

Table 5.4.1: Types of Field Investigations and Laboratory Tests

FIELD INVESTIGATIONS	LABORATORY TESTING
• Auger trial holes • Test pits • Bulk and undisturbed sampling • Dynamic cone penetration test • Cone penetration test • Rotary core drilling • Standard penetration test • Vane shear test • Pressuremeter test • Lugeon test • Piezometer installation • Shelby and piston tube sampling • Core orientation • Rotary percussion drilling • Plate load test • In-sit density test • Geophysical techniques • Ground water monitoring	• Triaxial compression • Unconfined compression • Shear box • Permeability • Oedometer • Grading/sieve analysis • Hydrometer • Atterberg limits • Bulk density • Moisture density relationship • California bearing ratio (CBR) • pH • Conductivity

The reader is also referred to the *South African Pavement Engineering Manual, Chapter 7, Geotechnical Investigations and Design Considerations*, for further background (Figure 5.4.1 from this document illustrates typical geotechnical investigation processes). **For an active link to *Chapter 7* refer to page 5-9.**

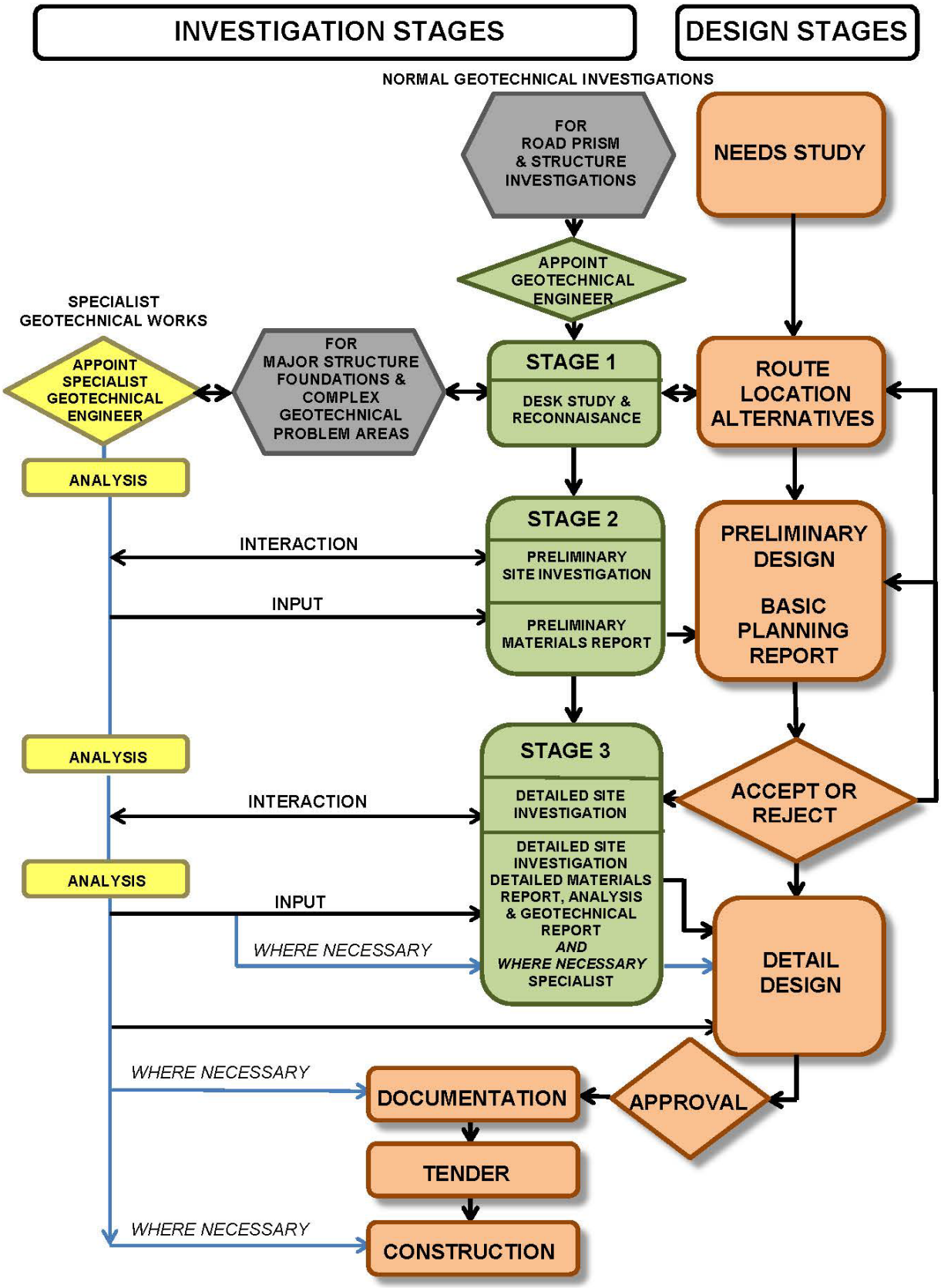


Figure 5.4.1: Geotechnical Investigation Processes

5.5 Materials Investigation:

Materials investigations are usually carried out for the purpose of road design and rehabilitation. The purpose of a materials investigation is to determine the properties of *in situ* horizons and/or engineered structures built from natural materials. The objectives of the investigations include:

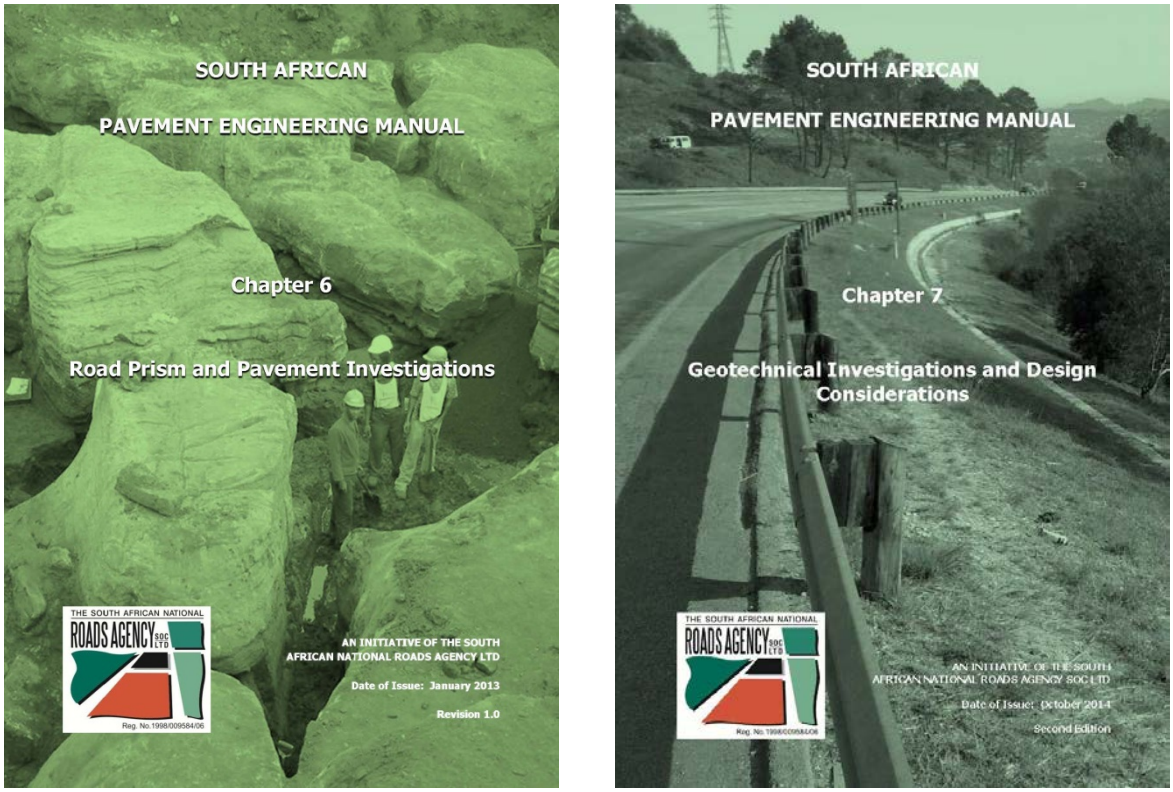
- The identification of suitable material for founding of engineered structures such as roads;
- Determine suitability of material from cuttings to be used elsewhere;
- The identification of problem soils within the road prism;
- The identification of the quality of existing pavement layers for purposes of rehabilitation design; and
- The identification of material sources for construction purposes.

The pavement and materials engineer therefore needs to assess the project and identify the scope and extent of testing. The importance of these investigations cannot be overemphasized. Budgetary constraints should not be used as an excuse to reduce the extent of testing as the cost of testing is a very small amount compared to the actual project cost. This should also be considered in the context of the potential cost of expensive remedial work which may result if insufficient investigations are conducted.

It remains the pavement and materials engineers' responsibility to advise the client on this matter. The *South African Pavement Engineering Manual* devoted an entire chapter (Chapter 6) to this topic. Reference can also be made to *Manual L 4/94, Materials Investigation and Pavement Design Manual, 1994, Transvaal Provincial Administration, Roads Branch*. The latter is especially useful when deciding on intervals for test pits for different categories of roads.

In the present day, borrow pits are rarely opened in urban areas. The first reason for this is that the area is built-up and the availability of open land for this is very limited. The second reason is the environmental requirements which must be fulfilled and permits to be applied for. This is a lengthy process and may take longer to get approvals than to complete the design of the project. Commercial sources are therefore the obvious solution.

The pavement and materials engineer will prepare a request for proposal (RFP) or tender document, depending on the procurement rules. This RFP or tender will be provided to reputable materials laboratories for pricing. Most clients require materials laboratories to be SANAS accredited. The South African National Accreditation System (SANAS) is the national body responsible for carrying out accreditations in respect of conformity assessment, as mandated through the Accreditation for Conformity Assessment, Calibration and Good Laboratory Practice Act (Act 19 of 2006).



SAPEM All Chapters

Figure 5.5.1:
South African Pavement Engineering Manual (2013/2014)

A phased approach can be adopted for most investigations. The first phase will consist of the actual test pit excavation and profiling. The profiles should provide the engineer with a good indication of uniformity and changes in materials. A clear change in materials from one test pit to the next will prompt the engineer to request additional test pit(s) within the interval to identify the location of this change.

The profiles can be complimented by Atterberg limits, which will further assist in the identification of further testing and eventually, to determine the extent of laboratory testing, which is the second phase of the investigation. The cost of laboratory testing can therefore be controlled to some extent, especially where the material is found to be uniform.

Similarly, phasing of the borrow pit investigation will consist of excavating and testing a limited number of test pits covering the extent of the proposed borrow pit. Once laboratory test results confirm the suitability of the material, more test pits on a 50 m – 100 m grid pattern can be investigated.

Any proposed modification of materials, whether mechanical or chemical, should be tested in the laboratory as part of the investigation. It is therefore important to ensure that sufficient quantities of materials are sampled at the outset to enable the laboratory to carry out the required tests. It becomes imperative that the engineer apply his mind from the outset of the project in order to identify possible strategies and to test these for adequacy.

During the design phase, the engineer should identify possible commercial sources located in the vicinity of the project. Whereas the aggregate supplier will be able to provide test results to show conformance to specification, testing of samples from the source is advantageous.

CHAPTER 6: TRAFFIC ENGINEERING

6.1 Introduction:

This Code of Procedure deals primarily with the planning and engineering requirements of the Development Control Unit within the Planning Department, and the Traffic Engineering Department in terms of their functions within the Johannesburg Roads Agency (JRA).

This chapter gives a brief description of traffic engineering processes whilst development control processes is covered in Chapter 1. The processes involved in these two areas of JRA activity are covered by detailed Standard Operating Procedures (SOP's). The SOP for the Mobility and Freight Traffic Engineering Department - Engineering Investigations, is given in full in Appendix D-6.1.

6.2 Mobility and Freight Traffic Engineering Department:

The Traffic Engineering Department is responsible, amongst other things, for Engineering Investigations related to:

- Traffic Signal Analysis;
- Road Safety Management;
- Traffic Impact Assessment;
- Network Monitoring.

The SOP is the standard methodology which will be used by the relevant staff in the Traffic Engineering Department in terms of their day-to day activities regarding Engineering Investigations. The objective of the SOP is to:

- Ensure that quality output is achieved as processes are followed;
- Serve as a framework for day-to-day engineering activities that need to be complied with;
- Indicate the respective roles and responsibilities of all parties involved and to indicate required timelines for conformance;
- Ensure consistency.

The elements of the Traffic Engineering SOP are fully detailed in Appendix D 6.1 and include the following:

1. Revision History;
2. Purpose/Objectives;
3. Scope;
4. Responsibilities;

5. Procedure;
6. Flowcharts;
    - A: Processing of All Service Requests;
    - B: Road Safety Investigations;
        - ❖ Requests for Traffic Calming;
    - C: Requests for Temporary Road or Lane Closures;
    - D: Requests for Directional & Tourism Signage;
    - E: Requests for Security Access Control;
    - F: Commenting on Traffic Impact Assessment;
    - G: New Traffic Signal Installation Undertaken In-House;
    - H: Revised Traffic Signal Installations Undertaken In-House;
    - I: Geometric Improvements at Intersections;
    - J: Geometric Improvements/Traffic Signal Designs Done by Consultants;
    - K: Provision of Traffic Counts & Traffic Signal Information;
7. Records Management;
8. Approval, Amendment and Review of Procedure/Process;
9. References;
10. Definitions.

Section 5: Procedures and Processes and Section 6 Flowcharts describe the steps and flow sequences respectively for each of the traffic engineering activities listed above. Note that process “A” is carried out at the same time as any (or all) of the processes described from “B” to “K”.

Figure 6.2.1 gives an example of one of the flowcharts from Appendix D 6.1, namely Chart D which refers to the processing of requests for directional and tourism signage.

Details relating to the preparation of Traffic Impact Assessment Reports (item 6.F above) are given in Chapter 3, Section 3.3.

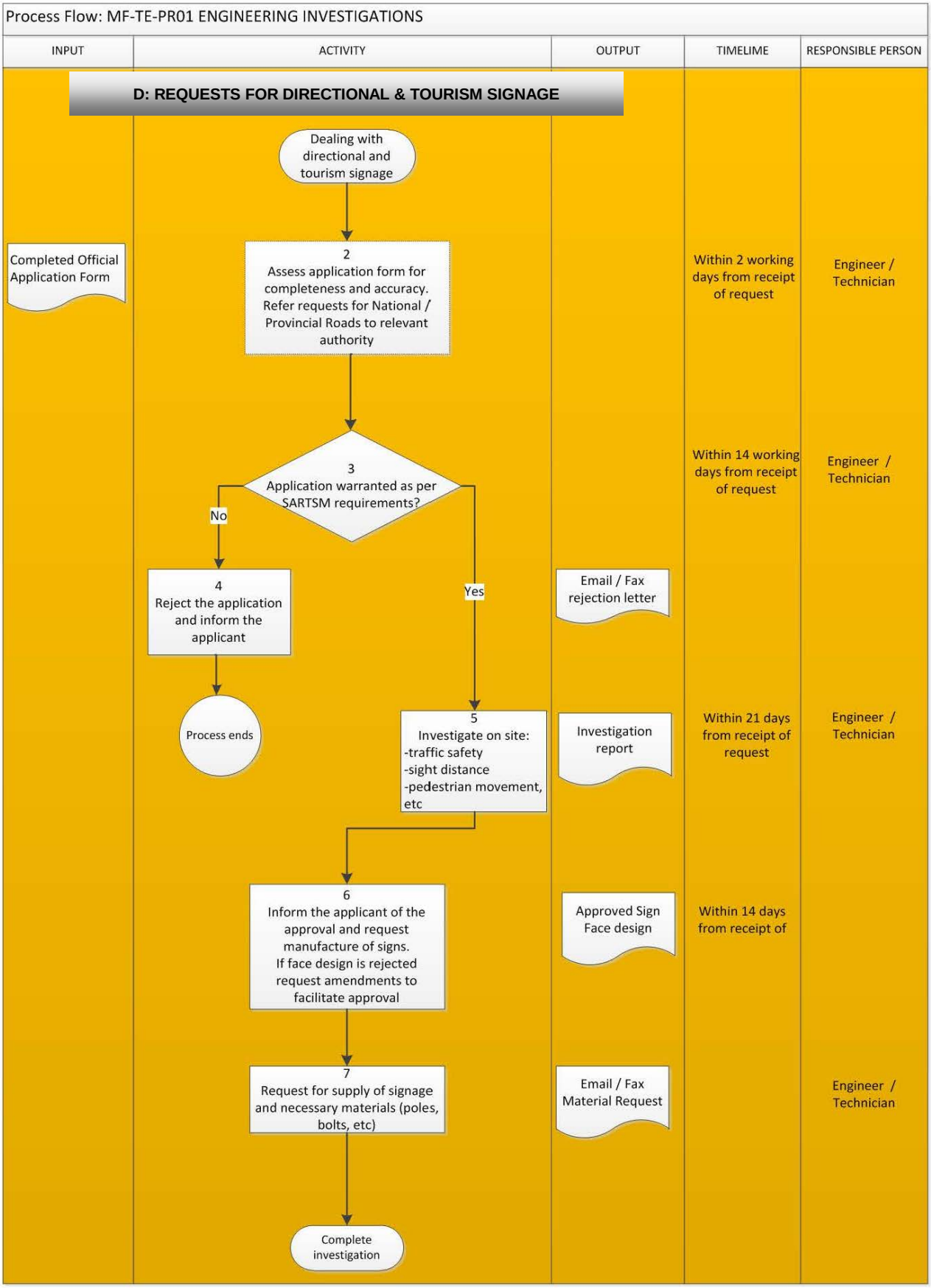


Figure 6.2.1: Flowchart for Requests for Directional & Tourism Signage

6.3 Road Traffic Signs:

"Road Traffic Signs" is a legally defined term in the National Road Traffic Act, Act 93 of 1996, and it's Regulations which encompasses the functions and applications of road signs, road markings and traffic signals. The only road signs, road markings and traffic signals recognised as "road traffic signs" are those prescribed by the Minister of Transport by inclusion in Schedule 1 to the Regulations and the Act. Additional signs, markings and signals may be added to Schedule 1 from time to time subject to the approval of the Minister. The approval of road traffic signs by this process is likely to be a lengthy and time consuming process. The Minister may, however, authorise the trial use of a proposed road traffic sign, in terms of Section 56 of the National Road Traffic Act, for a defined period of time (normally 12 months), during which time the efficacy of the proposal should be assessed.

It should also be noted that symbols, and the colours of different categories of sign, marking and signals, are included in the legal prescriptions of the Act, Regulations and Schedule 1.

It is recommended that any JRA staff member whose activities require assessment of road traffic sign proposals included as part of detail of developer submissions, or who is otherwise required to provide road traffic signing plans for Agency public roads, become familiar with the following:

- The National Road Traffic Act, Act 93 of 1996, and its Regulations and Schedules, as amended from time to time;
- The South African Development Community Road Traffic Signs Manual (SADC-RTSM), Volumes 1 and 4;
- The South African Road Traffic Signs Manual (SARTSM), Volumes 2 and 3;
- Materials and colour specifications for use in the manufacture and application of road traffic signs.

Three very common words "SHALL", "SHOULD" and "MAY" are each used **in a specific manner** throughout Volumes 1, 2, 3 and 4 of the Manual and the Act, Regulations and Schedule; the meanings accorded these words are as follows:

- "SHALL" – refers to a **mandatory condition** - when the word is used it means that the condition or conditions referred to must be complied with;
- "SHOULD" – refers to an **advisory condition** – when this word is used it is advisable or recommended to comply with the condition or conditions referred to (so far as the Manual is concerned both "should" and "recommended" are used on the basis that "recommended" has a stronger implication than "should");
- "MAY" – refers to a **permissive condition** – the condition referred to is optional.

In addition to the above the following elements of the SADC-RTSM/SARTSM are particularly related to definitions in terms of the law:

- Every regulatory sign, marking and signal has a legal description both in the Schedule 1 and in Volume1, Chapters 2, 6 and 7 of the SADC-RTSM (the descriptions in the latter vary slightly from the Schedule 1 to improve readability or ease of understanding – in any instance of doubt the Schedule 1 definition should be used.);
- Volume 2, Chapter 3 of the SARTSM discusses the differences between terms which are legally defined as different but might, in normal discussion, be considered synonymous e.g. **"intersection"** and **"junction"** (readers who deal with road traffic sign regulation are recommended to read Volume 2, Chapter 3, subsections 3.1.2 to 3.1.5 and 3.1.9);
- "Rules of the Road" are included in the Act as Chapter X and in the context of adequacy or otherwise, particularly of regulatory road traffic signs, it is important to understand which "regulations" are part of the "Rules of the Road" because it should not be necessary to provide regulatory road traffic signs to "reinforce" a "rule of the road".

Legislation is not always available to download free from the internet. The links below will enable those without access to the legislation to at least read relevant sections on-line. The legislation is first distributed in the Government Gazette which can be downloaded using the lowest link, provided one knows the relevant Gazette number.

http://www.acts.co.za/national-road-traffic-act-1996/

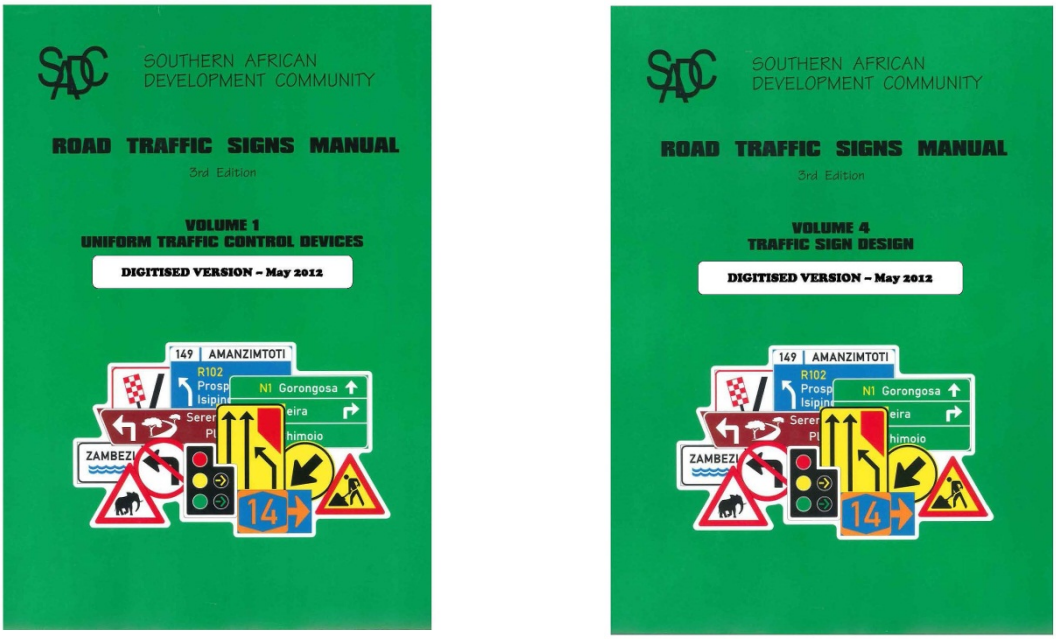
http://www.gov.za/sites/www.gov.za/files/38142_rg10303_gon846.pdf

http://www.gpwonline.co.za/Pages/default.aspx

Active links to each of the SADC-RTSM volumes of the Manual are given in Figure 6.3.1, and to the SARTSM volumes of the Manual in Figure 6.3.2 on page 6-6.

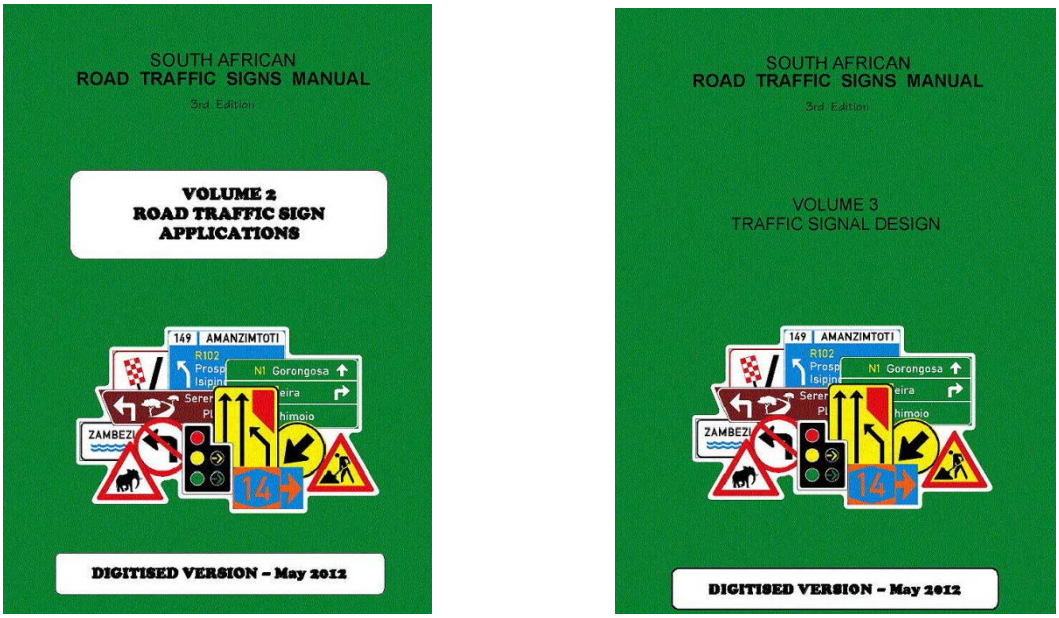
6.3.1 Definitions:

Legal definitions are given at all three levels of the legislative documents, namely the National Road Traffic Act, Regulations and Schedules. In working with legal road traffic matters it is often very important to understand how various terms are defined and how they relate to each other. It is therefore necessary to be thorough when trying to determine if a term has been defined in a road traffic context.



SADC-RTSM Volumes 1 & 4

Figure 6.3.1:
Southern African Development Community – Road Traffic Signs Manual Volumes 1 & 4



SARTSM Volumes 2 & 3

Figure 6.3.2: South African Road Traffic Signs Manual – Volumes 2 & 3

6.4 Traffic Signals:

As with almost any engineering endeavour, a degree of standardisation in processing and recording information and calculations etc. can result in a high level of efficiency and meaningful time savings both for developers and by JRA staff.

Volumes 1 and 4 of the SADC-RTSM give specific details of the full range of traffic control devices classified as traffic signals. Figures 6.4.1 and 6.4.2 from Volume 1, Chapter 6, “Traffic Signals” illustrate this range.

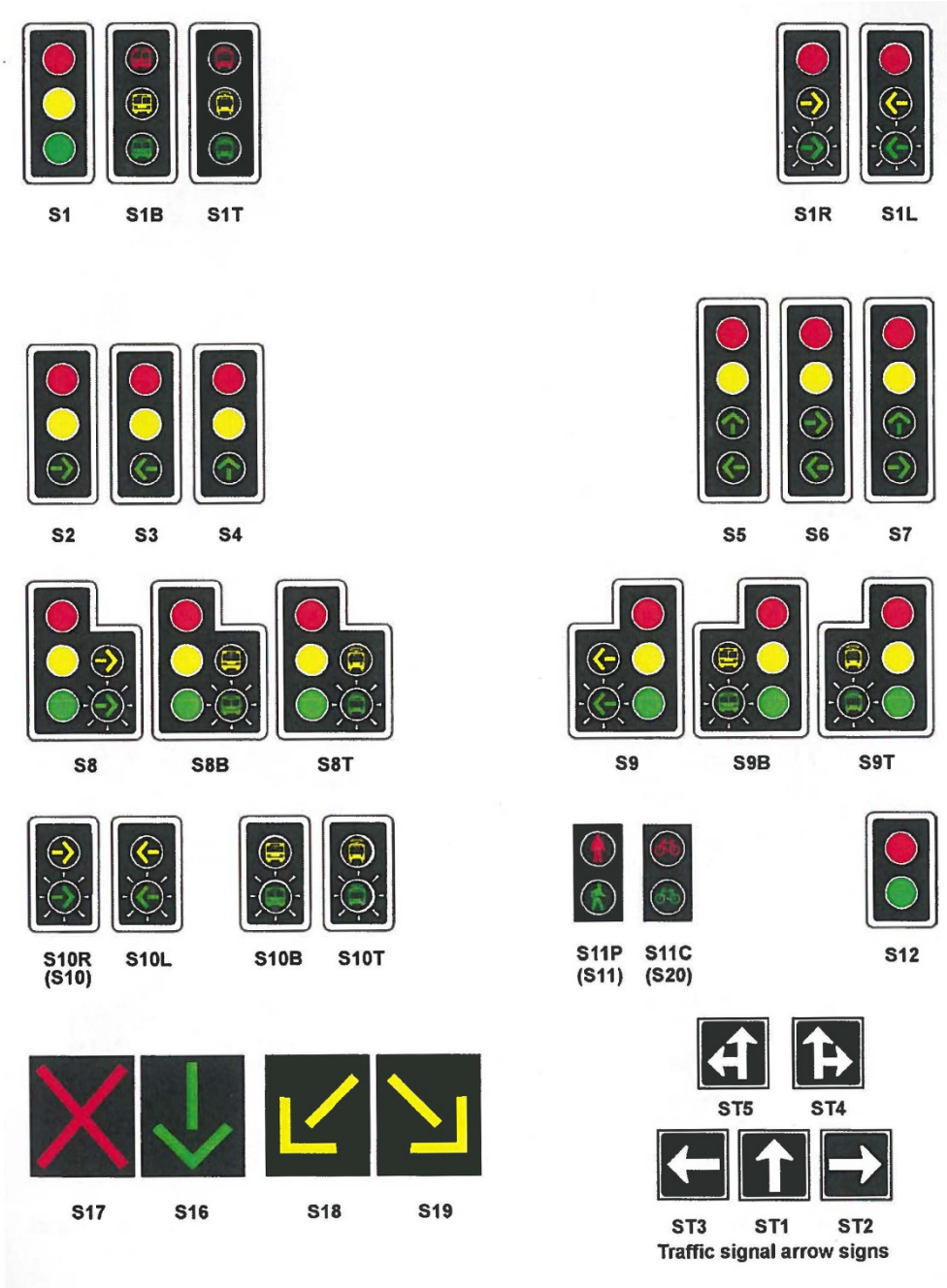


Figure 6.4.1: Standard Traffic Signal Faces & Traffic Signal Arrow Signs

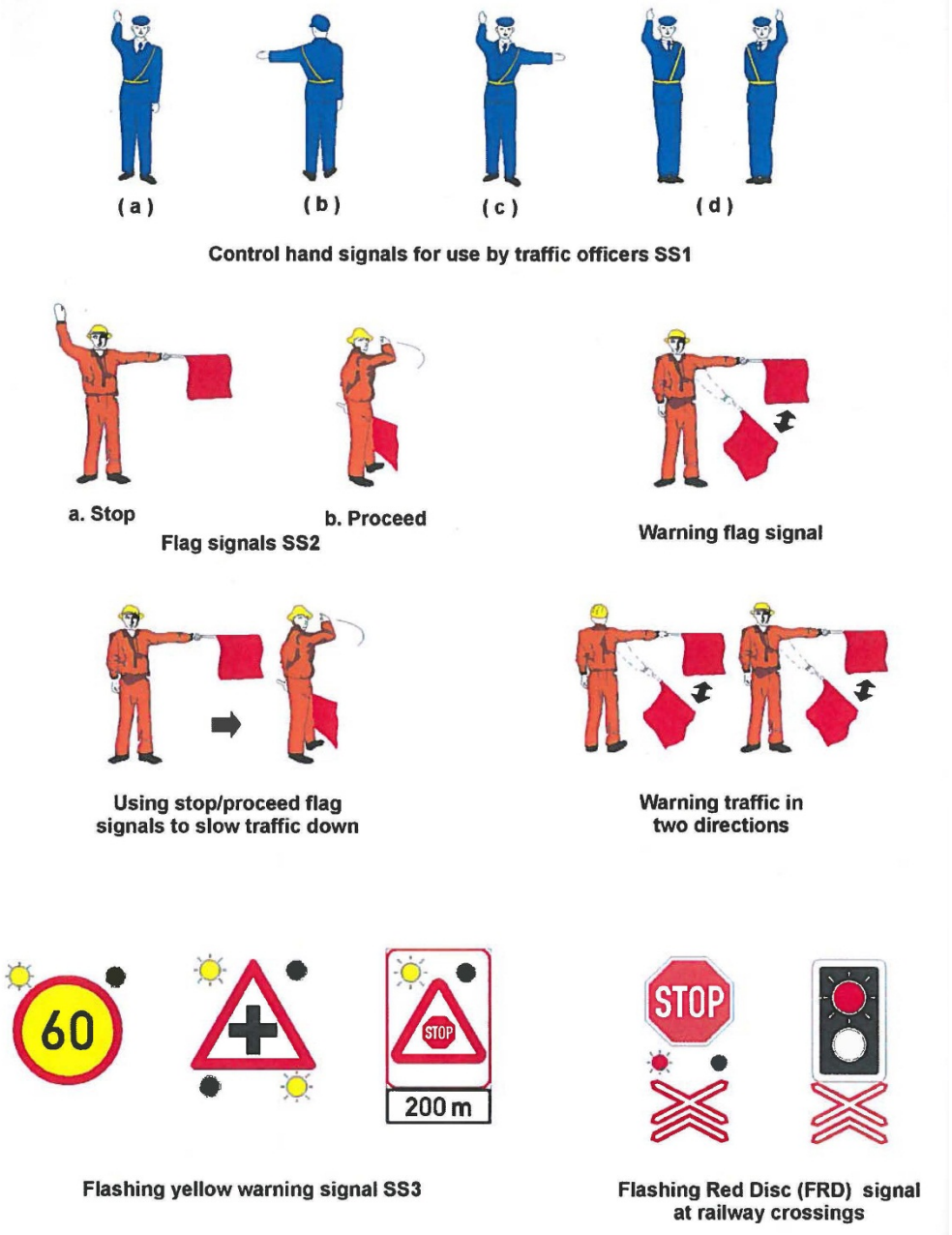


Figure 6.4.2: Other Signals

The whole of Volume 3 of the SARTSM is dedicated to all aspects of Traffic Signal Design. This volume is divided into three parts, namely:

- Part 1: Traffic Signal Control, including but not limited to, chapters covering:
  - ❖ Warrants;
  - ❖ Traffic Signal Faces;
  - ❖ Junction Layout;
  - ❖ Signal Timing & Phasing;
  - ❖ Vehicle-Actuated Control;
  - ❖ Vehicle-Responsive Control;
  - ❖ Area Traffic Control; etc.

- Part 2: Traffic Signal Equipment, including but not limited to, chapters covering:
    - ❖ Light Signals & Posts;
    - ❖ Facilities for Disabled Users;
    - ❖ Traffic Signal Controllers;
    - ❖ Central Control Systems; etc.

- Part 3: Traffic Signal Management, including but not limited to, chapters covering:
    - ❖ Responsibilities & Duties;
    - ❖ Risk Management;
    - ❖ Traffic Signal Installation;
    - ❖ Signal Timing Upgrading;
    - ❖ Signal Timing Records; etc.

6.4.1 Traffic Signal Timing Charts:

A brief description is given here of a process leading to a standardised form of submission of traffic signal timing plans to JRA. This process can be applied to either a new sign installation or to the upgrade or modification of an existing signal plan.

A worked example of the recommended Traffic Signal Timing Chart record is given in Appendix D6.2. Whilst specific junction and timing plans may vary the overall compilation of such a record, the primary elements are likely to include the following:

- Locality Plan;
- Approach details for all approaches (normally photographic);
- Existing Junction layout, including lane approaches
- Proposed geometric changes (if applicable);
- Signal head positions and designations (see Figure 6.4.1);
- Proposed changes to signal head types and/or positions;
- Signal Timing Plan – AM Peak;
- Signal Timing Plan – PM Peak;
- Signal Timing Plan – Off Peak;
- Signal Timing Plan – Night;
- Traffic Counts – AM & PM Peaks;
- Traffic Counts – Off Peak, Night, Saturday (as required by location);
- Signal Timings – Junction Intergreen Calculations;
- Signal Timings – Pedestrian Crossing Calculations;
- Other – Events Table;
- C.1 – Traffic Signal Layout Checklist (3 pages);
- C.2 – Traffic Signal Phasing & Timeline Checklist;
- C.3 – Traffic Signal Commissioning Checklist (2 pages);
- Typical Traffic Count Record/Typical Stage Movements.

CHAPTER 7: ROADS DESIGN

7.1 Design Guidelines:

Geometric road design standards used within Johannesburg should conform to the provisions of the collective guidelines given in the following documents:

- Draft UTG1 – Guidelines to the Design of Urban Arterial Roads - 1986;
- Draft UTG5 – Guidelines to the Design of Urban Collector Roads - 1988;
- Draft UTG7 – Part 1 – Guidelines to the Design of Urban Local Residential Streets - 1989;
- The "Red Book" – Guidelines for Human Settlement Planning & Design – Volume 2: Chapter 7 – Roads: Geometric Design and Layout Planning - 2000;
- TRH26 – Committee of Transport Officials (COTO) – South African Road Classification & Access Management Manual – 2012;
- City of Johannesburg – Complete Streets Design Guideline - 2014;
- Department of Transport – NMT Facility Guidelines 2014 – Policy and Legislation, Planning, Design and Operations;
- **Johannesburg Roads Agency Roads & Stormwater Manual, Volume2, Part1 - Roads and Part 2 – Stormwater comprising Standard Design Details – 2015.**

"Universal Access" is an overarching principle common to the last three documents listed above. The concept of *"Complete Streets"* proposes a range of road development details aimed primarily at the future development of new roads, or the significant redevelopment of existing roads, so that the roads may permit a higher level of achievement of "*Universal Access"* for their users (see Section 7.5).

However, the "*Complete Streets/Universal Access"* principles, by definition, require that more space in the complete roadway be provided particularly for pedestrians and cyclists (in fact non-motorised transport or NMT in all its forms), than has generally been the practice in the past. Retrospective application implies the provision of space for NMT at the expense of space previously allocated to motor vehicles, when overall space is inadequate for both. The coverage of Complete Streets in this manual has been aligned directly to the Road Infrastructure Strategic Framework for South Africa (RISFSA) classification, specifically to Classes 2 to 6.

It is evident from recent design parameters, including those covered in the *"Complete Streets"* concepts of bus rapid transit (BRT), non-motorised transport (NMT) and the recommended provisions for disabled persons at junctions, that some of the earlier guidance given in the reference documents noted earlier may need to be amended or updated, in order to cater adequately for these facets of modern urban road design

Until detailed standards and practices for the above design parameters have been formalised, designers should obtain specific JRA consent for geometric design details which are at variance with the listed documents, and specifically the provisions of Volume 2 of this Roads & Stormwater Manual (see also Appendix F7.3).

Table 7.1.1 below draws attention to the wide range of Appendices to this Code of Procedure. These have relevance to design procedures, processing and recording.

Table 7.1.1: Cross References to Appendices

APPENDICES RELEVANT TO DESIGN GUIDELINES	
APPENDIX	**DESCRIPTION**
A1.1	Standard Operating Procedure (SOP)-Development Application Procedure
B	Work in Road Reserves
C	Drawing Standards
D6.1	(SOP)-Traffic Engineering Department-Engineering Investigations
D6.2	Sample Traffic Signal Timings Calculations
E7.1	Checklist of Information on Detail Design Drawings
E7.2	Checklists for Roads & Stormwater design Drawings
F7.3	Volume 2, Parts 1 and 2, Lists of Standard Design Details by Title and Number
G	Stormwater Design Details Appropriate to Dolomitic Areas

7.2 Design Details:

The “Design Details” are more fully described as “Volume 2 - Standard Design Details for Roads & Stormwater”. The Design Details comprise two parts which are companion documents to this Code of Procedure, namely:

- Volume 2 - Part 1: Roads, and
- Volume 2 - Part 2: Stormwater.

These parts are published in A3 format and comprise Volume 2 in the following parts and sections:

- Part 1: Roads:
  - 1.1 Introduction (text);
  - 1.2 Roads: General Details (drawings);
  - 1.3 Roads: Design (drawings);
  - 1.4 Roads: Complete Streets – Design (drawings);
  - 1.5 Roads: BRT (Bus Rapid Transit) (drawings).

- Part 2: Stormwater:
  - 2.1 Introduction (text);
  - 2.2 Stormwater: Design (drawings);
  - 2.3 Stormwater: Maintenance (drawings);
  - 2.4 Stormwater: Sub Soil Drainage/Retaining Walls (drawings).

The text provided in Volume 2, Parts 1 & 2, is limited to a brief description of relevant terms and subject areas pertaining to the provision of roads and stormwater.

Appendix F7.3 to this Code of Procedure includes full lists of the initial Design Details covered in each section, with their drawing numbers.

Gaps in the number sequences have been provided to allow for the insertion of additional drawings in future, without the need to revise existing drawing numbers.

7.3 Road Classes:

The road classification system used by the City of Johannesburg and detailed in this Manual is based closely on the *Road Infrastructure Strategic Framework for South Africa* or RISFSA classification system. This system has been the basis of the development of the CoJ *Complete Streets Design Guideline* document.

Figure 7.3.1 below is the colour code key for Figure 7.3.2 which combines the descriptive details of this RISFSA road classification with the more traditional :Mobility and Access Diagram", which correlates with the different road classes. This figure also incorporates the "Cyclist Facilities" classification from the Complete Streets Design Guidelines.

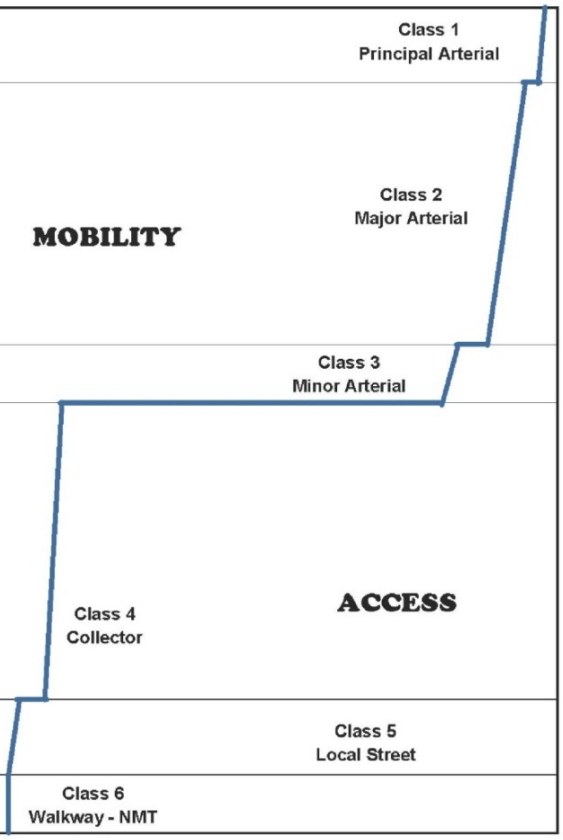
Figure 7.3.3 expands this classification to include typical road features used by the Johannesburg Roads Agency, such as:

- Intersection spacing;
- Access to property;
- Parking status;
- Normal speed limits;
- Types of intersection control;
- Typical cross section widths;
- Typical road lane width ranges;
- Typical road reserve width ranges;
- Applicability of public transport stops;
- Applicability of pedestrian crossings;
- Construction of pedestrian sidewalks;
- Provision of cycle lanes;
- Provision of traffic calming.

Figure 7.3.1:
Complete Streets – Key to Figure 7.3.2 – RISFSA Mobility & Accessibility

COMPLETE STREETS: MOBILITY & ACCESS

RISFSA Classification	Complete Streets Considerations	New Typology	Pedestrians	Bicycles	Public Transport	Motor Vehicles	Goods Vehicles	Emergency Vehicles
Class 1	The primary function is high mobility, hence complete streets principles are applicable primarily in ensuring adequate provision of grade separated crossings for pedestrians and cyclists.	Motorway/ Primary Distributor						
Class 2	This class of road represents major arterials and have historically catered for need of motorised travel. In the context of Complete Streets, the following needs to be taken into account: • These routes are the most direct linkages between home and work centres, hence cyclists are prone to use these routes. Consider providing Class II cycling facilities; • Some of these roads have low income residential settlements adjacent to them, hence special attention needs to be provided to pedestrian crossing facilities and access to public transport. Where these roads form part of the Strategic Public Transport Network, public transport modes need to be given priority.	Arterial/ Regional Distributor						
		BRT Trunk Route						
Class 3	Special care needs to be taken in separating motorised vehicles and pedestrians. Class III cycling facilities are appropriate.	District Distributor						
Class 4	Due to high numbers of pedestrians along these roads, Class III cycling facilities are more appropriate. In CBD areas: • On-street parking is important, hence special care needs to be taken when providing cycling facilities adjacent to on-street parking; • Minimum sidewalk width is not appropriate due to high numbers of pedestrians and the presence of other activities in the verge. In Industrial Areas: • Kerb radii need to accommodate heavy vehicle turning movements, hence the presence of long crossing paths at intersections may not be avoidable.	CBD Road/ Activity Road/ Local Distributor/ Boulevard						
		Industrial Road						
Class 5	Speed reduction measures should be used to keep speeds within acceptable levels for the safe movement of pedestrians and cyclists.	Residential Collector						
		Residential Street						
Class 6	Motorised vehicles are not permitted except for emergency vehicles in an emergency situation.	NMT Route/ Greenway/ Multi-Use Pathway						



CYCLIST FACILITIES:			
Class I	Bicycle Roads	Have an independent alignment in a bicycle reserve.	3.5 m width; 0.5 m lateral clearance; at least 2.5 m vertical clearance; typically grade separated intersections
Class II	Bicycle Ways	Are provided within a road reserve, either on or adjacent to the carriageway.	3.0 m 2-way/1.8 m 1-way; 3.0 m clearance at property entrances; ensure route continuity
Class III	Bicycle Lanes	Are specifically marked on the roadway pavement, usually unprotected.	Preferably with 60/70 km/h speed limit (optional to 80 km/h); allow for vehicle aerodynamic forces
Class IV	Bicycle Routes	Are accommodated on the roadway and indicated by road signs	Max. vehicle speed 50 km/h (40 km/h preferred) shared lane width 4.5 m preferred

Figure 7.3.2: Complete Streets – RISFSA Mobility & Accessibility

Figure 7.3.3: Complete Streets – JRA Design Elements

COMPLETE STREETS: SUMMARY OF DESIGN ELEMENTS

		REQUIREMENTS			TYPICAL FEATURES (use appropriate context sensitive standards for design)								
RISFSA Road Class	Complete Streets Typology	Intersection Spacing	Access to Property	Parking	Speed km/h	Intersection Control	Typical Cross Section	Roadway Lane Width	Road Reserve Width	Public Transport Stops & Ped. Xing	Pedestrian Footways (constructed)	Cycle Lanes	Traffic Calming
Class 1	Freeway/Primary Distributor	2,4 km (1,6 km to 3,6km)	Not allowed	No	100 – 120	Interchange	4/6/8 lane freeway	3,3 m - 3,7 m lanes	60 m – 120 m (60 m)	No	No	No	No
Class 2	Arterial/Regional Distributor	800 m (+/- 15%)	Not allowed *	No	80	Coordinated traffic signal/ interchange	4/6 lane divided, kerbed	3,3 m - 3,6 m lanes	38 m – 62 m (40 m)	Yes at intersections	Off road	Yes, on verge	No
	BRT Trunk Route	500 m	Not allowed	No	70	Coordinated traffic signal with bus priority/roundabout	2 lane BRT right of way in median, 2-4 mixed traffic lanes	3,3 m – 3,5 m lanes	30 m – 40 m	Only at BRT stations	Yes	Yes, in road or on verge	No
Class 3	District Distributor	600 m (+/- 20%)	Not Allowed *	No	70	Coordinated traffic signal/roundabout	4 lane divided or undivided, kerbed	3,3 m – 3,5 m lanes	25 m – 40 m (30 m)	Yes, at intersections	Yes	Yes, in road or on verge	No
Class 4	(Main) CBD Road Activity Street/Local Distributor/Boulevard	>150 m	Yes (larger properties)	Yes if conditions allow	60	Traffic signal, roundabout, or priority	4 lane, median at ped x-ing, boulevard, CBD one-way	3,0 m – 3,5 m lanes	20 m – 40 m (25 m)	Yes at intersections, or mid-block	Yes	Yes, in road or on verge	Median for peds, curved roadway
	Industrial Road	>150 m	Yes	No	60	Traffic signal or priority	4 lane, median at ped x-ing	3,2 m – 3,5 m lanes	25 m – 40 m (30 m)	Yes at intersections, or mid-block	Yes	Yes, on verge	Median for peds.
No RISFSA Class	(Small) CBD Road/ Activity Street	>150 m	Yes	Yes	40	Traffic signal or priority	2 – 4 lane plus parking	2,8 m – 3,3 m lanes	15 m – 25 m (22 m)	If applicable, anywhere	Normally yes	Yes, in road	Raised ped. crossing
Class 5	Residential Collector	>150 m	Yes	Yes, if appropriate	50	Roundabout, mini-circle or priority	2 - 3 lane undivided	6 m – 9 m roadway ?3,3 m lanes	16 m – 30 m (20 m)	Yes anywhere	Yes	Yes, in road or on verge	Raised ped. median, narrow lanes
	Residential Street		Yes	Yes on verge	40	Mini-circle, priority or none	1 - 2 lane mountable kerbs	3 m–5,5 m roadway (2 way)	10 m – 16 m (14 m)	If applicable anywhere	Not normally, pedestrians can use roadway	Use roadway	Yes, but should not be necessary
Class 6	NMT Route Greenway Multi-use Pathway	500 m maximum	Yes	No vehicles	15	None, pedestrians have right of way	Surfaced/block paving	3 m – 5 m	6 m	If applicable anywhere	Yes	Yes	Yes

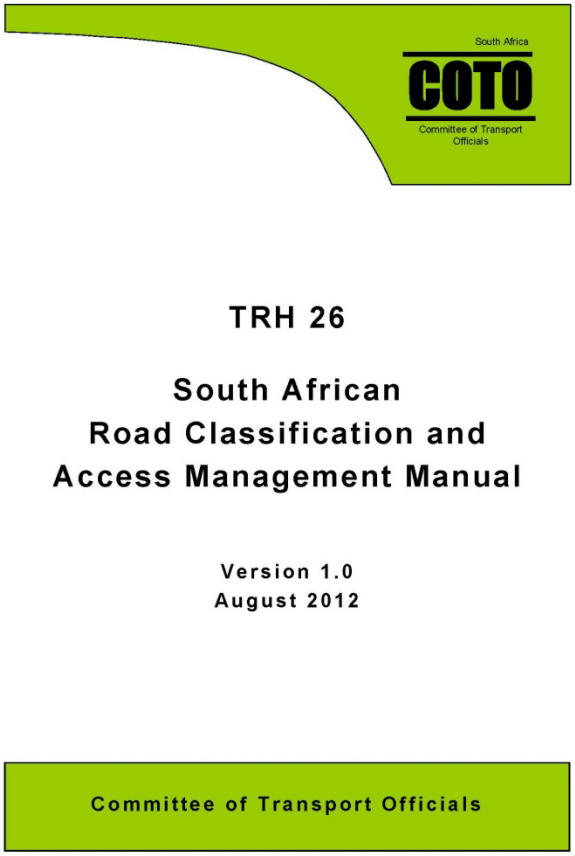
Figure 7.3.3 also records the requirement of JRA for a sub-class *"(Small) CBD Road/Activity Street"* located between RISFSA Classes 4 and 5.

The design details incorporated into Volume 2 of this Roads and Stormwater manual illustrate design requirements for JRA road network development.

The Technical Methods for Highways document in Version 1.0, August 2012 form expands significantly on the detail of the RISFSA functional classification of National, Provincial and Metropolitan roads and on the methodology appropriate to how such classification must be undertaken.

It also gives guidance on how a road must be managed in order to function effectively as classified.

In addition it addresses the access management component of the provision of a safe and efficient road network through the systematic control of the location and design of intersections, accesses and other elements of traffic management.



[COTO TRH 26 - August 2012]

Figure 7.3.4:
TRH 26 – South African Road Classification and Access Management Manual

7.4 Typical Cross Sections:

Two types of road cross section are detailed in *Volume 2, Part 1: Roads*. The first type, covered in the *General* section by drawings in the JRA-SD-RG series, detail prescribed service positions within road reserves ranging from a minimum width of 10.5 m up to 30 m or greater. A typical example from this drawing set is given in Figure 7.4.1. These road cross sections indicate, through notes, the specifications for road, cycle lane and sidewalk. It is further noted that, if the sidewalk and cycle lane share space to the outside of the kerb line, the sidewalk may be paved using interlocking concrete blocks but the cycle lane shall have a premix surface. The road cross sections in the *General* section refer back to drawings JRA-SD-RG-010 and -011 for urban functional road classification and urban access management requirements.

The second type of road cross section is detailed in the *Complete Streets* section of *Volume 2, Part 1: Roads* by drawings in the JRA-SD-RCS series. A typical example from this drawing set is given in Figure 7.4.2 which illustrates a 35 m RISFSA Class 3 District Distributor road reserve intersecting with a 25 m RISFSA Class 4 Local Distributor road reserve. Both of these road reserves in this figure include provision for *Complete Streets* Bus Rapid Transit, pedestrian and cycle paths/lanes and tactile paving at the intersections. The road reserve widths covered in this *Complete Streets* section ranges from a 40 m RISFSA Class 2 Arterial/Regional Distributor road reserve, through a range of 62 m RISFSA Class 2 Arterial/Regional Distributor road reserves with *Complete Streets* provisions, down to varying width RISFSA Class 6 Non-Motorise Transport/Greenway/Multi User Paths. All the *Complete Streets* drawings include plan layouts and basic typical cross sections which do not include service locations.

The first set of *General* road cross sections can be considered as representative of the current situation for the majority of Johannesburg roadways and therefore have relevance primarily for road rehabilitation purposes.

The second *Complete Streets* section tends to look at the future planning of new or upgraded road reserves in the context of:

- public transport;
- general traffic;
- non-motorised transport, and;
- disabled road user provision.

These provisions generally lead to wider road reserve requirements than are currently available in much of Johannesburg and becomes relevant at the planning stage of development. **The *Complete Streets* details do not indicate service positions or road construction requirements.**

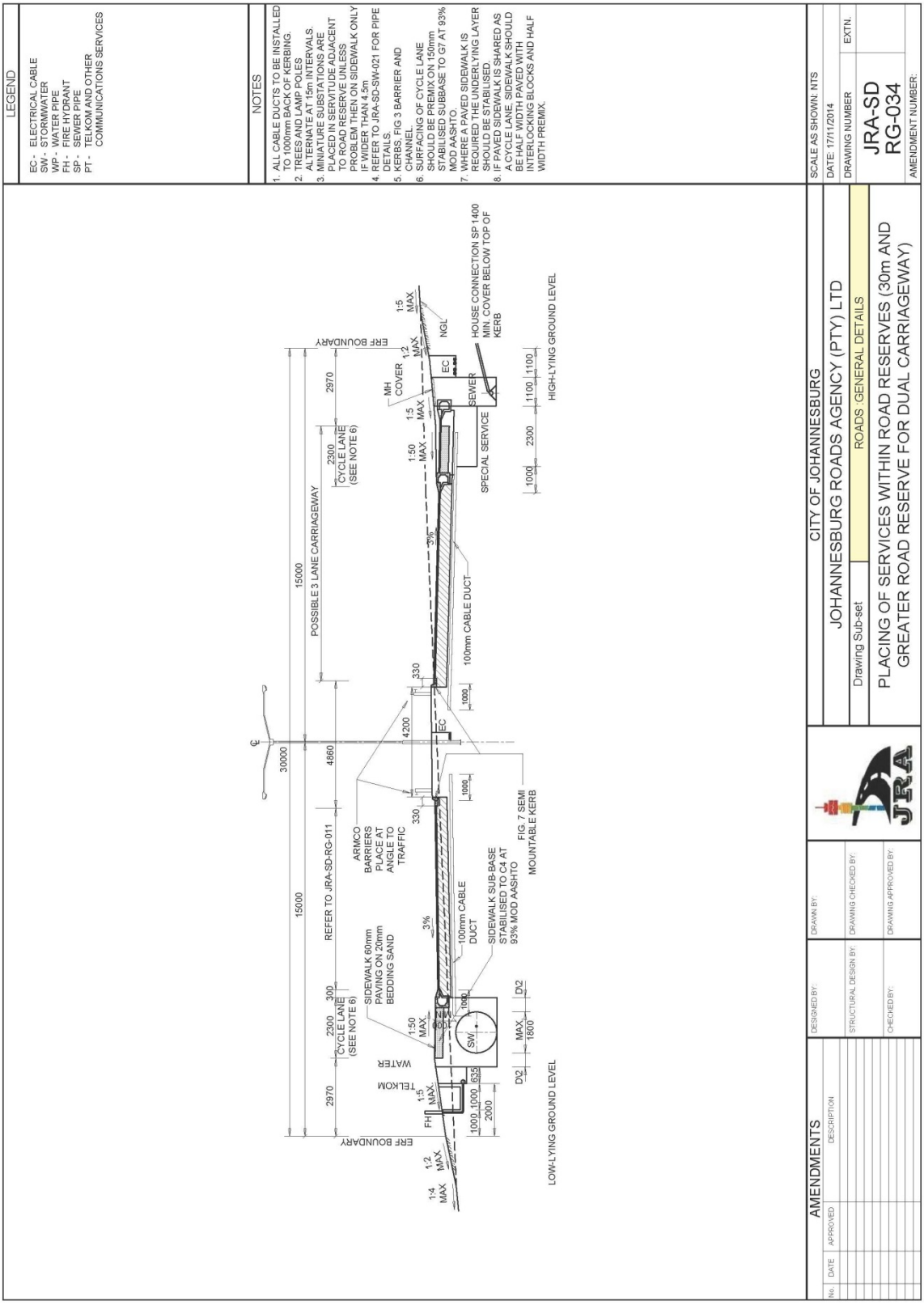


Figure 7.4.1: Placing of Services in Road Reserves (30 m Dual Carriageway)

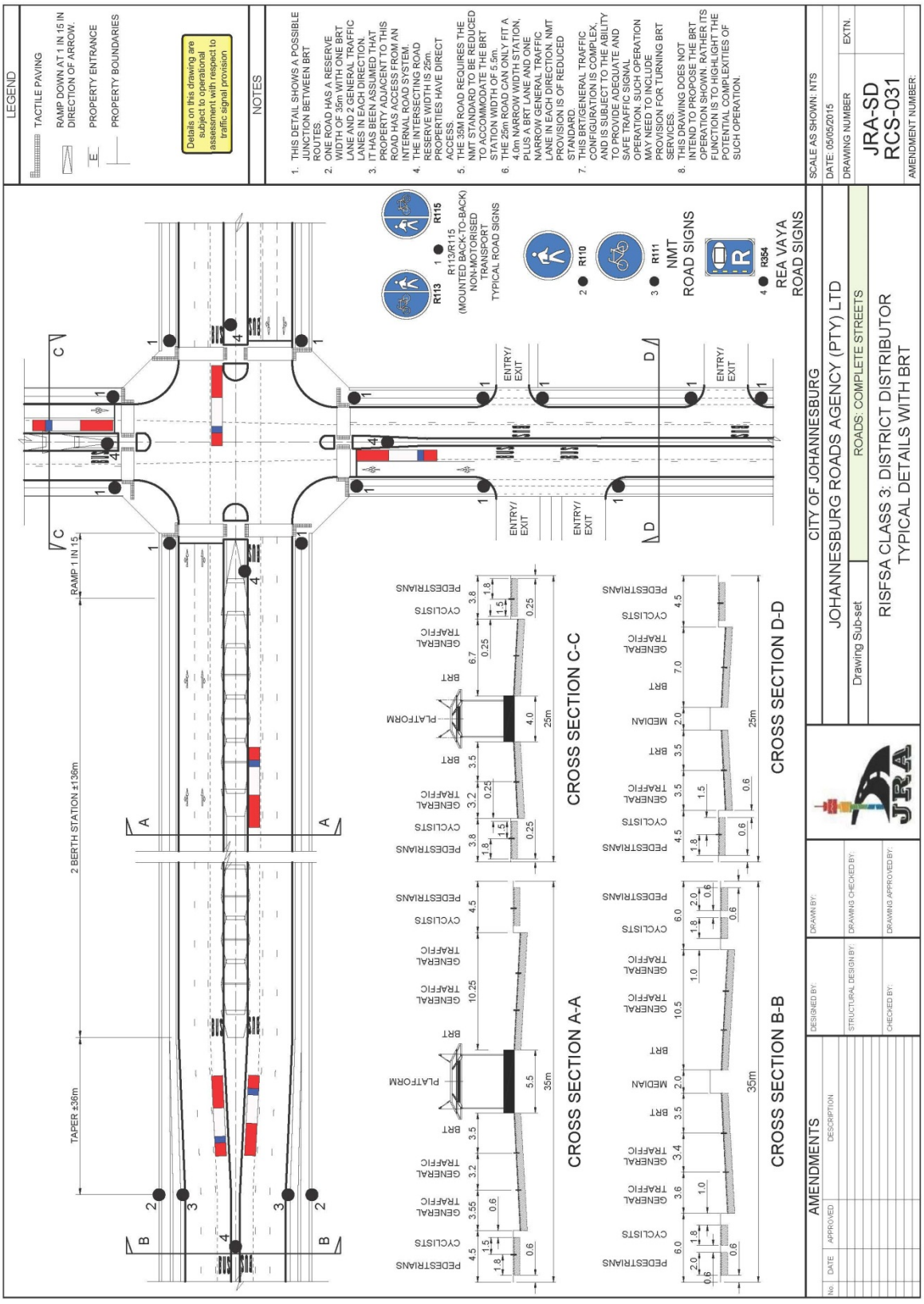


Figure 7.4.2: RISFSA Class 3 District Distributor (35 m Dual Carriageway)

7.5 Universal Design and Accessibility:

It is worth considering, at this stage, definitions of a number of terms which are closely related. These are:

- ***Universal Design and Accessibility*** refers to a broad spectrum of ideas and concepts developed to produce environments, buildings and products that are inherently accessible to people without disabilities, older people, and people with disabilities; all types of roadway, and their uses, can be considered as appropriate universal design and accessibility environments (see sections 1.2.1 and 1.2.2);

  A typical example of a "universal design and accessibility" detail is the dropped kerb or sidewalk ramp, available to all pedestrians but of specific assistance to the disabled with limited sight or mobility.

- ***Complete Streets,*** as the name implies, are designed for the benefit and safe access of all road users irrespective of age or capability (see section 1.2.3);

- ***Greenroads*** is a performance metric applied to the whole life cycle of a road by quantifying sustainable practices associated with the roadway design and construction to the benefit of all road users (see section 1.2.4).

It is pertinent, because of the similarity in terms, to consider also a definition of:

- ***Green Streets*** represent a sustainable stormwater strategy that meets regulatory compliance and resource protection goals, particularly within road reserves, by using a natural systems approach to manage stormwater, reduce flows, improve water quality and enhance watershed health

7.5.1 Principles of Universal Design

In 1997 a working group of architects, product designers, engineers and environmental design researchers at North Carolina State University developed the "*7 Principles of Universal Design"* as follows:

1. **Equitable Use:**
   The design is useful and marketable to people with diverse abilities.

   - **Guidelines:**
     - ❖ Provide the same means of use for all users; identical whenever possible; equivalent when not;
     - ❖ Avoid segregating or stigmatising any users;
     - ❖ Provisions for privacy, security, and safety should be equally available to all users'
     - ❖ Make the design appealing to all users.

2. **Flexibility in Use:**
   The design accommodates wide range of individual preferences and abilities.

   - **Guidelines:**
     - ❖ Provide choice in method of use;
     - ❖ Accommodate right or left-handed access and use;
     - ❖ Facilitate the user's accuracy and precision;
     - ❖ Provide adaptability to the users pace.

3. **Simple and Intuitive Use:**
   Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.

   - **Guidelines:**
     - ❖ Eliminate unnecessary complexity;
     - ❖ Be consistent with user expectations and intuition;
     - ❖ Accommodate a wide range of literacy and language skills;
     - ❖ Provide effective prompting and feedback during and after the task;

4. **Perceptible Information:**
   The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.

   - **Guidelines:**
     - ❖ Use different modes (pictorial, verbal, tactile) for redundant presentation of essential information;
     - ❖ Provide adequate contrast between essential information and its surroundings;
     - ❖ Maximise "legibility' of essential information;
     - ❖ Differentiate elements in ways that can be described (i.e. make it easy to give instructions or directions);
     - ❖ Provide compatibility with a variety of techniques or devices used by people with sensory limitations.

5. **Tolerance for Error:**
   The design minimises hazards and the adverse consequences of accidental or unintended actions.

   - **Guidelines:**
     - ❖ Arrange elements to minimise hazards and errors; most used elements, most accessible; hazardous elements eliminated, isolated, or shielded;
     - ❖ Provide warnings of hazards and errors;
     - ❖ Provide fail safe features;
     - ❖ Discourage unconscious action in tasks that require vigilance.

6. **Low Physical Effort:**
   The design can be efficiently and comfortably and with a minimum of fatigue.

   - **Guidelines:**
     - ❖ Allow users to maintain a neutral body position;
     - ❖ Use reasonable operating forces;
     - ❖ Minimise repetitive actions;
     - ❖ Minimise sustainable physical effort.

7. **Size and Space for Approach and Use:**
   Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture, or mobility.

   - **Guidelines:**
     - ❖ Provide a clear line of sight to important elements for any seated or standing user;
     - ❖ Make reach to all components comfortable for any seated or standing user;
     - ❖ Accommodate variations in hand and grip size;
     - ❖ Provide adequate space for the use of assistive devices or personal assistance.

7.5.2 Universal Access

In the context of road design the concept of *"Universal Access"* is appropriate to develop as a set of principles specifically aimed at providing *"Complete Streets"* for all road users. *"Universal Access"* can be considered as the goal of enabling all users of a public street to reach every destination served by the street.

The *"7 Principles of Universal Design"* can be translated as the following principles of *"Universal Access"*:

1. **Universal Access to Destinations**
   The public road system shall enable access to all destinations served by the system to pedestrians, cyclists and drivers, except that vehicle operation may be restricted for reasons of excessive noise, size or mass or extraordinary potential for damage to the property or person of others.

2. **Equal Rights to Use**
   The travel rights of people to use a specific travel mode on a portion of street designated for travel are not affected by less mass, size or average speed associated with the mode.

3. **Integration of Modes**

Differing modes of travel within a public road shall not be controlled by law or the design of the roadway without valid compelling, scientific and objective evidence that segregation offers operational advantages that override any disadvantages. Segregation of vehicular and pedestrian traffic may be warranted on busy roads. Segregation of different vehicle types is generally undesirable as this almost always results in increased conflicts at junctions, forces some users onto inferior facilities or in a failure on the part of some drivers to comply with the restrictions.

4. **Uniformity and Simplicity**

Transportation systems should be simple and intuitive. Differing forms of facility should utilise uniform design criteria and regulations. Similar circumstances should be treated in a similar manner to support more consistent, reliable and predictable user actions. Vehicle-type-specific exceptions to the “Rules of the Road” are not desirable since they can result in less reliable or predictable traffic behaviour.

5. **Accessible Surfaces**

Wherever practical, travel surfaces should accommodate foot travel and assistive devices such as wheelchairs, with minimal risk and interference. Road surfaces should also accommodate the narrow tyres of bicycles (and wheelchairs at road crossings).

6. **Crossable Roadways**

At non-signalised access locations, crossing times shall not exceed the time taken at walking speed to make the crossing, within the sight distance to potentially conflicting traffic, or during gaps in traffic. Any refuges provided to reduce crossing distance must be large enough to accommodate wheelchairs or prams.

Traffic signal timings should allow adequate clearance intervals for safe crossing by pedestrians and disabled persons.

7. **Space Appropriate to Use**

Adequate manoeuvring and recovery space should be incorporated into roadway design for all vehicle operators and pedestrians, including wheelchair users. When travel modes with significant speed differentials are present on a common road section the road should be designed to facilitate overtaking of one mode by another. Such overtaking should occur with clearances appropriate to the speed differential, mode manoeuvrability and vulnerability.

7.5.3 Complete Streets

The Johannesburg Road's Agency is committed to long term implementation of universal accessibility through its "Complete Streets" philosophy. The City of Johannesburg has published a Complete Streets Design Guideline document.

Implementation of the Complete Streets principles can occur in one of two ways:

- By the construction of new or fully upgraded roads as development of the city progresses; and
- As a commonly more limited retro-fit upgrading of existing streets.

For the purposes of this manual, and in line with the Complete Streets guideline principles and the scope of this manual, Volume 2, Part 1: Roads, Section 1.5 deals with the first of the options noted above. In doing so the desired criteria required to provide for Bus Rapid Transport (BRT), Non-Motorised Transport (NMT) and physically disabled and sight impaired road users have been included in the examples.

At the time of preparation of this document, the design of tactile geometry road fittings for physically disabled and sight impaired pedestrians, is under review. This review is likely to include a revision of the South African National Standard: Design for Access Mobility – Tactile Indicators – SANS 784:2008, Edition 1.

In preparing the example drawings in section 1.5 therefor the small scale details include notional illustrations of tactile indicators. A small number of enlarged details of sidewalk tactile geometry have been included, but are likely to be subject to detail change in due course.

The approach used in the selection of individual Complete Streets drawings has been based on limited coverage of:

- RISFSA Class 2 to Class 6 category roads (see drawings JRA-SD-RG-010 and 011, together with JRA-SD-RCS-010 and 011 in Volume 2, Part 1: Roads);
- Inclusion of public transport facilities where relevant;
- Provision for non-motorised transport;
- Provision for physically disabled and sight impaired road users.

The level of detail included is based on “high” end principles applicable to any new or upgraded roads to be constructed in Johannesburg in the future, in particular for major developments. It should be noted that the proposed road reserve width / cross section combinations given in the various drawings have been determined for better than minimal NMT standards.

In the context of Complete Streets, the details given in Figure 7.5.1 quantify the spatial requirements for a range of typical sidewalk, ramp and pedestrian crossing users around which accessibility needs should be determined. It is particularly relevant in this regard to draw attention to the amount of space required from a multi-user sidewalk to accommodate a medium standard public transport passenger shelter.

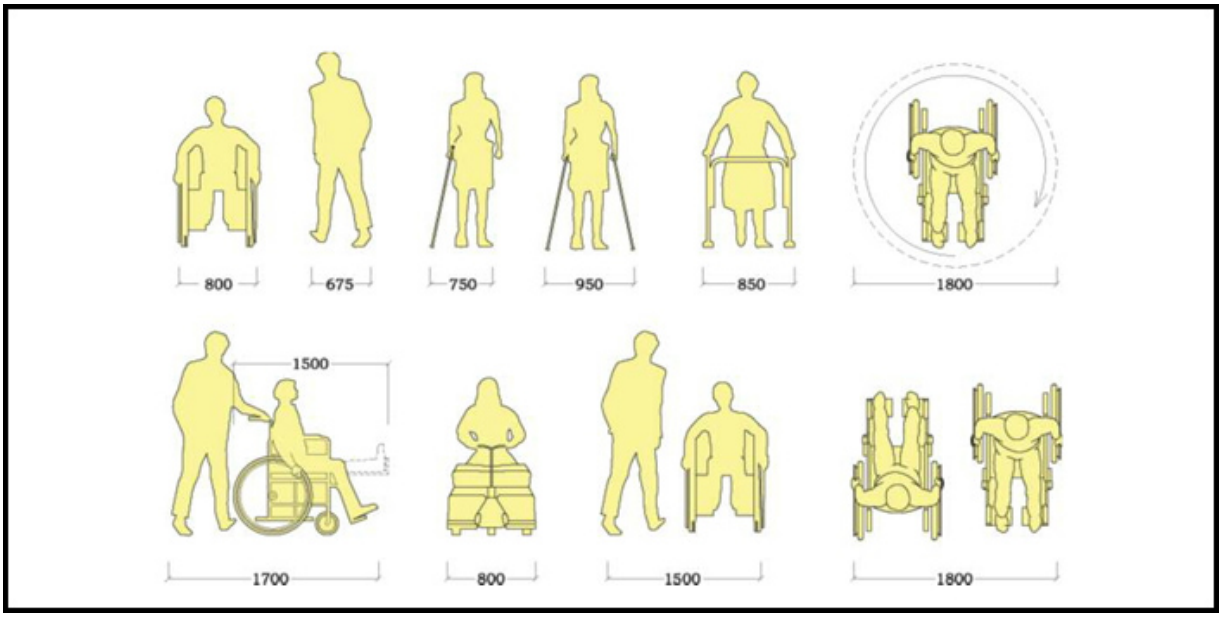


Figure 7.5.1: Spatial Requirements for Different Sidewalk Users

The upgrading of existing streets by retro-fitting to Complete Streets principles can be assisted by reference to the "high" end details given here, although retro-fitting will almost certainly involve a wider range of variables. These variables are likely to result in the end product being a compromise solution.

Figure 7.5.2 illustrates how Complete Streets principles can be accommodated within the over-arching concept of Universal Accessibility (see highlighted section of Figure 7.5.2).

7.5.4 Greenroads

"Greenroads" is a relatively new concept in road design and construction terms, and emanates from the establishment of the Greenroads Foundation in mid - 2010 in Redmond, Seattle, Washington State. The work of the Greenroads Foundation is encapsulated in the ***"Greenroads Rating System"*** which can be utilised to rate the ***"green"*** quality of a road related project according to a wide range of criteria.

The ***Greenroads Rating System*** exists currently in Version 1.5 form and is scheduled to be updated to Version 2 in March/April 2015. **It is evident that the process, after 4 years of development, is still subject to evolutionary refinement as its use expands.**

The Green Roads Council of South Africa (GRCSA) is currently pending review for the equivalency of South African standards and specifications related to those in use in the USA, as is the United Arab Emirates. The following countries have also commenced active pilot projects with a view to compliance with the ***Greenroads Rating System*** requirements:

- New Zealand;
- Canada.

Due to the current status of the South African ***"green roads"*** movement the remaining information in this section relates to details of the USA ***"Greenroads"*** system.

As has been noted earlier, ***"Greenroads" is a performance metric applied to the whole life cycle of a road by quantifying sustainable practices associated with the roadway design and construction to the benefit of all road users.***

The ***"green"*** aspect of the process comes primarily from the combination of ***"whole life-cycle"*** and ***"sustainability"***. Sustainability is seen to have seven key components, namely:

- Ecology:
  - ❖ Minimise impacts and improve the environment;

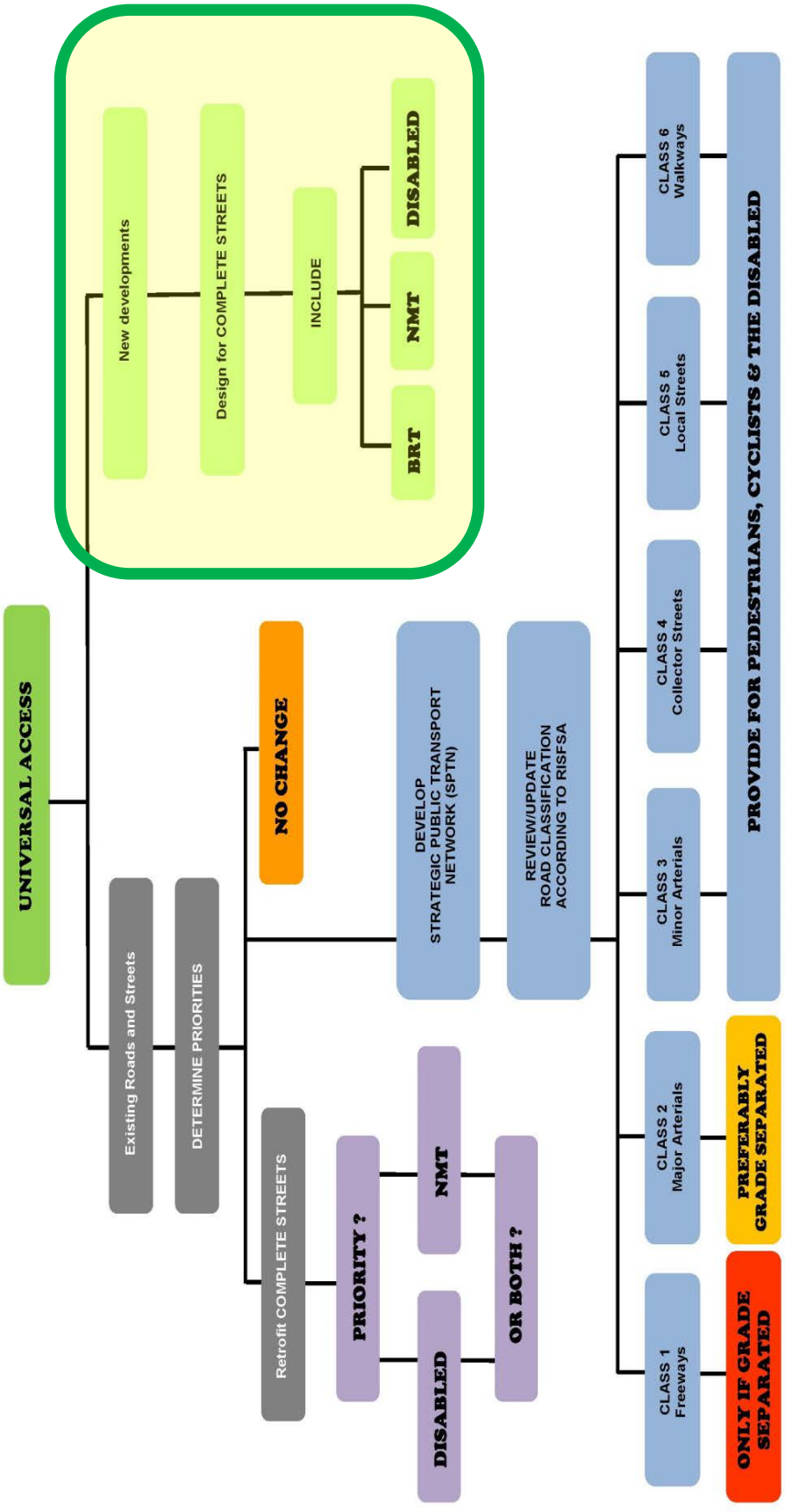


Figure 7.5.2: Scope for Road Based Universal Accessibility

- Equity:
  - ❖ Seek quality of life for all;
- Economy:
  - ❖ Manage resources wisely;
- Extent:
  - ❖ Determine relevant physical and temporal constraints for decision-making
- Expectations:
  - ❖ Define relevant human values and interests for decision-making;
- Experience:
  - ❖ Encourage integrated teams of learned experts;
- Exposure:
  - ❖ Develop new knowledge and teach it to others.

The following paragraphs represent a selection of issues or elements relevant to an understanding of the ***"Greenroads"*** and ***"Greenroads Rating System"*** processes. They do not represent a full discussion on the subject.

1. Philosophy:

In essence the ***"Greenroads"*** process is designed to direct roadway design and construction practitioners towards a higher order of sustainability in the outcome of projects they deal with. Sustainability is, however, a concept and does not define actions or decisions in a specific manner. ***"Greenroads"*** is a methodology for translating sustainability concepts into roadway design and construction practices.

The ***"Greenroads"*** process has been developed for four basic reasons:

- Roadways can be more sustainable than they currently are;
- Efforts to date to improve roadway sustainability have not been applied to a consistent set of standards or measures;
- The science and engineering underlying roadway sustainability can be complex;
- Different elements of roadway sustainability are difficult to compare to each other because they do not share common values.

The ***Greenroads Rating System*** has therefore been developed, and is still subject to ongoing refinement, in order to promote more sustainable solutions for roadway design and construction. The ***Greenroads Rating System*** comprises one group of mandatory criteria and, currently, six groups of ***credit*** criteria. When a project is rated it is rated in its entirety, all elements such as materials, design, roadway, bridges, and stormwater being included in the process to a greater or lesser extent. Apart from the mandatory criteria, all projects will not qualify for rating in all credit criteria due to the specific nature of the project. The optional credit criteria aid in the sustainability decision making of a project and conform to the following fundamental tenants:

- Straight forward and understandable;
- Use empirical evidence and existing evaluative techniques;
- Credit is commensurate with impact – high economic, environmental or social impact is given higher credit;
- Flexibility;
- Continual evolution;
- Minimal bureaucracy;
- Above minimum requirements.

2. Applicability:

"Greenroads" is a sustainability rating system for roadway design and construction and is applicable to all types of roadway project.

Greenroads" provides the following key things, namely:

- An holistic way of considering roadway sustainability;
- A defined and quantitative means to assess roadway sustainability;
- A tool for decision makers, agencies, consultants and contractors that enables informed design and construction decisions regarding sustainability.

The system applies specifically to:

- The design process;
- Construction activities within the work zone;
- Material procurement and hauling;
- Cement production;
- Hot mix asphalt production.

Some activities are only considered marginally or are excluded entirely:

- Materials manufacture or refining – cement, asphalt and similar materials' manufacturing/refining are only considered in life cycle analyses;
- Structures – are considered only as a collection of materials – non-material qualities such as design or aesthetics are excluded;
- Paths and trails associated with a roadway (sidewalks) are considered – independent paths and trails are excluded;
- Maintenance and preservation – although these have a significant impact on ultimate roadway sustainability they occur after rating certification and cannot be verified;
- Roadway use – traffic and other direct use characteristics are excluded as they cannot be adequately predicted or verified over time – however, design decisions affecting a facility are given credit.

3. Categories, Credits and Certification:

Figures 7.5.3 and 7.5.4 give details of the current ***"Greenroads Rating System"*** Version 1.5 **Categories** and **Credits** respectively. The rating system is, in fact, a collection of best practices, each of which is assigned a point value based on its impact on roadway sustainability.

These best practices are arranged in **Categories** under relevant subject headings. The first **Category** is designated ***"Project Requirements"*** and, in Version 1.5, includes 11 best practices. Compliance with these is mandatory in order for a project to qualify as a ***"Green Road"*** and to subsequently be assessed for a rating in terms of the other 6 **Categories**.

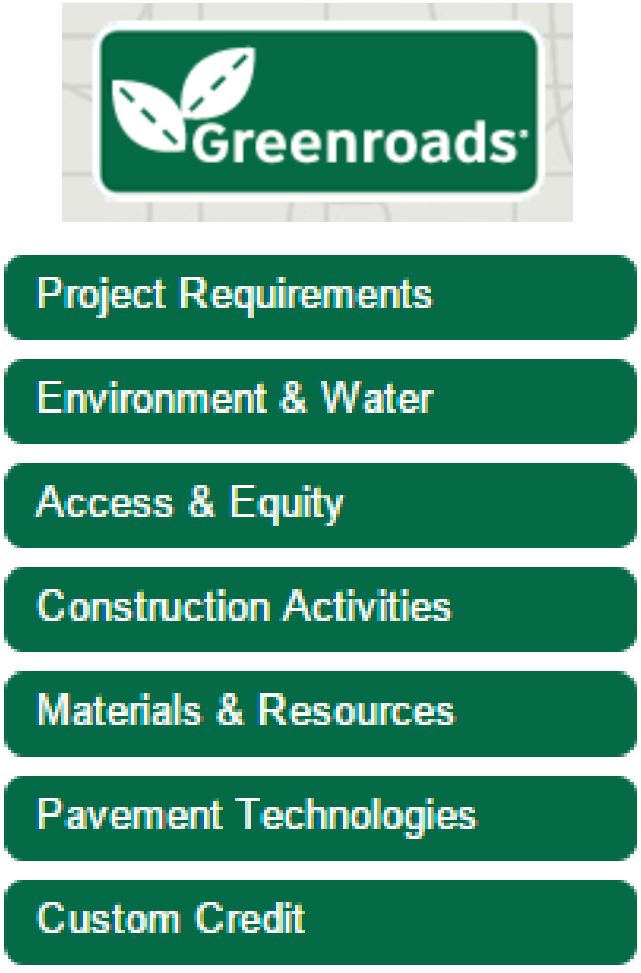


Figure 7.5.3: "Greenroads" Version 1.5 Rating System Categories

Voluntary **Credits** are directly applicable to at least one of the components of sustainability best practices – economic, environmental and social. These components are commonly expanded as follows:

- Economic – cost, durability, quality, efficiency;
- Environmental – water, air, natural resources, habitat;
- Social – equity, safety, culture, access.

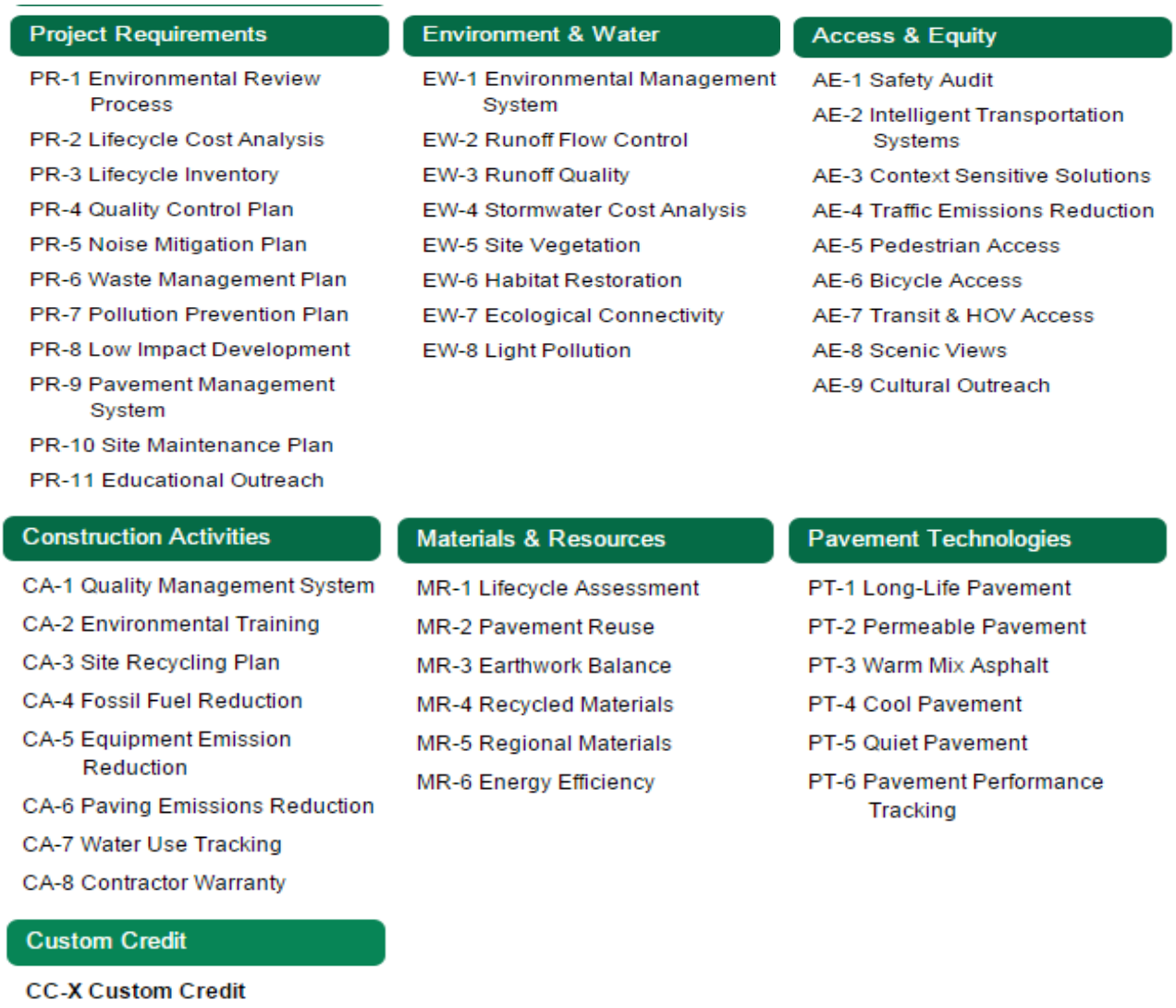


Figure 7.5.4: "Greenroads" Version 1.5 Rating System Credits Breakdown

"Greenroads Rating System" **Credits** are weighted in relation to their impact on sustainability and the duration of that impact:

- 1 credit – low and short term impact;
- 2 credits – low/long term or high/short term impact (also applied to organisational incentive credits where significant effort is required to meet the credit);
- 3 or more credits – high and lasting impact.

Points associated with the voluntary credits are added together to obtain a final ***"Greenroads"*** project score.

Through the attainment of points a ***"Greenroads"*** project may qualify for one of the recognised levels of **Certification**. There are currently 4 levels of certification – Bronze, Silver, Gold and Evergreen.

As has been noted earlier, the ***"Greenroads Rating System"*** is under review to be upgraded to Version 2. For the new version the **Categories** have been revised in line with experience derived from the use of Version 1.5. The mandatory **Project Requirements Category** has been increased from 11 to 13 components as shown below. The scope of the **Credit Categories** has been updated and most of the **Category** names revised accordingly. Specific reference to a "pavement" category has been removed to reduce the perception the ***"Greenroads"*** is a "pavement only" rating system. The individual credit listings for the different categories are not yet available.

The new **Categories** are:

Project Requirements (PR) (mandatory)	PR-1 Environmental Review PR-2 Life Cycle Cost Analysis PR-3 Environmental Footprint Analysis PR-4 Low-Impact Development PR-5 Pollution Prevention Plan PR-6 Waste Management Plan (PR-6 + CA-3) PR-7 Quality Control Plan PR-8 Noise Control Plan PR-9 Environmental & Safety Training (was CA-2) PR-10 Asset Management Systems PR-11 Site Maintenance Plan PR-12 Coordinated Public Utilities (**new**) PR-13 Community Engagement (PR-11 + AE-3)
Environment & Water (EW) **Access & Liveability (AL)** **Material & Design (MD)**	
Construction Activities (CA) **Utilities & Control (UC)** **Creativity & Effort (CE)**	

The credits and custom credits will be moved around to best fit the new categories and will be re-numbered in due course. Some credits are likely to be deleted since experience has shown that they are not being utilised.

The new ***"Creativity & Effort"*** category will take into account innovative new ideas and will make room for "super" performance and regional concerns.

It is expected that credits will be introduced which will address user health, safety, age and ability levels.

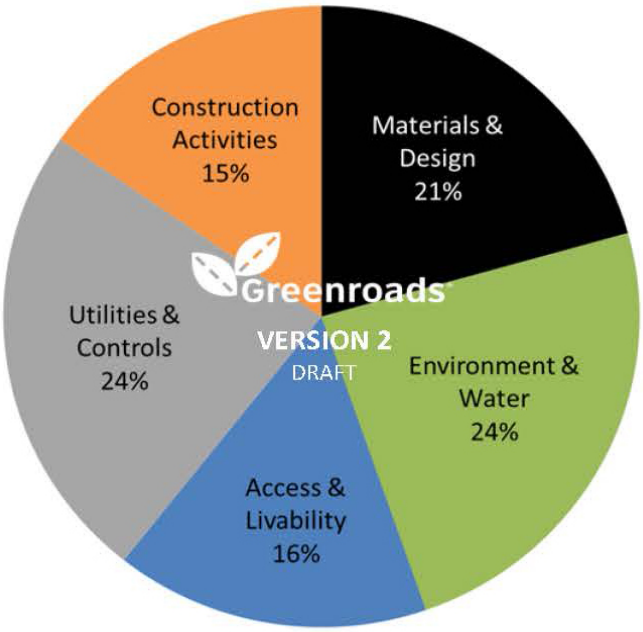


Figure 7.5.5:
DRAFT Potential Category Weights for V2

4. Street Lighting:

Street lighting manufacturers have entered into the concept of sustainability by developing new equipment which has the potential to improve ***"Greenroads Rating System"*** performance. For example one street lighting manufacturer is able to claim a 44% reduction in energy consumption from its new generation luminaires utilising LED technology (see Figure 7.5.6).

The use of LED technology has the potential to create beneficial change in terms of reliability and the ability to integrate into intelligent control systems. LED's are more energy efficient, create less light pollution and are environmentally better than traditional street lighting. This means that LED street lighting has the potential to offer the ***"greenest"*** illumination of roadways. LED street lighting requires specific technical qualities or specifications in order to overcome inherent potential limitations in luminosity and cost. There are three stages in transforming electrical energy into the light that reaches the road surface, namely:

- Electrical energy used to light individual LEDs (LED luminous efficiency);
- The amount of light that comes out of luminaires is the system luminous efficiency;
- The amount of light emanating from luminaires which is distributed to certain space on the road (utilisation factor).

LED street lighting installation
Steyn City, Johannesburg

Figure 7.5.6: "Greenroads" Street Lighting

In order to determine the energy efficiency of LEDs the above factors all need to be considered. Measurement of the illumination on each unit of road surface or Lighting Power Density (LPD) is the most reasonable method of evaluating the energy efficiency.

Modern LED based street lighting systems embody robust and modular design allowing future upgrading to be made easily without complete system replacement. The systems also experience long lifespans which improves the life cycle cost. Heat management is a specific factor that affects LED luminaire performance and overall LED life. The best LED luminaires are capable of achieving an average LD life of 50000 hours.

Top end LED luminaire installations are capable of achieving the following:

- 45% reduction in CO_2 emissions;
- 0% lead or mercury content;
- Best performance for large scale **"*green field*"** urban developments.

It is evident that if main line BRT operations are to become attractive to potential users who can walk in to the route, street lighting is crucial to the attractiveness of the potential user. At present, typical residential street lighting installations tend to be dated and ineffective due to wide spacing and tree cover. Subject to other technical criteria it could be beneficial to consider trial installations of specifically designed pedestrian friendly LED street lighting in the catchment to BRT routes.

5. Waste Material Recycling:

Recycling of previously used materials, particularly road construction materials has been carried out, to a greater or lesser extent, for many years. Such a practice is likely to grow with wider adoption of the ***"Greenroads"*** philosophy.

Figure 7.5.7 shows a very specific recycling achievement using rejected ceramic toilet and bathroom fittings. Instead of these being dumped in a waste landfill site the material has been put through a crushing process and then mixed with conventional concrete materials, at a rate of up to 20% by volume, for use in cycle track construction.

Figure 7.5.7: “Greenroads” Certification at Work

7.6 Bus Rapid Transit:

7.6.1 Background:

The City of Johannesburg's Integrated Transport Plan (ITP) for the period 2003 – 2008 sought to shift from the historic emphasis on car mobility to prioritise mobility and accessibility for people, primarily by improving the public transport system. A major recommendation of this ITP was the Strategic Public Transport Network (SPTN) as shown in Figure 7.6.1.

The SPTN identified the primary network connections that were deemed necessary for a compact, multi-modal city structure. The network had 45 or so developmental nodes with public transport routes totalling 325 km in length. It was envisaged that this network would be supported by an 18-seater, recapitalised, minibus taxi feeder network.

Figure 7.6.2 shows in yellow the two routes which were chosen, at the time, to be flagship routes for early SPTN implementation. However, the selection of South Africa as host for the 2010 FIFA Soccer World Cup, caused this planning to be reviewed, resulting in a conventional SPTN approach using kerb-side bus lanes being amended to a *Rea Vaya* BRT system approach using median bus lanes. This decision was taken in November 2006.

7.6.2 BRT Development

The stated objective of the BRT system was to develop in such a manner that 85% of the city's metropolitan population could be within 1 km of the BRT network or one of its feeder routes.

The operational plan developed in 2007 for the *Rea Vaya* BRT remained closely aligned to the SPTN flagship corridors, namely:

- Soweto to Sunninghill; and
- Alexandra to Sandton and Randburg.

In addition the World Cup influence resulted in the development of BRT facilities between Soweto and Ellis Park, connecting NASREC and Ellis Park.

Including the BRT Phase 1C, scheduled for completion in early 2017, the Soweto to Alexandra to Sandton elements of the earlier chosen routes will become operational. Figure 7.6.2 shows these sections together with the following support links:

- C53 - complementary route between Sunninghill and Westgate, *via* Oxford and Rivonia Roads;
- F1024 – feeder route between Alexandra and Rosebank;

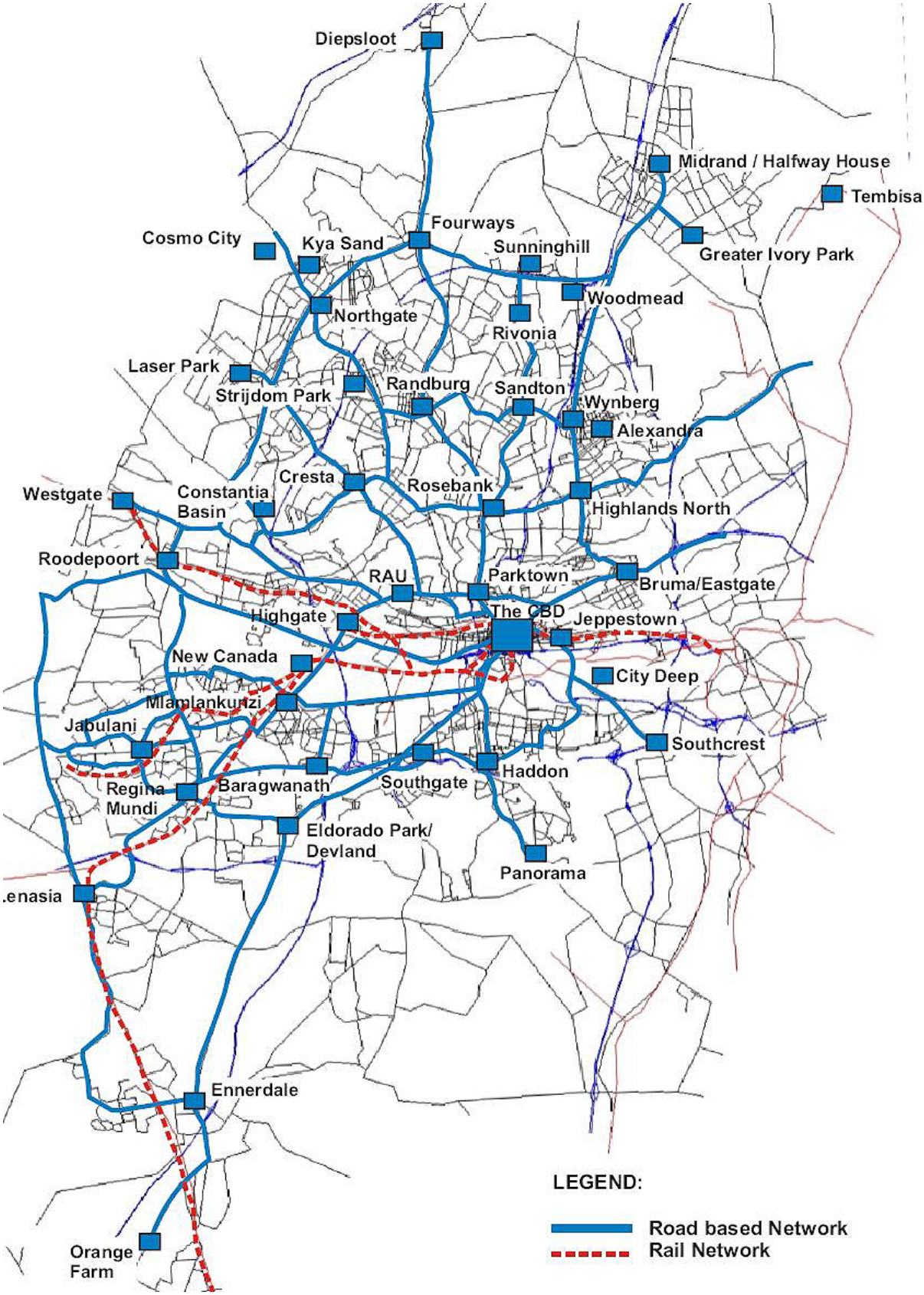


Figure 7.6.1: Strategic Public Transport Network (SPTN)

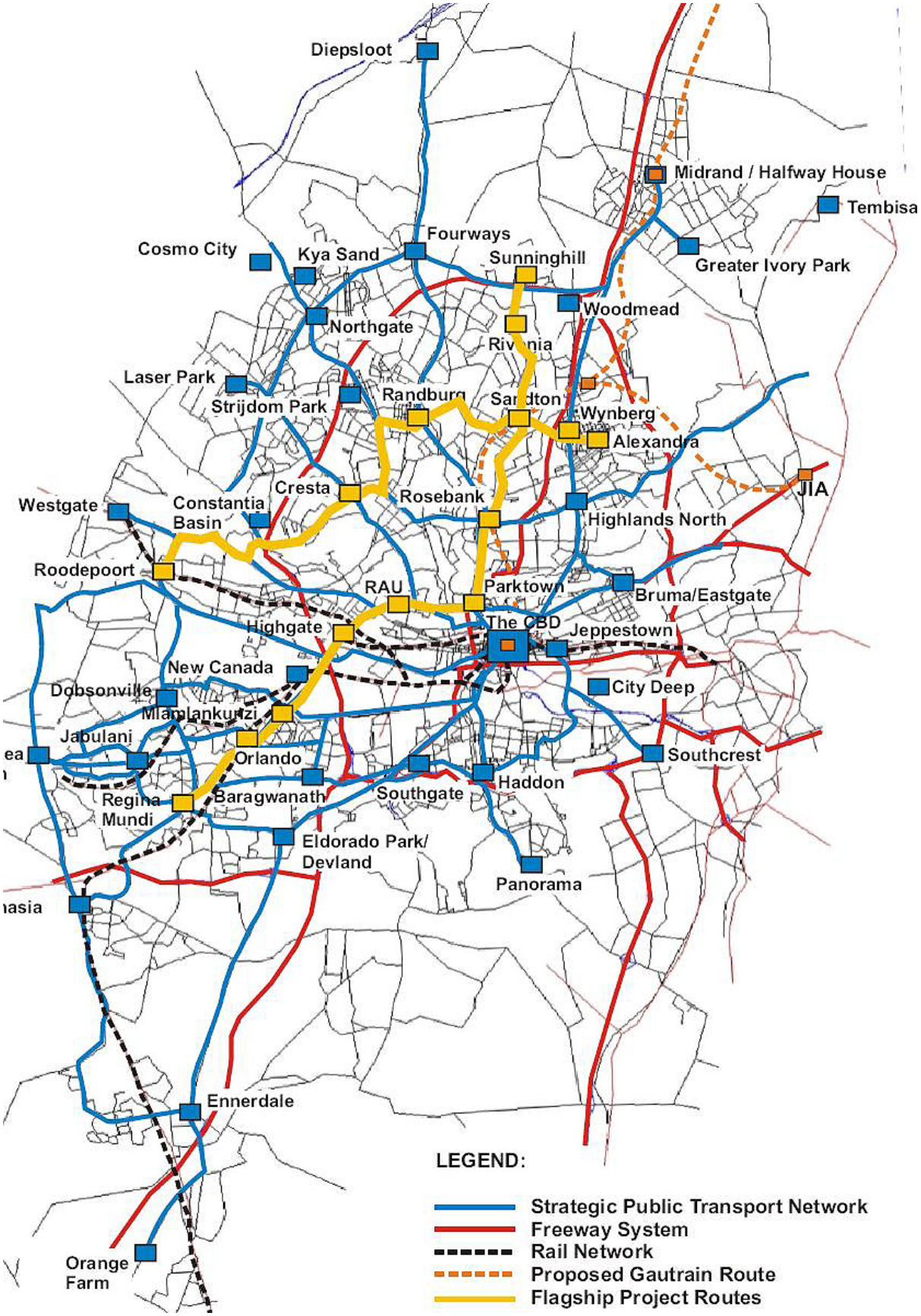


Figure 7.6.2: SPTN Flagship Routes

- F1026 – feeder route between Longmeadow and Wynberg.

Potential future BRT, complementary and feeder routes (2037 scenario) are shown in Figure 7.6.4 and include:

- T06C – BRT trunk route between Old Pretoria Road (Alexandra) and Randburg CBD;
- T34 - complimentary route between Noordwyk and Westgate using Old Pretoria Road and Louis Botha trunk;
- T35 - BRT trunk route between Alexandra and Rosebank using Louis Botha-Corlett Drive-Oxford road trunk;
- T53 - BRT trunk route between Westgate and Ivory Park using Allandale Road-Old Pretoria Road-K60-van der Bijl-Rivonia Road-Oxford Road;
- T52 - trunk route between Ivory Park and Noordwyk, using BRT trunk route on Allandale Road-K101-R562;
- C90 – complementary route in mixed traffic between Ivory Park and Longmeadow, using Republic Road-Modderfontein Road-R25;
- F1026 – feeder between Longmeadow and Wynberg.

Planning of future BRT operations is integral to the City's commitment to the development of major public transport systems, and is an ongoing process which will be subject to regular review based on:

- System passenger demand and take-up;
- Land use development;
- Changes in land use zoning;
- Funding availability.

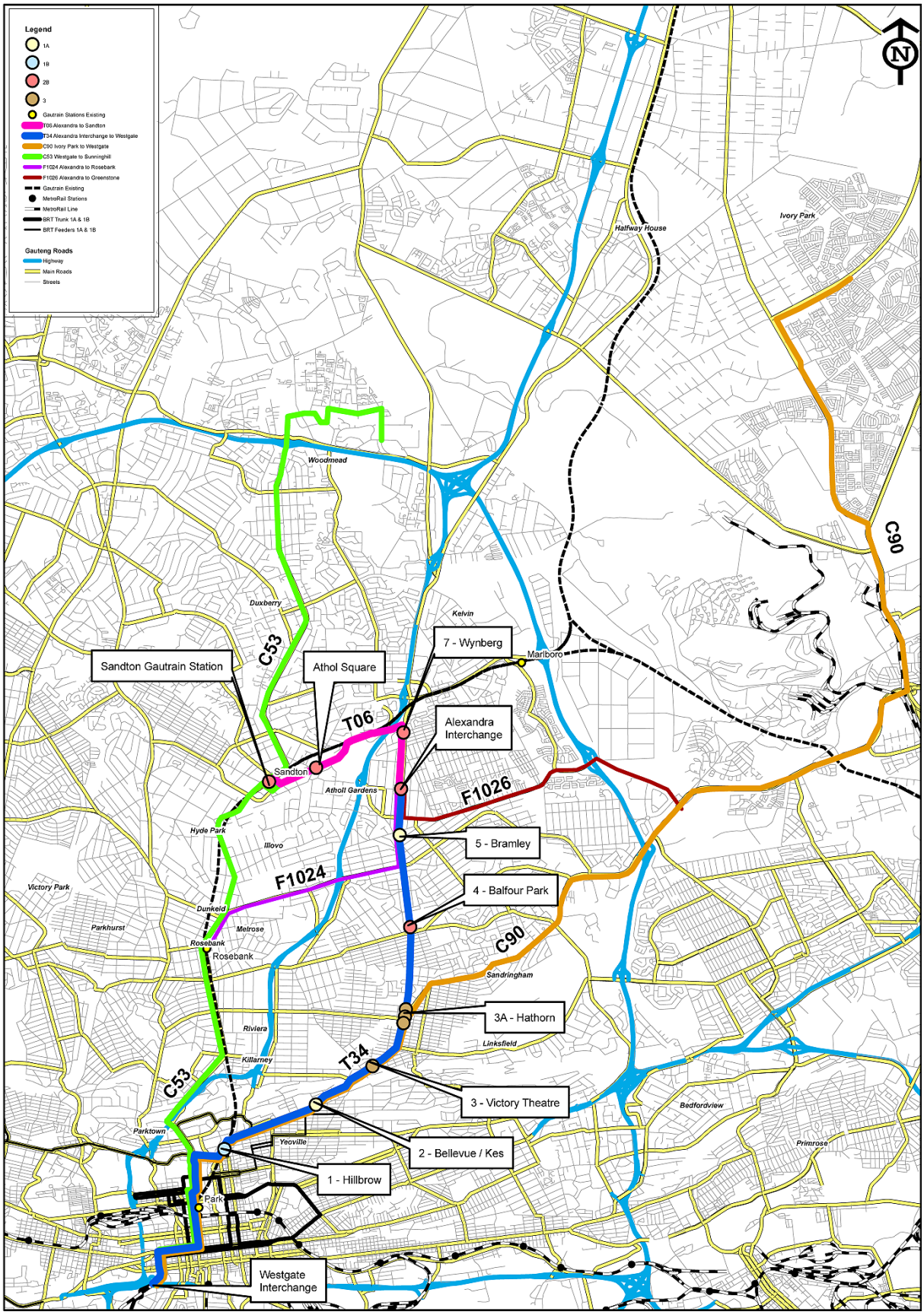


Figure 7.6.3: Proposed Phase 1C Rea Vaya Network (2016 Scenario)

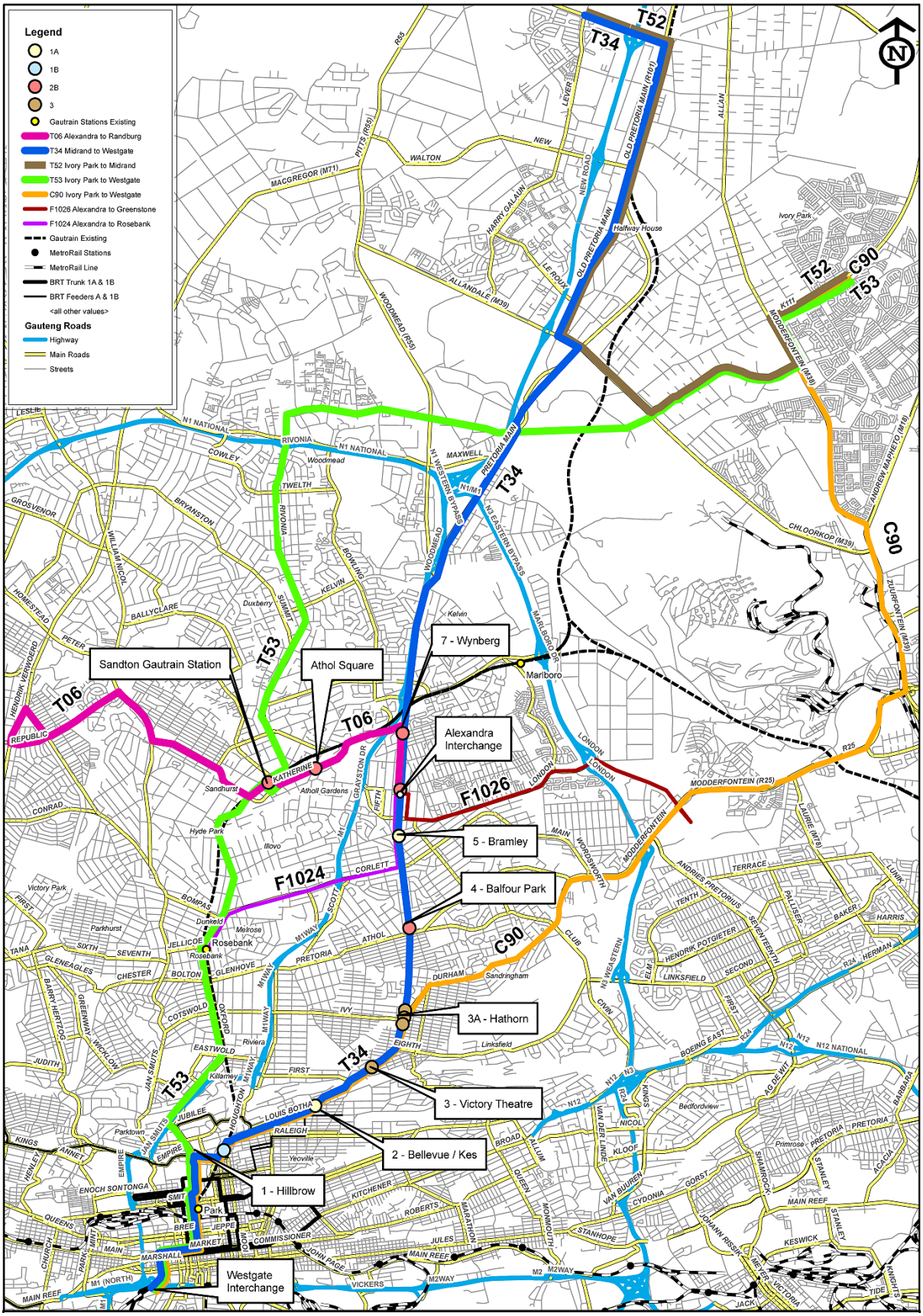


Figure 7.6.4: Proposed Phase 1C Rea Vaya Network (2037 Scenario)

7.7 Pavement Design:

7.7.1 Background:

Pavement design distinguishes between new pavement design and rehabilitation design. The design of new pavements is usually catalogue based, while rehabilitation design requires empirical or mechanistic design processes.

Distinction is furthermore made between the different types of pavements to be designed:

- Flexible pavements;
- Rigid pavements; and
- Concrete block pavements.

Flexible pavements have bituminous surfacing layers consisting of surface seals or thin asphalt surfacing. The base, and in some cases subbase layer(s) consist of either gravel (neat or stabilised) or thick bituminous layers. The latter is generally termed bitumen treated bases (BTB's). These pavements are sufficiently flexible to carry traffic without failing within the structural design period.

Rigid pavements on the other hand, consist of concrete slabs, typically overlying a stabilised subbase on top of gravel pavement layers. The concrete slabs are usually thick and can be one of the following:

- Jointed concrete pavement (JCP);
- Dowel jointed concrete pavement (DCJP);
- Continuously reinforced concrete pavement (CRCP); and
- Ultra-thin continuously reinforced concrete pavement (UTCRCP).

7.7.2 Design Process:

The pavement design process is best described as per Draft *TRH4: 1996, Structural Design of Flexible Pavement for Interurban and Rural Roads*, as shown in Figure 7.7.1 below. The respective stages are not discussed in detail as it is covered in detail in TRH4.

For the purpose of rehabilitation design the process is shown in Figure 7.7.2, and is covered in detail in TRH12.

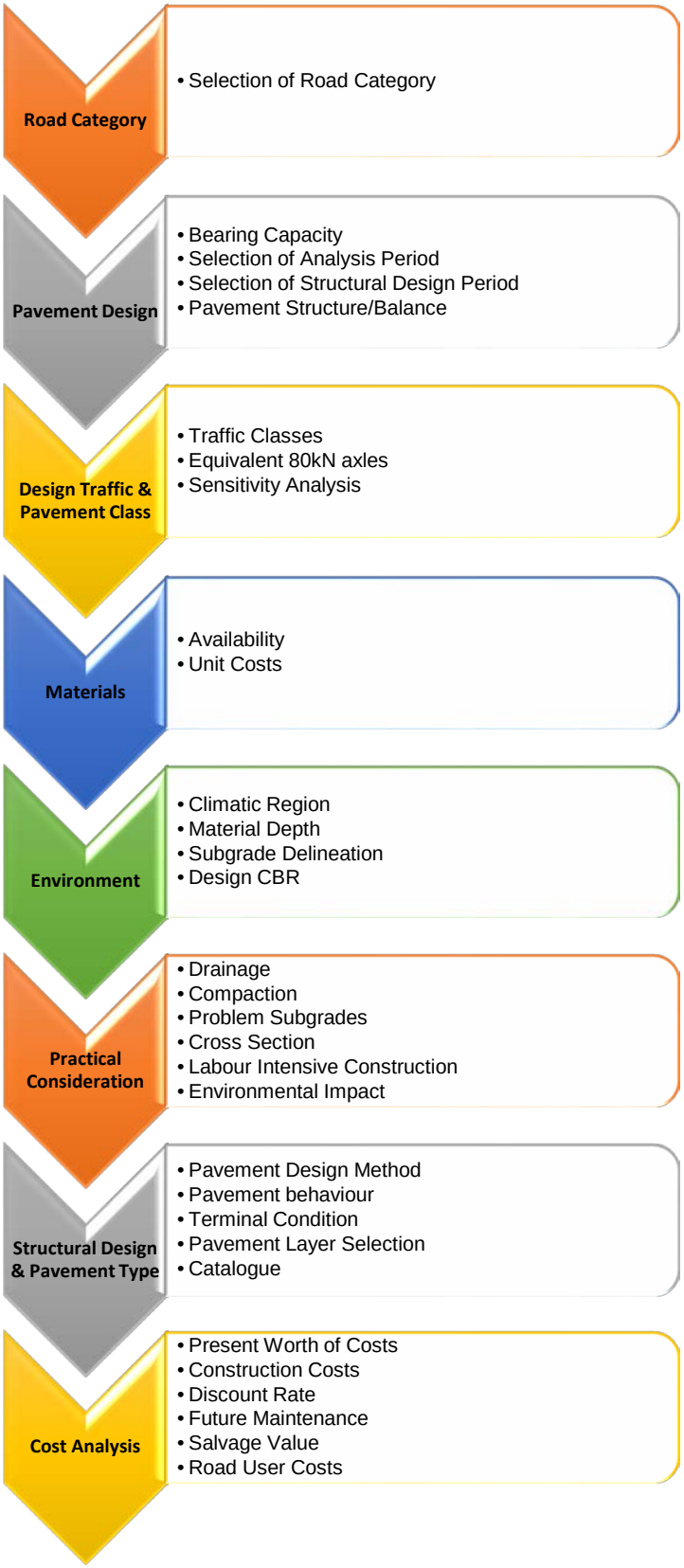


Figure 7.7.1: Pavement Design Process (TRH4)

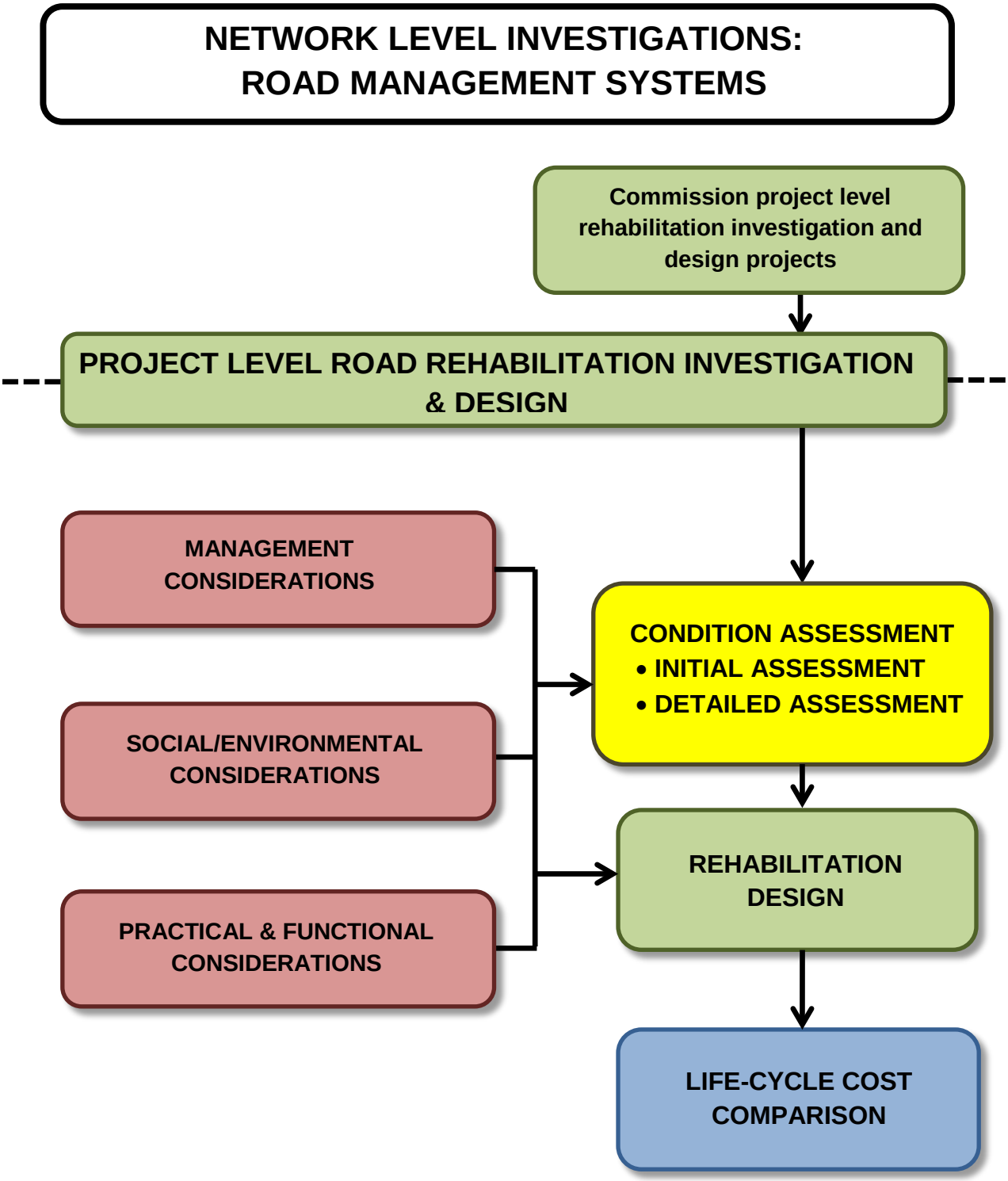


Figure 7.7.2: Pavement Rehabilitation Design Process (Jordaan)

7.7.3 Catalogues:

Various design catalogues have been developed for pavement design, which include the following:

- Draft TRH4: 1996, *Structural Design of Flexible Pavement for Interurban and Rural Roads*;
- Draft UTG2: 1987, *Structural Design of Segmental Block Pavements for Southern Africa*; and
- Manual M10, *Concrete Pavement Design and Construction*.

NOTE:
Care should be taken when using these design catalogues. As the publication dates indicate, these catalogues are old and although the principles remain the same, consideration must be given to changes that occurred and the impact that it can have on the design. One of the most important of these is the tyre pressures, which at the time of publication was assumed to be in the order of 520 kPa. At present, tyre pressures around 700 – 750 kPa are the norm.

These catalogues should be viewed as providing a basic indication of alternative pavement structures for certain conditions. They should however always be tested using the latest information available to ascertain its structural capacity.

7.7.4 Design Guidelines:

In addition to the design catalogues a number of design guidelines have been developed to assist the pavement engineer with respect to material behaviour. Most of these are covered by the TRH, TMH & UTG documents published for the Committee for Land Transport Officials (COLTO). These documents are available for downloading from the website of South African National Roads Agency (SOC) Limited (SANRAL), namely **www.sanral.co.za**.

Those relevant to pavement design are listed below:

- TRH1 (1986): Prime Coats and Bituminous Curing Membranes;
- TRH2 (1978): Geotechnical and Soil Engineering Mapping for Roads and the Storage of Materials Data;
- TRH3 (2007): Design and Construction of Surfacing Seals;
- TRH4 (1996): Flexible Pavement Design;
- TRH7 (1994): The Use of Bitumen Emulsions in the Construction and Maintenance of Roads;
- TRH8 (1987): Design and Use of Hot Mix Asphalts in Pavements;
- TRH10 (1994): The Design of Road Embankments;
- TRH11 (2009): Guidelines for Conveyance of Abnormal Loads;
- TRH12 (1997): Flexible Pavement Rehabilitation Design;
- TRH13 (1986) Cementatious Stabilizers in Road Construction;
- TRH14 (1985): Guidelines for Road Construction Materials;

- TRH15 (1994): Subsurface Drainage for Roads;
- TRH16 (1991): Traffic Loading for Pavement and Rehabilitation Design;
- TRH18 (1993): Investigation, Design, Construction and Maintenance of Road Cuttings;
- TRH20 (1990): The Structural Design, Construction and Maintenance of Unpaved Roads;
- TRH21 (1996): Hot Mix Recycling;
- TRH22 (1994): Pavement Management Systems;
- UTG2 (1987): Structural Design of Segmental Block Pavements;
- UTG3 (1988): Structural Design of Urban Roads;
- TMH9 (1992): Visual Assessment Manual for Flexible Pavements;
- TMH12 (2000): Visual Assessment Manual for Unsealed Roads.

The Asphalt Academy provides technical guidelines (TG) and has thus far published two, the first on modified binders (TG1) and the second on bitumen stabilised materials (BSM's), (TG2).

The South African Bitumen Association (SABITA) has an entire range of publications, mostly focused on bituminous products:

- Manual 1: Construction of bitumen rubber seals;
- Manual 2: Bituminous binders for road construction and maintenance;
- Manual 5: Guidelines for the manufacture and construction of hot-mix asphalt;
- Manual 7: SuperSurf – Economic warrants for surfacing roads;
- Manual 8: Guidelines for the safe and responsible handling of bituminous products;
- Manual 10: Bituminous Surfacings for Low Volume Roads and Temporary Deviations;
- Manual 11: Labour enhanced construction for bituminous surfacings;
- Manual 12: Methods for labour intensive construction for bituminous surfacings;
- Manual 13: LAMBS – the design and use of large aggregate mixes for bases;
- Manual 17: Porous asphalt mixes – design and use;
- Manual 18: Appropriate standards for the use of sand asphalt;
- Manual 19: Guidelines for the design, manufacture and construction of bitumen rubber asphalt wearing courses;
- Manual 20: Sealing of active cracks in road pavements;
- Manual 22: Hot-mix paving in adverse weather;
- Manual 23: Code of Practice – Loading bitumen at refineries;
- Manual 24: User guide for the design of hot mix asphalt;
- Manual 25: Code of Practice: Transportation, off-loading and storage of bitumen and bituminous products;
- Manual 26: Interim guidelines for primes and stone pre-coating fluids;

- Manual 27: Guideline for thin layer hot mix asphalt wearing courses of residential streets;
- Manual 28: Best practice for the design and construction of slurry seals;
- Manual 29: Guide to the safe handling of solvents in a bituminous products laboratory;
- Manual 30: A guide to the selection of bituminous binders for road construction;
- Manual 31: Guidelines for calibrating a binder distributor and ensuring satisfactory performance;
- Manual 32: Best practice guideline for warm mix asphalt;
- Manual 33: Design procedure for high modulus asphalt (EME);
- Manual 34 (34a and 34b): Guideline to legislation on the transportation of bitumen and Bitumen spill protocol.

Whereas the above generally refer to flexible pavements, The Concrete Institute (**www.theconcreteinstitute.org.za**) was established in support of rigid pavements. They have an extensive list of publications available but two of these are noted for reference:

- Concrete Industrial Floors on the Ground, Marais & Perrie; and
- Concrete Road Construction, Perrie & Rossman.

7.7.5 Design Software:

Some software design packages are available to the pavement engineer in support of the design process. Although they cater for new pavement design, the focus is generally on rehabilitation design. Packages frequently used in South Africa include:

- mePads®, developed by the CSIR;
- Rubicon®, developed by Modelling & Analysis Systems (MAS); and
- cncPave®, developed by Dr Pieter Strauss in conjunction with the Concrete Institute.

NOTE:
Attention is drawn to the fact that these packages were designed and are intended for experienced pavement engineers with the knowledge and background to apply their engineering judgement in order to get accurate and sensible results from respective analyses.

SANRAL, with the assistance of seasoned professionals in the industry, is currently embarking on a project to provide the industry with the South African Roads Design System (SARDS) to replace the previous South African Mechanistic Design Method (SAMDM). SARDS will provide the design engineer with a web-based tool to carry out designs for specific projects. Initially these will be limited to national and provincial roads, but is due to be extended to metropolitan roads as well.

CHAPTER 8: STORMWATER MANAGEMENT

8.1 Development Control of Stormwater:

8.1.1 Background:

In 2002 Johannesburg Roads Agency (JRA) reviewed its policy relating to stormwater management.

In 1983 The Department of Community Development published *"Guidelines for the Provision of Engineering Services for Residential Townships",* colloquially known as the "Blue Book". This guideline was the result of significant research aimed at managing urban development in view of the demand for housing close to centres of employment. At that time, the City of Johannesburg (CoJ) chose to ignore the stipulations dealing with stormwater attenuation. The thinking in the CoJ at the time was that all main stormwater conduits should be hard engineered structures. The financial implications were not properly understood and the policy failed dismally.

In 2002, JRA, faced with the degradation of natural water courses and the devastation of the environment, started to enforce the concept of attenuation on site. This approach is based on the then National Water Act (NWA). The NWA states quite clearly that the flow in a watercourse is not to be altered in any way. The increase in hardened surfaces associated with residential and industrial developments tends to contravene this requirement. The policy adopted by JRA is aimed at mitigating the negative impact of densification on the environment associated with our watercourse and riparian zone.

8.1.2 Policy:

The policy applied to all new developments amounts to the following:

- All developments on land exceeding 8 500 m^2 are subject to stormwater attenuation on site;
- The preferred means of attenuation is on surface;
- Attenuation off-site, to compensate for lack of an on-site facility is acceptable;
- The runoff associated with the development is to be attenuated such that the predevelopment flows for the 1 in 5 year as well as the 1 in 25 year storm events are not exceeded; the attenuation structure must be capable of withstanding the 1 in 50 year storm event;
- Discharge from the attenuation facility is subject to approval of the landowner downstream;
- Site Development Plans (SDP) will only be approved if supported by an acceptable stormwater management strategy;
- Clearance for the issue of a Section 82 or Regulation 38 certificate will only be given once the stormwater management strategy is in place;

- The proposed management of the attenuation facility is to be stated in the outline scheme report.

8.1.3 Design:

The design and sizing of the attenuation facility is to be carried out by a suitably qualified engineer. The design calculations must be submitted in a report that deals with the catchment characteristics pre- and post-development. The performance hydrographs of the proposed facility must be included in the report.

8.1.4 Guidelines:

The Rational Method of design is acceptable provided a Flood Routing routine for the pond is applied. This implies that the critical storm duration may be different from the time of concentration for the catchment. The Mean Annual Precipitation (MAP) is to be 750 mm. A triangular or rectangular storm pattern is acceptable.

In most instances, a pre-development runoff factor greater than 0,28 requires special motivation. The same applies to a post-development factor less than 0,8.

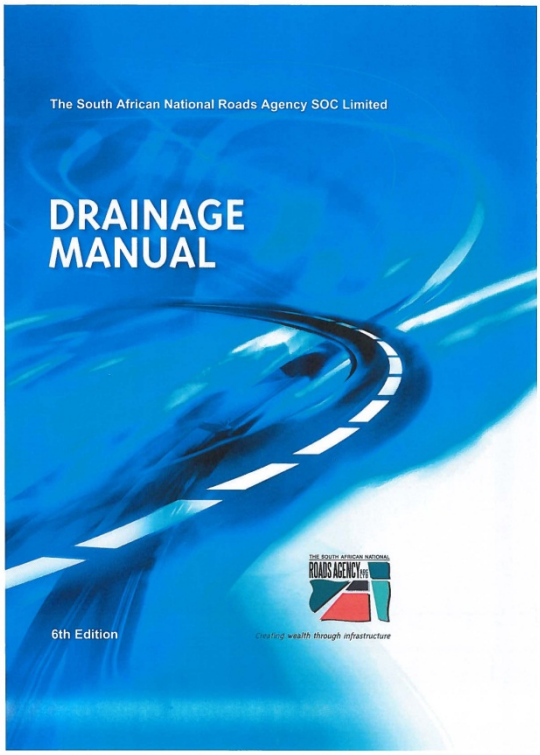
For planning purposes a volume of 350 m^3/ha of storage is required. This applies to a pond subjected to a 1 in 50 year storm event.

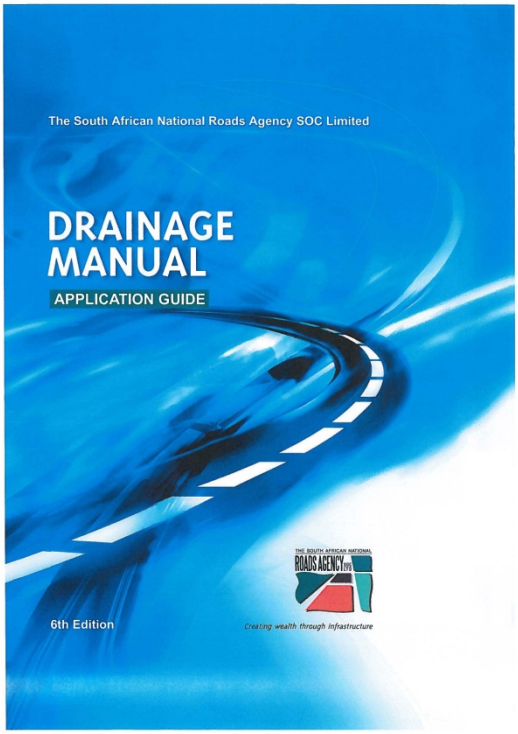
8.2 General Stormwater Design:

The South African National Roads Agency SOC Ltd (SANRAL) made available the 6th Editions of their Drainage Manual and Drainage Manual Application Guide in 2013.

Whilst the documents are produced by SANRAL, their coverage is sufficiently wide as to provide an excellent basis for design of almost any stormwater requirement. The manuals are available on SANRAL's web-site at the links given below.

An abbreviated index of the two manuals is given in Appendix B.





SANRAL Drainage Manual 6th _Edition (Sept_2013)

SANRAL Drainage Manual 6th Edition Application Guide (Sept_2013)

Figure 8.2.1: SANRAL Drainage Manuals – 6th Editions

8.3 Stormwater Management Conditions for Discharge into a Stream:

Discharge of stormwater into a stream shall be at the discretion of the Johannesburg Parks Department (JPD) and shall be subject to at least the following conditions:

- The discharge water shall be routed through an energy dissipating structure or stilling basin such that the velocity of the discharge water is reduced to a value between 0,8 m/s and 1,0 m/s (or less) depending on the soil conditions at the point of discharge; it is up to the designer to substantiate the design parameters by submitting soil test results;
- The energy dissipating structure shall be constructed in such a way that it will accommodate flow conditions in the stream, depending on the level of discharge;
- The outlet structure shall be provided with an appropriate upstream apron dipped against the direction of flow as well as a key on the downstream side;
- The energy dissipating elements shall be positioned such that the anticipated flow for a 1 in 25 year event in the stream is not interfered with;
- Texturing of the outlet structure elements that extend beyond the 1 in 25 year event is to be provided such that nearest compatibility with the natural watercourse is achieved;
- The angle of discharge will not be greater than 30^{o} relative to the average direction of flow established over a distance of 20 m upstream of the point of discharge;
- The resultant gradient between the point of discharge in the direction of flow and that of the bed of the stream shall such that it complies with the velocity restriction stated above;
- Segmented material used in the outlet structure shall be adequately anchored;
- Existing vegetation shall be reinstated where disturbed during construction;
- Surplus building and other foreign materials shall be removed at completion of the construction.

Notwithstanding the above specific requirements, stormwater management in the City of Johannesburg is controlled by the **Stormwater Management By-Laws** .

8.4 Stormwater Design for Dolomitic Environments:

The provision of stormwater infrastructure for roads and developments in areas which include dolomitic land is subject to specific design requirements. The development of dolomitic land should initially be subject to a risk analysis with specific reference to the possible formation of sinkholes and/or dolines.

Ultimately, from a stormwater control perspective, the objective should be to provide what amounts to a sealed system in order to remove the possibility of stormwater concentration, resulting from land development having any effect on possible sinkhole formation. In practical terms, such sealed stormwater systems can be provided by:

- Concrete stormwater piping provided with joint seals between pipes and at all pipe junctions and manholes;
- High Density Polyethylene (HDPE) piping.

Which of these pipe types may be determined as most suitable for a specific installation should involve consideration of the following factors:

- Application;
- Cost (preferably on an envisaged total life cost);
- Strength;
- Viability;
- Service life and joint integrity;
- Installation and inspection;
- Sustainability;
- Material competition;
- Engineer's knowledge of materials.

A complete geological outcrop map for Johannesburg is given in Figure 8.4.1 and Figure 8.4.2 indicates only the distribution of dolomites within the City of Johannesburg Metropolitan Municipality.

The Department of Public Works (DoPW) has prepared the following document for use by engineers dealing with infrastructure development on dolomite:

PW344: Appropriate Development of Infrastructure on Dolomite – Manual for Consultants – September 2010.

The following extracts from this document are of basic importance in consideration of stormwater control criteria relevant to the development of dolomitic areas:

- ***Definition of dolomitic land:***
  The term *"dolomitic land"* is used to describe areas in South Africa underlain directly or at a shallow depth (i.e. < 100 m) by the rock type dolomite. Dolomitic rock is composed of the mineral dolomite, which is a carbonate of calcium and magnesium.

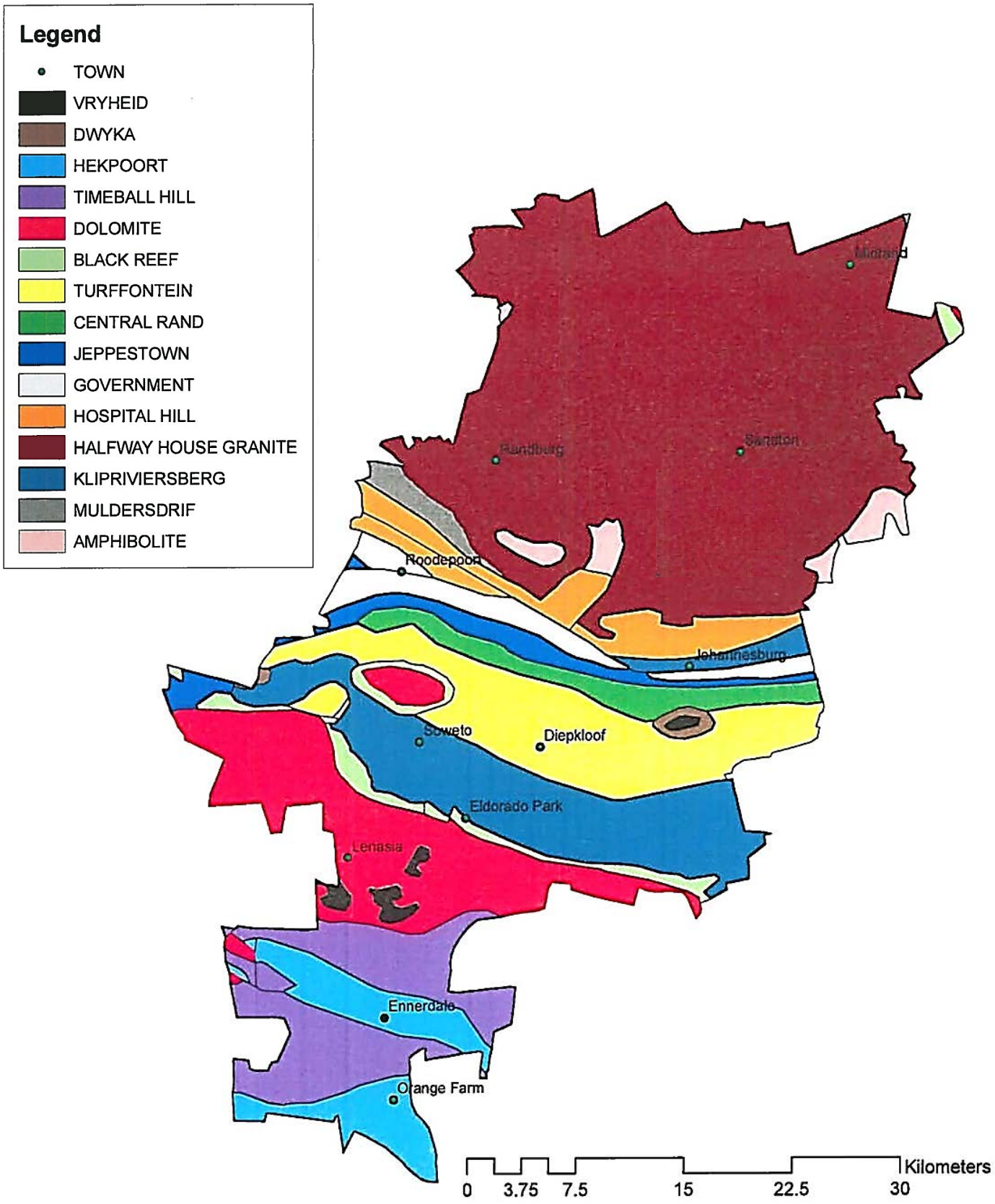


Figure 8.4.1: Geological Outcrop Map - Johannesburg

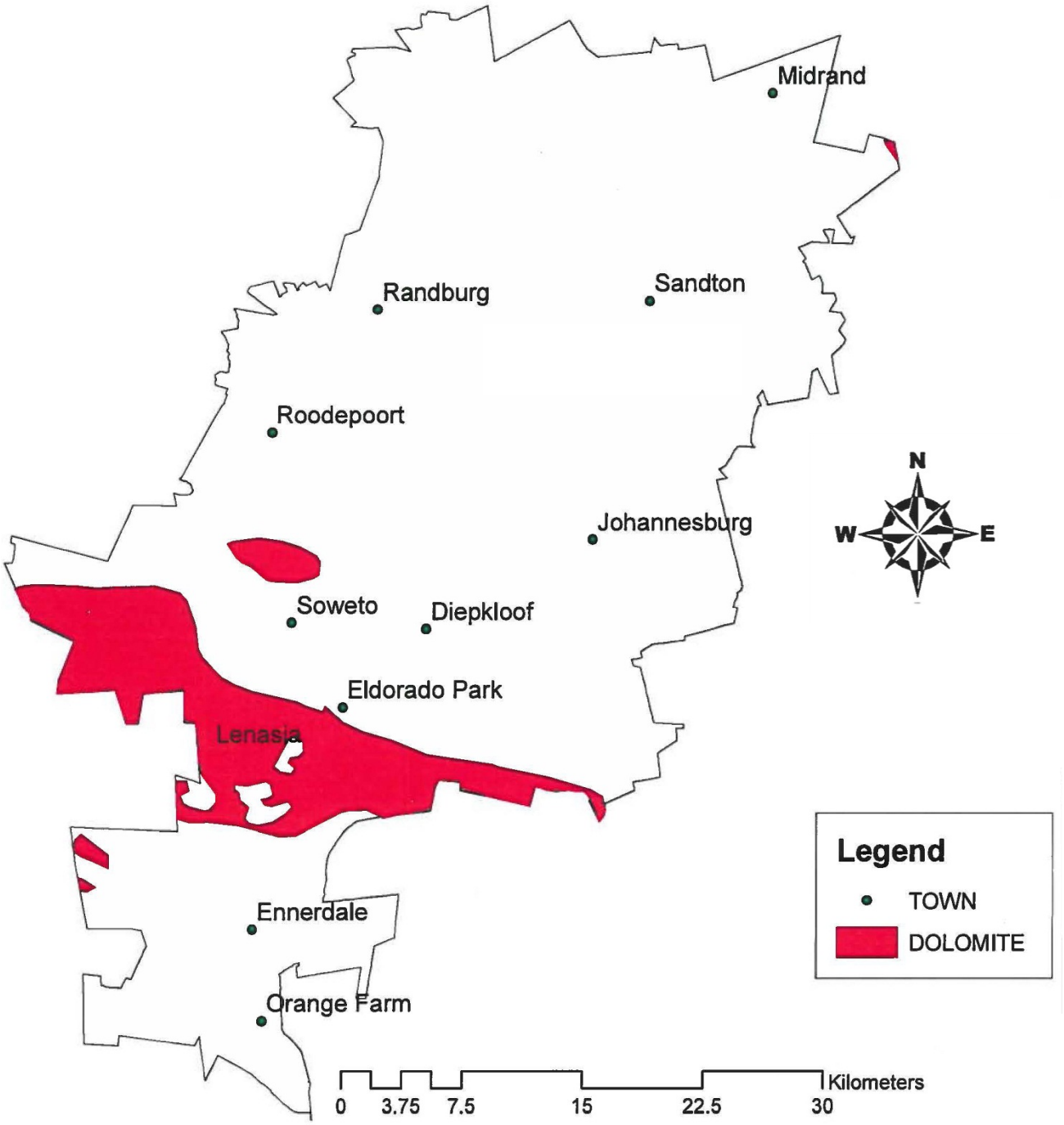


Figure 8.4.2: Dolomitic Distribution Map - Johannesburg

- ***Why is dolomitic land problematical?***

Dolomite is soluble. Rainwater and percolating groundwater gradually dissolve the rock over time creating cave systems and voids. Overlying soils covering the rock can collapse into these caves or voids in catastrophic ground movement such as sinkholes or dolines.

- ***Water is a triggering mechanism, in the majority of cases, of distress in dolomitic/limestone areas. It is therefore imperative that the concentrated ingress of water into the ground be avoided at all times, including the construction period.***

- A dolomitic area should be defined as having a risk characterisation as ***low, medium*** or ***high*** (**NOTE: low risk** does not mean **"no risk"**).

- ***Risk*** is classified in 8 classes.

- ***The design engineer*** must specify, in detail, all precautionary and safety measures to be taken in the event of work related to sinkhole and doline repairs.

- The consultant's attention is specifically drawn to the fact that his/her practice will accept ***full responsibility*** for the design detail(s), specifications and drawings. (DoPW – ***PW344*** is provided to ensure basic compliance with minimum statutory, regulatory, and legislative requirements, with the specific aim of achieving best practice details/specifications in conjunction with the consultant's expertise.)

A selection of details from PW344 is given in Appendix "F".

8.5 Water Sensitive Urban Design - WSUD:

Water sensitivity in South Africa, in an urban context, can be considered as the management of urban water resources by integrating engineering, social and environmental disciplines, while understanding that:

- Water is scarce in South Africa;
- Access to drinkable water is a basic human right;
- Water should be recognised as of economic value;
- Management of water resources should be based on a participatory approach;
- Water is a limited and vulnerable resource.

A "Water Sensitive Settlement" (WSS) is one in which water is managed and treated in a manner reflecting the principles of water sensitivity.

WSUD is considered to have the potential to manage and reverse water pollution and thereby negate the effects of water scarcity. In order to achieve WSS it is necessary to consider the effects of a number of issues, including, but not limited to:

- Institutional structures – stormwater managed by roads departments – water supply separated from sewage collection, treatment and disposal – resulting in poor service integration;
- WSUD needs to be demonstrated as being workable;
- Attempting to apply WSS can be considered as a "greening" concept, which adds another degree of complexity in situations where even basic services may not exist.

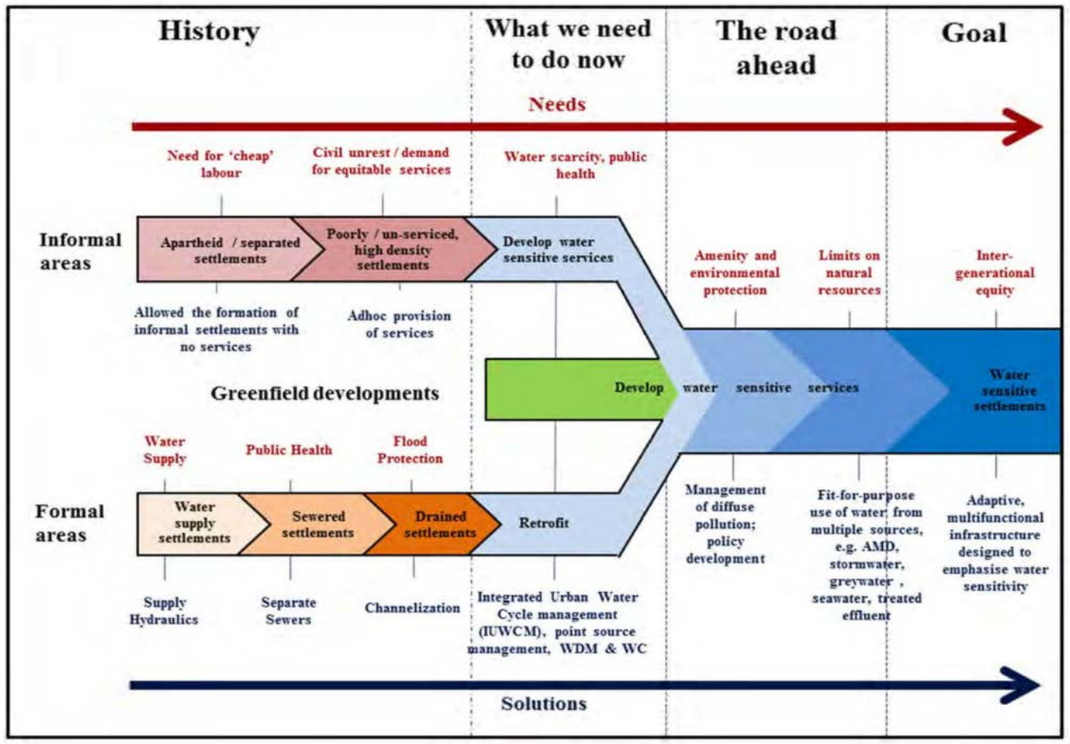
WSUD can be defined as:

"an approach to urban planning and design that integrates land and water planning and management into urban design; WSUD is based on the premise that urban development and redevelopment must address the sustainability of water" (Engineers, Australia – 2006).

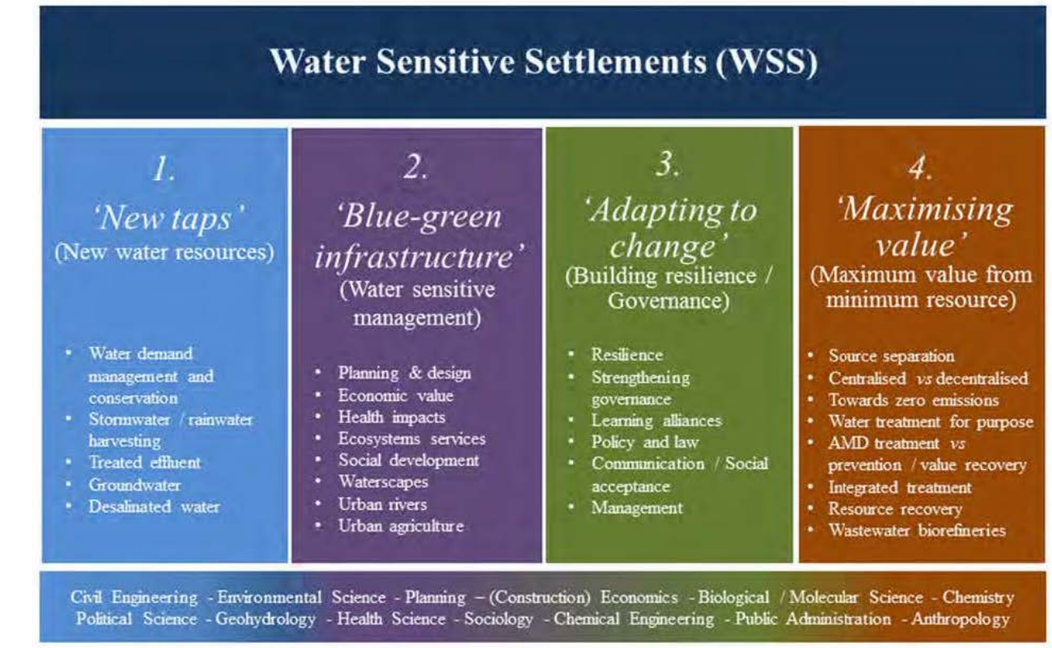
In order to progress the concept of WSS in South Africa the following statement has been developed to aid the understanding of WSS by stakeholders and to assist them to engage in the idea:

"….mitigating water scarcity, improving water quality, thereby protecting ecosystems ***(the WHY?)*** *– through the development of water sensitive urban areas (for all) that are sustainable, resilient and adaptable to change* ***(the HOW!)*** *– while simultaneously being a place where people want to live* ***(the RESULT!)****".*

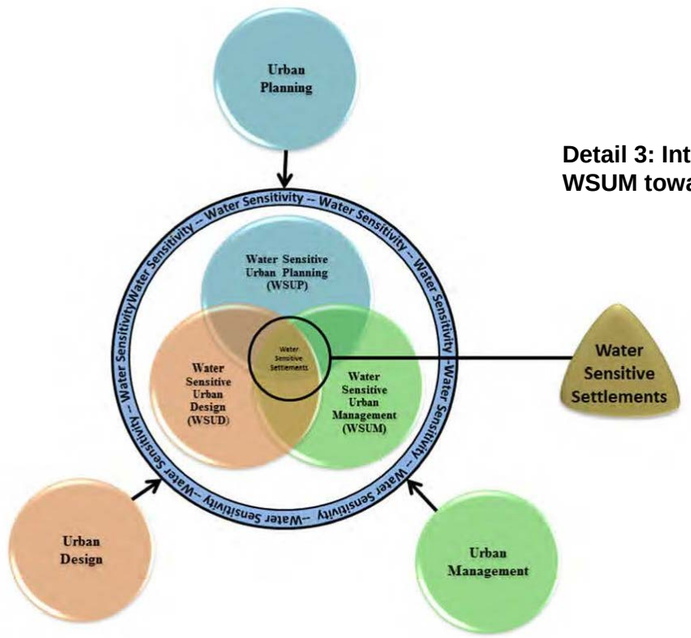
The foregoing, and the elements of Figure 8.5.1, have been extracted from *"Water Sensitive Urban Design (WSUD) for South Africa: FRAMEWORK AND GUIDELINES"* issued by the Water Research Commission (TT588/14) – (authors – Neil Armitage, Lloyd Fisher-Jeffes, Kirsty Carden, Kvin Winter, Vinothan Naidoo, Andrew Spiegel, Ben Mauck & Daniel Coulson)



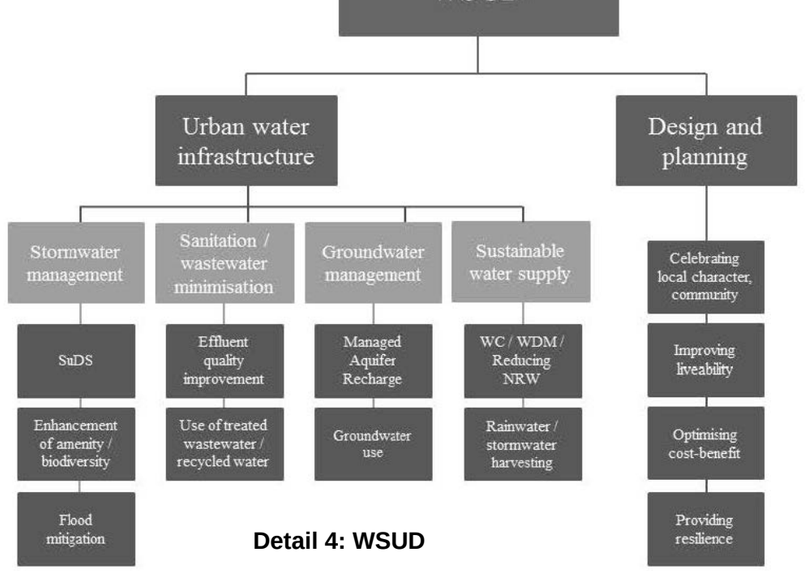
Detail 1: Framework for WSS in South Africa



Detail 2: WSS



Detail 3: Integration of WSUD, WSUP WSUM towards WSS



Detail 4: WSUD

Figure 8.5.1: Water Sensitive Urban Design

8.6 Sustainable Urban Drainage Systems - SUDS

Sustainable Urban Drainage Systems (SUDS) offer an alternative approach to conventional stormwater drainage practices by attempting to manage surface water drainage systems holistically in line with ideals of sustainable development. A SUDS achieves this by mimicking the natural hydrological cycle, often through a number of sequential interventions in the form of a *"treatment train"*.

The key objectives of SUDS include:

- The effective management of stormwater runoff quantity and quality;
- Promoting amenity value; and
- Preserving/encouraging biodiversity value.

This can be described in the form of a design hierarchy where each design level contributes to an improved, more sustainable drainage system. In other words, there is no point in supporting biodiversity of life, if life and property have not already been protected. (See Figure 8.6.1.)

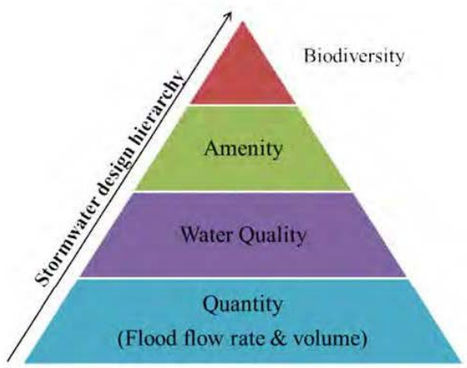


Figure 8.6.1: The Stormwater Design Hierarchy

Prior to the design of any stormwater system there are a number of important factors to be considered:

- The local hydrological cycle;
- The local ground conditions – including unusual geological formations;
- The different challenges of development on greenfield *vs* brownfield/retro-fitted sites;
- The impact of different types of development;
- Compliance with laws – particularly local by-laws which are often quite specific with respect to allowable development.

It is important to understand that a SUDS generally embraces a number of options that are arranged in a treatment train, in a similar way to the treatment of wastewater through a treatment works. In South Africa the different SUDS options have been categorised into 12 *"families"* (See Figure 8.6.4.)

There are 4 key interventions in the SUDS treatment train, each having slightly different combinations of SUDS options to control and/or manage stormwater:

- *"Good Housekeeping"* – to ensure that as much as possible is done to minimise the release of pollutants – such as solid waste – into the environment where they may subsequently be transported by stormwater;
- *"Source Controls"* – manage stormwater runoff as close to its source as possible, usually on site – including green roofs, rainwater harvesting, permeable pavements and soakaways;
- *"Local Controls"* – manage stormwater runoff in the local area, typically within road reserves – including bio-retention areas, filter strips, infiltration trenches, sand filters, swales;
- *"Regional Controls"* – manage the combined stormwater runoff from several developments – including constructed wetlands, detention ponds, and retention ponds.

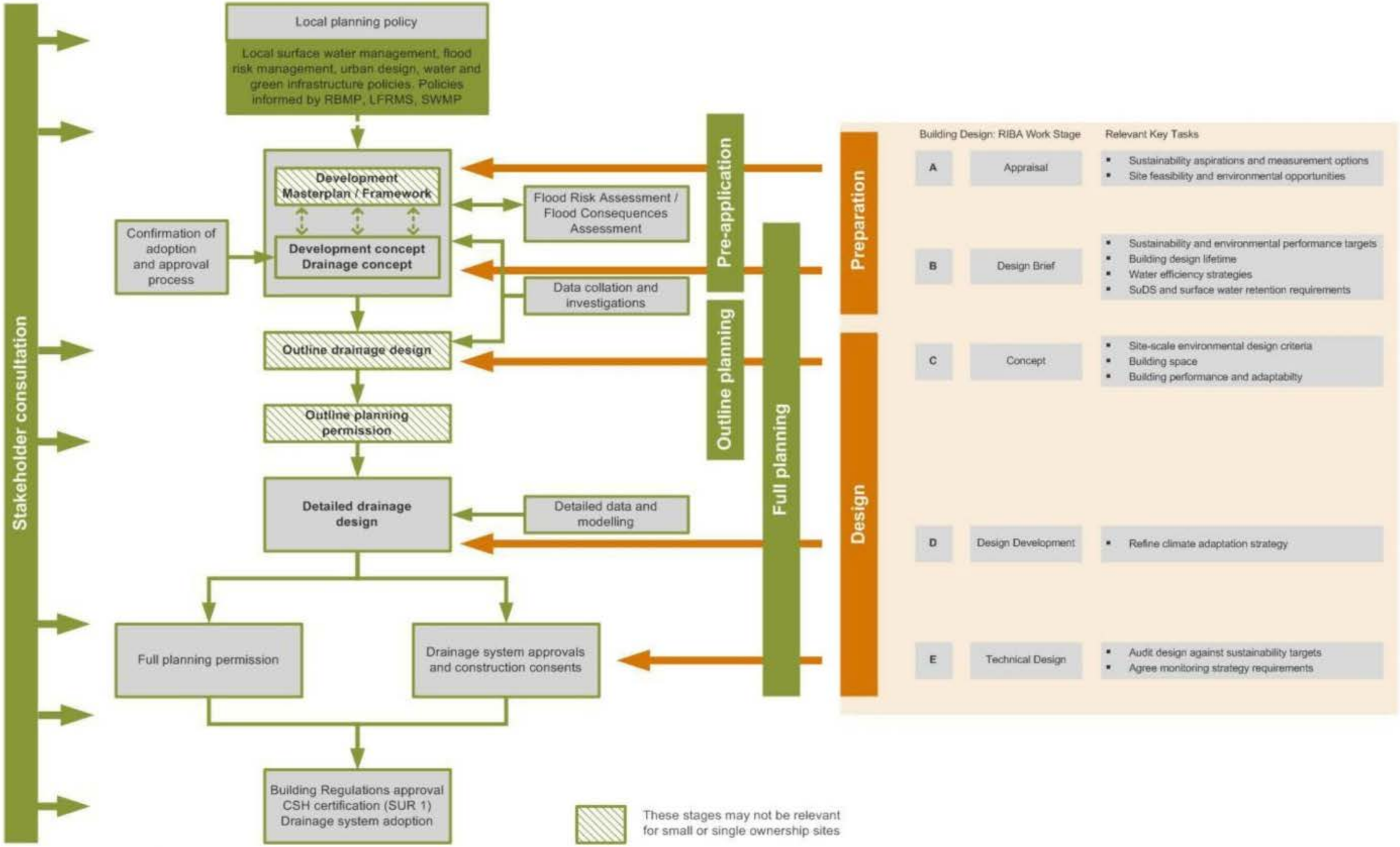


Figure 8.6.2: Integration of the Planning and Drainage Design Process

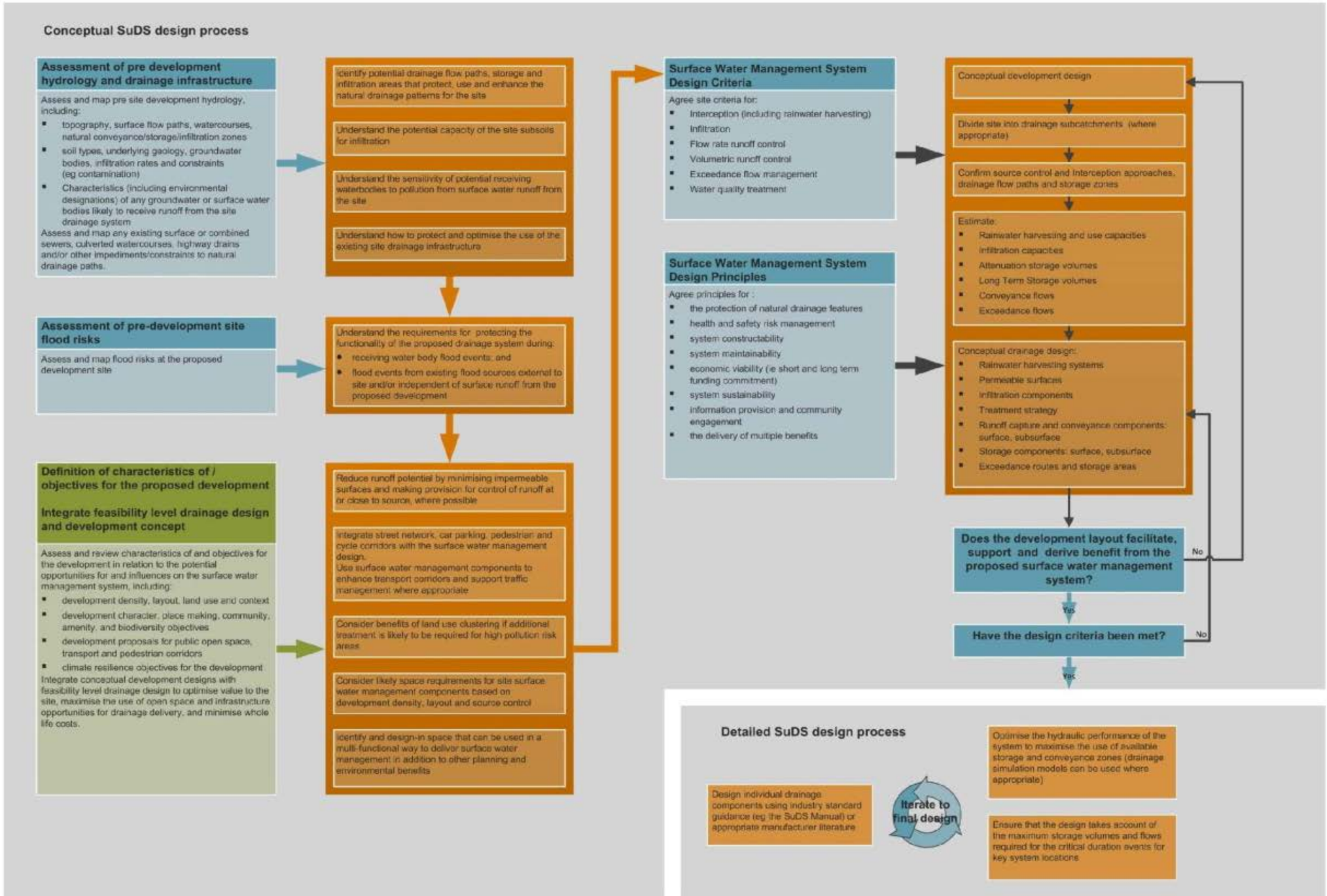


Figure 8.6.3: Surface Water Management Design Process Map

Appendix G: Sustainable Drainage System (SuDS) Conceptual Design

SP 36/12 WATER RESEARCH COMMISSION

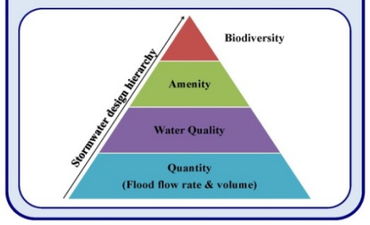
Urban Water Management

Why SuDS?

Development normally reduces the natural permeability characteristics of land by replacing free draining surfaces with impermeable surfaces, typically drained by pipes and/or canals. This also results in the general loss of vegetation, biodiversity and amenity. Conventional drainage systems are generally focused on eliminating local flood nuisances and ignore the water quality, amenity, and biodiversity. SuDS aims to mimic the natural hydrological cycle thereby improving water quality, preserving biodiversity, and enhancing amenity. The result is a more sustainable and liveable city.

Stormwater design hierarchy

The key objectives of the SuDS approach are the effective management of: stormwater runoff quantity, quality and the associated amenity and biodiversity as described by the hierarchy below where each level contributes to an improved, more sustainable drainage system.



SuDS Conceptual Design Matrix

		Quantity					Quality						Amenity		Biodiversity	Costing		
		Rainwater harvesting	Infiltration	Detention	Conveyance	Long-term storage	Sedimentation	Filtration	Adsorption	Biodegradation	Plant-uptake	Nitrification	Recreational benefits	Aesthetic enhancement	Habitat provision	Land take	Capital	Operation and maintenance
Source controls	Green roofs	S	×	P	×	×	P	P	P	P	P	P	Y	Y	Y	×	L/M	M
	Rainwater Harvesting	P	×	S	×	P	PR	×	×	×	×	×	×	×	N	L	M/H	M
	Soakaways	S	P	S	×	×	PR	P	P	P	×	×	×	×	N	×	M	L
	Permeable pavements	S	P/S	P/S	S	×	×	P	P	S	×	×	Y	Y	N	×	L/M	L
Local controls	Filter strips	×	S	S	P	×	P	P	P	P	S	S	Y	Y	Y	H	L	L
	Swales	×	S	S	P	×	S	P	P	S	S	S	×	Y	Y	M	L	M
	Infiltration trenches	S	P	S	×	×	PR	P	P	S	×	S	×	×	N	L	L/M	M
	Bio-retention areas	S	P	P/S	×	×	P	P	P	P	P	P	×	Y	Y	M	M	M
	Sand filters	S	S	P	×	×	S	P	P	S	×	×	×	×	N	L	L/M	M
Regional controls	Detention ponds	×	S	P	×	×	P	×	×	×	×	×	Y	Y	Y	H	L	L
	Retention ponds	P	S	P	×	P	S	S	S	P	P	P	Y	Y	Y	H	M	M
	Constructed wetlands	S	S	P	×	P	S	S	P	P	P	P	Y	Y	Y	H	H	L/M

Primary process (P) Secondary process (S)
Pre-treatment Required (PR) Not applicable (×)

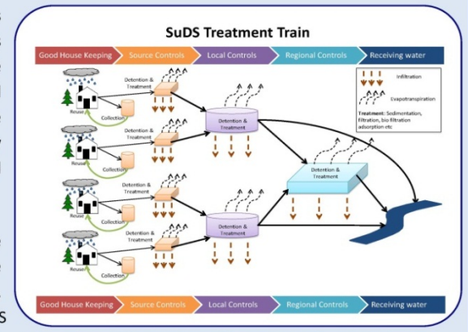
Provides amenity/habitat (Y)
Does not provide amenity/habitat (N)

High (H)
Medium (M)
Low (L)

1. SEMCOG, 2008, *Low Impact Development Manual for Michigan: A Design Guide for Implementers and Reviewers*, Southeast Michigan Council of Governments, Michigan 2. Woods-Ballard B., Kellagher R., Martin P., Jefferies C., Bray R. and Shaffer P (2007). *The SUDS Manual*. CIRIA 697. London. 3.Wilson S., Bray R. and Cooper P. (2004) *Sustainable drainage systems: Hydraulic, structural and water quality advice*. CIRIA C609. London.

SuDS Treatment Train

Treatment trains are critical in designing an effective SuDS scheme. The SuDS Treatment Train starts with good housekeeping before moving on to source controls, local controls and regional controls. SuDS controls should be used sequentially in order to optimally treat stormwater runoff.



Good Housekeeping ensures that as much as possible is done to minimise the release of pollutants – such as solid waste – into the environment where it may subsequently be transported by stormwater.

Source controls manage stormwater runoff as close to its source as possible, usually on site. Typical SuDS options include: green roofs, rainwater harvesting, permeable pavements and soakaways.

Local Controls manage stormwater runoff in the local area, typically within the road reserves. Typical SuDS options include: bio-retention areas, filter strips, infiltration trenches, sand filters and swales.

Regional Controls manage the combined stormwater runoff from several developments. Typical SuDS options include: constructed wetlands, detention ponds and retention ponds.

Safety, Health & Environment

There are circumstances where SuDS may be unsafe; for example where there is a serious risk of drowning or contamination resulting from point or non-point sources. These risks should be taken into consideration in the design and precautions taken. The Table on the right highlights pollutants that may be found in stormwater. The potential risks of each pollutant on a site needs to be assessed. This is especially important in the case of pathogens where stormwater facilities are open to the general public.

Pollutant Group	Pollutant	Impacts
Nutrients	Nitrogen & phosphorus	Excessive nutrients result in eutrophication. It is commonly associated with algal plumes, reduced clarity resulting in decreased bio-diversity
Sediments	Suspended & settable solids	Increased turbidity, sedimentation, smothering of aquatic plant and animal life
Organic material	Plant litter	Increased nutrients & sediment.
Pathogens	Bacteria, viruses & protazoa	Public health risk. contaminated recreational areas. Decreased economic value of natural recreational areas
Hydrocarbons	Oils, grease & others	Polluted water may become toxic. Aquatic life becomes toxic due to bioaccumulation. Decrease of biodiversity
Metals	Lead, copper, zinc and others	Polluted water may become toxic. Aquatic life becomes toxic due to bioaccumulation. Decrease of biodiversity
Toxic chemicals	Pesticides & insecticides	Polluted water may become toxic. Aquatic life becomes toxic due to bioaccumulation. Decrease of biodiversity
Solids	Debris & rubbish	Threat to wildlife. Aesthetic appeal decreased

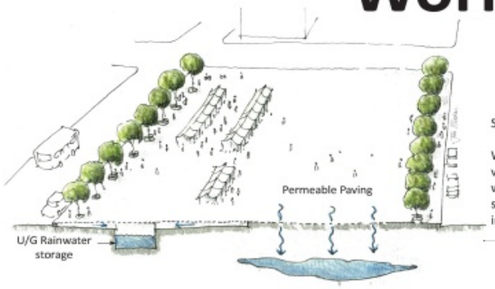
1. Krpo, A. (2004, 02). *GIS Model for Assessment of Land Use and Urban Development Effects on Stormwater Runoff: Puhinui Catchment Case Study* , 1-242. Auckland University.
2. Minton, G. (2002). Stormwater Treatment. Seattle, Washington, USA: Amica International Inc.

K5/1826: Alternative technology for stormwater management
www.wsud.co.za

Page 1 of 2

Figure 8.6.4: Sustainable Drainage System (SUDS) Conceptual Design

Working SuDS into the City (Appendix H)



SuDS FOR LARGE URBAN PLAZAS

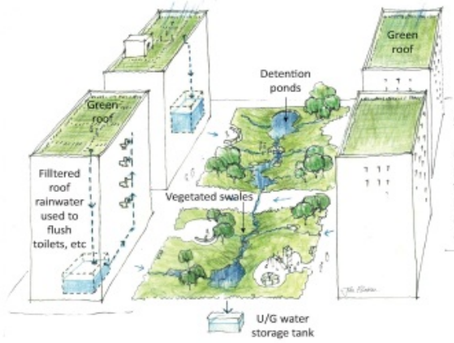
Where vegetated swales, etc. less viable, permeable paving can allow water to be drained to underground storage areas. It can then be used for irrigation or to recharge groundwater.

SuDS FOR SMALL URBAN PLAZAS/POCKET PARKS

Bioretention areas (stormwater planters, vegetated swales, etc) drain stormwater to underground rainwater collection tanks or aquifers.

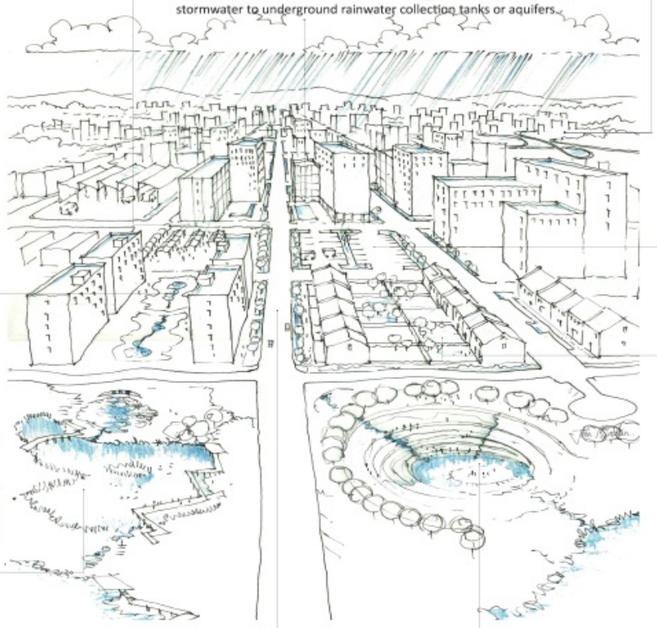
SuDS FOR HIGHWAY ISLANDS

Grass filters, vegetated swales and detention ponds with indigenous vegetation improving biodiversity as well as urban microclimate.



SuDS FOR RESIDENTIAL COMPLEXES

Green roofs, vegetated swales, detention ponds and underground rainwater storage tanks can be incorporated to provide irrigation etc. for the complex as well as attractive property enhancing recreational areas.

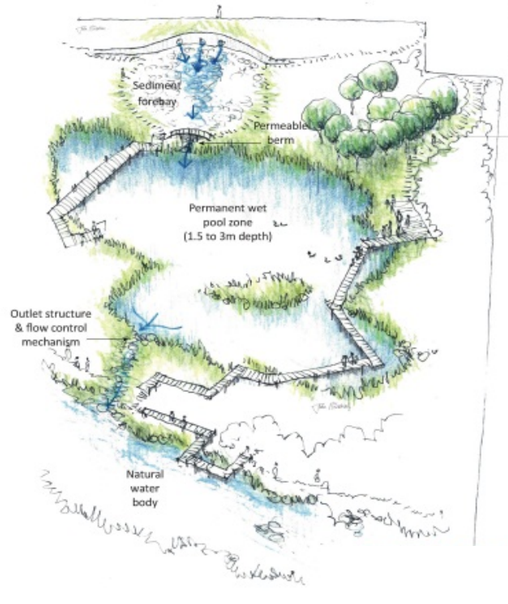


SuDS FOR CAR PARK AREAS

Systems of vegetated swales and bioretention areas (e.g. stormwater planters) help to slow and filter stormwater. System also improves urban microclimate and enhances urban landscape.

SuDS FOR PRIVATE GARDENS

Provide a system of rainwater tanks (for collection, storage) and bioretention areas (e.g. stormwater planters, rain gardens) to support water wise gardens.



SuDS RETENTION PONDS FOR RECREATIONAL ACTIVITIES

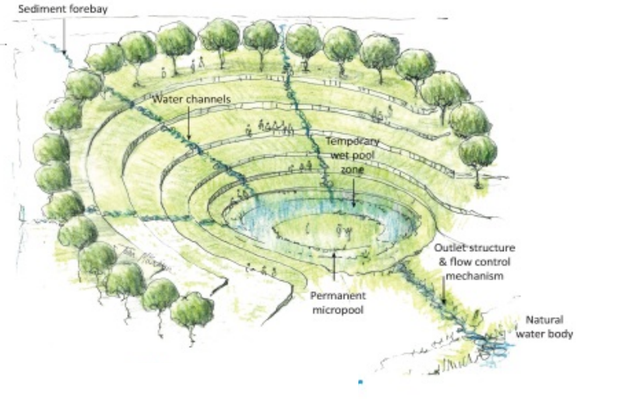
Vegetated swales and retention pond provide recreational activities whilst also improving environmental resilience and enhancing biodiversity.

SuDS TO CREATE ATTRACTIVE URBAN STREETS

Vegetated swales slow and filter stormwater. Vegetation can further improve microclimate by reducing urban heat island effects and enhancing aesthetics of area.

SuDS DETENTION AREAS FOR RECREATIONAL SPACES

Water channels, vegetated swales and detention areas designed for multi-purpose recreation opportunities.



ARTWORK BY JULIA MCLACHLAN

Figure 8.6.5: Working SUDS into the City

Typical SuDS design drawings

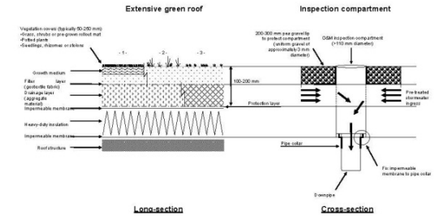


Figure C1: General design for green roofs and adjoining inspection compartment
[after Wilson *et al.*, (2004); Woods-Ballard *et al.*, (2007)]

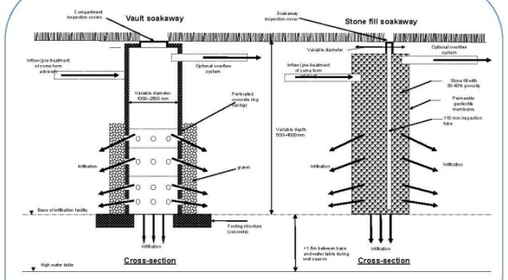


Figure C2: General designs for soakaways
[after Woods-Ballard *et al.*, (2007); Haubner *et al.*, (2001)]

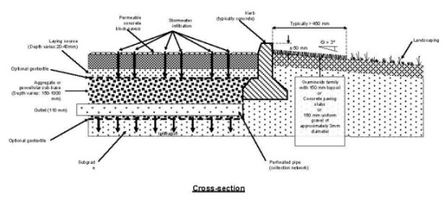


Figure C3: General design for permeable pavements and adjoining landscaped areas
[after Wilson *et al.*, (2004); Woods-Ballard *et al.*, (2007)]

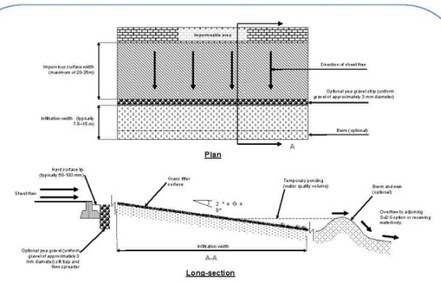


Figure C4: General design for filter strips and adjoining silt trap and berm
[after Wilson *et al.*, (2004); Woods-Ballard *et al.*, (2007); Haubner *et al.*, (2001)]

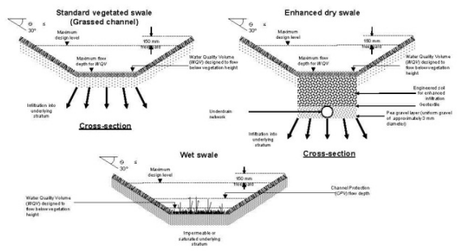


Figure C5: General design for swales
[after Wilson *et al.*, (2004); Woods-Ballard *et al.*, (2007); Haubner *et al.*, (2001)]

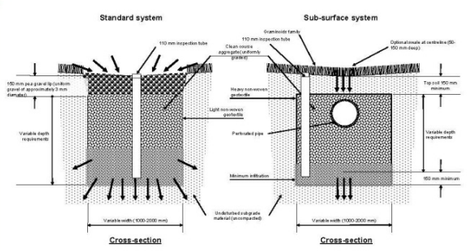


Figure C6: General design for dual system infiltration trenches
[after SEMCOG (2008)]

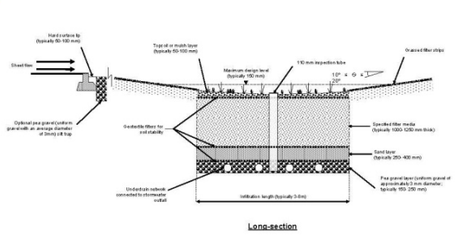


Figure C7: General design for bio-retention areas
[after Wilson et al., (2004); Woods-Ballard *et al.*, (2007); Haubner *et al.*, (2001)]

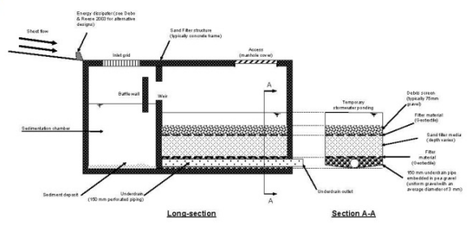


Figure C8: General design for sand filters with pre-treatment chamber
[after Debo & Reese (2003); Wilson *et al.*, (2004); Woods-Ballard *et al.*, (2007)]

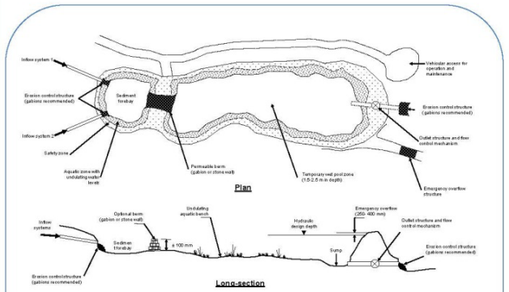


Figure C9: General design for detention ponds
[after Wilson *et al.*, (2004); Woods-Ballard *et al.*, (2007) and Others]

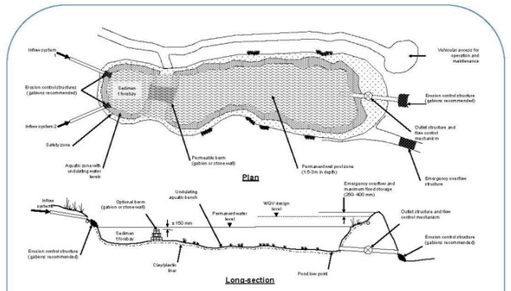


Figure C10: General design for retention ponds
[after Wilson *et al.*, (2004); Woods-Ballard *et al.*, (2007)]

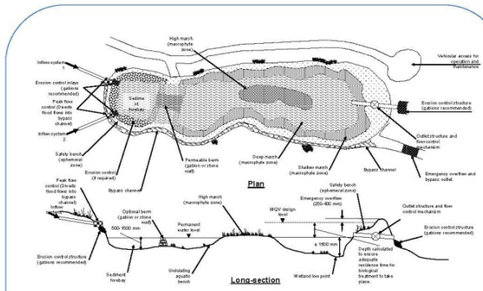


Figure C11: General design for constructed wetlands
[after Wilson *et al.*, (2004); Woods-Ballard *et al.*, (2007) & others]

K5/1826: Alternative technology for stormwater management
www.wsud.co.za

Page 2 of 2

Figure 8.6.6: Typical SUDS Design Drawings

8.7 MANHOLE COVER SPECIFICATIONS

The majority of existing JRA manhole covers and frames have been manufactured from in cast iron in terms of SABS (SANS) 558-1973 – *"Cast Iron Surface Boxes and Manhole and Inspection Covers and Frames".* Theft of the cast iron covers for resale as "scrap" has reached unacceptable levels in recent years. The theft also creates a hazard as many thefts go un-reported, with the possibility that pedestrians may unwittingly step into the resultant opening. JRA recently decided to invest in replacement covers made from materials which do not have a significant resale value.

South African National Standards (SANS) exist for alternative manhole cover materials (for replacements), and for manhole covers and frames (for new installations), as follows:

- SANS 1882: 2003 – *"Polymer Concrete Surface Boxes, Manholes and Inspection Covers, Gully Gratings and Frames"*; and
- SANS 50124: 1094/EN 124:1994 – *"Gully Tops and Manhole Tops for Vehicular and Pedestrian Areas - Design Requirements, Type Testing, Marking, Quality Control"*.

There are several South African companies which can supply polymer and "fibre" based manhole products which comply with the specifications noted below. If enquiring after replacement non-metallic manhole covers on their own, it is important to state this to the supplier as replacement manhole covers are made to fit cast iron frames, whereas non-metallic cover and frame sets differ in their dimensions. Figure 8.7.1 illustrates a number of problem issues.

8.7.1 Polymer Concrete

SANS 1882: 2003 defines "Polymer Concrete" as follows:

- Reinforced plastic mortar mixture of synthetic thermosetting resin (polymer, polyester, or vinyl ester or epoxy and others), aggregates (commonly graded silica sand and stone, or both of the same size, or different sizes and shapes), glass fibre strands or fibres, polypropylene fibres and a reactive agent.

SANS 1882: 2003 includes recommendations on purchaser specifications Annex A) and on the quality verification of polymer concrete manhole covers and frames (Annex B). If the manufacturer complies with SANS 9001 this covers the provision of an integrated quality system.

8.7.2 SANS 50124: 1994/EN 124: 1994

This standard specification has a wide classification range (6 classes) related to the specific position of installation of covers and frames within a roadway. Materials are specified as:

(a) Flake graphite cast iron;
(b) Spheroidal graphite cats iron;
(c) Cast steel;
(d) Rolled steel;
(e) One of (a) to (d) combined with concrete;
(f) Steel reinforced concrete.

SANS 50124/EN 124 permit "other materials" provided "all requirements of this specification shall be met and an independent body shall establish any other relevant requirements and testing methods.

Detail 1: Left to Right
Incorrect fit of a replacement cover – Missing cover, often for a very long time – Ill-fitting cover, now damaging the frame

Detail 2: Impediments to Pedestrian, and Particularly Wheelchair Progress

Figure 8.7.1: A Collection of Manhole Issues

CHAPTER 9: STRUCTURAL EVALUATIONS

9.1 Introduction:

It is essential that a public authority regularly evaluates the condition of existing structures within its jurisdiction. Such structures include bridges, road structures and minor structures. The objective of structural evaluations is to assess the condition of a structure with specific reference to its serviceability performance and its load carrying capacity.

A structural evaluation must be carried out on two distinct levels, namely:

- Firstly – a special inspection to obtain physical evidence of the geometry and condition of the structure;
- Secondly – a theoretical or experimental analysis of the structural behaviour and adequacy.

The imbalance of a "special inspection" is emphasised by the fact that the parameters used in the structural analysis must accurately reflect the condition of the structure at the time.

This "special inspection" must not be confused with the routine inspections which the road authority should conduct in terms of its Bridge Management System. The need for "special inspections" will result from the findings of the routine inspections or other special circumstances.

Such circumstances may include one or more of the following:

- Deterioration, distress or damage of the structure;
- Changes in design load specifications, road classification or load restriction;
- Rehabilitation or upgrade of the structure;
- Assessment of the structural capacity to allow the passage of a superload.

9.2 SANRAL Code of Procedure:

The SANRAL *Code of Procedure for the Planning and Design of Highway and Road Structures in South Africa* was published in February 2002 (with limited updates in January 2008). The SANRAL CoP covers the full spectrum of requirements relating to the design of road based structures and is therefore recommended as a core document for those engineers and technicians dealing with such structures within the Johannesburg metropolitan area.

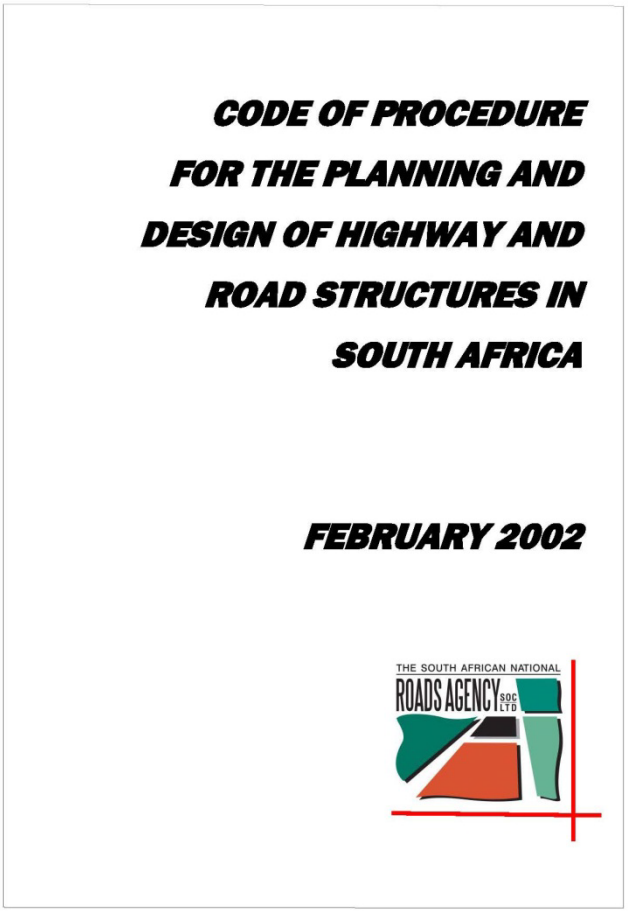


Figure 9.1.1: SANRAL Code of Procedure - February 2002

The wide range of chapters includes:

- Procedures;
- Geometric Standards;
- Survey Requirements for Bridges and Culverts;
- Geotechnical Investigations;
- **Structural Evaluation;**
- Hydraulic Requirements;
- PLUS many other topics.

Whilst the material is covered from a SANRAL needs perspective, knowledge of this Code may have many applications for those dealing with road structures in Johannesburg. The specific reason for including reference to the SANRAL CoP is for its Chapter 8 content on “Structural Evaluations”, which may be of great value to those responsible for maintaining bridge and culvert infrastructure. The scope of this “Structural Evaluations” chapter is illustrated in Figure 9.2.1.

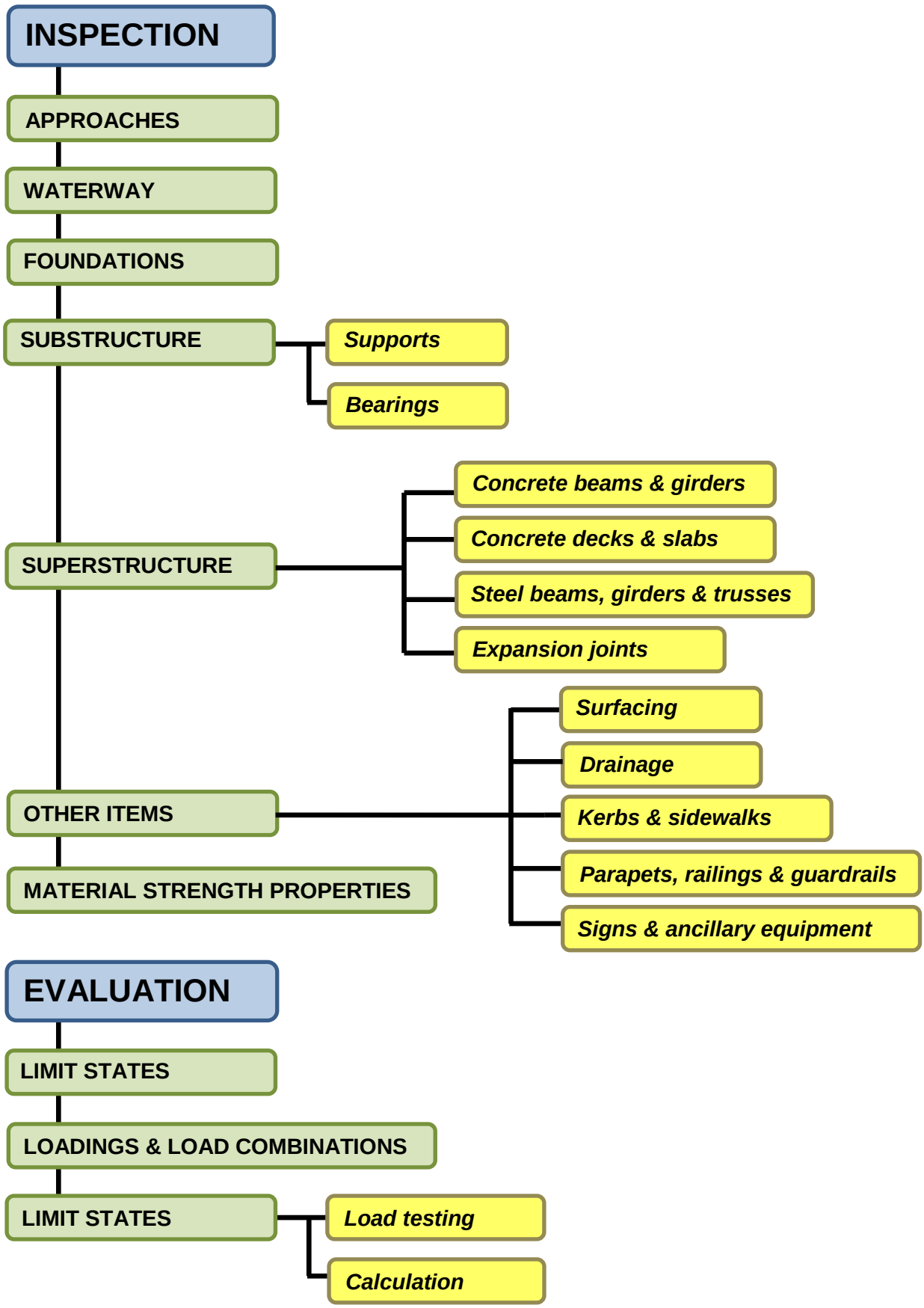


Figure 9.2.1: Special Structural Inspection and Evaluation Procedure

CHAPTER 10:
MARKETING & COMMUNICATION BRANDING GUIDELINES

10.1 Co-Branding Corporate Identity Manual:

10.1.1 Colour Palette – Primary

These specific colour values must be adhered to when reproducing the identity or any collateral element. The colour breakdown includes:

- Spot colour reference;
- CMYK breakdown (for lithographic printing); and
- RGB breakdown (for electronic usage).

The new “Golden Yellow” (Pantone 130 C) colour has been chosen for its strength, radiance and vibrancy. Pantone 130 C is warm and inviting, reminiscent of the African sunshine. It does the same in process colours as well as spot colours what metallic gold could only do in spot colours. Pantone 130 C is a strong accent colour to the “Joburg” black and is 100% achievable in process colour (CMYK).

A new Grey (Pantone 405 C) has been chosen to replace Pantone 431 C. Pantone 405 C is a warmer grey which accents the Black and Pantone 130 C perfectly to allow all collateral to feel warmer and more inviting.

Tints of the primary colour palette may be used.

PANTONE© 130 C		PANTONE© 405 C		PANTONE© BLACK C	
Cyan	0%	Cyan	0%	Cyan	0%
Magenta	35%	Magenta	0%	Magenta	0%
Yellow	100%	Yellow	15%	Yellow	0%
Black	0%	Black	80%	Black	100%
R	230	R	100	R	0
G	176	G	90	G	0
B	0	B	80	B	0

Figure 10.1.1: Primary Colour Palette

10.1.2 Colour Palette – Secondary

These specific colour values must be adhered to when reproducing the identity or any collateral element. The colour breakdown includes:

- Spot colour reference;
- CMYK breakdown (for lithographic printing); and
- RGB breakdown (for electronic usage).

Tints of the primary colour palette may be used.

Figure 10.1.2: Secondary Colour Palette

Frutiger 45 Light

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz 1234567890

Frutiger 45 Light italic

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz 1234567890

Frutiger 55 Roman

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz 1234567890

Frutiger 55 Roman Italic

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz 1234567890

Frutiger 65 Bold

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz 1234567890

Frutiger 65 Bold Italic

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz 1234567890

10.1.3 Fonts – Primary Print

Typography creates an important visual distinction for our brand and allows us to be instantly recognised.

The Frutiger family is to be used for all printed collateral.

Arial

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz 1234567890

Arial Italic

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz 1234567890

Arial Bold

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz 1234567890

Arial Bold italic

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz 1234567890

Arial Black

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz 1234567890

10.1.4 Fonts – Secondary Electronic

In instances where it is not possible to use the Frutiger family, the Arial family may be used as an alternative.

For electronic applications the Arial family may also be used in addition to the Frutiger family.

The Arial family is mainly used for the internal generation of items, be they presentations, letters, faxes and the like.

10.1.5 Grid Structure – 12's Grid

The grid is divided into 12th's, but may be sub-divided into 24th's AND 48th's for finer grids. The width of the clear border area is 1/48 on the vertical grid all the way round the format.

Grid measurements:

If the border width = 1/48 of the height of the format, then the actual width applied to all "A" formats is: A0 = 25 mm; A1 = 17.5 mm; A2 = 12.5 mm; A3 = 8.75 mm; A4 = 6 mm.

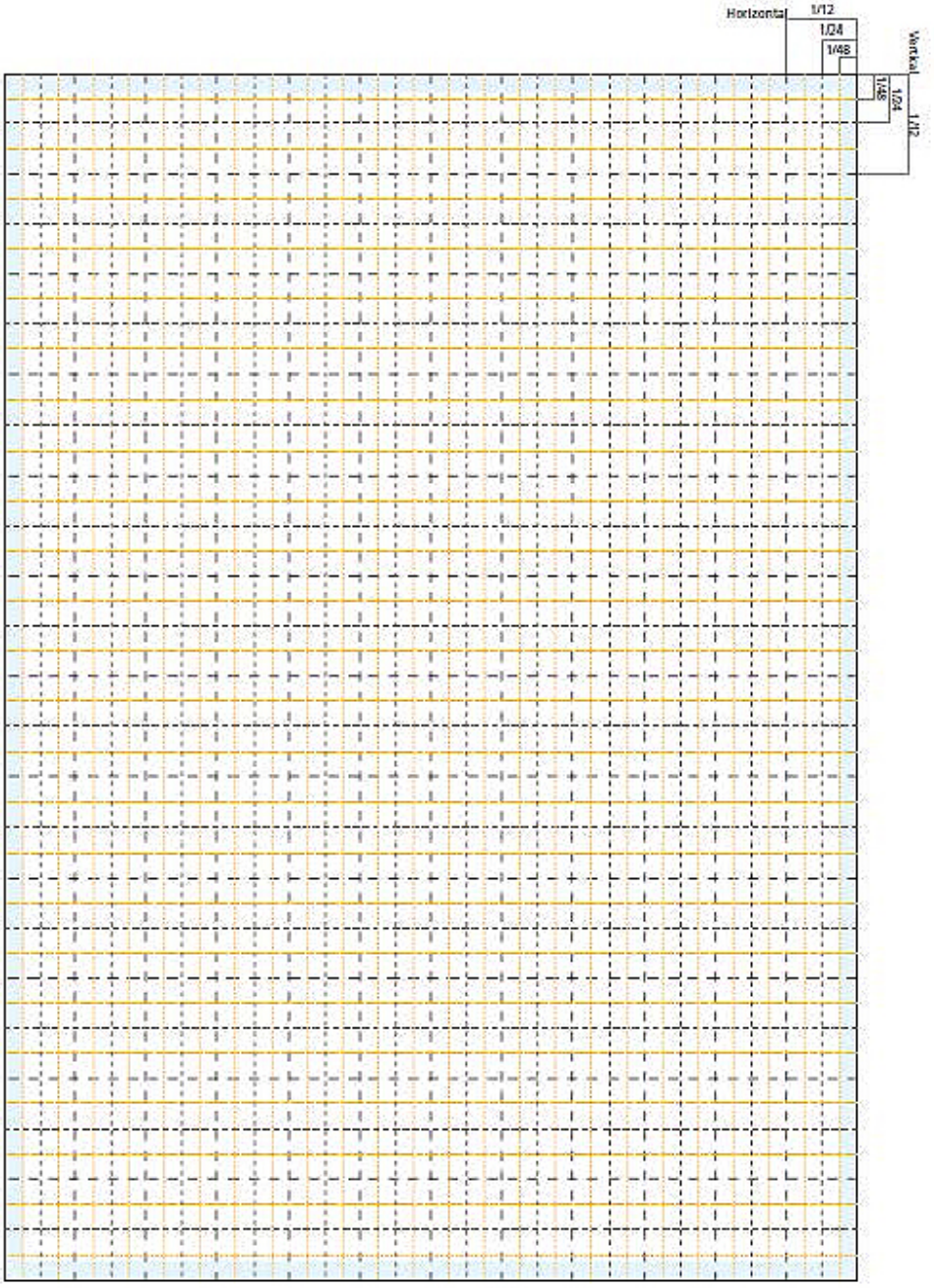


Figure 10.1.3: Grid Structure

10.1.6 Typographic Hierarchy

This hierarchy serves as a guideline with which to determine the style and relationship of size, leading and kerning between headings, sub-heading and body copy.

All type should be in Upper and Lower case, ranged left, ragged right.

These sizes and styles are only a guide to common text applications and may need to be adjusted according to the copy length or other requirements.

Main Heading

Secondary Heading

Lorem ipsum dolor sit amet, consectetur aedipscing elit, set diam nonnumy eiusmod tempor incudunt ut laboareae et dolore magn aliquam erat volupat. Ut enim ad minimum veniami quis nostrud Exercitation ullacorpor suscipit laboris nisi ut aliquip ex commodo consequat. Dusi autem vel eum irere dolor in reprehenderit in volupate velit esse molestaie son consequat, vel illum dolore eu fugiat nulla pariatur.

Cover

Main Heading: Frutiger 55 Roman 20 pt.
130% leading, 5 kerning
Secondary Heading: Frutiger 55 Roman 15 pt.
130% leading, 5 kerning
Tertiary Heading: Frutiger 45 Light 12 pt.
145% leading, 5 kerning

Inside Spreads

Main Heading: Frutiger 45 Light 18 pt.
130% leading, 0 kerning
Secondary Heading: Frutiger 65 Bold 10 pt.
130% leading, 0 kerning
Tertiary Heading: Frutiger 45 Light 9 pt.
145% leading, 0 kerning

10.1.7 Brand Architecture:

1. Structure

Primary Branding

Joburg Master Identity

Secondary Branding

Co-Branding

Office of the Executive Mayor
Department of Arts and Culture
Department of Housing

Municipal Owned Entities (MOEs)

Johannesburg City Parks
Johannesburg Development Agency
Johannesburg Roads Agency
Corporate Units
Johannesburg Fresh Produce Market
Johannesburg Metropolitan Bus Services
Joburg Zoo
Joburg Property Company
The Johannesburg Civic Theatre
City Power Johannesburg
Johannesburg Water
Metropolitan Trading Company
Pikitup Johannesburg
Emergency Management Services
Johannesburg Metropolitan Police Department

Sub-Branding

Joburg Region A
Joburg Region B
Joburg Region C
Joburg Region D
Joburg Region E
Joburg Region F
Joburg Region G

Tertiary Branding

Identities

Museums: Museum Africa, Hector Pieterson Museum
Programmes/Initiatives: Arts Alive, Newtown, Joburg 2030

Figure 10.1.4: Branding Structure

2. Identity Architecture

The architecture is a consistent means of associating the City of Johannesburg with any other brand entity, or serving as an endorsement to any other branded entity.

The City of Johannesburg's identity architecture has three specific defined relationships:

- The association with any descriptor;
- The association with any other single identity – whether the intention is to co-brand or to serve as an endorsement;
- The association with more than one other identity – whether the intention is to co-brand or to serve as an endorsement.

The architecture system has been kept clean and simple to allow it to be easily understood and implemented.

Figure 10.1.5: Identity Architecture - 1

Depending on the application required the logo can stand alone or appear with the positioning statement – “a world class African city”.

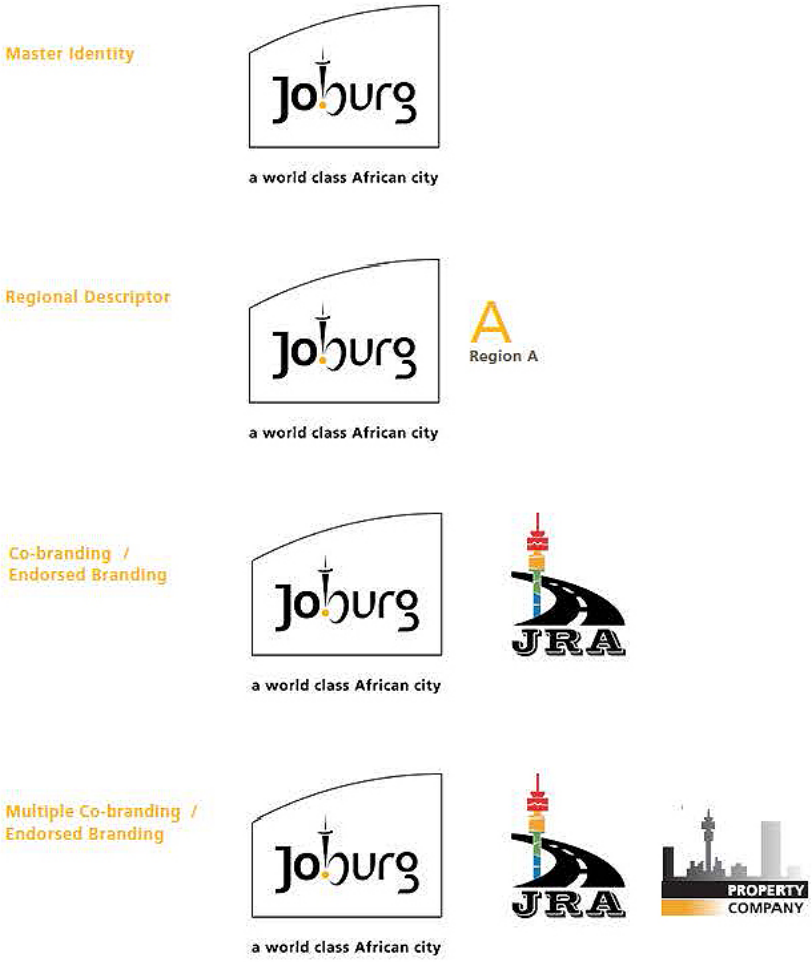


Figure 10.1.6: Identity Architecture – 2 – Inclusion of “a world class African city”

3. Region Brand Architecture

"The Region" has a unique size and position relationship to the City of Johannesburg logo.

The Region appears only as indicated below. Depending on the application required the logo can stand alone (Figure 10.1.7) or appear with the positioning statement – **"a world class African city"** (Figure 10.1.8).

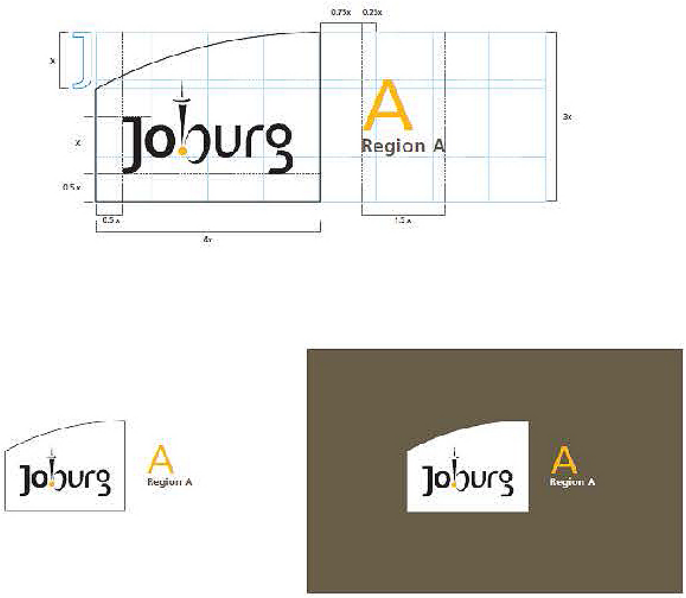


Figure 10.1.7: Regional Branding Architecture- 1

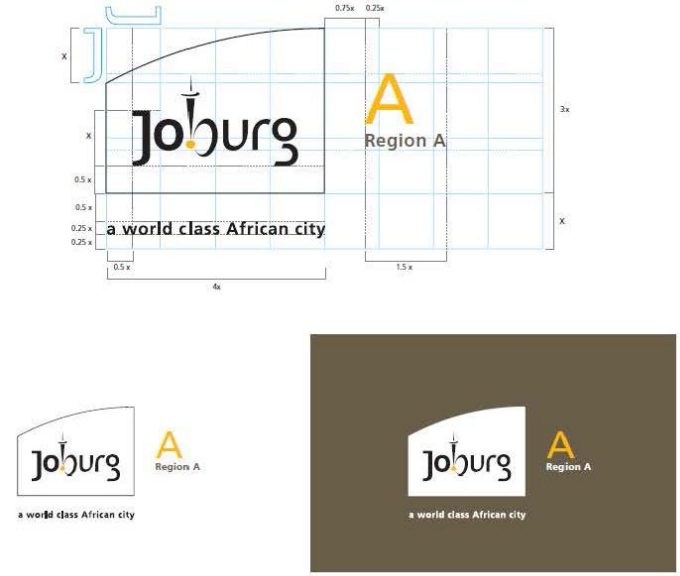


Figure 10.1.8: Regional Branding Architecture – 2
Inclusion of "a world class African city"

4. Co-Branding/Endorsed Brand Architecture

Co-Branding/Endorsed logos have a unique size and position relationship to the City of Johannesburg logo.

All logos should have an optical equal weighting. Co-Branding/Endorsed logos which are acutely vertical/horizontal in shape might need to exceed the grid lines indicated. Consult the City Marketing Department for approval if this circumstance should arise.

Follow the guidelines indicated.

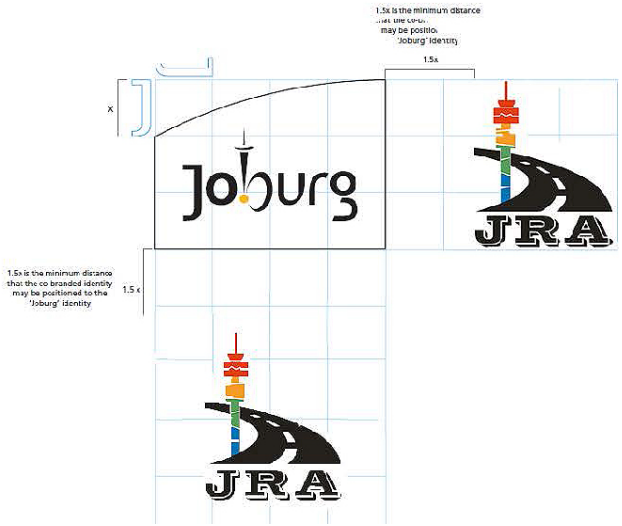


Figure 10.1.9: Co-Branding/Endorsed Branding Architecture- 1

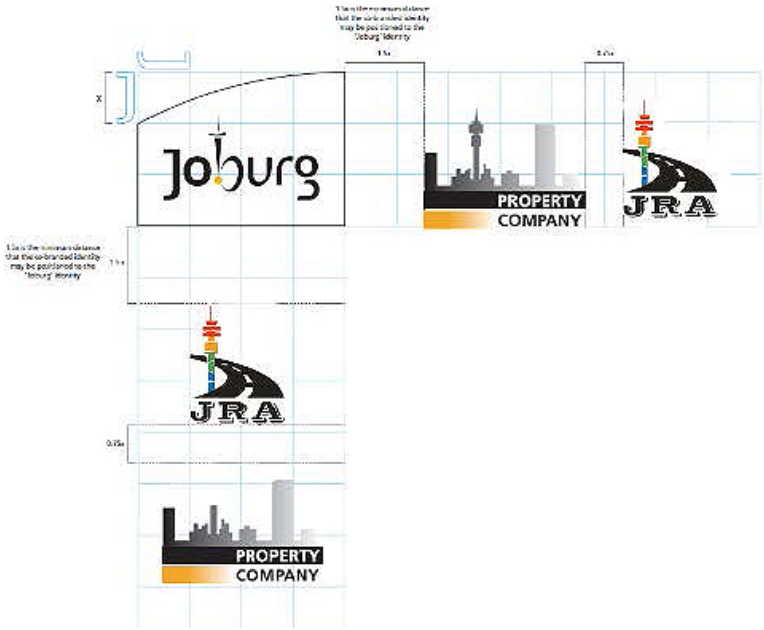


Figure 10.1.10: Co-Branding/Endorsed (Multiple) Branding Architecture- 2

10.2 Construction Boards Template:

Construction Boards should conform to the following overall dimensions:

- Width: 2500 mm;
- Height: 1850 mm.

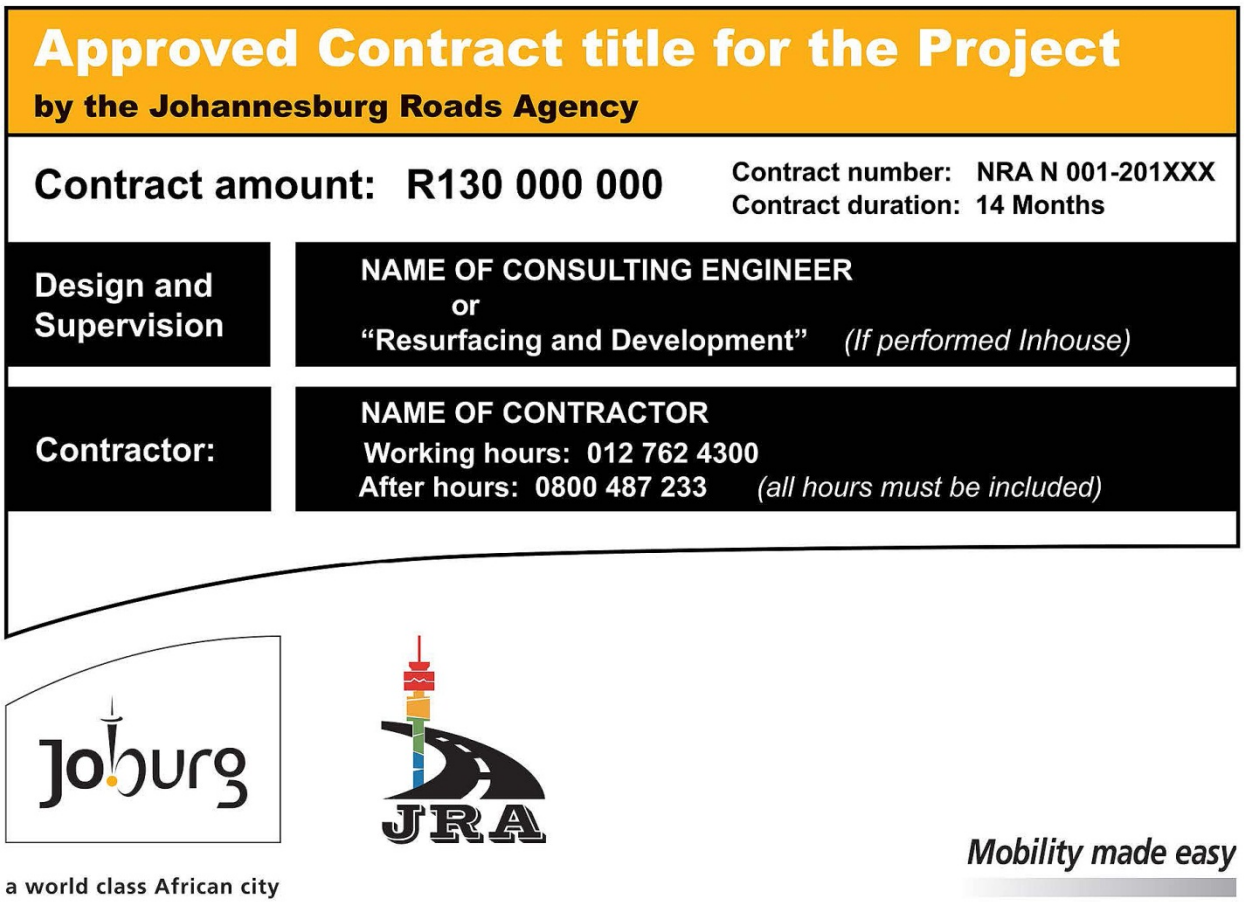


Figure 10.2.1: Construction Board Template

10.3 JRA Capex Projects Boards Templates:

JRA Capex Project Boards comprise moveable sign boards with the following dimensions:

- Width 900 mm;
- Height 1000 mm;
- Height standing on legs: 1200 mm.

Four (4) to six (6) moveable sign boards should be placed at both entrances/exits of the working areas on major constructions and at other suitable points between.

Important: Exact CMYK Golden Yellow colour below **must** be used for printed construction boards, NOT RGB values!

Figure 10.3.1

Figure 10.3.2

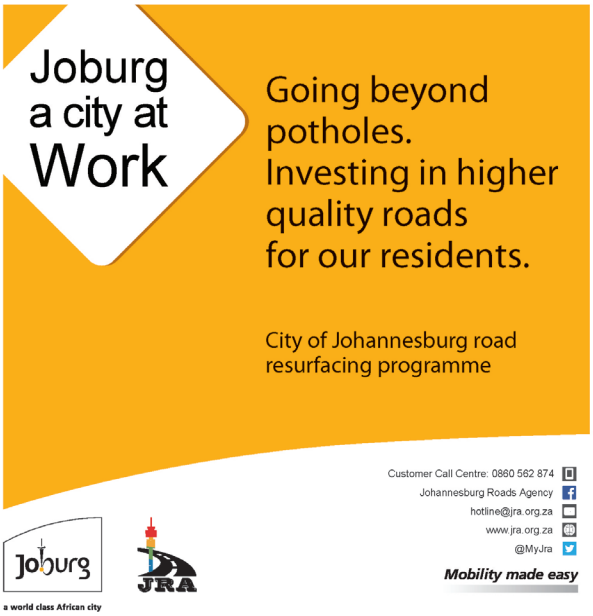


Figure 10.3.3

Figure 10.3.4

Figure 10.3.5

Figure 10.3.6

APPENDICES

CONTENTS

APPENDIX A1.1

(Refers to Chapter 1: Development Control)

Standard Operating Procedure (SOP)
Department - Development Application Procedure

CONTENTS

Prepared by: Mbongeni Zondo Signature:	Date Prepared: 6 March 2015
Prepared by: Jose Monteiro Signature:	Date Reviewed:
Prepared by: Thulani Makhubela Signature:	Date Approved:

1.0 REVISION HISTORY

Revision	Date	Description of Change	Reviewed by	Approved by
0	31 March 2015	New	N Ngema	T Makhubela

2.0 PURPOSE/OBJECTIVE(S)

The purpose of this procedure is to ensure that all documents, data, processes, procedures, work instructions, drawings, specifications and manuals are:

- Identified, developed, approved, issued and maintained in a controlled manner;
- Reviewed and updated as necessary, and re-approved;
- Implemented, complied with, filed, stored, revised, accessed and disposed of in a controlled manner;
- Controlled so that they are readily available when needed for reference purposes and to demonstrate conformance to required legislation, regulations, adopted international standards and best practices.

3.0 SCOPE

The Development Control Unit is within the Planning Department of JRA. The unit is responsible for advising and commenting on development applications such as township, rezoning, subdivisions, and other development related applications emanating from private and public developers. It also ensures that the construction of roads and stormwater drainage systems is executed in accordance with the required standards.

In summary this procedure covers all activities to adhered to with regards to:

- Analysis of development applications;
- Recommending and reporting;
- And development monitoring

4.0 RESPONSIBILITIES

4.1 Developer :
4.2 CoJ :
4.3 JRA Manager- Development Control :
4.4 JRA Senior Engineer :

5.0 PROCEDURE/PROCESS

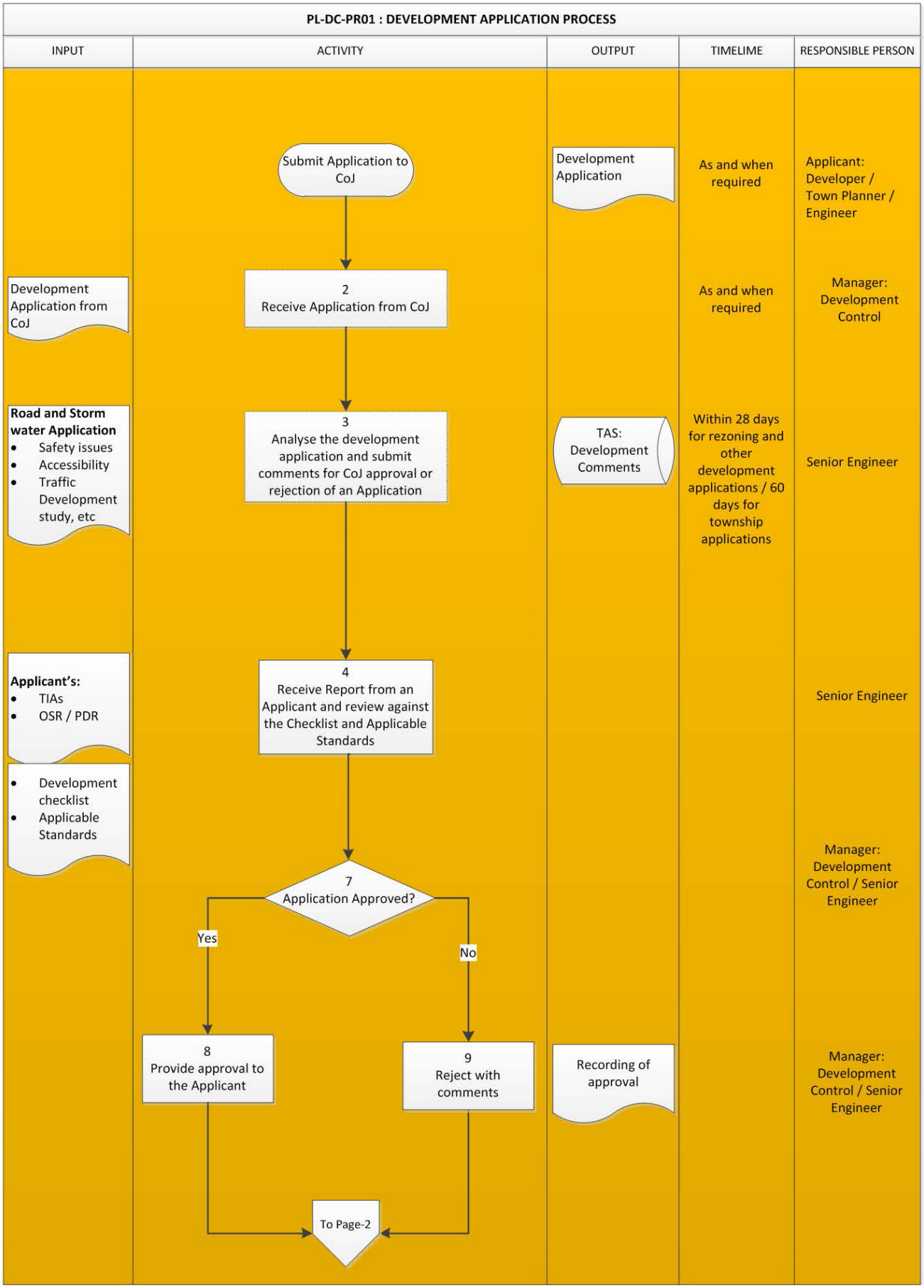
Step	Activity	Responsibility	Time line	Record Generated
Overview:				
This SOP covers the activities undertaken when development application is lodged				
Development Application Procedure				
5.1	The developer submits a development application to COJ	Developer	As and when required	Application submission (hard copy)
5.2	COJ receives development application from the developer	COJ	As and when required	Application registration
5.3	COJ submits the application to JRA for comments.	COJ	As and when required	COJ's delivery book
5.4	JRA receives development application from COJ	JRA	One day	Recording of the application in the spread sheet
5.5	JRA analyses and comments on the Road and Storm water application, to ensure that these issues are addressed: - Safety - Accessibility - Traffic development study	JRA Development and control : Manager / Senior Engineer	• Township, rezoning, removal of restrictions and division of land applications within 60 days • Other development applications (subdivision, consent use and consolidation) within 30 days.	Comments are filed and put on TAS
5.6	JRA submits comments to COJ	JRA Development and control : Manager / Senior Engineer	One day after completion of assessment	JRA's delivery book

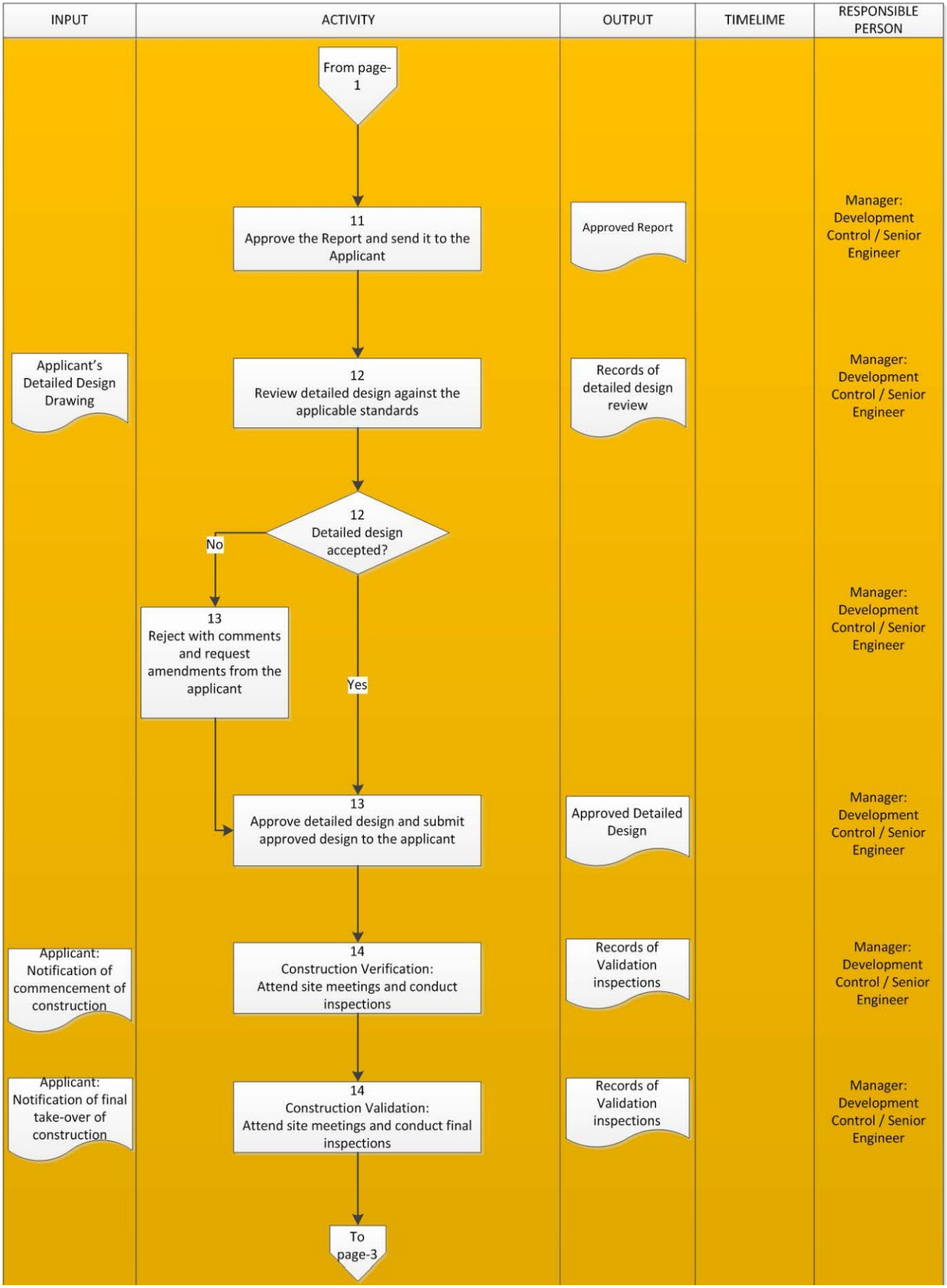
Step	Activity	Responsibility	Time line	Record Generated
5.7	COJ receives comments from JRA	COJ	One day	Recording of comments in COJ's system
5.8	After receiving comments from JRA, COJ approves or reject the application based on the comments from entities.	COJ	Timeline is dependent on the receipt of comments from different entities	Recording of approval and conditions in COJ's system
5.9	COJ forwards feedback (application approval) to the developer	COJ	Immediately after receiving comments from different entities	Recording of approval and conditions sent to the developer in COJ's system
5.10	The developer receives a feedback from COJ after the application has been analysed and commented on by JRA	Developer		Developer's records
5.11	After receiving the feedback (application approval) from COJ, The developer prepares the Engineering Services Report	Developer	Time line is dependent on the developer	Developer's records
5.12	The developer then submits the report the report to JRA for review and support	Developer	Time line is dependent on the developer	Developer's records
5.13	JRA receives Engineering Services Report from the developer	JRA Development and control : Manager / Senior Engineer		Recording of the report in the spread sheet
5.14	JRA reviews the Engineering Services Report against standards	JRA Development and control : Manager / Senior Engineer	Within 2 weeks from receipt of Engineering report	Review records - comments are typed and kept in the TAS system and on file
5.15	JRA support or accepts the report. Send an acceptance letter to the developer.	JRA Development and control : Manager / Senior Engineer	Within one day after completion of review	Acceptance letter is faxed and the fax slip is kept on file

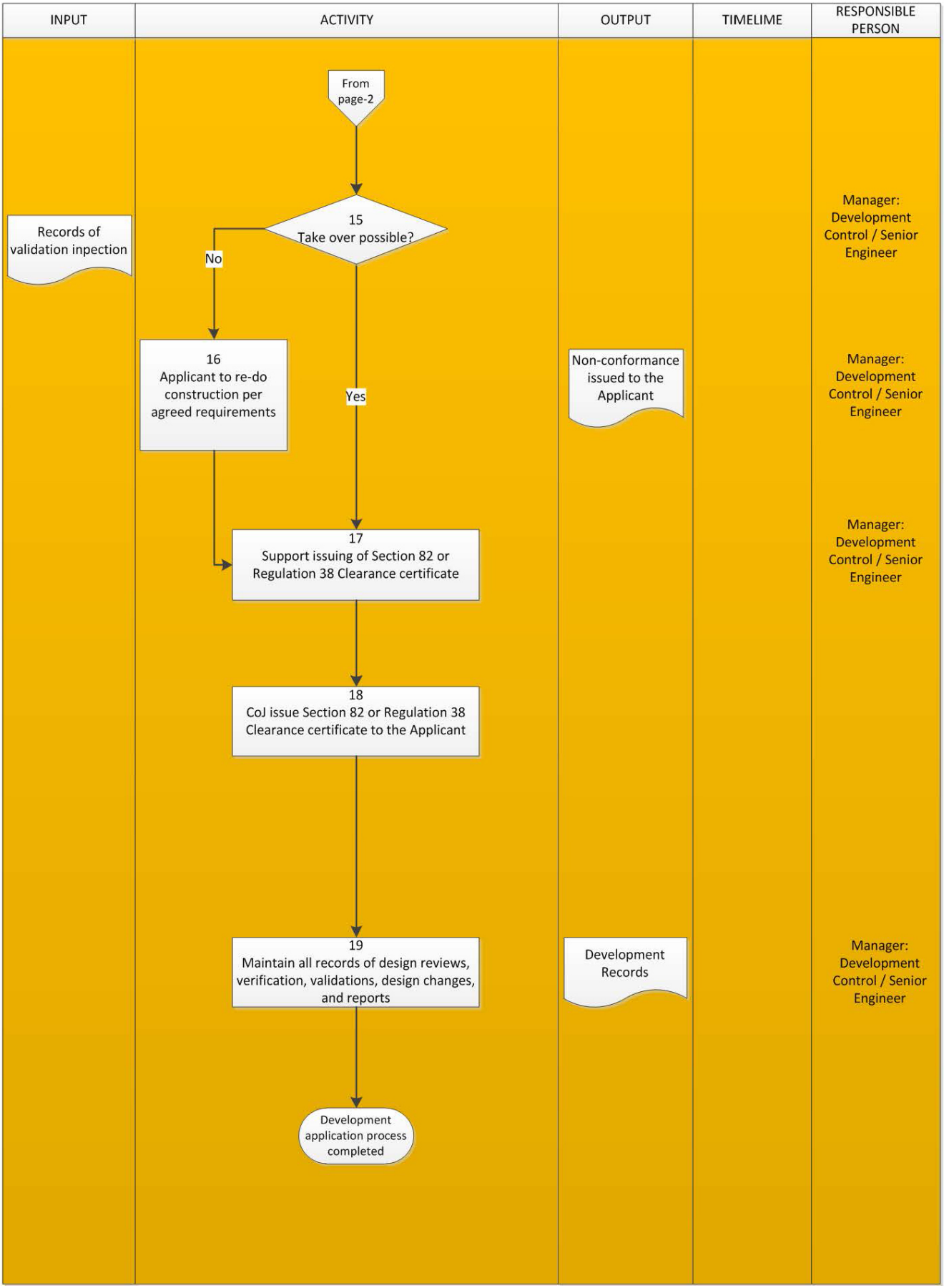
Step	Activity	Responsibility	Time line	Record Generated
5.16	JRA provides feedback (report acceptance) to the developer	JRA Development and control : Manager / Senior Engineer	Within one day after completion of review	Acceptance letter is faxed and the fax slip is kept on file
5.17	The developer receives feedback (report acceptance) from JRA.	Developer	Within one day after completion of review	Developer's records
5.18	After receiving feedback from JRA, the developer prepares Design Drawings.	Developer	Time line is dependent on the developer	Developer's records
5.19	The developer then submits Design Drawings to JRA	Developer	Time line is dependent on the developer	Developer's records
5.20	JRA receives Design Drawings from the developer.	JRA Development and control : Manager / Senior Engineer	Time line is dependent on the developer	Recording of design drawings in the spread sheet
5.21	JRA reviews the Design Drawings against standards	JRA Development and control : Manager / Senior Engineer	Time line is dependent on the developer	Comments are typed and are kept in the system and on file
5.22	JRA supports/accepts Design Drawings. Notify the developer of the outcome of the detailed design review.	JRA Development and control : Manager / Senior Engineer	Time line is dependent on the developer	Acceptance letter is faxed and the fax slip is kept on file
5.23	JRA provides feedback (design drawings acceptance) to the developer.	JRA Development and control : Manager / Senior Engineer	Time line is dependent on the developer	Developer's records
5.24	The developer receives feedback (design drawings acceptance) from JRA.	Developer	Time line is dependent on the developer	Developer's records
5.25	The developer notifies JRA about construction	Developer	Time line is dependent on the developer (availability of funding)	Developer's records

Step	Activity	Responsibility	Time line	Record Generated
5.26	JRA conduct site inspections to ensure compliance to standards. Issue non-conformance to the developer when defects and or non-compliance to standards observed. Re-inspect re-worked construction site when applicable.	JRA Development and control : Manager / Senior Engineer	During execution of construction	Site inspection report / Non-conformance Report
5.27	Conduct site final inspection to validate construction against approved detailed design and applicable standards. Take-over will be undertaken depending on the outcome of the final inspection.	JRA Development and control : Manager / Senior Engineer	During final take over	Validation report
5.28	File all records and reports generated.	JRA Development and control : Manager / Senior Engineer	At the end of the construction	Pack: Records of review, verification, validation inspections, changes and report.

6.0 FLOW CHART
6.1 Table PL-DC-PR01 on pages A-1.1.6 to A-1.1.8 covers the Development Application Process


PL-DC-PR01 : DEVELOPMENT APPLICATION PROCESS
INPUT
ACTIVITY
OUTPUT
TIMELIME
RESPONSIBLE PERSON
Submit Application to CoJ
Development Application
As and when required
Applicant: Developer / Town Planner / Engineer
Development Application from CoJ
2 Receive Application from CoJ
As and when required
Manager: Development Control
Road and Storm water Application
Safety issues
Accessibility
Traffic Development study, etc
3 Analyse the development application and submit comments for CoJ approval or rejection of an Application
TAS: Development Comments
Within 28 days for rezoning and other development applications / 60 days for township applications
Senior Engineer
Applicant's:
TIAs
OSR / PDR
4 Receive Report from an Applicant and review against the Checklist and Applicable Standards
Senior Engineer
Development checklist
Applicable Standards
7 Application Approved?
Manager: Development Control / Senior Engineer
Yes
No
8 Provide approval to the Applicant
9 Reject with comments
Recording of approval
Manager: Development Control / Senior Engineer
To Page-2


INPUT
ACTIVITY
OUTPUT
TIMELIME
RESPONSIBLE PERSON
From page-1
11
Approve the Report and send it to the Applicant
Approved Report
Manager: Development Control / Senior Engineer
Applicant's Detailed Design Drawing
12
Review detailed design against the applicable standards
Records of detailed design review
Manager: Development Control / Senior Engineer
12
Detailed design accepted?
No
Yes
Manager: Development Control / Senior Engineer
13
Reject with comments and request amendments from the applicant
13
Approve detailed design and submit approved design to the applicant
Approved Detailed Design
Manager: Development Control / Senior Engineer
Applicant: Notification of commencement of construction
14
Construction Verification: Attend site meetings and conduct inspections
Records of Validation inspections
Manager: Development Control / Senior Engineer
Applicant: Notification of final take-over of construction
14
Construction Validation: Attend site meetings and conduct final inspections
Records of Validation inspections
Manager: Development Control / Senior Engineer
To page-3


INPUT
ACTIVITY
OUTPUT
TIMELIME
RESPONSIBLE PERSON
From page-2
15
Take over possible?
No
Yes
Records of validation inpection
Manager: Development Control / Senior Engineer
16
Applicant to re-do construction per agreed requirements
Non-conformance issued to the Applicant
Manager: Development Control / Senior Engineer
17
Support issuing of Section 82 or Regulation 38 Clearance certificate
Manager: Development Control / Senior Engineer
18
CoJ issue Section 82 or Regulation 38 Clearance certificate to the Applicant
19
Maintain all records of design reviews, verification, validations, design changes, and reports
Development Records
Manager: Development Control / Senior Engineer
Development application process completed

7.0 RECORDS MANAGEMENT				
Reference	**Record Title**	**Authority or Responsible Party**	**Minimum Retention**	**Disposal**
16/3/1	Township and rezonings	Development Control Unit	5 years	archive
16/5/3	subdivisions	Development Control Unit	5 years	archive
16/5/6	Consent Use	Development Control Unit	5 years	archive
16/5/3	Consolidation	Development Control Unit	5 years	archive
16/5/2	Removal of Restrictions	Development Control Unit	5 years	archive
16/5/3	Division of land	Development Control Unit	5 years	archive
6/2/3	Alienation	Development Control Unit	5 years	archive
6/2/3/1	Leasing	Development Control Unit	5 years	archive
6/2/3/2	Sale	Development Control Unit	5 years	archive
6/2/3/3	Donation	Development Control Unit	5 years	archive
6/3/1	Land acquisition	Development Control Unit	5 years	archive
6/3/1/1	Purchase (Council Purchase)	Development Control Unit	5 years	archive
6/3/1/2	Expropriation	Development Control Unit	5 years	archive
6/3/1/3	Hire	Development Control Unit	5 years	archive
6/3/1/4	Servitudes	Development Control Unit	5 years	archive

8.0 APPROVAL, AMENDMENT AND REVIEW OF PROCEDURE/PROCESS	
Approval:	i) Manager will endorse the SOP ii) HOD will approve the SOP
Amendment:	Amendments will be implemented by the Manager and HOD
Review frequency:	As and when required minimum, annually

9.0 REFERENCES

LEGAL SOURCE	REFERENCE	TITLE OR DESCRIPTION
National Acts		
	1996	Constitution of the Republic of South Africa
	102 of 1982	Black Local Authorities Act
	4 of 1984	Black Communities Development Act
	3 of 1996	Removal of restrictions Act
	20 of 1986	Division of Land Act
	67 of 1995	Development Facilitation Act
	36 of 1998	National Water Act
	73 of 1989	Environmental Conservation Act
	35 of 2000	Municipal Systems Act
	56 of 2003	Municipal Finance Management Act
	8 of 2004	National Environmental Management Act
Provincial Ordinances (O)		
	15 of 1986	Town Planning and Townships Ordinance
	25 of 1965	Town Planning and Township Ordinance
	11 of 1931	Town Planning and Township Ordinance
Town Planning Schemes		
	1976	Halfway House and Clayville
	1976	Randburg
	1979	Johannesburg
	1980	Sandton
	1987	Roodepoort
	1994	Modderfontein
	1995	Peri-Urban Areas
	1997	Southern Johannesburg Region
	1998	Lenasia South East
JRA Policies & other technical guidelines		
	1981	Guidelines for the Planning and Design of Township Roads and Stormwater Drainage, SAICE
	1983	Road Drainage Manual, National Transport Commission
	1987	Guidelines for Engineering Services in New Townships, Department of Community Development
	1987	UTG 2, Structural Design of Segmental Block Pavements for Southern Africa, CSIR
	1988	UTG 5, Geometric Design of Urban Collector roads, CSIR
	1989	UTG 7, Geometric Design of Urban Local Residential Streets, CSIR
	1990	UTG 10, Guidelines for the geometric Design of Commercial and Industrial , Local Streets, CSIR

JRA Policies & other technical guidelines (continued)		
	1991	UTG 4, Guidelines for Urban Storm Water Management, CSIR
	1993	UTG 3, Structural Design of Urban Roads, CSIR
	1995	Manual for Traffic Impact Studies, CSIR Report 93/635
	2000	Guidelines for Human Settlement and Design, CSIR
	2003	National Guidelines for road Access Management in South Africa, COLTO,
	2005	JRA Standard Drawings
	2006	Stormwater Management, JRA Policy Statement
	2006	JRA Networks Storm Water Management, Conditions for Discharge into a Stream
	2009	JRA Guidelines for Preliminary Design Reports in Respect of Roads and Stormwater

10.0 DEFINITIONS

CoJ: City of Johannesburg (Land Use Management Department)

JRA: Johannesburg Roads Agency (Development Control Unit)

TAS: Town Planning Application System

UTG: Urban Transport Guidelines

CSIR: Council for Scientific and Industrial Research

COLTO: Committee of Land Transport Officials

TIA: Traffic Impact Assessment

OSR: Outline Scheme Report

PDR: Preliminary Design Report

APPENDIX A1.2

(Refers to Chapter 1: Development Control)

CONTENTS

a world class African city

City of Johannesburg
Johannesburg Roads Agency

66 Sauer Street
Cnr. Jeppe Str.
Johannesburg
2001

P/Bag X70
Braamfontein
South Africa
2017

Tel +27(0) 11 298 5000
Fax +27(0) 11 298 5178
www.jra.org.za
www.joburg.org.za

Tel: (011) 298-5059
Fax: (011) 298-5066

Ref: [redacted]
J. Monteiro

[redacted]

Date: [redacted]

Fax: (011) 501-4769

Attention: [redacted]

Sir,

[redacted]**: RE-SUBMISSION OF DESIGN DRAWING**

Your letter dated [redacted] together with your Detail Design Drawing no: [redacted], refers.

The Detail Design Drawing is acceptable subject to the following:

1. All brickwork for the manholes, as well as kerb inlets, is to be built in English bond, using bricks of quality FBSE 30 to SANS 227-2007, with water absorption less than 14% and efflorescence less than 10. Kerb inlets and manholes should match JRA standard details as shown in our standard drawings nos. JRA-SD-SW-020 to 023 and JRA-SD-SW-050 to052.

2. The class of stormwater pipe under the roadway is to be as per the classification shown on our standard drawing no JRA-SD-SW-090.

3. The Johannesburg Roads Agency does not support the use of paving blocks in the public road reserve, and their use in special circumstances must be motivated to the Engineer for the area. Only if this motivation is approved, can paving blocks be allowed. Where allowed, all blocks used for roadway paving must be type S-A if to be taken over by the Johannesburg Roads Agency for maintenance. These blocks should also be of a type that Midrand Depot holds in stock for maintenance purposes. The Depot may be contacted at (011) 256-8550 in this regard.

Kindly note that the Johannesburg Roads Agency requires a due performance guarantee for all road and stormwater drainage construction work, to be carried out in the public road reserve. This guarantee should be in a form approved by Legal Administration, Department of Transportation,

Planning and Environment of the City of Johannesburg, and should be for the full value of the construction work to be carried out in the public road reserve. This guarantee will remain in force for the duration of construction; upon takeover of the new works by the Johannesburg Roads Agency, the guarantee may be reduced to 10% of the value of the new works for a further defects liability period of 12 (twelve) months.

Before any construction commences in a public road reserve, please could your client complete a Wayleave form which indemnifies the City of Johannesburg and the Johannesburg Roads Agency against claims arising as a result of construction in the road reserve. These Wayleave forms are available at the appropriate roads depots in the region of construction. A copy/copies of the approved Detail Design drawings(s), plus proof of the payment of the due performance guarantee, must be produced before the Wayleave can be issued.

Please invite Mr JP Nortjie of JRA, Traffic Engineering Department prior to commencing with road marking and signage. Mr JP Nortjie can be contacted at 076 170 5363.The Zandfontein Depot Manager, Mr George Moloi is to be contacted at (011) 444-5953 prior to the commencement of works, during site meetings and at final inspection

Please could you also liaise with Metro Traffic regarding their requirement for accommodation of traffic under construction.

It should be noted that we cannot check all the details involved in the design of your scheme. Our checking is rather to ensure that the broad outlines such as access, geometric layout, location with regard to adjacent developments, and general aesthetics, conform to our requirements.

The attention to detail remains your responsibility, and the works should be designed in such a manner that they conform at all times with general engineering standards as set out in the "Guideline for the provision of engineering services and amenities in residential township development" issued by the National Housing Board, general standards of safety (both pedestrian and vehicular), geometric design and stormwater capacity.

Please could you ensure that your design and construction conforms to SANS 1200. We also require that all coordination is to WGS 84 with Lo 29º projection, and that heights are to be based on the National Bench Mark System. This data should be shown on all drawings.

Kindly inform Mr B. Kgaswe at telephone no 011-298-5205 when construction will commence, and when site meetings are scheduled together with the deport manager for the region, so that they may attend. Mr Kgaswe will also carry out acceptance inspections of work to be taken over by the Johannesburg Roads Agency. The Johannesburg Roads Agency does not, however, inspect private roads and stormwater drainage systems that are not taken over by the City of Johannesburg, but which remain the responsibility of the body corporate as internal services.

On completion of the new works, the Johannesburg Roads Agency will require the following:

1. Acceptance of the works by a final site inspection by a representative of the Johannesburg Roads Agency together with the Consulting Engineer.

2. The Consulting Engineers Certificate of Completion.

3. As-built drawings of these works on transparent film, and also in digital format. This format should be AutoCAD (DWG), or if this is not possible, drawing exchange format (DXF). All digital drawing files must have a file name that is the same as the hard copy drawing number.

Digital drawings are only acceptable when burnt onto CD`s or DVD`s (Stiffy disks are not acceptable for durability reasons). The CD/DVD disc label must reflect the project name with drawing numbers onto the disc labels.

Record drawings must be submitted with a covering letter detailing the project, list of drawings, format of digital drawings and number of discs included.

4. The as-built cost of works to be taken over by the Johannesburg Roads Agency.

5. A certificate from a registered Land Surveyor confirming that all survey beacons are in place and in order.

6. Road construction laboratory tests from an independent laboratory for all road layers and surfacing as per the relevant SANS 1200 requirements.

7. A guarantee in the amount of 10% of the value of the new works for a further defects liability period of 12 (twelve) months.

Only after receipt of these seven items can a clearance certificate be issued for the Development.

Yours faithfully

pp Manager: Development Control
tm/ms

copy: Depot Manager:Zandfontein Depot – Mr. G. Moloi

Fax no: 086 236 2622

APPENDIX B

(Refers to Chapter 2: Work in Road Reserves)

CONTENTS

City of Johannesburg
Johannesburg Roads Agency

66 Sauer Street
Cnr. Jeppe Str
Johannesburg
2001

P/Bag X70
Braamfontein
South Africa
2017

Tel +27(0) 11 298 5000
Fax +27(0) 11 298 5178
www.jra.org.za
www.joburg.org.za

JOHANNESBURG ROADS AGENCY

PROCEDURE FOR WAYLEAVE APPLICATION
(Updated 01 October 2012)

TO BE COMPLETED BY APPLICANT (STEPS 1, 2, 3 and 5)

STEP 1

Obtain detailed information from all relevant service agencies with regard to position of such services which are adjacent to where the work is to be carried out. Provide them with a drawing at minimum scale 1:500, with NORTH POINT, BLOCK PLAN WITH STAND NUMBERS, and STREET NAMES AND HOUSE NUMBERS (where possible). All service information must be obtained from the relevant Local Council before applicant applies for wayleave.

Please Note:
If information of the position or levels of the services are required, exposing and backfilling these services must be undertaken by hand. Give the relevant Service Agency two (2) weeks prior notice to obtain this information.

STEP 2

When applying for the wayleave, the applicant must hand in 3 copies of the drawing where the proposed work is taking place. Details required on the drawing are:

1. PROPOSED WORK.
2. DEPTH OF PROPOSED SERVICE BELOW ROAD LEVEL`
3. DISTANCE OF PROPOSED SERVICE FROM BOUNDARY
4. POSITION OF ALL STRUCTURES INCLUDING UNDERGROUND
5. EXTENT OF UNDERGROUND STRUCTURES
6. ALL SERVICES FROM OTHER SERVICE AGENCIES. (If there is no service from a particular agency for that area, a comment to that effect from that agency is required)

These drawings will have the official stamps of those Agencies or Departments to confirm they are in agreement that the data is in accordance with their latest records, before the wayleave is considered for approval.

STEP 3

The signed copies of the drawings and the signed application form must be handed to the Regional Depots, for final approval.

STEP 4 FOR WAYLEAVE OFFICE

The central wayleave registration office will check that all requirements have been met.

The Regional Depots will register the application on the GIS and the applicant must pay the registration fee as indicated in the schedule attached to this document. When it has been registered a wayleave number will be given and then the wayleave will be issued. The applicant must take note of the special conditions. (See Annexure B)

The Regional Depot will forward the details of the approved wayleave to the relevant JRA wayleave inspector in whose area the excavation will take place and he will monitor the site and make sure that the correct standards and the Code of Practice is adhered to during the excavation.

STEP 5

On completion of the work the applicant shall contact the JRA wayleave inspector who will then set up a site meeting to sign off the completed work.

Thereafter the completion certificate will be issued once all requirements have been met. The 12 month guarantee period for the permanent reinstatement and/or the backfilling as well as the 14 day maintenance period for temporary reinstatements by the wayleave holder commences from the date of issue of the certificate of completion.

City of Johannesburg
Johannesburg Roads Agency

66 Sauer Street
Cnr. Jeppe Str
Johannesburg
2001

P/Bag X70
Braamfontein
South Africa
2017

Tel +27(0) 11 298 5000
Fax +27(0) 11 298 5178
www.jra.org.za
www.joburg.org.za

WAYLEAVE FORM

Application is hereby made by the undersigned to do work within the road reserve as detailed below. The applicant undertakes to do the work according to the latest edition of the CODE OF PRACTICE FOR WORK IN THE ROAD RESERVE, contained in schedule 2 to the Public Road and Miscellaneous by-laws, 2004.

No work shall commence before the Wayleave is issued. The JRA will do all reinstatements unless specific permission is granted for this wayleave. All applicable fees are to accompany this application. These fees are only an estimate and will be properly measured on completion of the reinstatement.

APPLICANT

AGENCY / DEPARTMENT / PRIVATE : _____.

CONTACT PERSON: _____

CONTACT TEL. :_____

CONTACT FAX:_____.

Email:_____

CONTRACTOR:_____.

PROJECT. NO:_____

REINSTATEMENT ORDER NO:_____.

PROVISIONAL DATES

STARTING DATE:_____. COMPLETION DATE:_____.

DRAWING NUMBER : _____.

LOCATION OF WORK **(give full details)**

SUBURB: _____ STREET NAME: _____

:

STREET (FROM): _____. STREET (TO): _____:

ERF NO'S: _____.

HOUSE NO'S: _____.

EXCAVATION DETAILS:

LENGTH OF EXCAVATION : : RIDING SURFACE _____m^2 KERBS _____m

ASPH. FOOTWAY_____m^2 : INTERL. BLOCK _____m^2 UNPAVED FOOTWAYS _____m^2

****All work will be done between the hours of 09:00 and 15:30 to ensure free flow of traffic during peak hours.**

SPECIAL NOTE.

In terms of Clause 7 of the Code of Practice all roads in the JRA jurisdiction are classified as protected roads. As such no road will be excavated, all services that need to cross a road will be laid using trench less technology. In the event where this is not possible, a letter applying to excavate the road must be submitted the JRA wayleave office with a plan showing all services already in the ground. If written approval is given, no work will commence until a wayleave officer is present.

THE FOLLOWING SERVICE AGENCIES ARE AWARE THAT THE APPLICANT WILL BE WORKING WITHIN THE VICINITY OF THEIR SERVICES, HAVE GIVEN THE APPLICANT THEIR CONDITIONS FOR

City of Johannesburg
Johannesburg Roads Agency

66 Sauer Street
Cnr. Jeppe Str
Johannesburg
2001

P/Bag X70
Braamfontein
South Africa
2017

Tel +27(0) 11 298 5000
Fax +27(0) 11 298 5178
www.jra.org.za
www.joburg.org.za

WORKING WITHIN THE VICINITY OF THEIR SERVICES AND THEREFORE HAVE NO OBJECTION TO THE APPLICANT APPLYING FOR A WAYLEAVE.

AGENCY	***REMARKS / SIGNATURE / DATE***
CITY POWER	
EGOLI GAS	
JHB WATER	
CITY PARKS	
JRA STORM WATER	
SASOL	
DARK FIBRE AFRICA	

AGENCY	***REMARKS / SIGNATURE / DATE***
TELKOM	
ESKOM	
RAND WATER	
NEOTEL	
MTN	
CITY CONNECT	

JRA OFFICE USE:

DATE RECEIVED: _____ NAME OF OFFICIAL _____ SIGNATURE _____

DATE APPROVED: _____ NAME OF OFFICIAL _____ SIGNATURE _____

YES	NO	WAYLEAVENO:		

UNDERTAKING / INDEMNITY: .....
....

City of Johannesburg
Johannesburg Roads Agency

66 Sauer Street
Cnr. Jeppe Str
Johannesburg
2001

P/Bag X70
Braamfontein
South Africa
2017

Tel +27(0) 11 298 5000
Fax +27(0) 11 298 5178
www.jra.org.za
www.joburg.org.za

UNDERTAKING / INDEMNITY

I, the undersigned hereby,

- Acknowledge receipt of a brochure containing the procedures and conditions pertaining to wayleave applications and understand that It will be my responsibility to contact the relevant Service agencies within and outside the area of jurisdiction of the Johannesburg Roads Agency (PTY) Ltd, undertake to adhere to the conditions not applicable to this department, e.g. TELKOM, ESKOM and RAND WATER.

- Undertake to furnish the relative Service Agencies with all necessary application form(s) and information obtained as a result of this application, in order to obtain final wayleave approval and permission to work within the road reserve:
  - ❖ Acknowledge that service information is given in good faith and that the accuracy of this information is not guaranteed;
  - ❖ Guarantee all backfilling and permanent reinstatement work done by the contractor, for a period of 12 months from the time when the work is signed off as completed by the JOHANNESBURG ROADS AGENCY Inspector;
  - ❖ Accept responsibility for all costs associated with the work, including any damages to other services, permanent backfilling/reinstatement of trenches, the cost of any tests that may be required and any claims that may result from the work until the permanent reinstatement is completed;
  - ❖ Accept full responsibility for all costs associated with the relocation of the service / structure in future to accommodate any road or Stormwater drainage works;
  - ❖ Accept the terms and conditions of the wayleave approval and all the conditions contained in the code of practice for work in the Road Reserve.

- Indemnifies the JOHANNESBURG ROADS AGENCY (JRA) against any claim(s), cost or damage or loss of whatsoever nature that may be incurred or sustained by the JRA, the applicant or any third party and also against all actions, legal proceedings and claims of whatsoever nature that may be instituted or made against the JRA arising out of, by reason of, or in any way whatsoever caused by or connected with the exercising by the applicant of the rights granted by the Wayleave application as well as in respect of cost which may be incurred by the JRA in examining or resisting any such demands, actions, legal proceedings and claims, instituted by any person or party for injury to person(s) loss of life or damage to or loss of property, arising directly or indirectly exercising the permission granted with approval of this application.

Signature (applicant)	Date	Signature (JRA Officer)

JOHANNESBURG ROADS AGENCY (PTY) LTD

(Company Registration No: 2000/028993/07)

Laboratory and Research
Spring Street
Ophirton
2091
Tel. (011) 493 6386/7
Fax (011) 493 0612

Private Bag X70
Braamfontein
2017

File Ref:

DYNAMIC CONE PENETRATION TEST.

STREET : ..... SUBURB : .....

FROM : ..... TO : .....

CHAINAGE /POSITION : .....DATE : 200__/___/___.

No. of		Reading	No. of		Reading
0			205		
5			210		
10			215		
15			220		
20			225		
25			230		
30			235		
35			240		
40			245		
45			250		
50			255		
55			260		
60			265		
65			270		
70			275		
75			280		
80			285		
85			290		
90			295		
95			300		
100			305		
105			310		
110			315		
115			320		
120			325		
125			330		
130			335		
135			340		
140			345		
145			350		
150			355		
155			360		
160			365		
165			370		
170			375		
175			380		
180			385		
185			390		
190			395		
195			400		
200			405		

City of Johannesburg
Johannesburg Roads Agency
66 Sauer Street
Cnr. Jeppe Str
Johannesburg
2001

P/Bag X70
Braamfontein
South Africa
2017

Tel +27(0) 11 298 5000
Fax +27(0) 11 298 5178
www.jra.org.za
www.joburg.org.za

a world class African city

JOHANNESBURG ROADS AGENCY (PTY) LTD

(Company Registration No: 2000/028993/07)

Laboratory and Research
Spring Street
Ophirton
2091
Tel. (011) 493 6386/7
Fax (011) 493 0612

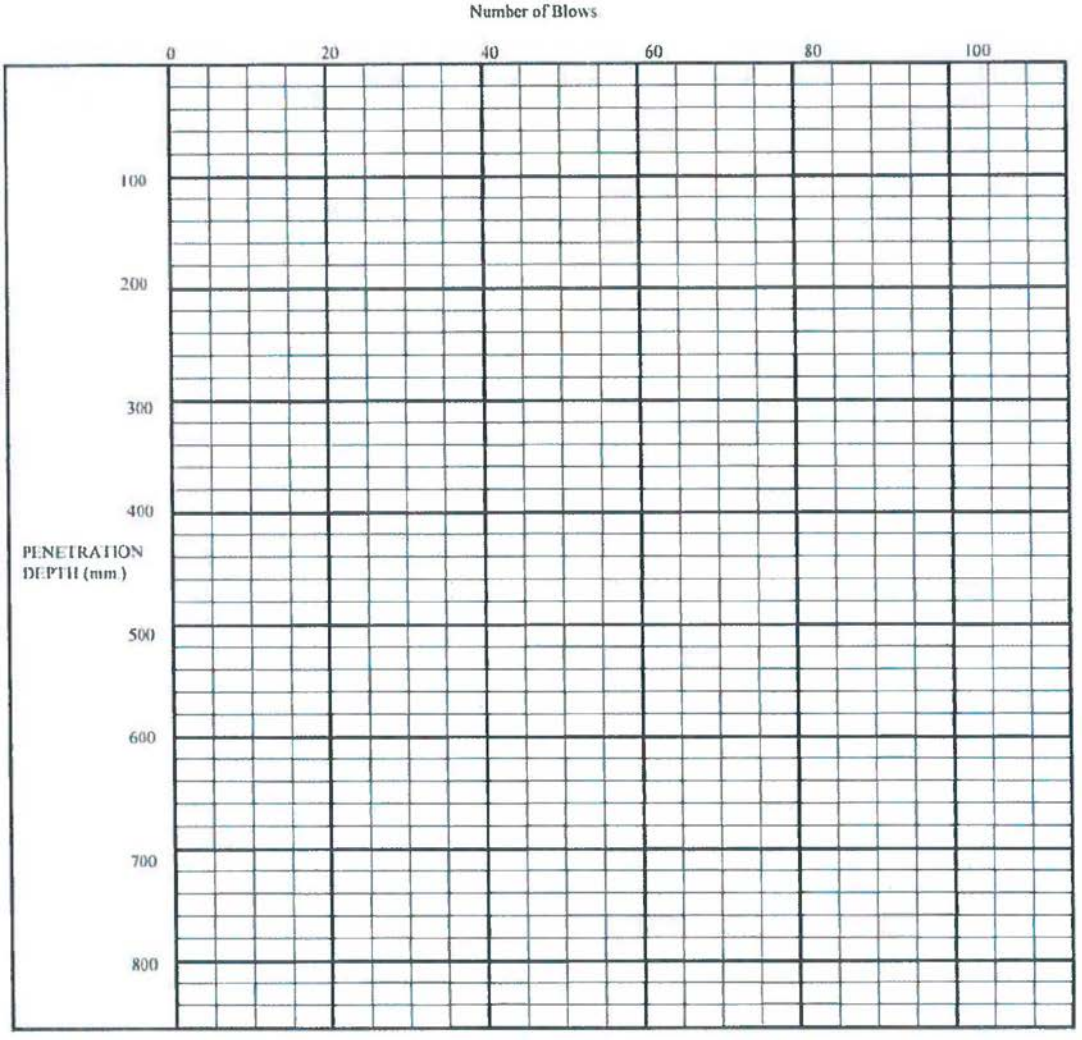
Private Bag X70
Braamfontein
2017

File Ref:

DYNAMIC CONE PENETRATION TEST

STREET:_____ SUBURB:_____ POSITION:_____

FROM:_____ TO:_____ DATE:_____



APPROVAL: SERVICE PROVIDER _____ DATE:_____

APPROVAL: JRA _____ DATE:_____

City of Johannesburg
Johannesburg Roads Agency

66 Sauer Street
Cnr. Jeppe Str
Johannesburg
2001

P/Bag X70
Braamfontein
South Africa
2017

Tel +27(0) 11 298 5000
Fax +27(0) 11 298 5178
www.jra.org.za
www.joburg.org.za

JOHANNESBURG ROADS AGENCY (PTY) LTD
(Company Registration No: 2000/028993/07)

JRA Building
66 Sauer Street, cnr Jeppe
Johannesburg

Private Bag X70
Braamfontein
2017

ATTENTION: ALL SERVICE AGENCIES

Regarding what part of the reinstatement will the Service Agencies be allowed to reinstate and what will the Johannesburg Roads Agency do:

- No road may be excavated unless special permission is granted by the JRA. All services must be put in using trenchless technology when putting it in the road.
- All the backfilling part of the excavation will be done by the Service Agency or their appointed contractor and the excavation made safe till handed over to the Johannesburg Roads Agency.
- The reinstatement of all the top 100mm asphalt surfaces will be done by the Johannesburg Roads Agency, unless written approval is given by the JRA that the Wayleave Holder can use their own specified contractor.
- When submitting the DCP tests, the JRA DCP graphs must be used. Subject to written approval by the JRA the Wayleave Holder can use the services of an independent private laboratory.
- Note that if a DCP test fails, the excavation must be re-backfilled, re-compacted and the DCP re-tested. **NB: THE JRA RESERVES THE RIGHT TO ARRANGE THE EXECUTION OF THIS WORK AT THE COST OF THE SERVICE AGENCY.**

City of Johannesburg
Johannesburg Roads Agency

66 Sauer Street
Cnr. Jeppe Str
Johannesburg
2001

P/Bag X70
Braamfontein
South Africa
2017

Tel +27(0) 11 298 5000
Fax +27(0) 11 298 5178
www.jra.org.za
www.joburg.org.za

SCHEDULE OF FEES FOR REINSTATEMENT OF EXCAVATIONS: 2012/2013
(NOTE: Fees are revised annually as from 1 July.)

SERVICE	NEW TARIFF
Road Riding Surface	R585
Backfilling	R690
Paved Footways	R435
DCP Testing	R1 280
Unpaved Footways	R400
Kerbing (lm)	R635
Temporary Reinstatements	R300
Wayleaves processing fees, per project per suburb	R585
Wayleave processing fee for unplanned work per suburb (emergencies)	R265
.	
For Re-inspection where previous inspection had failed and work was Redone	R585
Penalty for failed reinstatements done by own agent	R6 890
Non Compliance to City By laws	R250.000

City of Johannesburg
Johannesburg Roads Agency

66 Sauer Street
Cnr. Jeppe Str
Johannesburg
2001

P/Bag X70
Braamfontein
South Africa
2017

Tel +27(0) 11 298 5000
Fax +27(0) 11 298 5178
www.jra.org.za
www.joburg.org.za

CERTIFICATE OF INSPECTION AND / OR COMPLETION

Wayleave Number: _____.

The JRA Inspector must sign this form. The signature is just for administrative control and by no means implies that the work has been done according to the specifications and conditions of the wayleave. The onus and responsibility of ensuring that the service has been correctly installed, is that of the applicant.

Description of wayleave Date:_____

_____. _____ _____ _____.
Street on Street From Street To Suburb

Responsible person (for the erection / installation of the service)

Name **Company:** _____.

Telephone Number: (____) _____.

COMPLETION NOTICE

The Central wayleave Office is hereby informed that:

- The work done in terms of the above Wayleave has been completed according to the conditions as prescribed in the Wayleave Procedure document; a DCP Test was done and complies with the JRA requirements;

AND

- The permanent reinstatement has been done in accordance with the specifications in the Code of Procedure for Work in the Road Reserve;

OR

- The backfilling has been done and a copy of proof of payment/ Reinstatement Order to the amount of R_____ is attached for the JRA to do the permanent reinstatement.

Name: _____ Signed: _____ _____
Wayleave Holder Date

COMPLETION CERTIFICATE

It is hereby certified that the site of the work carried out in terms of the above Wayleave was inspected on the above date and that:

- The work has been completed; and
- The site has been cleared and cleaned; and
- The wayleave holder did the permanent reinstatement and the 12month guarantee period commences from the date of the Wayleave stamp underneath.

OR

The wayleave holder completed the backfilling and the two-week maintenance period commences from the date of the Wayleave stamp underneath. A Reinstatement Order was received from the wayleave holder.

SITE INSPECTIONS

REMARKS:

_____

_____

REINSTATEMENT ORDER NO: _____.

Name:_____ Signed:_____ _____
JRA Inspector Date

……..

……

OFFICIAL WAYLEAVE STAMP AND DATE

City of Johannesburg
Johannesburg Roads Agency

66 Sauer Street
Cnr. Jeppe Str
Johannesburg
2001

P/Bag X70
Braamfontein
South Africa
2017

Tel +27(0) 11 298 5000
Fax +27(0) 11 298 5178
www.jra.org.za
www.joburg.org.za

WAYLEAVE SERVICES LIAISON LIST

WAYLEAVE REGIONAL REGISTRATION OFFICES

REGION	WAYLEAVE OFFICIAL	ADDRESS	TEL. NO.
REGION A	Makhosi Ndaba	6 Dale Rd cnr Glen Auston Rd, Midrand	011 2568550 0827265136
REGION B	Makhosi Ndaba	6 Dale Rd cnr Glen Auston Rd, Midrand	011 2568550 0827265136
REGION C	Godfrey Legodi	159 Hamburg Rd cnr Reid Rd, Florida	011 3703846 0827265129
REGION D	Dolly Sefatlhe	1 Calendula Road Klipspruit West	011 947 1002/3/5 0836645328
REGION E	Khulu Ngcobo	15 Short Rd cnr Pain Str, Norwood	011 2985018 0827265128
REGION F	Rhulane Ngobeni and Daniel Matjeding	185 Main Reef Rd, Newtown	011 8704208 0825614804
REGION G	Gugulethu Nzimande	1 Calendula Str, Klipspruit West	011 9471002 0825673980
LABORATORY	Bongani Msiza	8 Spring Str, Ophirton	011 4936386
JRA STORM WATER	Ron Neelman	66 Sauer Sre cnr Jeppe Str, Newtown	011 2985019/20/21

JOHANNESBURG ROADS AGENCY CALL CENTRE.
JOBURG CONNECT (011) 375 5555

City of Johannesburg
Johannesburg Roads Agency

66 Sauer Street
Cnr. Jeppe Str
Johannesburg
2001

P/Bag X70
Braamfontein
South Africa
2017

Tel +27(0) 11 298 5000
Fax +27(0) 11 298 5178
www.jra.org.za
www.joburg.org.za

WAYLEAVE SERVICES LIAISON LIST

SERVICE PROVIDERS

SERVICE AGENCY	CONTACT	ADDRESS	TEL. NO.	FAX NO.	E-MAIL
CITY POWER	Derrick Oliver	40 Herronmere Rd, Reuven	011 490700	011 4907688	doliver@citypower.co.za
TELKOM	Lazarus Ramalobela	2 Crownwood Rd, Crown Mines, 1725	011 3099186	011 3099185	ramalobelal@telkom.co.za
EGOLI GAS	Morven Northcott	1 Annet Rd, Cottesloe, 2092	011 3565000	011 7266403	mnorthcott@egoligas.co.za
ESKOM	May Husselman	204 Smit Str, Braamfontein	011 7112104	011 7112189	husselm@eskom.co.za
JOBURG WATER	Johanna Coetzee	17 Harrison Str, Marshalltown, 2107	011 6881615	011 6881587	jcoetzee@jwater.co.za
RAND WATER	Job Kubheka	522 Impala Rd, Glenvista	011 6820433	0116820893	
CITY PARKS	Gabriel Motsatsi	Cnr Hamburg Rd and Westlake Rd, Florida Lake	011 4703722	0114725790	gmotsatsi@jhbcityparks.com
NEOTEL	Shane Cannon	33 Foofd Str, Forum 3, Building 9, Braampark	011 5850453	011 5850001	scannon@neotel.co.za
MTN	Khumo Maponya	14th Avenue, Fairland, 2195	0832125178		
SASOL	Bruce van der Heuvel	146 Honfbaai Rd, Elandhaven	011 8658563	011 8658591	
DARK FIBRE AFRICA	Zandi Kuiper	55 Regency Dr, Route 21 Corporate Park, Nellmapus Rd and Irene, Pretoria	012 3457520	0866941233	Zandi.kuiper@dfafrica.co.za
CITY CONNECT	Carel van der Merwe	Building 13 Meadow House, Woodmead Estate, 1 Woodmead Dr, Woodmead, 2023	0872500316/ 0795297382		wayleave@citiconnect.co.za

a world class African city

City of Johannesburg
Johannesburg Roads Agency

66 Sauer Street
Cnr. Jeppe Str
Johannesburg
2001

P/Bag X70
Braamfontein
South Africa
2017

Tel +27(0) 11 298 5000
Fax +27(0) 11 298 5178
www.jra.org.za
www.joburg.org.za

City of Johannesburg
Johannesburg Roads Agency

66 Sauer Street
Cnr. Jeppe Str
Johannesburg
2001

P/Bag X70
Braamfontein
South Africa
2017

Tel +27(0) 11 298 5000
Fax +27(0) 11 298 5178
www.jra.org.za
www.joburg.org.za

ANNEXURE B.1

SUMMARY OF CONDITIONS FOR WORK IN THE ROAD RESERVE

This page is intended to provide a summary of conditions and specifications. Please refer to the Council's Code of Procedure for Work in the Road Reserve for more detail.

Before any work is done in the road reserve, a wayleave must be issued by the Johannesburg Roads Agency wayleave office. This will only be done after a completed wayleave application form has been received by the Wayleave Officer and the reinstatement fee paid. Before submitting the form to the Wayleave Officer, approval must be obtained from all other agencies indicated on the form.

In the case of emergency work, e.g. burst pipes, a wayleave application form must be submitted within 24 hours and the JRA maintenance depot must be informed.

All work must be done according to the Code of Practice. Only work indicated on the wayleave form may be done and only during the period indicated, unless written approval has been obtained from the relevant wayleave office to change the dates.

The wayleave holder is responsible for all costs, including any damage to other services, backfilling, reinstatement, tests and any claims that may result. The wayleave holder is also responsible for traffic signs, barricading and the safety of motorists, pedestrians and workers.

If any trees or road furniture is affected by the proposed work, then the relevant office must be contacted.

The underground service shall have not less than 800 mm cover and all manhole or valve covers shall be finished flush with the surface of the road or the verge.

Backfilling and reinstatement: Permanent backfilling must be done according to the specifications given in the Code of Procedure. The minimum requirement is that the backfilled layers must have at least the same shear strengths as those of the adjacent undisturbed pavement layers. The tests done with a DCP or a RCCD will either be done by the JRA or a copy of the results of the tests by an independent private laboratory, approved by the JRA must be submitted to the wayleave office. The reinstatement of the (100mm asphalt layer) surface will be done by the road authority unless specific written permission is granted by the JRA to the wayleave holder to arrange for the reinstatement of the surface.

The wayleave holder is responsible for obtaining the required strengths, but the following is recommended as a method that should be adequate in most cases.

The wayleave holder must ensure that the top 400 mm (550 mm for primary and secondary roads) must be stockpiled separately and stabilized with 4% Ordinary Portland cement (OPC) when replaced with 60 kg/m^3 of cement. The material must be compacted in thin (75 to 100 mm) layers with a vibratory compactor at optimum moisture content (OMC) to the required densities (base: 98%, subbase: 95%, selected subgrade: 93%, and subgrade: 90% Mod AASHTO) to within 100 mm of the existing road surface. This method should provide the required shear strengths is most cases, but it should be noted that material that was originally stabilised cannot be re-used and must be discarded.

City of Johannesburg
Johannesburg Roads Agency

66 Sauer Street
Cnr. Jeppe Str
Johannesburg
2001

P/Bag X70
Braamfontein
South Africa
2017

Tel +27(0) 11 298 5000
Fax +27(0) 11 298 5178
www.jra.org.za
www.joburg.org.za

The reinstatement of the surfacing must consist of 100 mm hot-mix asphalt. The lower 70 mm must be:

"blackbase" (26,5 mm nominal, continuously graded) and the top 30 mm fine (4,75 mm nominal, continuously graded hot mix).

Cold mix may only be used in temporary backfills (Emergency backfill)

If desired the wayleave holder may place foamed concrete of a minimum 4 Mpa crushed strength and manufactured to an approved manufacturers specification. The foamed concrete is to be placed to a level 100 mm below the surrounding road surface. As soon as the foamed concrete has set sufficiently, a 70 mm layer of asphalt base course material shall be placed, to be followed by the 30 mm asphalt wearing course.

The top 100 mm of the trench must be backfilled by the wayleave holder, compacted and maintained in a serviceable condition for a period of fourteen days after the Completion Notice has been submitted.

Constructed footways must be reinstated with the original surfacing materials and the supporting layers compacted to obtain shear strengths at least equal to those of the adjacent undisturbed footway.

Un-constructed verges must be backfilled in such a way that the verge is in the same condition as it was before excavation.

After completion of any work in the road reserve, the site must be cleared and cleaned and all excess material, tools and equipment must be removed.

The wayleave form, or a copy thereof, must be returned to the Wayleave Officer within 24 hours after completion of the work with the Completion Notice filled in, signed and the DCP or RCCD tests submitted.

Any excavation left unattended for a period of 5 calendar days will be made safe by the JRA and charged to the Service Agency or contractor.

Your co-operation is appreciated.

City of Johannesburg
Johannesburg Roads Agency

66 Sauer Street
Cnr. Jeppe Str
Johannesburg
2001

P/Bag X70
Braamfontein
South Africa
2017

Tel +27(0) 11 298 5000
Fax +27(0) 11 298 5178
www.jra.org.za
www.joburg.org.za

ANNEXURE B.2

ROADWORKS SIGNING FOR URBAN STREETS

(Extract from the South African Roads and Traffic Signs Manual (SARTSM), Volume 2, Chapter 13)

City of Johannesburg
Johannesburg Roads Agency

66 Sauer Street
Cnr. Jeppe Str
Johannesburg
2001

P/Bag X70
Braamfontein
South Africa
2017

Tel +27(0) 11 298 5000
Fax +27(0) 11 298 5178
www.jra.org.za
www.joburg.org.za

APPENDIX C

(Refers to Chapter 4: Drawing Standards)

CONTENTS

C-4.1 Drawings:

ISO 216 is the international standard which defines paper sizes. It incorporates the “A” and “B” series of paper sizes which includes the most commonly used A4 paper size in use today. JRA drawings will normally be prepared to one of the standard “A” series sizes.

The underlying principle behind ISO216 is that any of the standard sizes of paper, when folded in half parallel to the shorter side, will retain the original 1: $\sqrt{2}$ aspect ratio. This aspect ratio equates to the value 0.707 when rounded to the nearest millimetre.

All drawings prepared by JRA staff, or to be submitted to JRA, shall conform to the ISO 216 Standard A-series paper sizes, with the exception that drawings may be produced longer than standard in landscape format, if the task being undertaken requires this.

For specific details appropriate to survey CAD drawings refer to Chapter 5, Section 5.2, including the link to TMH 11: Standard Survey Methods, and in particular to Chapter 11, Survey Drafting.

C-4.1.1 Drawing Sizes:

The size of standard ISO “A” series drawings appropriate to a specific task will be dictated by the scope of the task, in terms of a road and/or stormwater design, and the scale at which the drawings are to be prepared (see Table C-4.1.2 for guidance).

As noted above drawings sizes shall be adhered to, but if a roll drawing is required, the length in landscape format can be varied i.e. a 2,0 m long plot at A0 size will be 841 mm x 2000 mm, or for A1, 593 mm x 2000 mm.

In engineering terms, drawings in the A0, A1, A2 and A3 sizes are most commonly used in landscape format, whereas the A4 size is most commonly used in portrait format.

Standard drawing sizes are given in Table C-4.1.1 and are illustrated in relative terms in Figure C-4.1.1.

Table C-4.1.2 gives some guidance on the uses for different sizes of ISO standard “A” series drawings. This table also indicates the minimum useful size to which each standard size drawing may be economically reduced for circulation for comment or for discussion purposes.

Table C-4.1.1: Dimensions of ISO Series "A" Drawings

ISO Drawing Size	Common Orientation	Width [1] (mm)	Height (mm)	Border [2] (mm)
A0	Landscape	1189	841	20
A1	Landscape	841	594	20
A2	Landscape	594	420	15
A3	Landscape	420	297	15
A4	Portrait	210	297	15
Sizes given above are commonly used for engineering drawing. Sizes below are less common but may be used for visual aid, educational, promotional or other functions.				
A5 [3]	Either L or P	148	210	n/a
A6 [3]	Either L or P	105	148	n/a
A7 [3]	Either L or P	74	105	n/a
A8 [3]	Either L or P	52	74	n/a
A9 [3]	Either L or P	37	52	n/a
A10 [3]	Either L or P	26	37	n/a

NOTE:
1. For filing purposes all sizes A0 to A4 should be folded to A4 portrait size. See Figure C-1.2.
2. Border width specified in SANS 10111-1:2011.
3. Borders need not be used on smaller sizes.

Table C-4.1.2: Suitable Drawing Sizes for ISO Series "A" Drawings

Sheet Size	Drawing	Minimum Reduced Size
A0	Plan layouts – not ideal for use on site	A2
A1	Detail drawings and preferred size for plan layouts	A3
A2	Detail drawings	A4
A3	Standard details/Sketches for reports	A4
A4	Sketches for reports	n/a

C-4.1.2 Drawing Title Blocks:

Title blocks shall be positioned at the bottom of all drawings, with the number block located in the bottom right hand corner, in a form similar to that given by the standard A3 example included with this chapter. The A3 format included is that used for the JRA Roads and Stormwater Standard Details which, together with this Code of Procedure, comprise the JRA Design and Maintenance Manual. Since the standard details commonly include significant notes and numbers of symbols a column is provided on the right hand side of the standard A3 drawing frame.

Larger design working drawings normally require relatively fewer notes and key symbols, and these can be accommodated in a “floating” box which can be positioned to suit the content of the drawing. Notes and key should preferably be collected together into a similar box to aid their effectiveness.

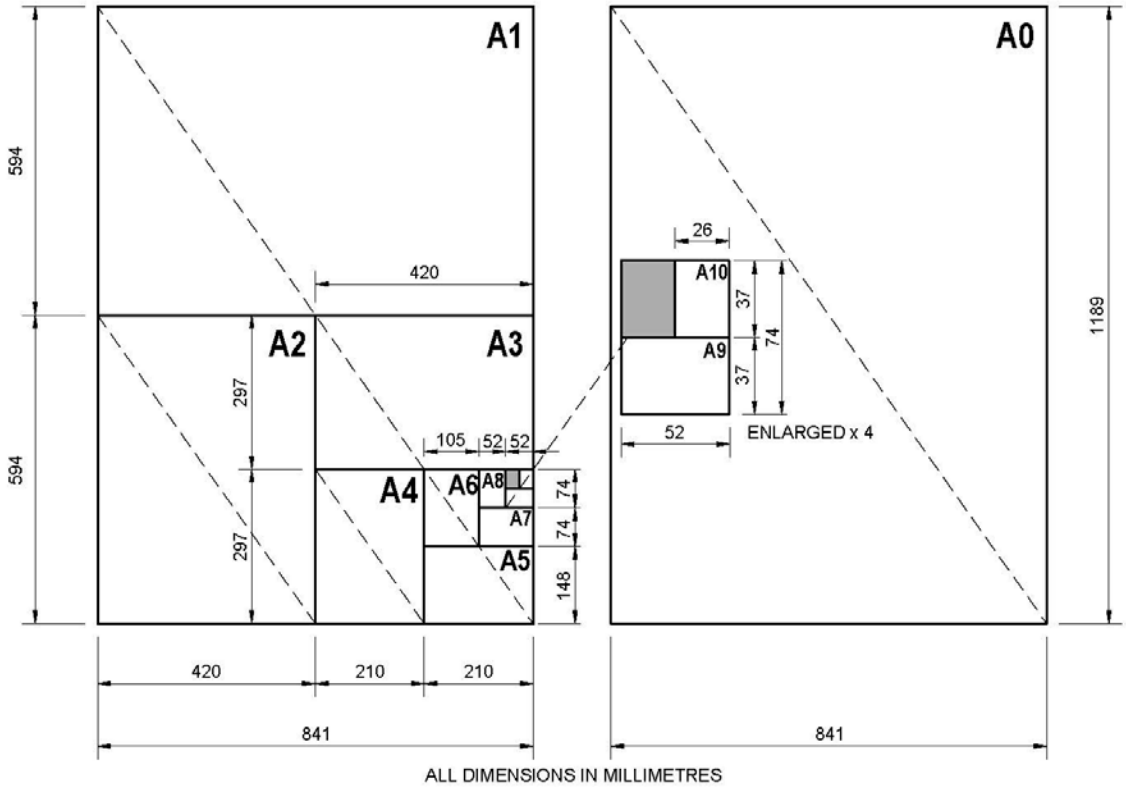


Figure C-4.1.1: Relative Sizes of ISO Series “A” Drawings

C-4.1.3 Drawing Folding for Filing:

JRA has established standard ISO size drawing templates for in-house use by JRA. Those submitting drawings to JRA for approval should be encouraged to use the same templates. These templates can include guide marks around the frame to facilitate the folding of A0, A1, A2 and A3 drawings to an A4 size for filing in a standard manner. See Figure C-4.1.2.

C-4.1.4 Camera Alignment Marks:

Camera alignment marks have also be incorporated into the borders frame of all standard ISO size drawing templates used by JRA to facilitate photographic copying of drawings, should the need arise. Camera alignment or centring marks are located at the centre point of each side of the drawing frame. See Figure C-4.1.2.

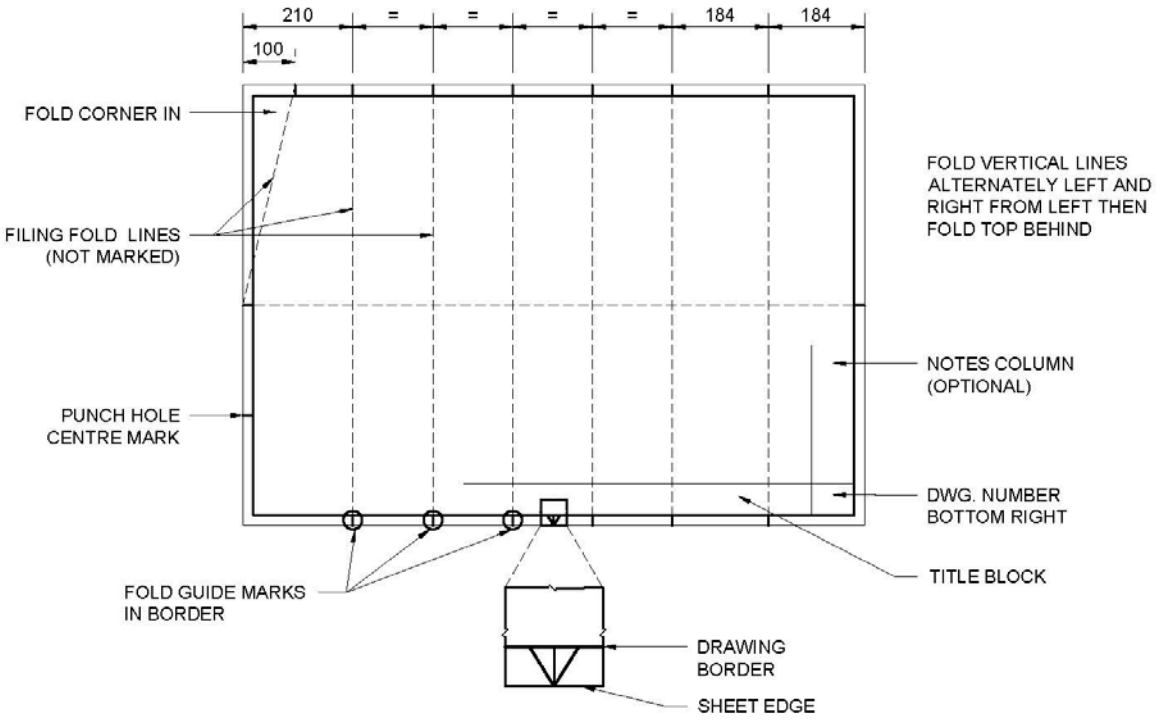


Figure C-4.1.2: Recommended Frame Marks for ISO "A" Series Drawings

C-4.1.5 Drawings in AutoCAD:

JRA prepares all its drawings in AutoCAD. The preferred practice for the preparation of drawings is to prepare all drawing detail and text detail in model space, and title blocks are inserted by template in paper space. Viewports are then created in paper space to display the drawings and text from model space.

C-4.1.6 Drawing Linework:

Whilst different JRA branches may vary their linework specifications according to the needs of the subject and the scale to be used, Table C-4.1.3 shows general requirements for pen widths for specific types of line.

Table C-4.1.3: Pen Widths for Line Types

Pen Width (mm)	Feature
0,18	Dimension lines
0,25	Dashed Lines (Hidden Lines), Centre Lines and Dimension Lines
0,35	Body of drawing
0,50	Body of drawing
0,70	Body of drawing and Title Block
1,00	Special Lines

A pen width of 0,25 mm should be the minimum pen width used on standard A0 or A1 drawings which may be reduced in size for convenient use. A minimum pen width of 0,18 mm may be used on smaller standard size drawings if they are not likely to be used in a reduced size. It is beneficial to produce a central server based "Linetype" file which can include predetermined line types (continuous, broken, hidden, colour etc.) that can also be made available to consultants working for JRA. Subject to need, such a file can be extended to include specific service line types, traffic road marking types and other regularly used features.

C-4.1.7 Drawing Text:

The JRA standard text font is "Simplex", but "Simplex Narrow" (with a 0.8 reduction factor) may be used to improve the spatial appearance of dimensions or notes.

All text shall be displayed in upper case. Table C-4.1.4 gives standard text heights and their typical use on drawings. Title text in title blocks, or identifying details within a drawing shall NOT be underlined.

Note that all text heights in model space will have to be varied to achieve the desired text heights in paper space.

Table C-4.1.4: Standard Text Sizes

Text Size (mm)	Typical Use	Line Width (mm)
2,5	All notes, dimensions and specifications	0,25
3,5	Note Headings	0,35
5,0	Headings	0,50

C-4.1.8 Drawing Dimensions:

All dimensions should include 2,5 mm long arrows and should use 2,5 mm high text with a 0,25 mm pen thickness.

Note that all text heights and arrows in model space will have to be varied to achieve the desired text heights and arrows in paper space.

C-4.1.9 Drawing Leaders:

In AutoCAD a line or arrow linking a text note to its point of relevance is termed a **"leader"**. All leaders should match dimension criteria for drawing consistency.

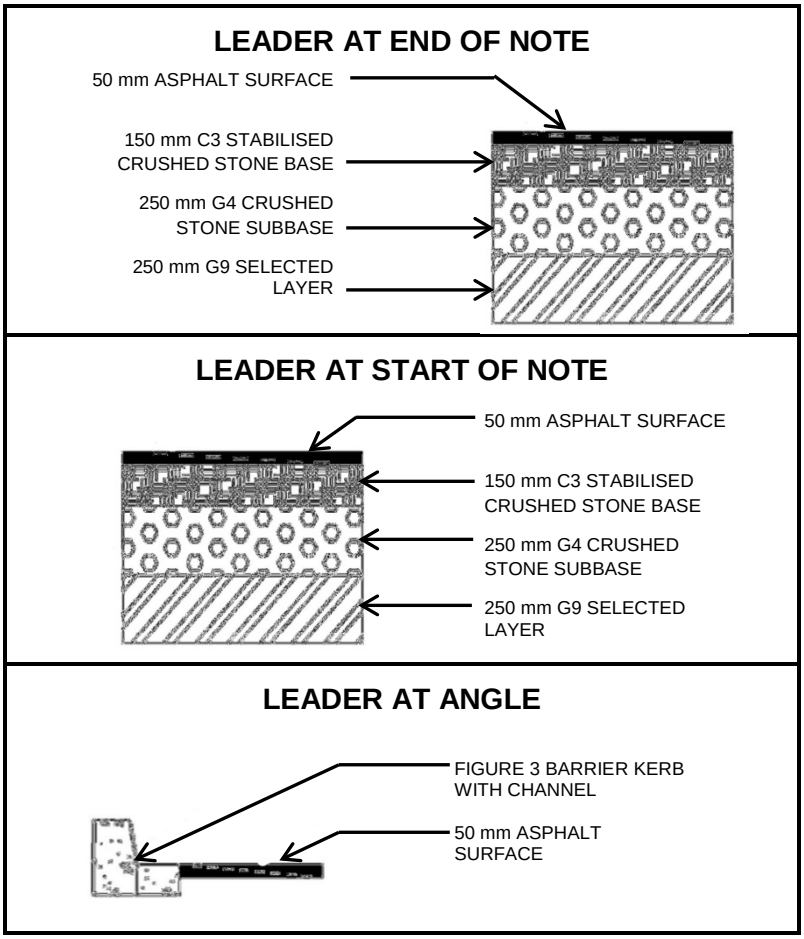


Figure C-4.1.3: Examples of Note Leaders

Leaders shall be drawn horizontally from the start of the note when the text is on the right of the leader, or horizontally from the end of the note when the text is on the left of the leader. When several notes/leaders are used they should be aligned vertically if practical. If the leader needs to be angled, the angled section should follow an initial horizontal section. Figure C-4.1.3 illustrates these principles.

C-4.1.10 Drawing Scales:

All AutoCAD drawings should be prepared in model space at 1:1, so that:

- For all drawing **plan layouts** 1 unit = 1 metre;
- For all drawing **details** 1 unit = 1 millimetre.

Table 2.2.5 gives preferred drawing scales relevant to the drawing type. Under special circumstances non-standard scales may be used as indicated below:

- 1:75, 1:750, 1:7500;
- 1:125, 1:1250, 1:12500.
- 1:150, 1:1500, 1:15000.

Table C-4.1.5: Drawing Scales

Types of Drawing	Scales
Locality Plan	1 : 50 000 1 : 20 000
Key Plan/Block Plan	1 : 5 000 1 : 2 000
Plans (Layout, Drainage, Setting Out, Construction, Road Marking, Services, Intersection, Signage, etc.)	1 : 1 000 1 : 500 1 : 250 1 : 200 1 : 100
Component Drawings (Details, Typical Cross Sections, etc.)	1 : 50 1 : 20 1 : 10 1 : 5 1 : 2 1 : 1
Longitudinal Sections	1 : 1 000 Horizontal 1 : 100 Vertical

C-4.1.11 Drawing Layers:

All work done in JRA in AutoCAD must be drawn **"by layer"**. This applies to linetypes and colours, therefore each layer must be set up in the **layer properties manager** to the correct linetype and colour.

All layers created by JRA should have a prefix ""JRA" so that it is possible to differentiate between layers produced by others and those produced by JRA. If JRA should develop more than one drawing centre/section, and it is likely that work on a drawing may be undertaken in more than one section, it is recommended that the layer designation be extended to identify the section's layers i.e. JRASW could be applied for a stormwater section or JRARS for a road signs section. This naming of the layer needs to be specific so that it is clear to others using the drawing who prepared the layer and what it represents.

Subject to the nature of JRA work in AutoCAD, standard template files can be created to include specific standard layers appropriate to the specific drawing subjects. In this context template linetypes should be adhered to, however, colours can be changed in the **layer properties manager** to suit required **plot style settings (CTB files)** – see Section C-4.1.13.

C-4.1.12 Standard Drawing Notes & Symbols:

In the interests of drawing production efficiency JRA may create centralised directories for standard notes and standard drawing symbols. These directories can be further subdivided to cater for different roads and stormwater disciplines within JRA.

C-4.1.13 Drawing Plot Style Settings (CTB Files):

CTB files are used to define plot settings relating to the screen colour in AutoCAD. JRA should be in a position to provide CTB files matching JRA's needs to organisations who, for whatever reason, are preparing drawings for JRA, or for JRA's approval, and which are likely to ultimately located in JRA's drawing filing system.

Note: If an organisation supplies CTB files compatible with its drawings, which were not originally provided by JRA, these should be installed in an appropriate CTB file directory on JRA's server(s).

C-4.2 Drawing Control:

C-4.2.1 Drawing Numbers:

JRA may specify a drawing numbering system to organisations preparing work for JRA for whatever reason.

Such a system should include:

- JRA;
- JRA discipline or sub-discipline designation;
- JRA project designation (a number);
- A specific drawing number (may be alphanumeric);
- A revision number (alphanumeric).

JRA should follow the same numbering structure for drawings produced within the agency.

As an example the following could be the drawing number issued for the second amendment to the third drawing in a series of drawings for a new structure:

- JRA-S-32150-003-REV2.

(Where, "32150", is the CIMS number which has been issued to the project.)

C-4.2.2 Drawing Register:

It is important that any drawing issue or drawing transmittal by JRA, or by an organisation working for JRA, be recorded in a drawing register for future reference, particularly in the event of a dispute.

C-4.2.3 Drawing Checklist and Checking:

Drawings contain significant amounts of detail, all of which must be checked in terms of a disciplined procedure to ensure that there are no errors and that all relevant information has been provided.

General and specific checklists can be developed for different work disciplines. These should only be considered as aids to the checking process. All drawings should be checked prior to issue (see Section C-4.2.4). The process to be followed includes:

- Check by draughtsperson after which the drawing is passed on to the designer;
- Check by designer after which the drawing is passed on to a qualified checker;
- Check by a qualified checker after which the drawing is handed back to the designer;
- The designer and draughtsperson deal with comments arising from the checking process.

C-4.2.4 Drawing Mark-Ups/Check Print:

The draughtsperson shall place a check print stamp in the bottom right hand corner of each check print prior to carrying out the initial check. A typical check print stamp detail is shown in Figure C-4.2.1 below.

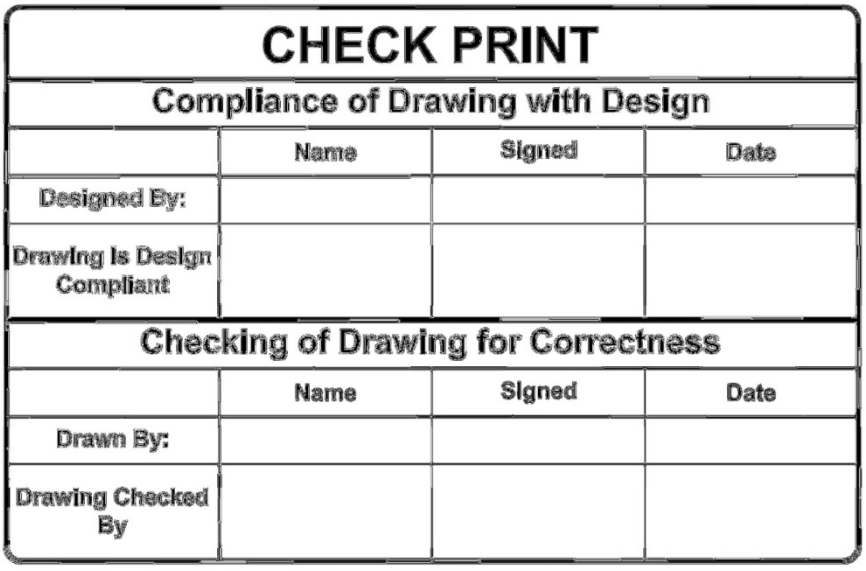


Figure C-4.2.1: Example of Typical Check Print Stamp

Indication of check marks, corrections or additions on the check print must be clear, concise and consistent so that the check process details are understood by all participants.

The recommended mark-up/check procedure is as follows:

- **Mark-ups:** the changes and notes to errors on the drawing must be shown with a red ball point pen;
- **Mark-up change record:** when the draughtsperson actions a change relevant to a mark-up on the original print the handwritten instruction must be highlighted with a yellow highlighter;
- **Drawing check after mark-up changes:** a second check of the drawing should be made on a fresh print after the mark-up changes have been made; if the change has been correctly made it is to be highlighted using a blue highlighted.

C-4.2.5 Drawing Revisions:

JRA requires that all in-house drawings, and drawings prepared for submission to JRA, should use alphabetic revision references prior to issue for construction and numerical revision references post construction issue.

For example:

- REV A – Preliminary Design;
- REV B – Issued for Tender;
- REV C - If required due to change;
- REV D - If required due to change; etc.
- REV 0 – Issued for construction;
- REV 1 – Change 1;
- REV 2 – Change 2 etc.

Each drawing must show the revision history, including a short description of changes made at each revision stage. All revisions shall be dated.

Each revision made must be “clouded” and must be identified by a triangle containing the revision reference number. This process is not accumulative. In other words it is only necessary to show REV 1 triangles (and “clouding”) on a REV 1 drawing.

C-4.2.6 Drawing Issues:

Once a drawing is ready for issue the following procedure shall be followed:

- The drawing must be converted to a PDF format file by either scanning an original signed drawing, or by printing directly to PDF if, by agreement, a signature is not required;

- The drawing is issued by the mutually agreed method (paper copy, e-mail or CD) with an accompanying completed issue slip;
- It is required that confirmation of receipt be received from the addressee; this shall be saved with all the issue documents in their respective issue folders (Preliminary, Design, Tender and Construction).

APPENDIX D6.1

(Refers to Chapter 6: Traffic Engineering)

Standard Operating Procedure (SOP)
Mobility & Freight – Traffic Engineering Department
Engineering Investigations

CONTENTS

Prepared by: *Esther Schmidt* Signature:	Date Prepared:
Reviewed by: *Johan Wilken* Signature:	Date Reviewed:
Approved by: *Darryll Thomas* Signature:	Date Approved:

1.0 REVISION HISTORY

Revision	Date	Description of change	Reviewed by	Approved by
0	30.03.2015	First Issue	N Ngema	I Davies

2.0 PURPOSE / OBJECTIVE(S)

This SOP will be the standard method which will be used by affected staff in the Traffic Engineering Department with regards to their daily operational activities in regards to Engineering Investigations

The objective of this Standard Operating Procedure (SOP) is to:

- Ensure that quality output is achieved as processes are followed;
- Serve as framework for day-to-day engineering activities that needs to be complied with;
- Indicate the respective roles and responsibilities of all parties involved and to indicate required timelines for conformance;
- Ensure consistency

3.0 SCOPE

This SOP is applicable to the Traffic Engineering Department responsible for Engineering Investigations related to **Traffic Signal Analysis, Road Safety Management, Traffic Impact Assessment and Network Monitoring:**

In summary, this SOP is applicable to :

- *Operations Manager;*
- *Managers;*
- *Engineers;*
- *Technicians*
- *Interns*
- *Administration Officers*

4.0 RESPONSIBILITIES

The following describes the responsibility matrix applicable to this procedure

4.1	Managing Director	Accountable person.
4.2	HOD: Mobility and Freight	Lead, direct and manage operational activities within Regional Operations (companywide).
4.3	Operations Manager	To manage the department in terms of the investigation, planning and implementation of the arterial, local collectors and freeway operation and control in accordance with the policies and the objectives of the Johannesburg Roads Agency.
4.4	Manager Traffic Signal Design	To manage the investigation, planning and implementation of the signal network for safe and efficient road operation and control and ensure work is conducted in accordance with the policies and the objectives of the Johannesburg Roads Agency.
4.5	Manager Traffic Impact Assessment	To managed the assessment and evaluation of traffic and transportation studies including development schemes within the region in accordance with the policies and the objectives of the Johannesburg Roads Agency.
4.6	Manager: Road Safety	To manage the investigation, planning and implementation of high accident locations and remedial schemes in accordance with the policies and the objectives of the Johannesburg Roads Agency are conducted.
4.7	Manager: Network Monitoring	To manage the collection and safe storage of traffic data and the monitoring of the traffic flow of all the arterial, local collectors and freeway operation. To monitor the network and participate in future network planning. To monitor changes in the travel patterns.
4.8	Engineer/ Technician: Traffic Signal Design	To ensure that the investigation, planning and implementation of signalized intersections are conducted in accordance with the policies and the objectives of the Johannesburg Roads Agency and the SARTMS
4.9	Engineer/ Technician: Traffic Impact Assessment	To evaluated traffic and transportation studies including development schemes within the region in accordance with the policies and the objectives of the Johannesburg Roads Agency.
4.10	Engineer/ Technician: Road Safety	To make sure that the investigation, planning and implementation of high accident locations and remedial schemes are conducted.
4.11	Engineer: Network Monitoring	To collect and store traffic data and the monitoring of the traffic flow of all the arterial, local collectors and freeway operation
4.12	Senior Enumerator	To manage the Enumerators section in terms of the collection and safe storage of traffic data and the monitoring of the traffic flow of all the arterial, local collectors and freeway operation
4.13	Driver Supervisors/ Enumerators	To ensure that the counters are adhering to the programs and processes for the collection of traffic data on all the arterial, local collectors and freeway.

5.0 PROCEDURE

Overview:

This SOP covers the standard method for day-to-day activities relating to the Traffic Engineering Investigations.

a) *Processing of All Service Requests*
b) *Dealing with Road Safety Requests including Traffic Calming, Guardrails, Signage, Road Markings, Miscellaneous Road Safety*
c) *Procedure to Deal With Requests For Temporary Road Or Lane Closures (Wayleave Applications)*
d) *Procedure to Deal With Requests For Directional & Tourism Signage*
e) *Procedure to Deal With Requests For Security Access Control*
f) *Procedure for Commenting On Traffic Impact Assessments*
g) *Procedures to Deal With Requests for the Installation of New Traffic Signals and To Ensure Installation, If Warranted.*
h) *Procedures to Deal with Requests for the Revision of Traffic Signal Phasings.*
i) *Procedures to Deal with Requests For Geometric Improvements At Intersections*
j) *Procedures to Deal with Approval of Designs for the Installation of New Traffic Signals and Geometric Upgrades Submitted By Consultants.*
k) *Procedures to Deal with Requests for the Provision of Traffic Count and Traffic Signal Information.*

Step	Activity	Responsibility	Time line	Record Generated
A: PROCESSING OF ALL SERVICE REQUESTS				
1.1	For requests received via email/ letter/ fax, record them on Hansen	Engineer/ Technician	Daily	Hansen service request
1.2	For requests received via Hansen: Download service request daily	Engineer/ Technician	Daily	Hansen service request
1.3	Assign request to relevant engineer/ technician	Manager	Daily	Hansen service request
1.4	Assess if request contains sufficient information with regards to the complaint (detailed complaint and location) and contact details of complainant, if not, request is resolved indicating “Insufficient information”.	Engineer/ Technician	Within 5 working days from receipt of request	Hansen service request
1.5	Assess if request is addressed to correctly responsible division, if not, rectify and address to respective depot, other department, etc.	Engineer/ Technician	Within 5 working days from receipt of request	Hansen service request
1.6	Requests for work on Provincial or National Roads is referred to the relevant authority, and the client is informed with contact details of relevant authority.	Engineer/ Technician	Within 5 working days from receipt of request	Hansen service request / Email / Letter / Telephone
1.7	Assess if request warrants any further action/site investigation, if not, inform client (letter/telephonically/e-mail) and resolve on Hansen with comments	Engineer/ Technician	Within 5 working days from receipt of request	Updated Hansen service request / Email / Letter or Telephone
1.8	Undertake required site investigations where required.	Engineer/ Technician	Within 30-60 working days from receipt of request	Site investigation report

1.9	Determine appropriate (if any) remedial measures to be implemented	Engineer/ Technician	Within 30-60 working days from receipt of request	Design if required
1.10	Generate service request to relevant depot responsible for implementing remedial measure. Prepare memo to relevant depot.	Engineer/ Technician	Within 30-60 working days from receipt of request	Hansen service request / Memorandum
1.11	Inform client accordingly (email)	Engineer/ Technician	Immediately on completion of investigation	Memo/ email
1.12	Forward memo/ design to relevant department for implementation.	Engineer/ Technician	Within 30-60 working days from receipt of request	Memo or design
1.13	Resolve original service request	Engineer/ Technician	Within 30-60 working days from receipt of request	Hansen service request
B. PROCEDURE TO DEAL WITH ROAD SAFETY INVESTIGATIONS *(Traffic calming, guardrails, signage, road markings, miscellaneous road safety)*				
2.1	Perform on-site Investigations (complete Checklist for site inspections)	Engineer/ Technician: Road Safety	Within 30-60 working days from receipt of request	Site Inspection checklist / Site report
2.2	Design the engineering proposals as per JRA standards and general engineering practices in compliance with all applicable design standards and regulations	Engineer/ Technician: Road Safety	Within 30-60 working days from receipt of request	Design proposal
2.3	If proposals can be implemented immediately generate service request to respective depot	Engineer/ Technician: Road Safety	Within 30-60 working days from receipt of request	Hansen service request
2.4	If future funding is required, place on appropriate priority list for request for future funding	Engineer/ Technician: Road Safety	30-60 working days from receipt of request	Future funding priority list
2.5	Inform the client accordingly	Engineer/ Technician: Road Safety	Within 30-60 working days from receipt of request	Email or letter
Requests for Traffic Calming				
2.6	Undertake investigation to determine if speed humps are warranted as per SARTSM and COJ Traffic Calming Policy	Engineer/ Technician: Road Safety	Within 30-60 working days from receipt of request	Site investigation report
2.7	Notify the applicant to submit approval from Ward councillor for the speed hump (approval letter)	Engineer/ Technician: Road Safety	Prior to approval of design	Letter from Ward Councillor
2.8	If funded through external party, ensure that the applicant submit a design to be approved by JRA. If funded internally, design to be done by JRA	Engineer/ Technician: Road Safety	Within 30-60 working days from receipt of request	Approved design
2.9	Ensure the speed hump design comply with the JRA specifications	Operations Manager	Within 30-60 working days from receipt of request	Approved design

2.10	Advise the contractor to purchase a way leave granting permission to work on site	Operations Manager	Prior to commencement of construction	Approved way leave
2.11	JRA inspectors must have supervisory access to the site at all times	Inspectors	As and when necessary to conduct site visits	Site inspection
2.12	The site should be formerly handed over to JRA on completion with report including pictures of the completed site	Engineer/ Technician: Road Safety		Completion report
C: PROCEDURE TO DEAL WITH REQUESTS FOR TEMPORARY ROAD OR LANE CLOSURES (WAYLEAVE APPLICATIONS)				
3.1	Applicants request a road or lane closure via the JRA Way leave Department.	Wayleave department	On request by applicant	Way leave
3.2	The Way leave Department assesses the application, and if regarded necessary, the request is referred to Traffic Engineering Section for assessment.	Wayleave department	On request by applicant	Way leave
3.3	Assess if request contains sufficient information regarding the duration and type of closure. Request additional information, if required, especially where the scope of the closure will have a major impact on traffic. In these cases, a Traffic Impact Assessment or Statement by a professional traffic engineer may be required.	Engineer/ Technician: Road Safety	Within 7 working days from receipt of request	Email to client Traffic Impact Statement
3.4	Requests for closure of Provincial or National Roads are referred to the relevant authority, and the client is informed with the relevant contact details.	Engineer/ Technician: Road Safety	Within 5 working days from receipt of request	Email to client Request for Provincial or National road closure
3.5	Assess application with regard to: • safety, • type of closure, • duration, • confirm traffic impact, • accommodation of traffic, pedestrians, signage.	Engineer/ Technician: Road Safety	14 working days from receipt of request	Way leave application assessment
3.6	Propose alternatives and amendments, where required reject or accept application.	Engineer/ Technician: Road Safety	Within 14 working days from receipt of request	Letter to applicant setting out amendments where required or rejection of application

3.7	Instruct client to obtain written consent from affected property owners where required	Engineer/ Technician: Road Safety	Within 14 working days from receipt of request	Letter to applicant requesting the written consent
3.8	Instruct client to forward application to JMPD for additional approval, if required.	Engineer/ Technician: Road Safety	Within 14 working days from receipt of request	Approved application (from JMPD)
3.9	Place copy of comments on file.	Engineer/ Technician: Road Safety	Within 14 working days from receipt of request	File copy of letter
D. PROCEDURE TO DEAL WITH REQUESTS FOR DIRECTIONAL & TOURISM SIGNAGE				
4.1	Official application form is supplied to applicant (electronically/fax/mail).	Engineer/ Technician: Road Safety	Within 2 working days from receipt of request	Application form via email / fax
4.2	Assess application to ensure completeness and accuracy of information(contains sufficient information, if not, refer back to applicant)	Engineer/ Technician: Road Safety	Within 3 working days from receipt of request	Email / fax application letter
4.3	Requests for work on Provincial or National Roads is referred to the relevant authority, and the client is informed with the relevant contact details.	Engineer/ Technician: Road Safety	Within 3 working days from receipt of request	Email / Fax
4.4	Application is tested to determine if signage is warranted as per the South African Road Traffic Signs Manual (SARTSM), if not, application is rejected.	Engineer/ Technician: Road Safety	Within 14 working days from receipt of request	Email / Fax rejection letter
4.5	Inform client accordingly.	Engineer/ Technician: Road Safety	Within 14 working days from receipt of request	Email / Fax rejection letter
4.6	If warranted as per SARTSM, a formal assessment follows.	Engineer/ Technician: Road Safety	Within 14 working days from receipt of request	Investigation report
4.7	Investigate on site. Determine if signage locations can be safely supported (traffic safety, sight distance, pedestrian movement etc) If not, propose alternative locations.	Engineer/ Technician: Road Safety	Within 21 working days from receipt of request	Investigation report
4.8	Inform client accordingly of approved locations, requesting sign face design (as per SARTSM standards).	Engineer/ Technician: Road Safety	Within 30 working days from receipt of request	Letter
4.9	Assess and approve sign face design. If rejected, request amendments for approval.	Engineer/ Technician: Road Safety	Within 14 working days from receipt of design	Sign face design
4.10	Inform client to manufacture signs (as per SARTSM standards), with the relevant approval number to be supplied on the signage.	Engineer/ Technician: Road Safety	Within 14 working days from receipt of design	Letter

4.11	Assess and approve sign face design. If rejected, request amendments for approval.	Engineer/ Technician: Road Safety	Within 14 working days from receipt of design	Approved sign face design
4.12	Inform client to manufacture signs (as per SARTSM standards), with the relevant approval number to be supplied on the signage.	Engineer/ Technician: Road Safety	Within 14 working days from receipt of design	Letter
4.13	Request the client to supply signage and all necessary materials (poles, bolts etc.)	Engineer/ Technician: Road Safety		Email / Fax Material request
E. PROCEDURE TO DEAL WITH REQUESTS FOR SECURITY ACCESS CONTROL				
5.1	On receipt of the application, the Administering Department must acknowledge receipt in writing of the application after payment of the application fee and in that acknowledgment provide the Applicant with a reference number for the application; and	Administration Officer	Within 7 working days from receipt of application	Application reference number
5.2	Notify the Applicant whether the application contains all the information and documentation required in terms of the Security Access Restriction Policy Revised 2014and stating that such notification is not to be construed as signifying that the application will or will not be approved.	Administration Officer	within fourteen (14) business days after payment of the application fee	Email/ letter
5.3	May require the Applicant, at the Applicant's cost, to submit such further information or documentation as it may reasonably require in order to reach a decision on the application and will defer consideration of the application until such time as the further information required is submitted to its satisfaction.	Administration Officer	Within 60 -90 working days from registration	Motivation and statistics (Additional vehicles that access the area, crime stats etc.)
5.4	If such further information is not submitted, return the application and all supporting documentation to the Applicant without considering it.	Administration Officer	Within 60 -90 working days from registration	
5.5	Compile a report on the application for the Executive Director's consideration.	Operations Manager: Road Safety	Within 60 -90 working days from registration	Report
5.6	Carry out such inspections as it considers necessary.	Engineer/ Technician: Road Safety	Within 60 -90 working days from registration	Completed Inspection Checklist

5.7	Database of all applications formulated with expiry dates	Administration Officer	As and when required	Database
5.8	Monitor compliance with the assistance of JMPD and raise a non-conformance report in the event of deviation.	Engineer : Road Safety	As and when required	Non-compliance report
F. PROCEDURE FOR COMMENTING ON TRAFFIC IMPACT ASSESSMENTS				
6.1	Evaluate the Traffic Impact study in accordance to agreed standards and guidelines	Manager/ Engineer Traffic Impact Assessments	Within 30-60 working days from receipt of report	Register of TIAs
6.2	Arrange discussions with author report and/or developer, and/or Development Control Section of the JRA.	Manager/ Engineer Traffic impact assessments	Within 30-60 working days from receipt of report	Meeting records
6.3	Undertake required site visits where warranted	Manager/ Engineer Traffic impact assessments	Within 30-60 working days from receipt of report	Site visit report
6.4	Submit comments to Development Control Section of the JRA via internal memo.	Manager/ Engineer Traffic impact assessments	Within 30-60 working days from receipt of report	Memorandum
G. PROCEDURE FOR NEW TRAFFIC SIGNAL INSTALLATION UNDERTAKEN IN-HOUSE				
7.1	If received via email/letter/fax or phone: Record request on Hansen.	Manager / Engineer / Technician	Daily	Hansen service request
7.2	Assign request to relevant Engineer / Technician	Manager / Engineer / Technician	Daily	Hansen service request
7.3	Assess application to determine if it contains sufficient information, if not, refer back to applicant.	Engineer / Technician	Within 3 working days from receipt of request	Email / phone
7.4	Request that traffic surveys be conducted	Engineer / Technician	Within 30 - 60 working days from receipt of request	Traffic survey request (Excel spread sheet)
7.5	Inform client accordingly.	Engineer/ Technician	Within 14 working days from receipt of request	Email letter
7.6	Check the traffic queue counts results against that as laid down in the SARTSM manual for the installation of traffic signals. Inform client if the signal is warranted or not.	Engineer/ Technician	Within 30 - 60 working days from receipt of request	Email / letter
7.7	If warranted, place intersection on priority list according to priority order.	Engineer/ Technician		Priority list (Excel spread sheet)
7.8	Add comments / remarks to Hansen request and close report.	Engineer/ Technician		Closed Hansen service request
7.9	Obtain principle approval from Gautrans / SANRAL once it is determined that traffic signals are warranted on a Provincial Road.	Engineer/ Technician		Traffic Signal Approval (Email / letter)

7.10	Submit final SARTSM compliant design to Gautrans / SANRAL for final approval and way leave	Engineer/ Technician		Complaint design (Email)
7.11	Forward design documentation, including Gautrans / SANRAL approval and way leave to Infrastructure Development for installation or implementation	Engineer/ Technician	Within 5 working days from completion of design	Approved design / Way leave
7.12	Assist Infrastructure Development by setting out the pole positions on site before work commence.	Engineer/ Technician	When requested	According to approved design
7.13	Be on site during commissioning / switch on to check compliance and design.	Engineer/ Technician	When requested	Compliance checklist
7.14	Complete checklist sheets C1 to C6 and sign off	Engineer/ Technician	After commissioning	Signed design checklist
7.15	Monitor new installation and do fine tuning where required.	Engineer/ Technician	After commissioning	Site investigation
H. PROCEDURE FOR REVISED TRAFFIC SIGNAL DESIGNS UNDERTAKEN INHOUSE				
8.1	If received via email/letter/fax of phone: Record request on Hansen.	Manager / Engineer / Technician	Daily	Hansen service request
8.2	Assign design to relevant Engineer / Technician	Engineer / Technician	Daily	Hansen service request
8.3	Assess application to determine if it contains sufficient information, if not, refer back to applicant.	Engineer / Technician	Within 3 working days from receipt of request	Email / phone
8.4	Request full intersection traffic surveys.	Engineer / Technician	Within 30 - 60 working days from receipt of request	Traffic survey document
8.5	Inform client accordingly.	Engineer/ Technician	Within 14 working days from receipt of request	Email / letter
8.6	Analyse traffic counts data and produced revised traffic signal timings. Ensure that the design complies with the South African Traffic Road Signs Manual.	Engineer/ Technician	Within 30 - 60 working days from receipt of request	Traffic count analysis report (Excel spread sheet)
8.7	Forward signed design to Infrastructure Development for implementation	Engineer/ Technician	Within 5 working days from completion of design	Approved design
8.8	Be on site the day the revisions are implemented to check compliance with design.	Engineer/ Technician	When requested	Signal design data and site visit
8.9	Monitor the revision and do fine tuning where required.	Engineer/ Technician	When necessary after commissioning	Signal design verification
I. PROCEDURE FOR GEOMETRIC IMPROVEMENTS AT INTERSECTIONS				
9.1	If received via email/letter/fax of phone: Record request on Hansen.	Manager / Engineer / Technician	On request from the applicant	Hansen service request

9.2	Assign design to relevant Engineer / Technician	Engineer / Technician	On receipt of request	Hansen service request
9.3	Provide interim reply to requestor, if necessary	Engineer / Technician	On receipt of request, if necessary	Email to client
9.4	Conduct investigation, evaluate and determine if warranted	Engineer / Technician	Within 14 working days from receipt of request	Site investigation
9.5	Notify requestor of the outcome of the investigation	Engineer / Technician	Within 30 working days from receipt of request	Investigation Email to client
9.6	Add the necessary comments to the Hansen request	Engineer / Technician	Within 30 working days from receipt of request	Updated Hansen service request
9.7	If warranted place intersection on priority list according to priority order	Engineer / Technician	Within 30 working days from receipt of request	Priority list
9.8	Determine when construction could take place depending on the availability of the budget.	Engineer / Technician	As and when required	Budget allocated
9.9	Initiate E.I.A process. Provided information to relevant Consultant	Engineer / Technician	As and when required	Email / letter to Consultant
9.10	Appoint Consultant to do geometric design and bill of quantities ,Refer to SCM procedure for appointment of consultants	Engineer / Technician	As and when required	Email / letter to Consultant
9.11	Determine if the construction work can be done by the “As and When” contractor or must go out on tender. Refer to SCM procedure for appointment of consultants	Engineer / Technician	As and when required	
9.12	If “As and When”. Obtain ROD on EIA. Ensure that funds are available on budget. Project Implementation to proceed with construction	Engineer / Technician	As and when required	
9.13	If tender process. Obtain RON on the EIA. Ensure funds are available on budget. Project Implementation to go through Tender process to award Tender to successful Contractor. Refer to SCM Tender process	Engineer / Technician	As and when required	
J.PROCEDURE FOR GEOMETRIC IMPROVEMENTS AND TRAFFIC SIGNAL DESIGNS DONE BY CONSULTANTS				
10.1	Accept design documentation from Consultant	Manager / Engineer / Technician	Daily	Designs
10.2	Assign design to relevant Engineer / Technician	Engineer / Technician	Daily	Designs
10.3	Check design against the requirements of the TIA	Engineer / Technician	Daily	TIA

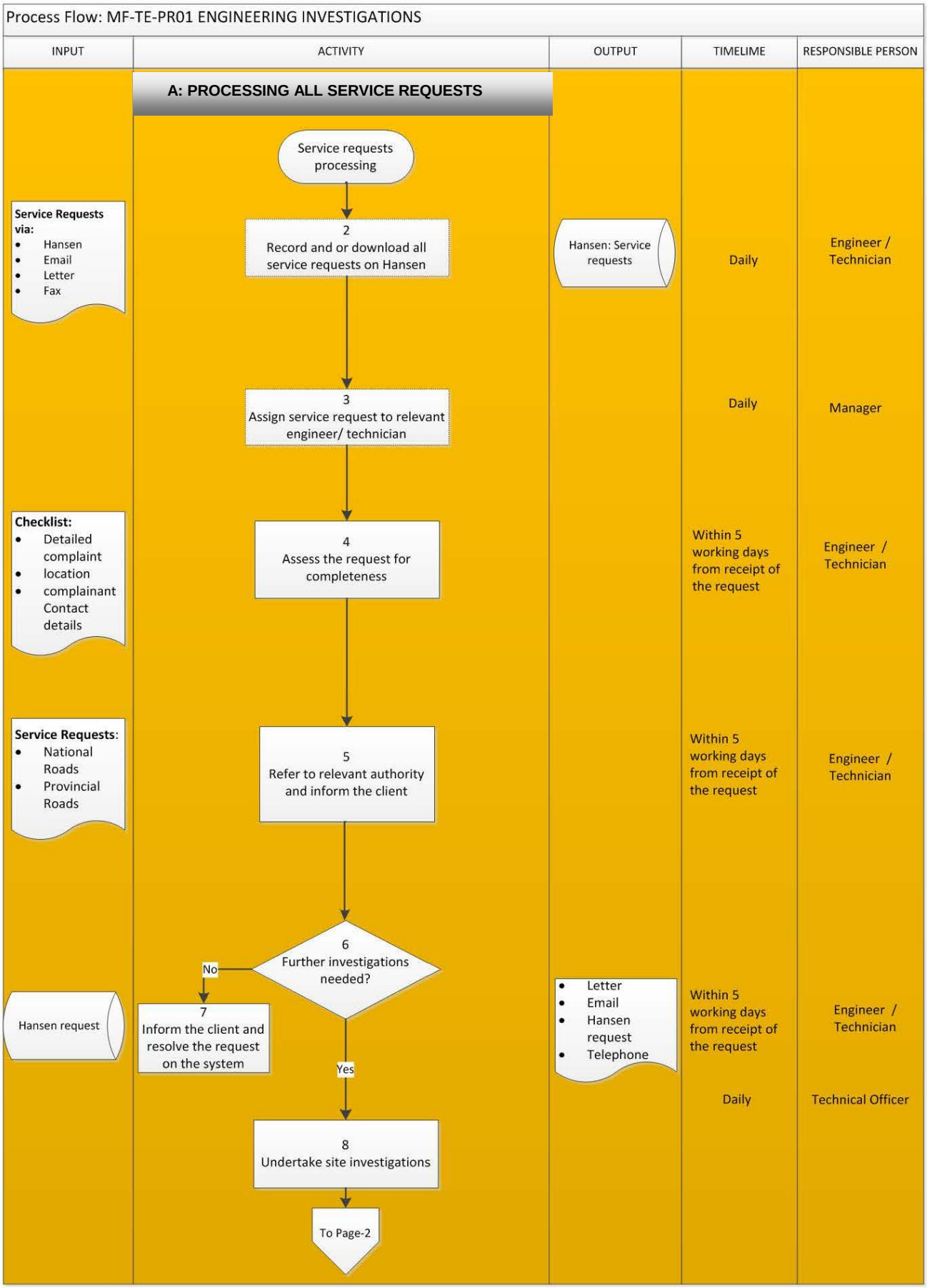
10.4	Check the traffic signal / geometric design for compliance. Use SARTSM and JRA Standards as a reference	Engineer / Technician	Daily	Designs
10.5	Inform Consultant in writing if the design is acceptable.	Engineer / Technician	Daily	Email / letter
10.6	Forward approved designs to relevant department	Engineer / Technician	Daily	Documentation and letter
10.7	Inform Consultant in writing if the design is not acceptable and request revised designs for approval once corrected.	Engineer / Technician	Daily	Email / letter
10.8	Verify if revised design is acceptable as per requirements	Engineer / Technician	Daily	Designs
10.9	Consultant and Engineer from JRA to be on site the day the revisions are implemented to check compliance with approved design.	Consultant / JRA Engineer / Technician	When Required	Commissioning on site
K. PROCEDURE FOR THE PROVISION OF TRAFFIC COUNTS AND TRAFFIC SIGNAL INFORMATION				
11.1	Draw up routine working program for each financial year for all the teams.	Respective Depot Manager	Before end of June of each year.	I &A Spread Sheet
11.2	Capture of the service request on the spread Sheet.	Depot Manager / Engineer / technician	daily when necessary	I &A Spread Sheet
11.3	Formulate traffic counting brief in line with the identified need, ensuring that it covers all aspects of data and information required for the design and decision making process. Clarifying all the necessary requirements to the traffic counters to ensure that they fully understand the brief.	Engineer	Within 30-60 days of receipt of request	Records kept in file
11.3	Calibrate all the Machines	Depot Manager / Engineer	As per calibration schedule	Calibration records
11.4	Ensure all the teams have right tools to resume their duties	Senior Enumerator	Daily	I &A Spread Sheet
11.5	Schedule work for teams on daily basis	Senior Enumerator	Daily	I &A Spread Sheet
11.6	Drive the teams to and from the site	Driver Supervisor	Daily	I &A Spread Sheet
11.7	Lead and direct traffic counters to resume their duties as required.	Driver Supervisor	Daily	I &A Spread Sheet
11.8	Downloads the Traffic Count Machines, Verifying the other forms of traffic counts to ensure correct information gathered	Senior Enumerator	Daily	I &A Spread Sheet

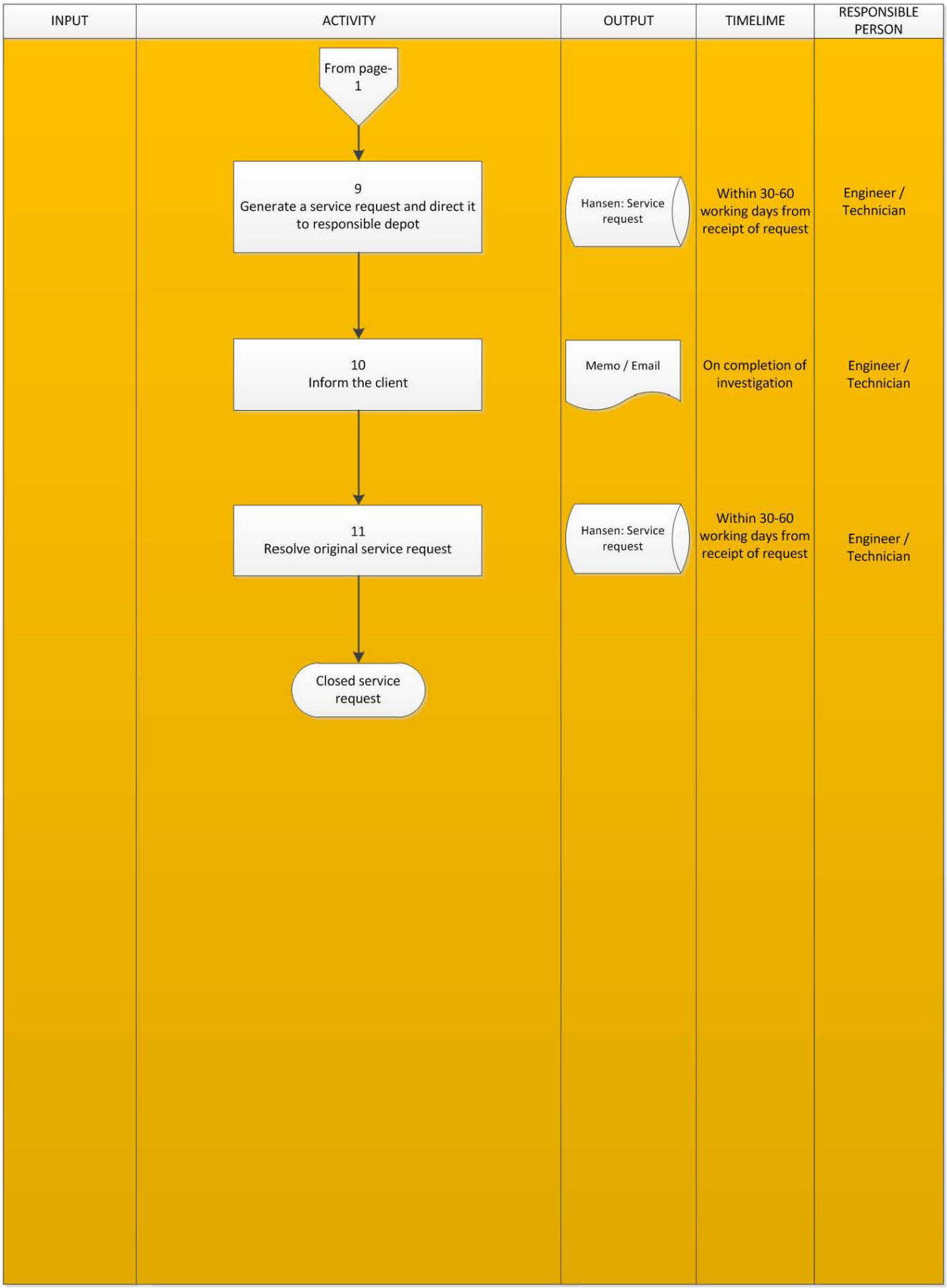
11.9	Review Data obtained from traffic counts: • To ensure that the data obtained meet the requirements of the brief. • Evaluate the result obtained from traffic counts to come with the possible solutions that meet the design requirement. • By proposing the potential approaches solutions. • By evaluating potential solutions against requirements and wider impacts. • By presenting the reasoned technical, economic and contextual arguments for the select option.	Engineer	Daily	I &A Spread Sheet
11.10	Analyse and recommend the traffic counts information to the relevant client	Engineer	Daily	I &A Spread Sheet
11.11	Getting the service request from the customer	Engineer	Per Request	Email/ call request
11.12	Customer must pay to JRA's account receive the information	Engineer	Per Request	Email/ Call

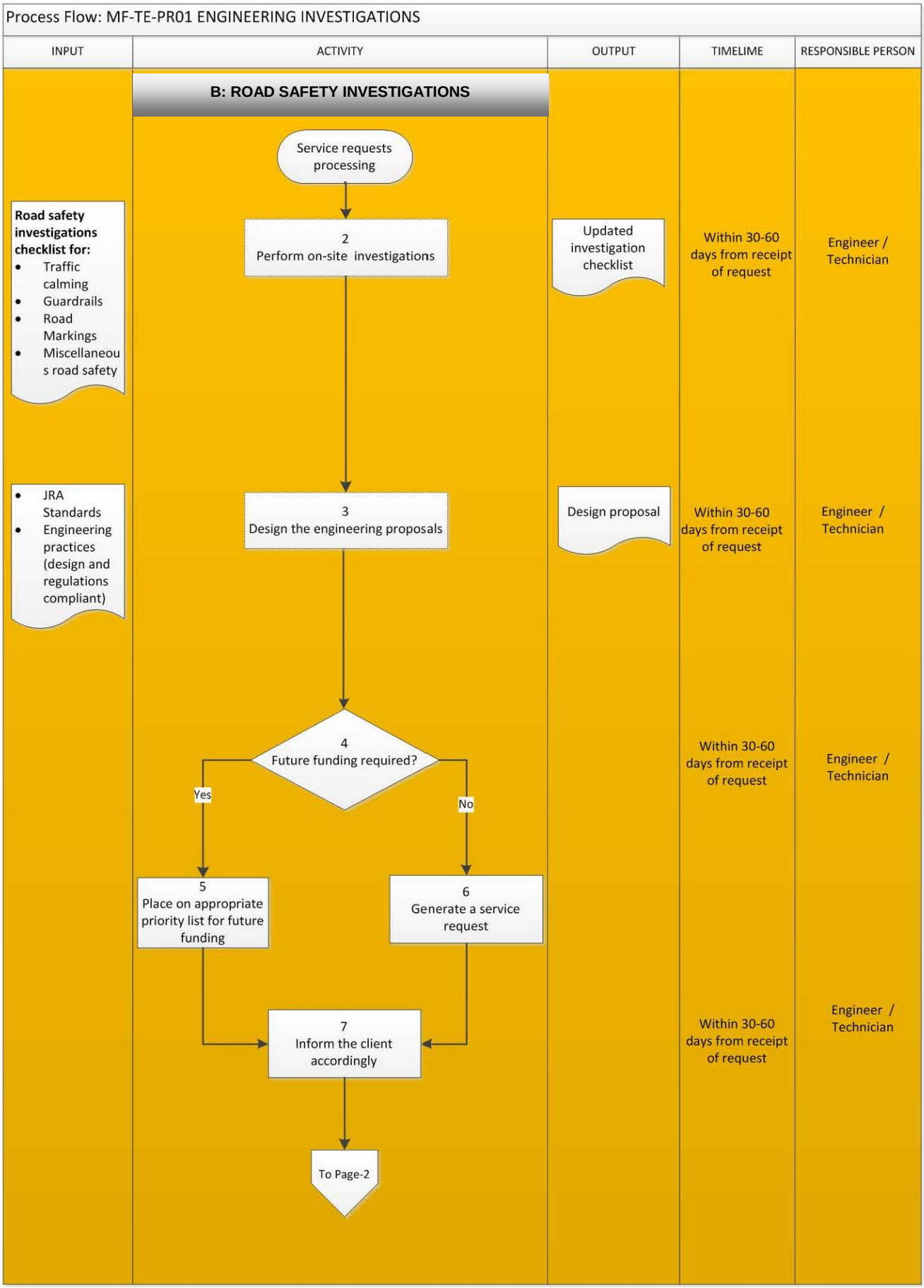
6.0 FLOW CHARTS

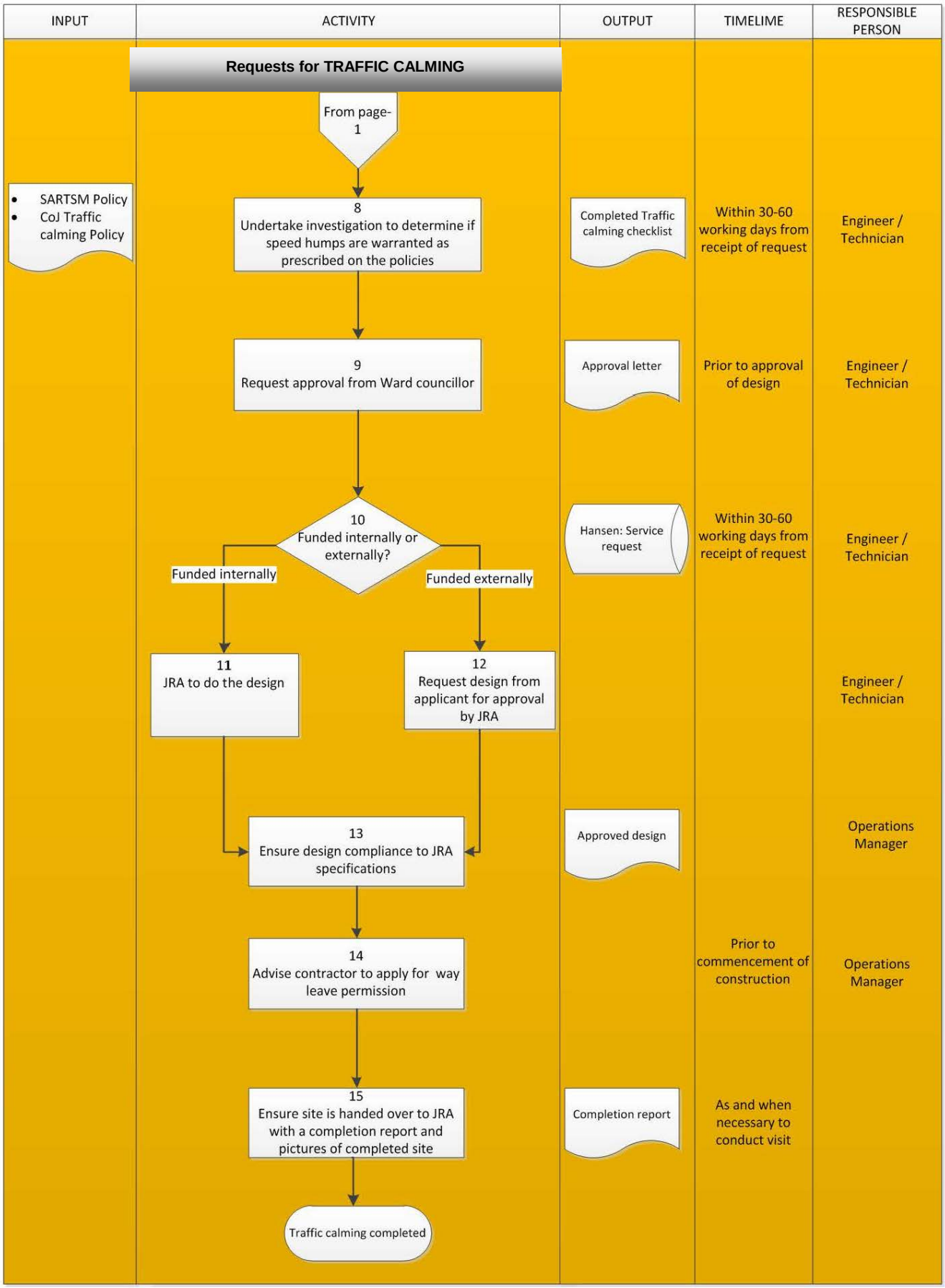
6.1 Table MF-TE-PR01 covers various Engineering Investigations Process Flow Charts as follows:

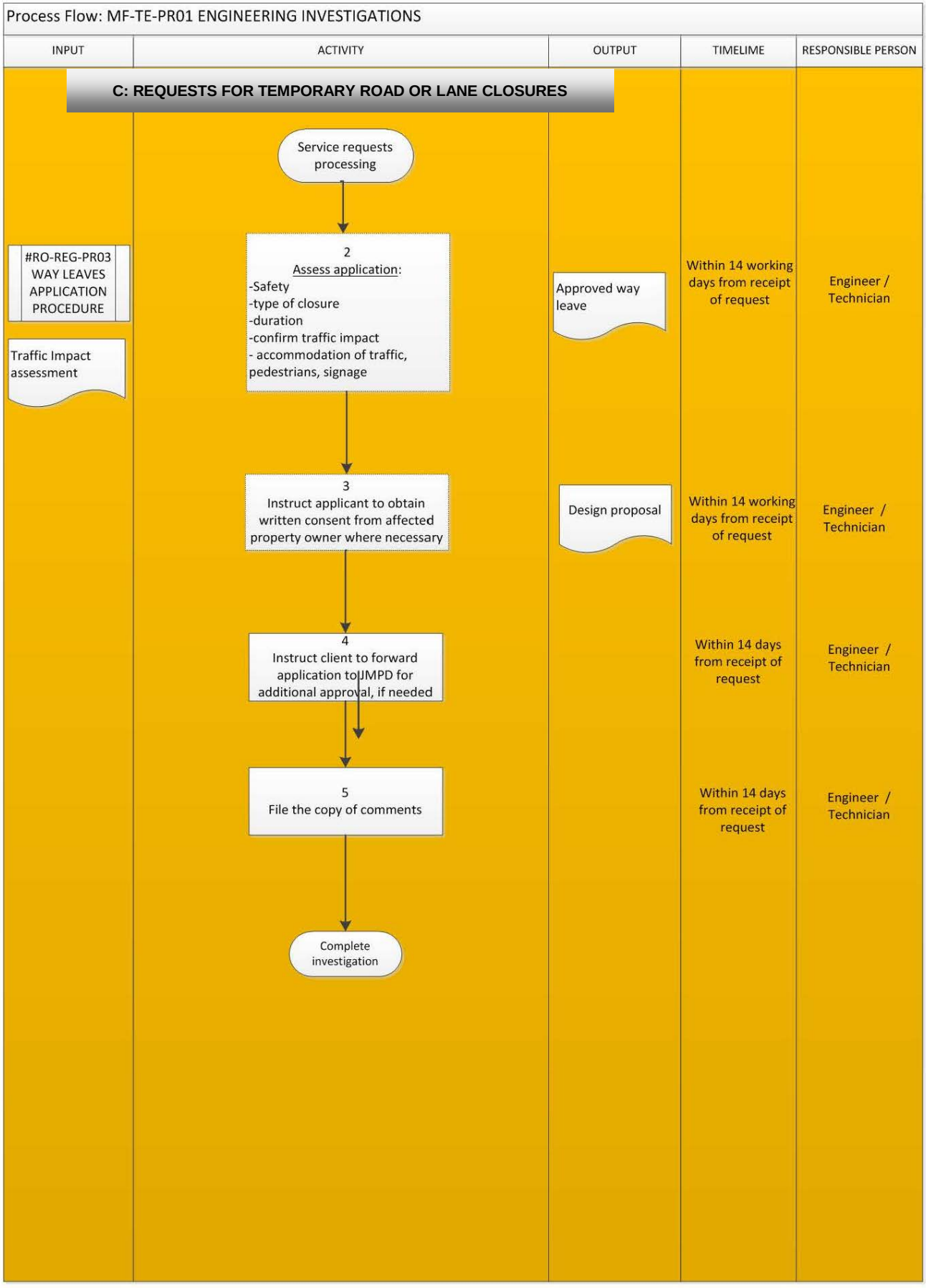
- Pages D6 -13 and D6 -14: A. Processing Service Requests;
- Pages D6 -15 and D -16: B. Road Safety Investigations including requests for Traffic Calming;
- Page D -17: C. Requests for Temporary Road or Lane Closures;
- Page D6 -18: D. Requests for Directional and Tourism Signage;
- Page D6 -19: E. Requests for Security Access Control;
- Page D6 -20: F. Commencing on Traffic Impact Assessment;
- Page D6 -21: G. New Traffic Signal Installation Undertaken In-House;
- Page D6 -22: H. Revised Traffic Signal Designs;
- Page D6 -23 and D6.-24: I. Geometric Improvements at Intersections;
- Page D6 -25: J. Geometric Improvements and Traffic Signal Design;
- Page D6 -26: K. Provision of Traffic Counts and Traffic Signals.

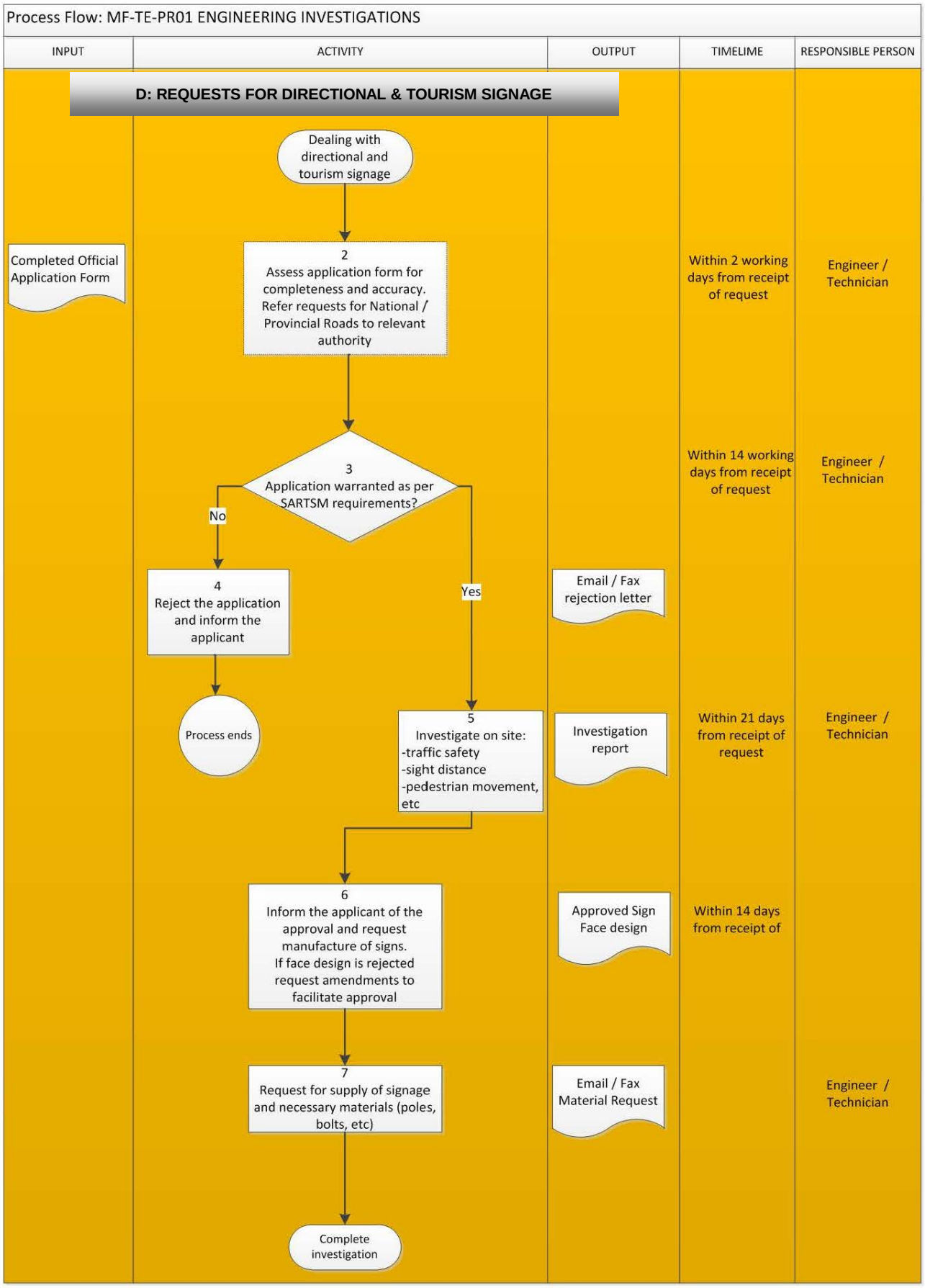

Process Flow: MF-TE-PR01 ENGINEERING INVESTIGATIONS
INPUT
ACTIVITY
OUTPUT
TIMELIME
RESPONSIBLE PERSON
A: PROCESSING ALL SERVICE REQUESTS
Service requests processing
Service Requests via:
Hansen
Email
Letter
Fax
2
Record and or download all service requests on Hansen
Hansen: Service requests
Daily
Engineer / Technician
3
Assign service request to relevant engineer/ technician
Daily
Manager
Checklist:
Detailed complaint
location
complainant Contact details
4
Assess the request for completeness
Within 5 working days from receipt of the request
Engineer / Technician
Service Requests:
National Roads
Provincial Roads
5
Refer to relevant authority and inform the client
Within 5 working days from receipt of the request
Engineer / Technician
6
Further investigations needed?
No
Yes
Hansen request
7
Inform the client and resolve the request on the system
Letter
Email
Hansen request
Telephone
Within 5 working days from receipt of the request
Engineer / Technician
Daily
Technical Officer
8
Undertake site investigations
To Page-2

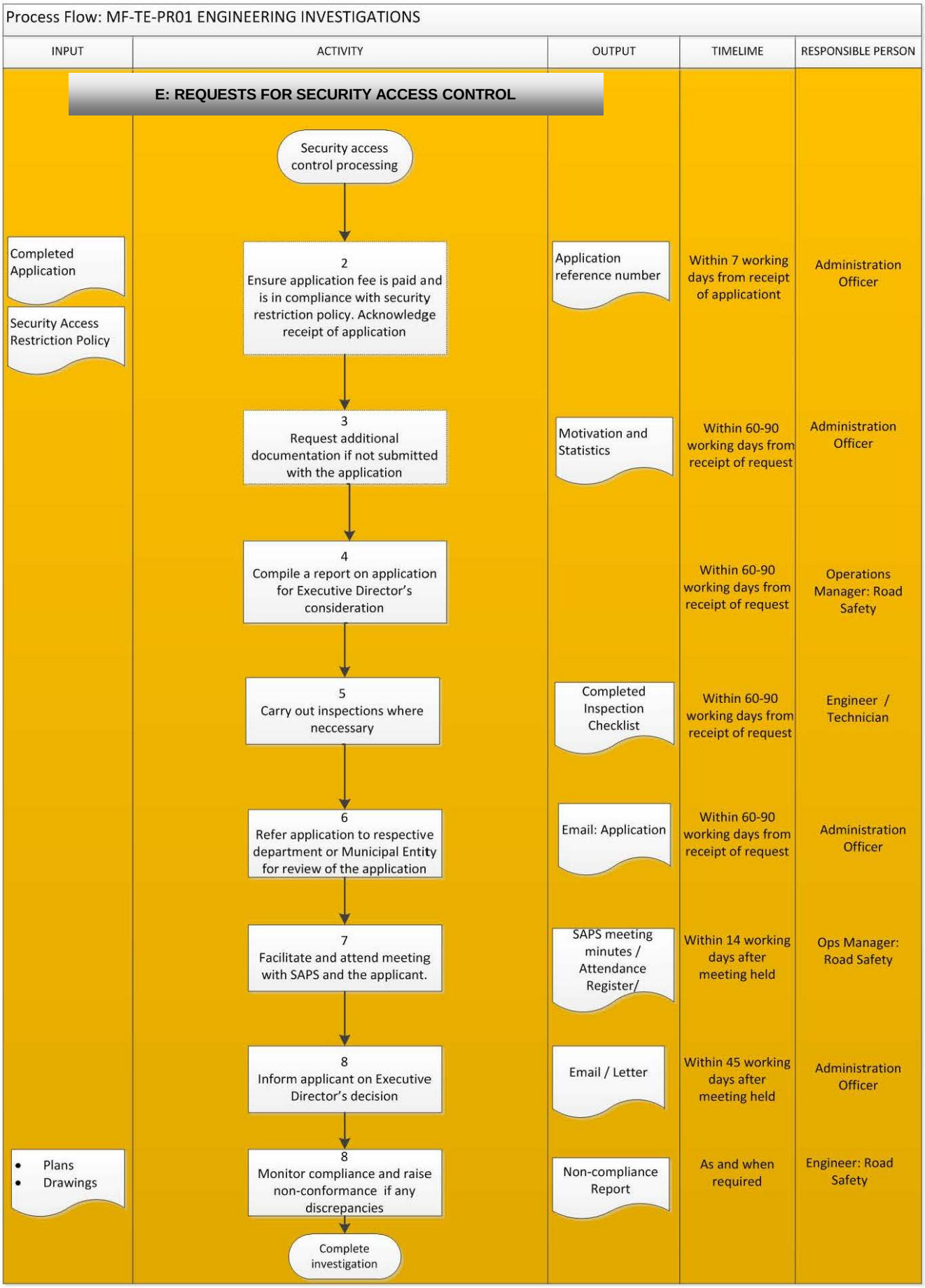

INPUT
ACTIVITY
OUTPUT
TIMELIME
RESPONSIBLE PERSON
From page-1
9
Generate a service request and direct it to responsible depot
Hansen: Service request
Within 30-60 working days from receipt of request
Engineer / Technician
10
Inform the client
Memo / Email
On completion of investigation
Engineer / Technician
11
Resolve original service request
Hansen: Service request
Within 30-60 working days from receipt of request
Engineer / Technician
Closed service request

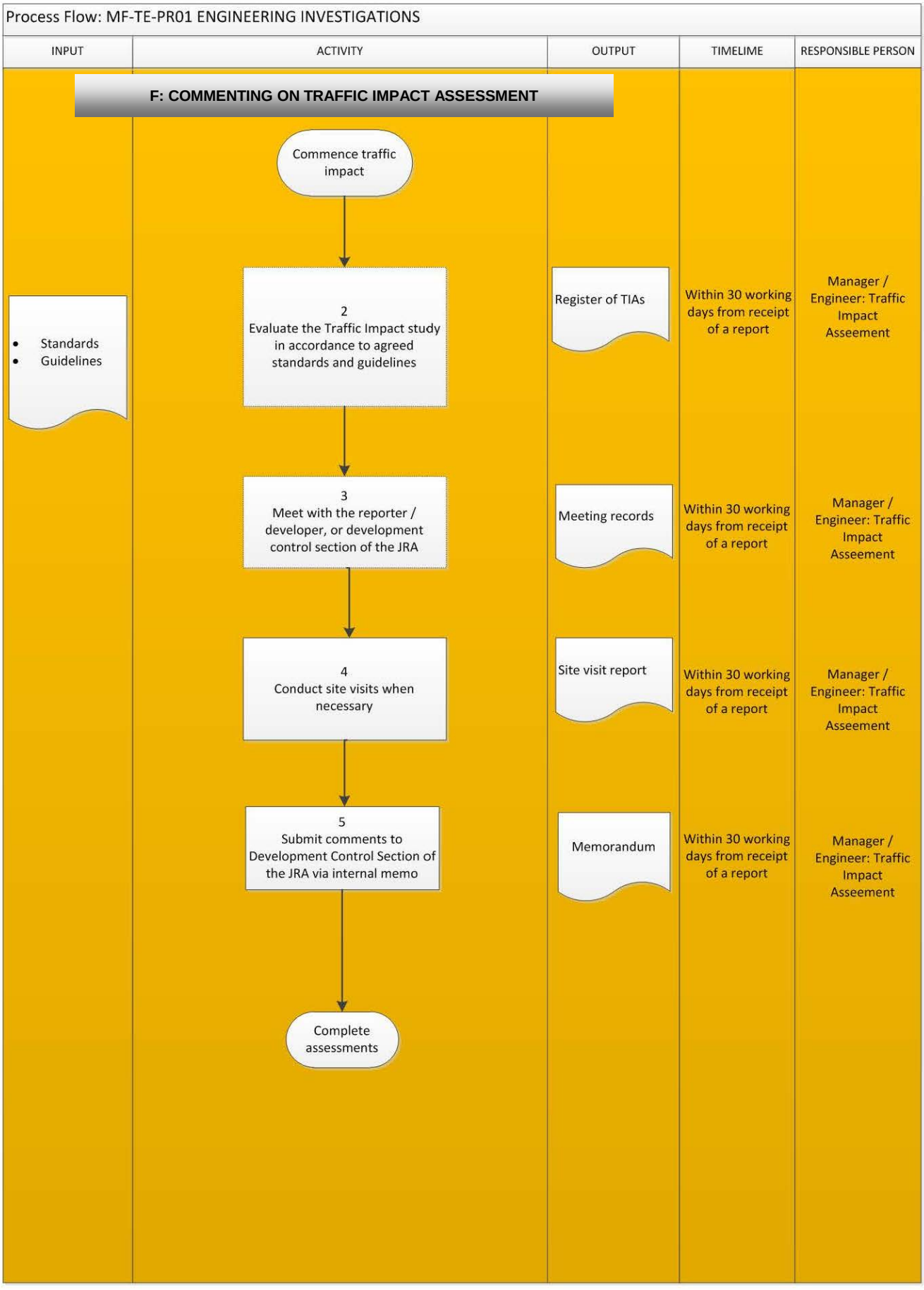

Process Flow: MF-TE-PR01 ENGINEERING INVESTIGATIONS
INPUT
ACTIVITY
OUTPUT
TIMELIME
RESPONSIBLE PERSON
B: ROAD SAFETY INVESTIGATIONS
Service requests processing
Road safety investigations checklist for:
Traffic calming
Guardrails
Road Markings
Miscellaneous road safety
2
Perform on-site investigations
Updated investigation checklist
Within 30-60 days from receipt of request
Engineer / Technician
JRA Standards
Engineering practices (design and regulations compliant)
3
Design the engineering proposals
Design proposal
Within 30-60 days from receipt of request
Engineer / Technician
4
Future funding required?
Yes
No
Within 30-60 days from receipt of request
Engineer / Technician
5
Place on appropriate priority list for future funding
6
Generate a service request
7
Inform the client accordingly
Within 30-60 days from receipt of request
Engineer / Technician
To Page-2

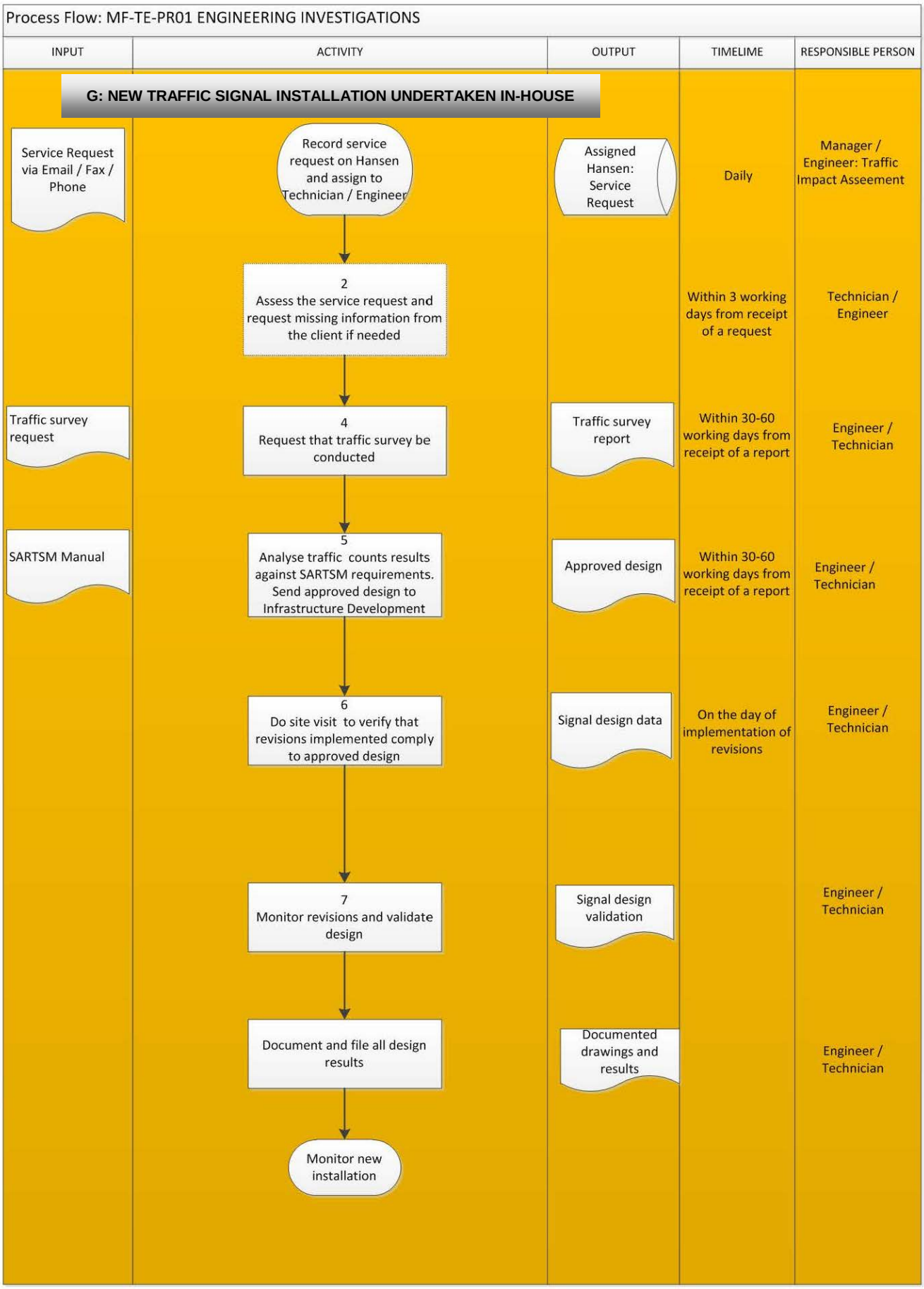

INPUT
ACTIVITY
OUTPUT
TIMELIME
RESPONSIBLE PERSON
Requests for TRAFFIC CALMING
From page-1
SARTSM Policy
CoJ Traffic calming Policy
8
Undertake investigation to determine if speed humps are warranted as prescribed on the policies
Completed Traffic calming checklist
Within 30-60 working days from receipt of request
Engineer / Technician
9
Request approval from Ward councillor
Approval letter
Prior to approval of design
Engineer / Technician
10
Funded internally or externally?
Funded internally
Funded externally
Hansen: Service request
Within 30-60 working days from receipt of request
Engineer / Technician
11
JRA to do the design
12
Request design from applicant for approval by JRA
Engineer / Technician
13
Ensure design compliance to JRA specifications
Approved design
Operations Manager
14
Advise contractor to apply for way leave permission
Prior to commencement of construction
Operations Manager
15
Ensure site is handed over to JRA with a completion report and pictures of completed site
Completion report
As and when necessary to conduct visit
Traffic calming completed

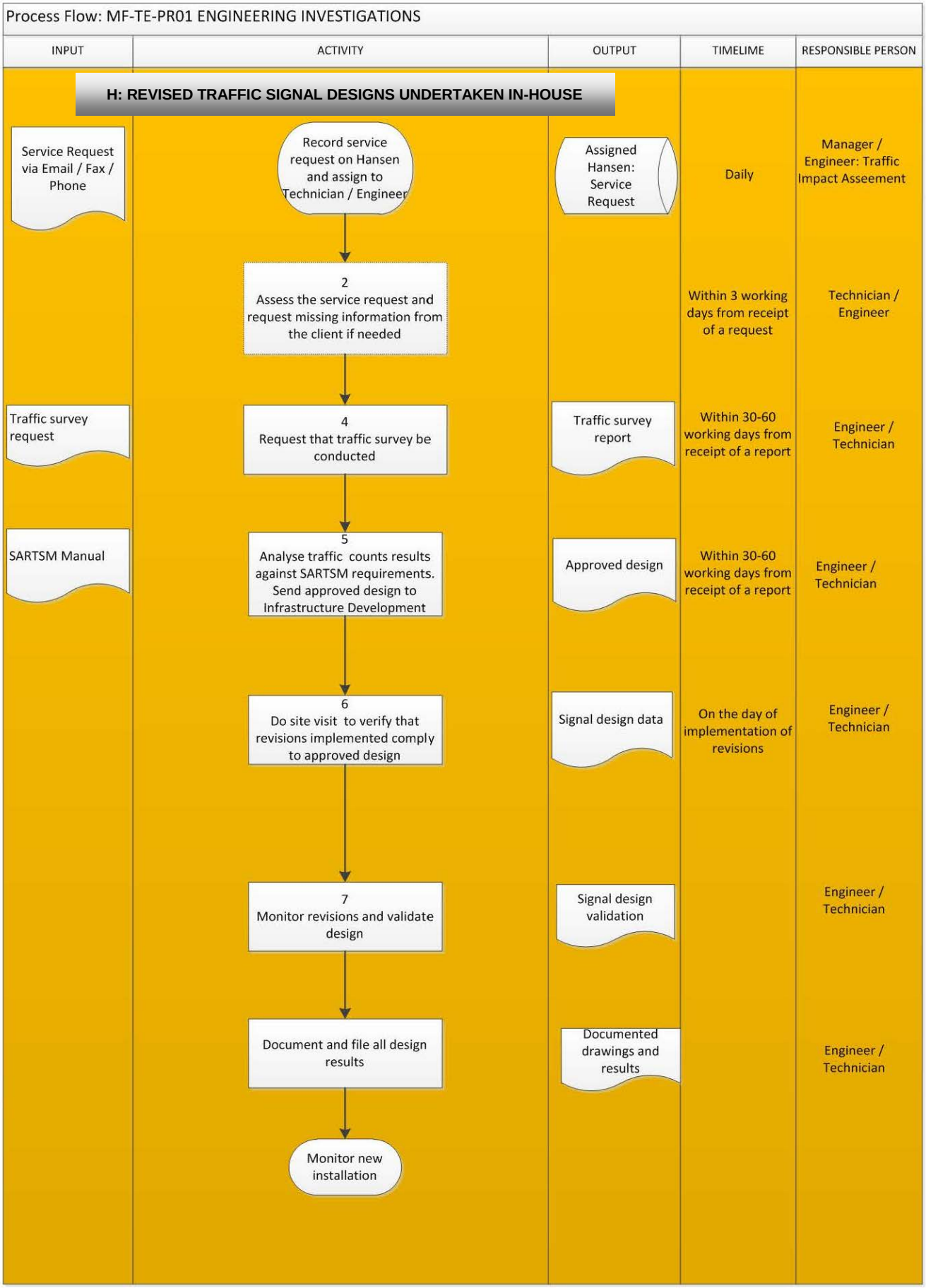

Process Flow: MF-TE-PR01 ENGINEERING INVESTIGATIONS
INPUT
ACTIVITY
OUTPUT
TIMELIME
RESPONSIBLE PERSON
C: REQUESTS FOR TEMPORARY ROAD OR LANE CLOSURES
Service requests processing
#RO-REG-PR03 WAY LEAVES APPLICATION PROCEDURE
Traffic Impact assessment
2
Assess application:
-Safety
-type of closure
-duration
-confirm traffic impact
- accommodation of traffic, pedestrians, signage
Approved way leave
Within 14 working days from receipt of request
Engineer / Technician
3
Instruct applicant to obtain written consent from affected property owner where necessary
Design proposal
Within 14 working days from receipt of request
Engineer / Technician
4
Instruct client to forward application to JMPD for additional approval, if needed
Within 14 days from receipt of request
Engineer / Technician
5
File the copy of comments
Within 14 days from receipt of request
Engineer / Technician
Complete investigation

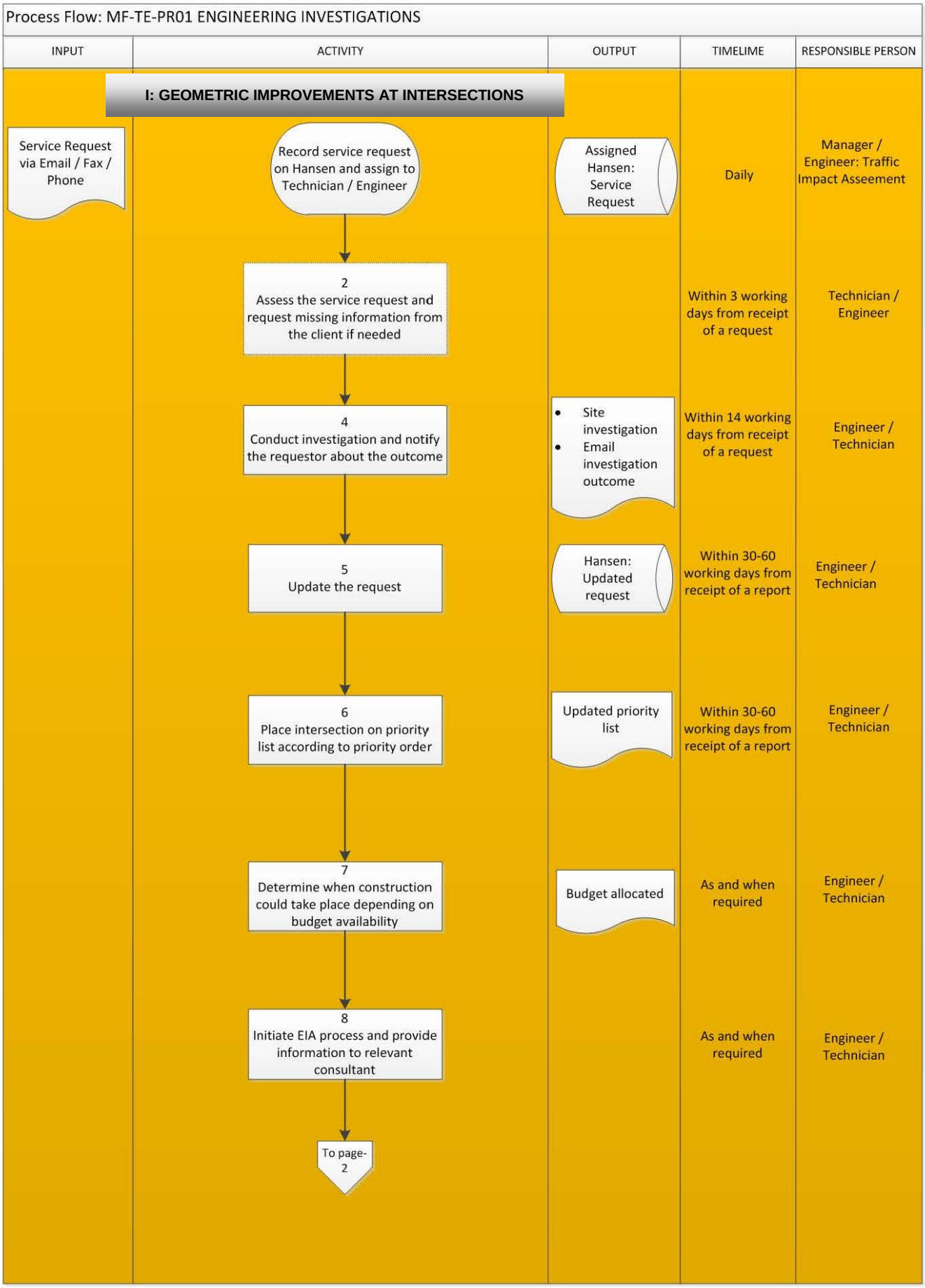

Process Flow: MF-TE-PR01 ENGINEERING INVESTIGATIONS
INPUT
ACTIVITY
OUTPUT
TIMELIME
RESPONSIBLE PERSON
D: REQUESTS FOR DIRECTIONAL & TOURISM SIGNAGE
Dealing with directional and tourism signage
Completed Official Application Form
2
Assess application form for completeness and accuracy. Refer requests for National / Provincial Roads to relevant authority
Within 2 working days from receipt of request
Engineer / Technician
3
Application warranted as per SARTSM requirements?
Within 14 working days from receipt of request
Engineer / Technician
No
Yes
4
Reject the application and inform the applicant
Email / Fax rejection letter
Process ends
5
Investigate on site:
-traffic safety
-sight distance
-pedestrian movement, etc
Investigation report
Within 21 days from receipt of request
Engineer / Technician
6
Inform the applicant of the approval and request manufacture of signs.
If face design is rejected request amendments to facilitate approval
Approved Sign Face design
Within 14 days from receipt of
7
Request for supply of signage and necessary materials (poles, bolts, etc)
Email / Fax Material Request
Engineer / Technician
Complete investigation


Process Flow: MF-TE-PR01 ENGINEERING INVESTIGATIONS
INPUT
ACTIVITY
OUTPUT
TIMELIME
RESPONSIBLE PERSON
E: REQUESTS FOR SECURITY ACCESS CONTROL
Security access control processing
Completed Application
Security Access Restriction Policy
2 Ensure application fee is paid and is in compliance with security restriction policy. Acknowledge receipt of application
Application reference number
Within 7 working days from receipt of applicationt
Administration Officer
3 Request additional documentation if not submitted with the application
Motivation and Statistics
Within 60-90 working days from receipt of request
Administration Officer
4 Compile a report on application for Executive Director's consideration
Within 60-90 working days from receipt of request
Operations Manager: Road Safety
5 Carry out inspections where neccessary
Completed Inspection Checklist
Within 60-90 working days from receipt of request
Engineer / Technician
6 Refer application to respective department or Municipal Entity for review of the application
Email: Application
Within 60-90 working days from receipt of request
Administration Officer
7 Facilitate and attend meeting with SAPS and the applicant.
SAPS meeting minutes / Attendance Register/
Within 14 working days after meeting held
Ops Manager: Road Safety
8 Inform applicant on Executive Director's decision
Email / Letter
Within 45 working days after meeting held
Administration Officer
Plans
Drawings
8 Monitor compliance and raise non-conformance if any discrepancies
Non-compliance Report
As and when required
Engineer: Road Safety
Complete investigation


Process Flow: MF-TE-PR01 ENGINEERING INVESTIGATIONS
INPUT
ACTIVITY
OUTPUT
TIMELIME
RESPONSIBLE PERSON
F: COMMENTING ON TRAFFIC IMPACT ASSESSMENT
Commence traffic impact
Standards
Guidelines
2
Evaluate the Traffic Impact study in accordance to agreed standards and guidelines
Register of TIAs
Within 30 working days from receipt of a report
Manager / Engineer: Traffic Impact Asseement
3
Meet with the reporter / developer, or development control section of the JRA
Meeting records
Within 30 working days from receipt of a report
Manager / Engineer: Traffic Impact Asseement
4
Conduct site visits when necessary
Site visit report
Within 30 working days from receipt of a report
Manager / Engineer: Traffic Impact Asseement
5
Submit comments to Development Control Section of the JRA via internal memo
Memorandum
Within 30 working days from receipt of a report
Manager / Engineer: Traffic Impact Asseement
Complete assessments

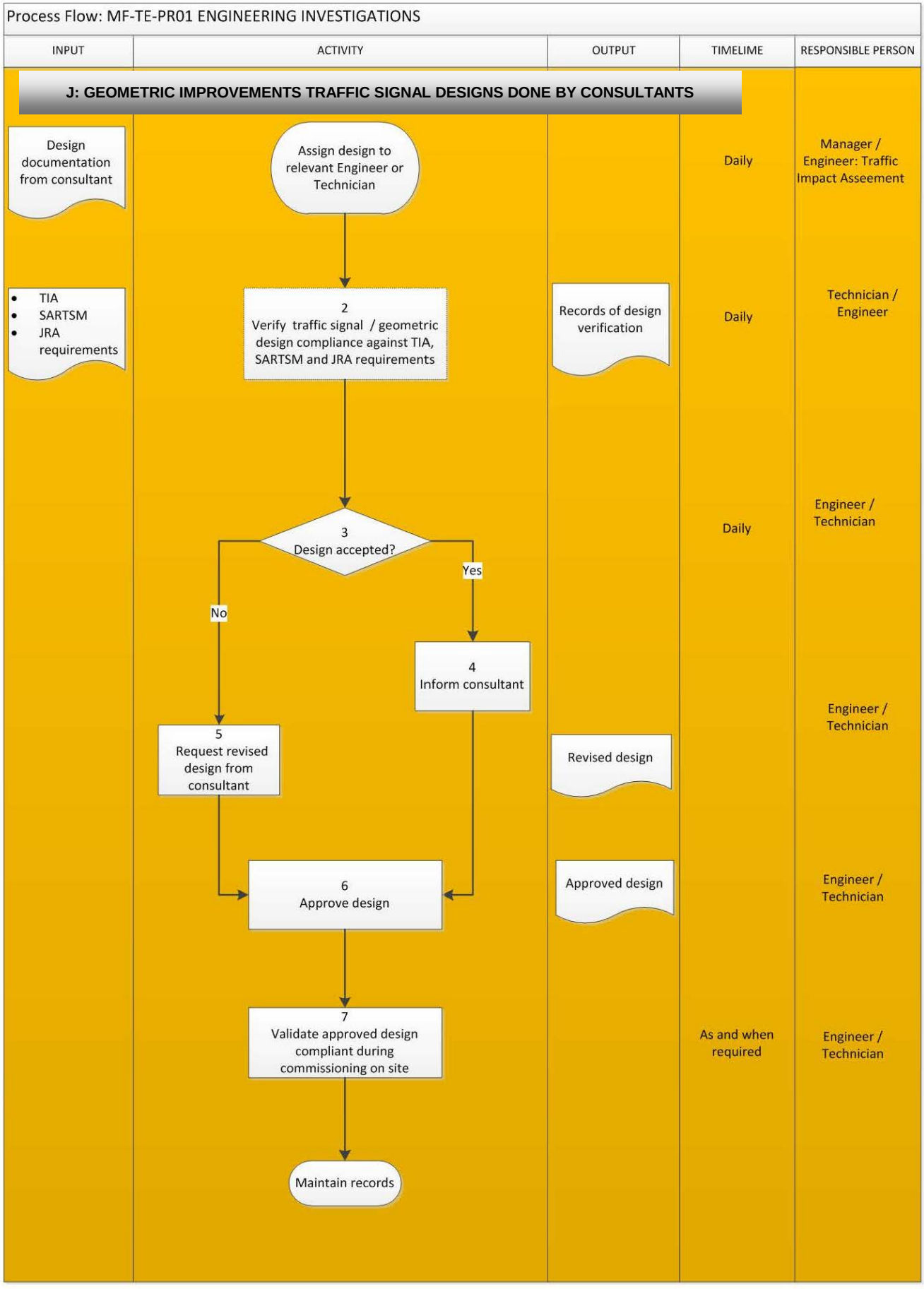

Process Flow: MF-TE-PR01 ENGINEERING INVESTIGATIONS
INPUT
ACTIVITY
OUTPUT
TIMELIME
RESPONSIBLE PERSON
G: NEW TRAFFIC SIGNAL INSTALLATION UNDERTAKEN IN-HOUSE
Service Request via Email / Fax / Phone
Record service request on Hansen and assign to Technician / Engineer
Assigned Hansen: Service Request
Daily
Manager / Engineer: Traffic Impact Asseement
2
Assess the service request and request missing information from the client if needed
Within 3 working days from receipt of a request
Technician / Engineer
Traffic survey request
4
Request that traffic survey be conducted
Traffic survey report
Within 30-60 working days from receipt of a report
Engineer / Technician
SARTSM Manual
5
Analyse traffic counts results against SARTSM requirements. Send approved design to Infrastructure Development
Approved design
Within 30-60 working days from receipt of a report
Engineer / Technician
6
Do site visit to verify that revisions implemented comply to approved design
Signal design data
On the day of implementation of revisions
Engineer / Technician
7
Monitor revisions and validate design
Signal design validation
Engineer / Technician
Document and file all design results
Documented drawings and results
Engineer / Technician
Monitor new installation

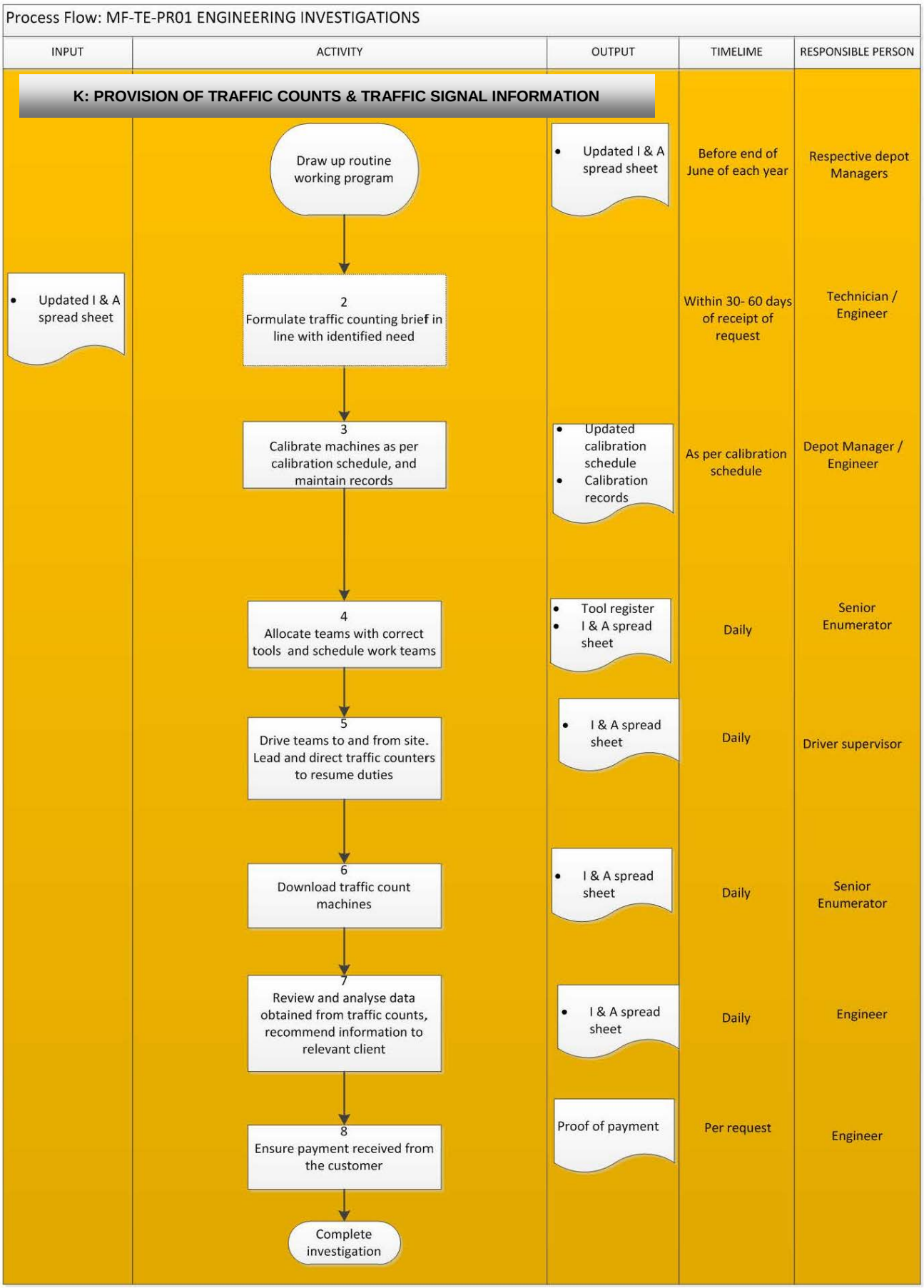

Process Flow: MF-TE-PR01 ENGINEERING INVESTIGATIONS
INPUT
ACTIVITY
OUTPUT
TIMELIME
RESPONSIBLE PERSON
H: REVISED TRAFFIC SIGNAL DESIGNS UNDERTAKEN IN-HOUSE
Service Request via Email / Fax / Phone
Record service request on Hansen and assign to Technician / Engineer
Assigned Hansen: Service Request
Daily
Manager / Engineer: Traffic Impact Asseement
2
Assess the service request and request missing information from the client if needed
Within 3 working days from receipt of a request
Technician / Engineer
Traffic survey request
4
Request that traffic survey be conducted
Traffic survey report
Within 30-60 working days from receipt of a report
Engineer / Technician
SARTSM Manual
5
Analyse traffic counts results against SARTSM requirements. Send approved design to Infrastructure Development
Approved design
Within 30-60 working days from receipt of a report
Engineer / Technician
6
Do site visit to verify that revisions implemented comply to approved design
Signal design data
On the day of implementation of revisions
Engineer / Technician
7
Monitor revisions and validate design
Signal design validation
Engineer / Technician
Document and file all design results
Documented drawings and results
Engineer / Technician
Monitor new installation


Process Flow: MF-TE-PR01 ENGINEERING INVESTIGATIONS
INPUT
ACTIVITY
OUTPUT
TIMELIME
RESPONSIBLE PERSON
I: GEOMETRIC IMPROVEMENTS AT INTERSECTIONS
Service Request via Email / Fax / Phone
Record service request on Hansen and assign to Technician / Engineer
Assigned Hansen: Service Request
Daily
Manager / Engineer: Traffic Impact Asseement
2
Assess the service request and request missing information from the client if needed
Within 3 working days from receipt of a request
Technician / Engineer
4
Conduct investigation and notify the requestor about the outcome
Site investigation
Email investigation outcome
Within 14 working days from receipt of a request
Engineer / Technician
5
Update the request
Hansen: Updated request
Within 30-60 working days from receipt of a report
Engineer / Technician
6
Place intersection on priority list according to priority order
Updated priority list
Within 30-60 working days from receipt of a report
Engineer / Technician
7
Determine when construction could take place depending on budget availability
Budget allocated
As and when required
Engineer / Technician
8
Initiate EIA process and provide information to relevant consultant
As and when required
Engineer / Technician
To page-2

Process Flow: MF-TE-PR01 ENGINEERING INVESTIGATIONS

INPUT	ACTIVITY	OUTPUT	TIMELIME	RESPONSIBLE PERSON
	I: GEOMETRIC IMPROVEMENTS AT INTERSECTIONS			
Procedure #FN-SCM-PR08 Appointment of Consultants and Panels	From page-2 9 Appoint a consultant to do geometric designs and Bill of Quantities		As and when required	Technician / Engineer
	10 Monitor project implementation ensuring compliant to design specifications		As and when required	Engineer / Technician
	Project Close-out			


Process Flow: MF-TE-PR01 ENGINEERING INVESTIGATIONS
INPUT
ACTIVITY
OUTPUT
TIMELIME
RESPONSIBLE PERSON
J: GEOMETRIC IMPROVEMENTS TRAFFIC SIGNAL DESIGNS DONE BY CONSULTANTS
Design documentation from consultant
Assign design to relevant Engineer or Technician
Daily
Manager / Engineer: Traffic Impact Asseement
TIA
SARTSM
JRA requirements
2
Verify traffic signal / geometric design compliance against TIA, SARTSM and JRA requirements
Records of design verification
Daily
Technician / Engineer
3
Design accepted?
Yes
No
Daily
Engineer / Technician
4
Inform consultant
5
Request revised design from consultant
Revised design
Engineer / Technician
6
Approve design
Approved design
Engineer / Technician
7
Validate approved design compliant during commissioning on site
As and when required
Engineer / Technician
Maintain records


Process Flow: MF-TE-PR01 ENGINEERING INVESTIGATIONS
INPUT
ACTIVITY
OUTPUT
TIMELIME
RESPONSIBLE PERSON
K: PROVISION OF TRAFFIC COUNTS & TRAFFIC SIGNAL INFORMATION
Draw up routine working program
Updated I & A spread sheet
Before end of June of each year
Respective depot Managers
Updated I & A spread sheet
2 Formulate traffic counting brief in line with identified need
Within 30- 60 days of receipt of request
Technician / Engineer
3 Calibrate machines as per calibration schedule, and maintain records
Updated calibration schedule
Calibration records
As per calibration schedule
Depot Manager / Engineer
4 Allocate teams with correct tools and schedule work teams
Tool register
I & A spread sheet
Daily
Senior Enumerator
5 Drive teams to and from site. Lead and direct traffic counters to resume duties
I & A spread sheet
Daily
Driver supervisor
6 Download traffic count machines
I & A spread sheet
Daily
Senior Enumerator
7 Review and analyse data obtained from traffic counts, recommend information to relevant client
I & A spread sheet
Daily
Engineer
8 Ensure payment received from the customer
Proof of payment
Per request
Engineer
Complete investigation

7.0 RECORDS MANAGEMENT				
Reference	**Record Title**	**Authority or Responsible Party**	**Minimum Retention**	**Disposal**
7.1.	Road closure applications	Administration Officer	Until termination of application	Shredding / Achieving
7.2	Service requests	Engineer/ Technicians	3 Years	Shredding / Achieving
7.3	Letters/ memorandums	All	3 Years	Shredding / Achieving
7.4	Designs	Engineer/ Technicians	ongoing	Shredding / Achieving
7.5	Site investigation report	Engineer/ Technicians	3 Years	Shredding / Achieving
7.6	Site Inspection checklist	Engineer/ Technicians	ongoing	Shredding / Achieving
7.7	Traffic survey request (Excel spread sheet)	Engineer/ Technicians	ongoing	Shredding / Achieving
7.7	Priority list (Excel spread sheet)	Engineer/ Technicians	ongoing	Shredding / Achieving
7.8	Compliant design (Email)	Engineer/ Technicians	ongoing	Shredding / Achieving
7.9	Approved design / Way leave	Engineer/ Technicians	Till installation	Shredding / Achieving
7.10	Completed Timesheets	Engineer/ Technicians	ongoing	Shredding / Achieving
7.11	Compliance checklist	Engineer/ Technicians	Till Commissioning	Shredding / Achieving
7.12	Signed design checklist	Engineer/ Technicians	ongoing	Shredding / Achieving
7.13	Site investigation	Engineer/ Technicians	ongoing	Shredding / Achieving
7.14	Traffic count analysis report (Excel spread sheet)	Engineer/ Technicians	ongoing	Shredding / Achieving
7.15	Approved design	Engineer/ Technicians	On completion of the design	Shredding / Achieving
7.16	Signal design verification	Engineer/ Technicians	Until Commissioned	Shredding / Achieving
7.17	I &A Spread Sheet	Engineer/ Technicians	ongoing	Shredding / Achieving
7.18	Calibration records	Engineer/ Technicians	ongoing	Shredding / Achieving

8.0 APPROVAL, AMENDMENT AND REVIEW OF PROCESS / PROCEDURE	
Approval:	i) The Ops Manager: Traffic Engineering will **endorse** the SOP; ii) HOD: MF will **approve** the SOP
Amendment:	Amendments will be implemented by the Ops Manager: Traffic Engineering
Review frequency:	As & When required but at minimum, 2 years

9.0 REFERENCES

7.1 The Municipal Systems Act 32 of 2000

7.2 Municipal Finance Management Act No. 56 of 2003;

7.3 The National Treasury Guide for the preparation of the annual report

7.4 SARTSM Manuals *:* South African Road Traffic Signals Manual

10.0 DEFINITIONS

- **JRA**: Johannesburg Roads Agency
- **SOP:** Standard Operating Procedure
- **SARTSM**: South African Road Traffic Signs Manual
- **I & A:** Intelligence and Analysis
- **ROD:** Record of Decision
- **EIA:** Environmental Impact Assessment
- **SCM:** JRA Supply Chain Management department
- **TIA:** Traffic impact Assessment

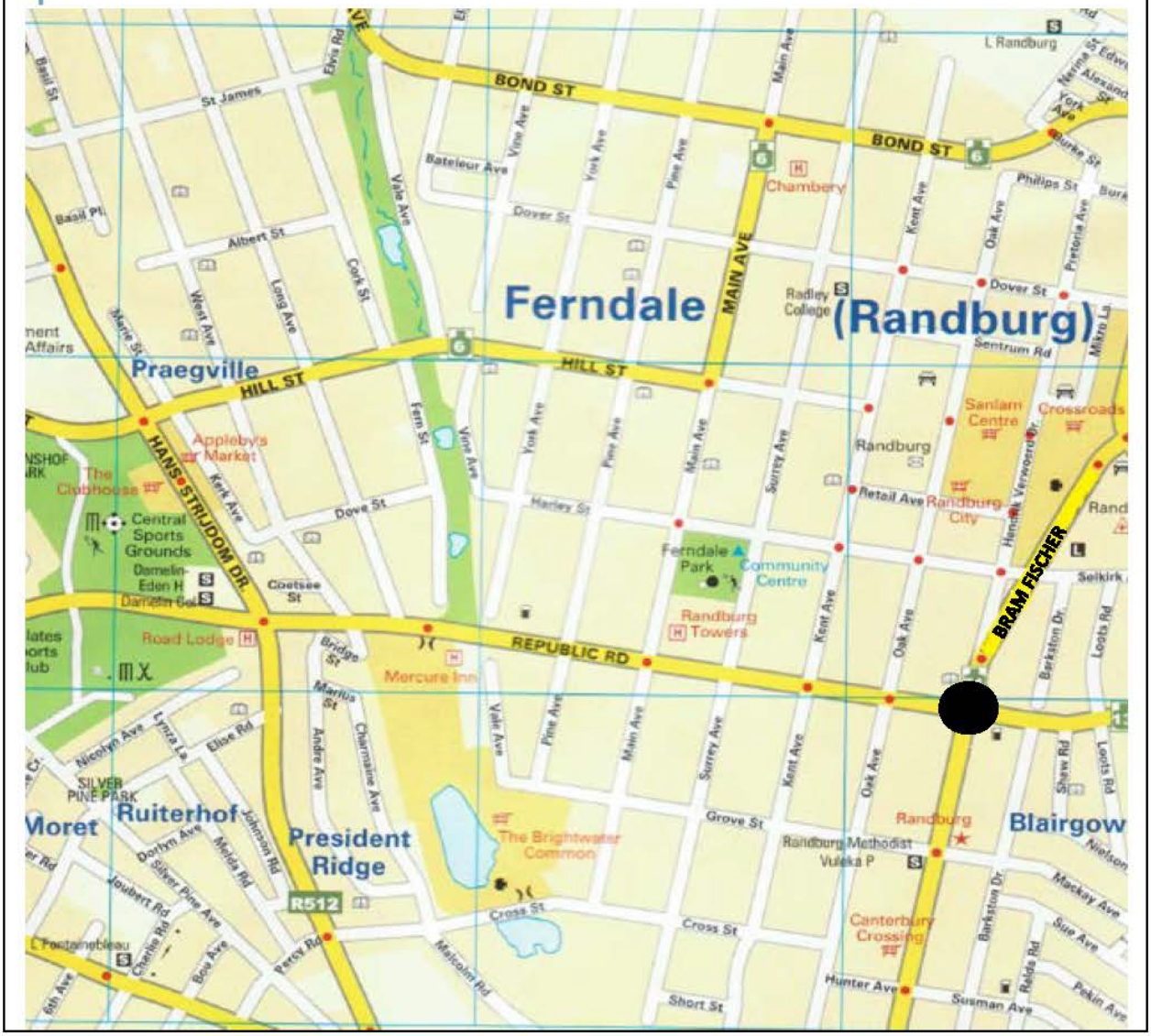
APPENDIX D6.2

(Refers to Chapter 6: Traffic Engineering)

Sample Traffic Signal Timings Calculations
(Existing Signalised Intersection)

CONTENTS

Republic and Bram Fischer (Hendrik Verwoerd) *Version 4*



Signed:		Johannesburg Roads Agency	**Signed:**		**Intersection Name :**
Name:	A G Brislin		**Name:**	J A Wilken	**Republic and Bram Fischer (Hendrik Verwoerd)**
Position:	Engineer (Pr Eng)		**Position:**	Man: Traff Sig Design (Pr Tech Eng)	
Pr: 980355			**Pr: 201470193**		**Intersection No.:**
			Date:	31-Oct-14	**R1627**

Republic and Bram Fischer (Hendrik Verwoerd) *Version 4*

Republic - Westbound

Republic - Eastbound

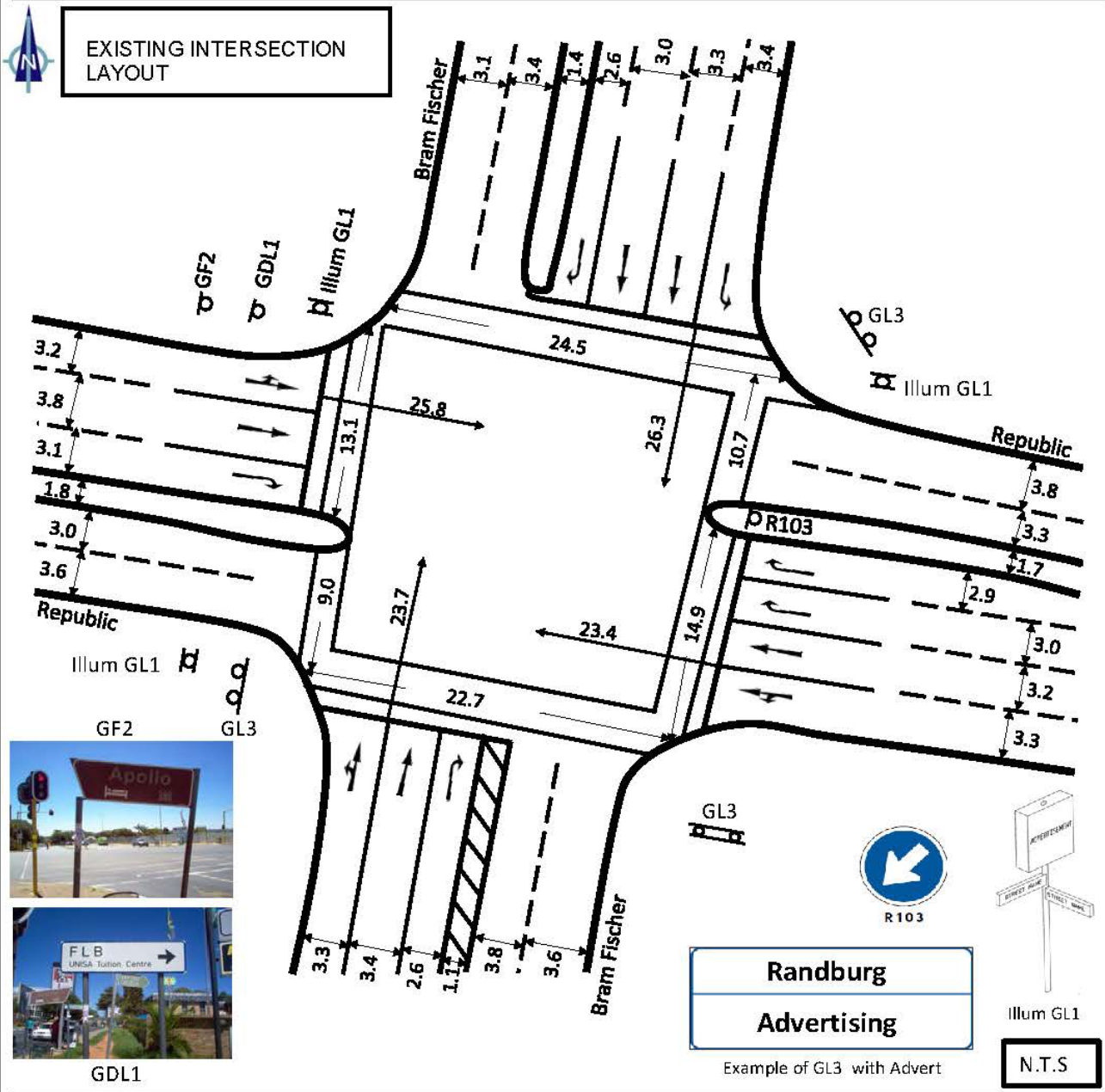
Bram Fischer - Northbound

Bram Fischer - Southbound

Signed:		Johannesburg Roads Agency	**Signed:**		**Intersection Name :**
Name:	A G Brislin		**Name:**	J A Wilken	**Republic and Bram Fischer (Hendrik Verwoerd)**
Position:	Engineer (Pr Eng)		**Position:**	Man: Traff Sig Design (Pr Tech Eng)	
Pr: 980355			**Pr: 201470193**		**Intersection No.:**
			Date:	31-Oct-14	**R1627**

Republic and Bram Fischer (Hendrik Verwoerd) *Version 4*

EXISTING INTERSECTION LAYOUT



GF2 GL3

GDL1

Illum GL1

Randburg
Advertising

Example of GL3 with Advert

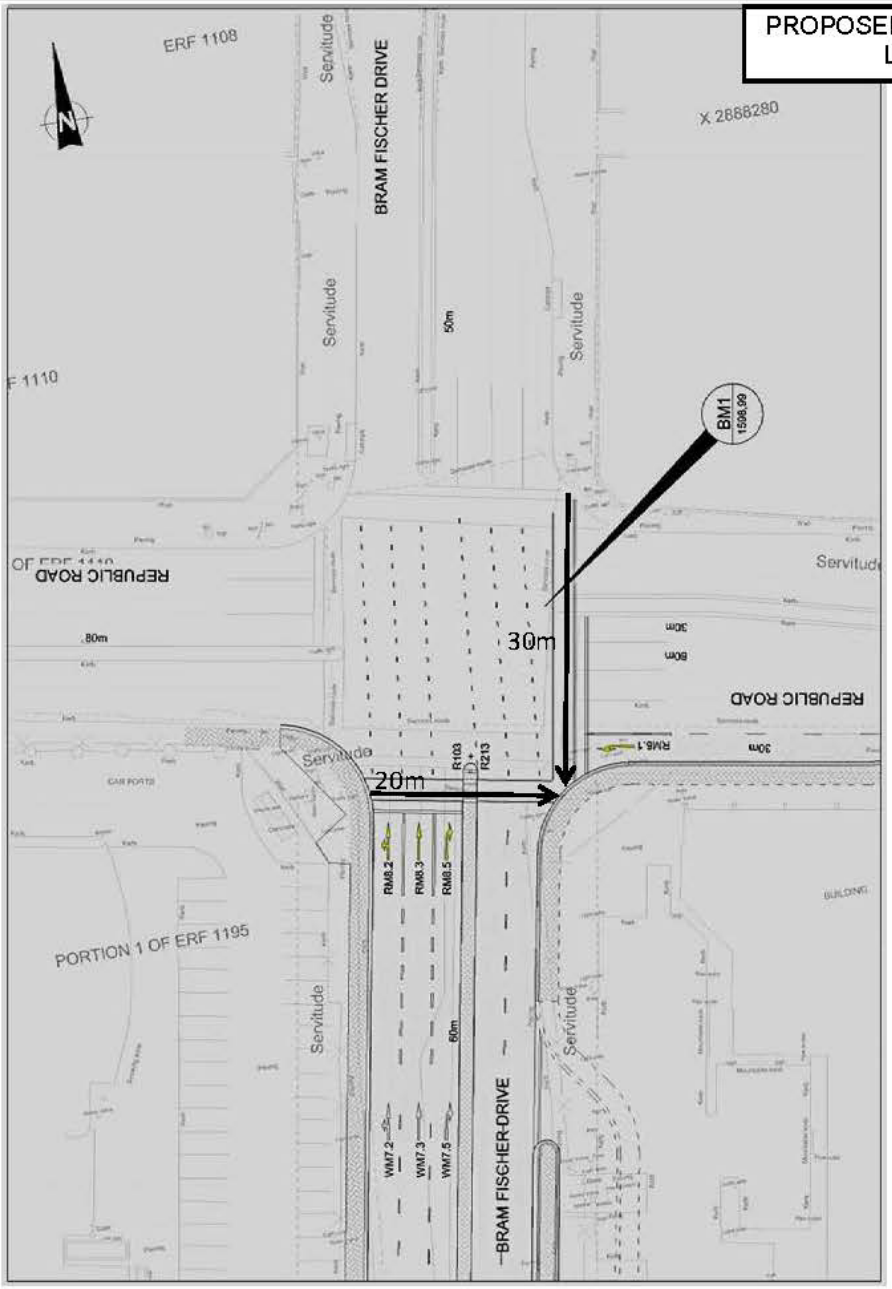
N.T.S

National Road Traffic Regulation 287A. It is hereby declared that the "drawing of the layout of the junction or crossing, indicating lane markings and road layout" is approved

Signed:		Signed:		Intersection Name :	
Name:	A G Brislin	Name:	J A Wilken	Republic and Bram Fischer (Hendrik Verwoerd)	
Position:	Engineer (Pr Eng)	Position:	Man: Traff Sig Design (Pr Tech Eng)		
Pr: 980355		Pr: 201470193		Intersection No.:	
		Date:	31-Oct-14	R1627	

Republic and Bram Fischer (Hendrik Verwoerd) *Version 4*

PROPOSED INTERSECTION LAYOUT



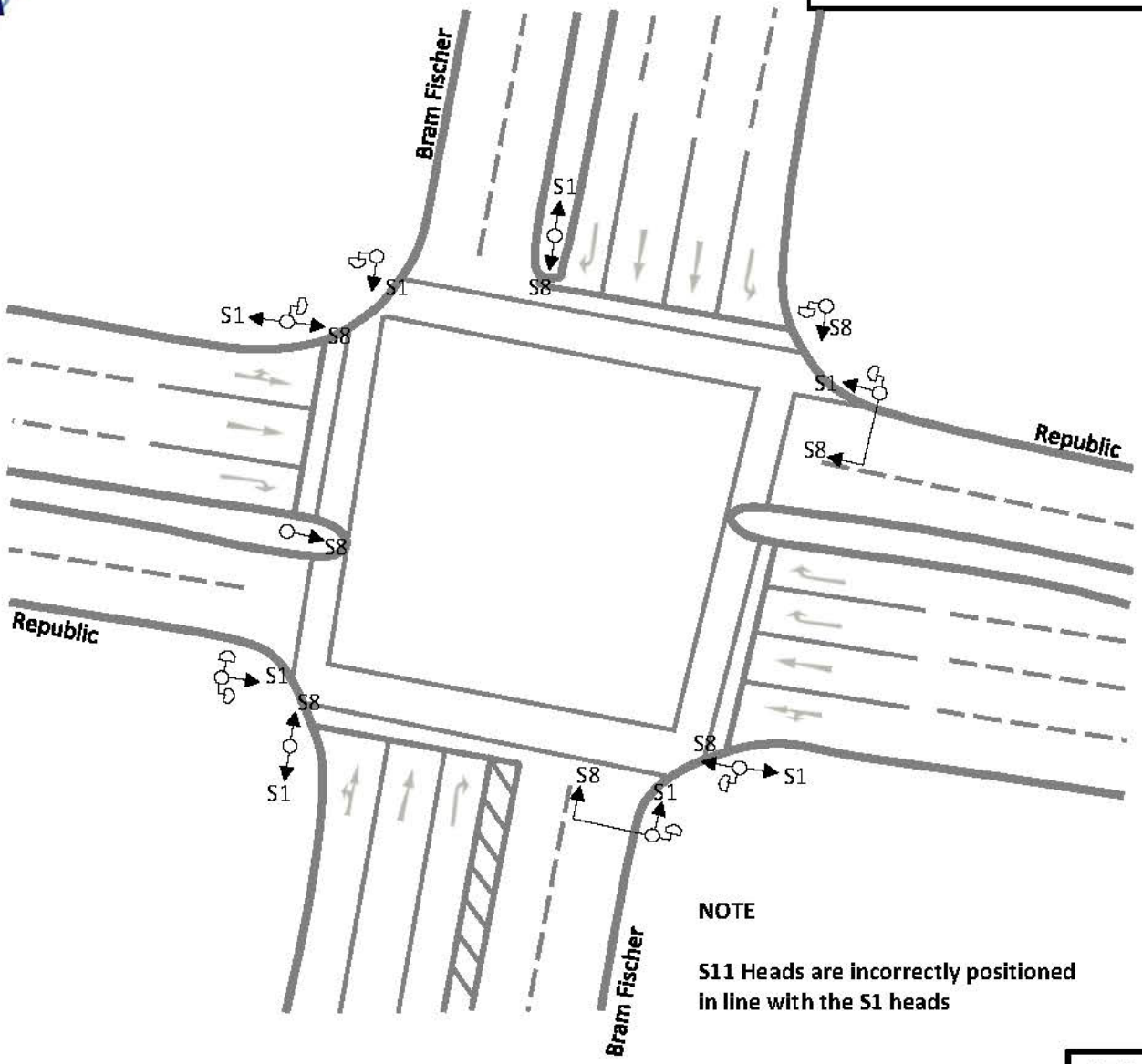
N.T.S

National Road Traffic Regulation 287A. It is hereby declared that the "drawing of the layout of the junction or crossing, indicating lane markings and road layout" is approved

Signed:		Johannesburg Roads Agency	**Signed:**		**Intersection Name:**
Name:	A G Brislin		**Name:**	J A Wilken	**Republic and Bram Fischer (Hendrik Verwoerd)**
Position:	Engineer (Pr Eng)		**Position:**	Man: Traff Sig Design (Pr Tech Eng)	
Pr: 980355			**Pr: 201470193**		**Intersection No.:**
			Date:	31-Oct-14	**R1627**

Republic and Bram Fischer (Hendrik Verwoerd) *Version 4*

EXISTING SIGNAL LAYOUT



NOTE

S11 Heads are incorrectly positioned in line with the S1 heads

N.T.S

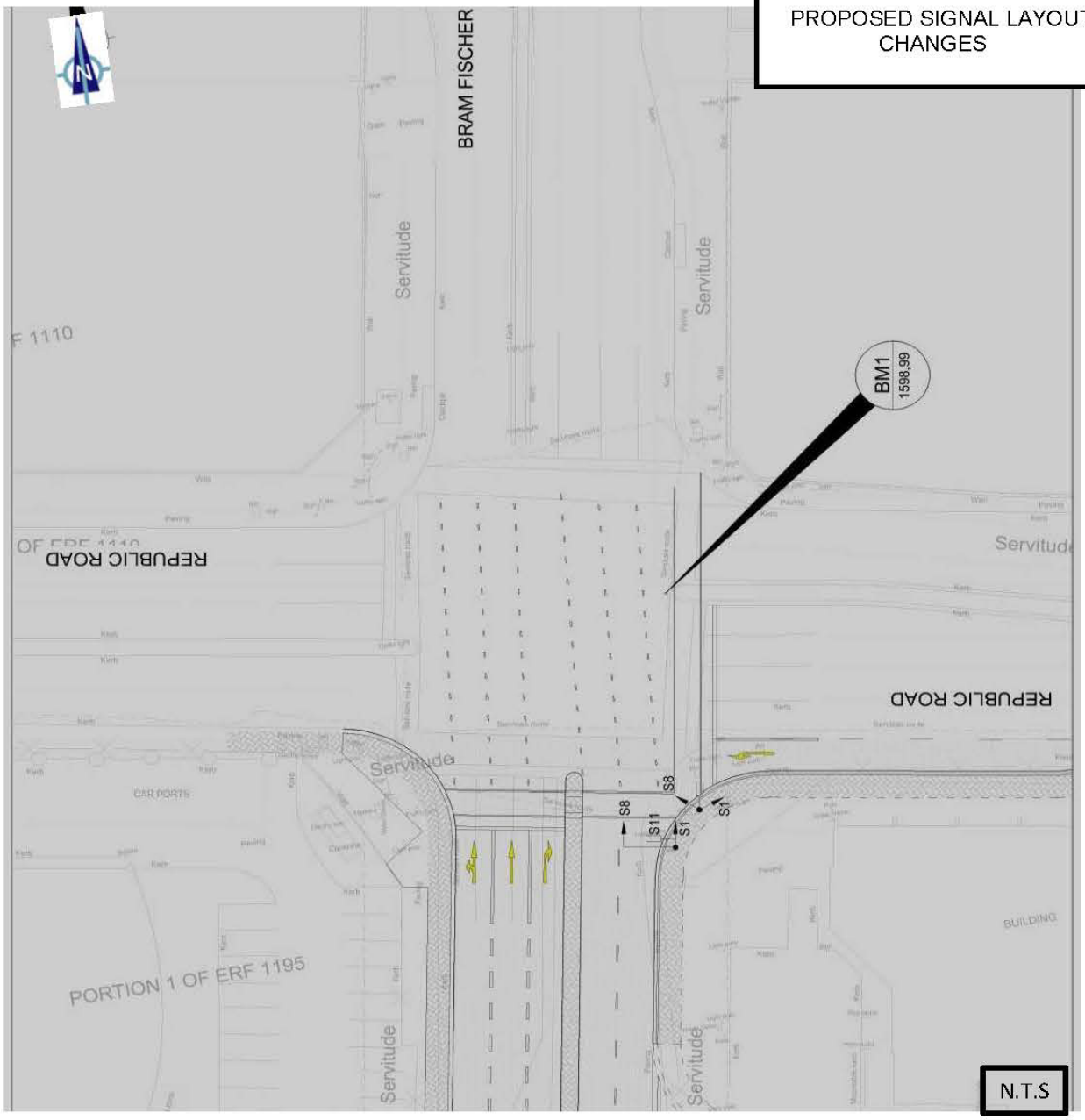
National Road Traffic Regulation 287A. It is hereby declared that the "drawing showing the number type and location of traffic signals faces" is approved

Signed:		**Signed:**		**Intersection Name :**
Name:	A G Brislin	**Name:**	J A Wilken	**Republic and Bram Fischer (Hendrik Verwoerd)**
Position:	Engineer (Pr Eng)	**Position:**	Man: Traff Sig Design (Pr Tech Eng)	
Pr: 980355		**Pr: 201470193**		**Intersection No.:**
		Date:	31-Oct-14	**R1627**

Johannesburg Roads Agency

Republic and Bram Fischer (Hendrik Verwoerd) *Version 4*

PROPOSED SIGNAL LAYOUT CHANGES



National Road Traffic Regulation 287A. It is hereby declared that the "drawing showing the number type and location of traffic signals faces" is approved

Signed:		Johannesburg Roads Agency	**Signed:**		**Intersection Name :**
Name:	A G Brislin		**Name:**	J A Wilken	**Republic and Bram Fischer (Hendrik Verwoerd)**
Position:	Engineer (Pr Eng)		**Position:**	Man: Traff Sig Design (Pr Tech Eng)	
Pr: 980355			**Pr: 201470193**		**Intersection No.:**
			Date:	31-Oct-14	**R1627**

Republic and Bram Fischer (Hendrik Verwoerd) *Version 4*

Fixed Time Plan

Stage	Start	Gr	FRed	FlGr	Ext	Yel	AR	Total
V1	0	33.0				3.0	2.0	38.0
V1R	38			6.0		3.0	2.0	11.0
V2R	49			5.0		3.0	2.0	10.0
V2	59	35.0				3.0	3.0	41.0
								0.0
								0.0
								0.0
P1	0	17.0	13.0					30.0
P2	59	20.0	15.0					35.0
								0.0
CYCLE								100

Stage Movements

NOTES

Version 4

Republic east approach upgraded by adding a short exclusive left turn lane and moving corner kerb. Timings to remain as per version 3, including offsets except FRM

National Road Traffic Regulation 287A. It is hereby declared that the "phasing, time plans and offset settings of the junction" is approved.

Signed:		**Signed:**	
Name:	A G Brislin	**Name:**	J A Wilken
Position:	Engineer (Pr Eng)	**Position:**	Man: Traff Sig Design (Pr Tech Eng)
Pr:	980355	**Pr:**	20147019 3
		Date:	31-Oct-14

In operation

Time Plan :	AM Peak Plan 1
Cycle :	100
From-To:	06:00 - 09:00
Operation:	Fixed Time Plan
Offset:	70 "
Version:	4

Intersection Name: Republic and Bram Fischer (Hendrik Verwoerd)

Intersection No. R1627

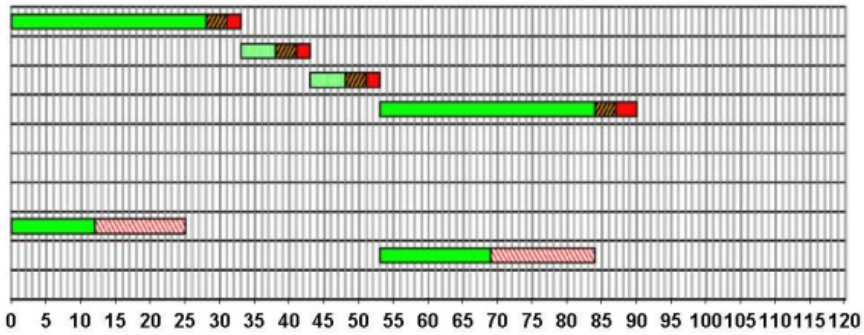
Republic and Bram Fischer (Hendrik Verwoerd)

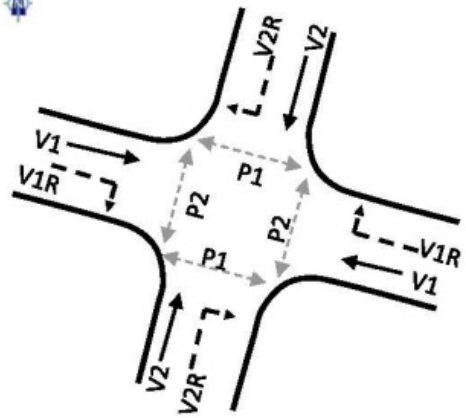
Version 4

Time

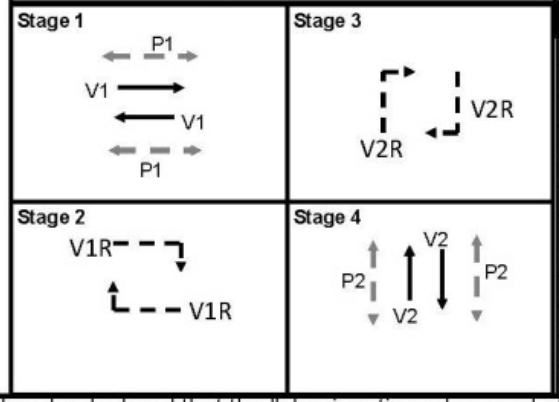
Stage	Start	Gr	FRed	FIGr	Ext	Yel	AR	Total
V1	0	28.0				3.0	2.0	33.0
V1R	33			5.0		3.0	2.0	10.0
V2R	43			5.0		3.0	2.0	10.0
V2	53	31.0				3.0	3.0	37.0
								0.0
								0.0
								0.0
P1	0	12.0	13.0					25.0
P2	53	16.0	15.0					31.0
								0.0
CYCLE								90

Fixed Time Plan





Stage Movements



NOTES

Version 4

Republic east approach upgraded by adding a short exclusive left turn lane and moving corner kerb. Timings to remain as per version 3, including offsets except FRM

National Road Traffic Regulation 287A. It is hereby declared that the "phasing, time plans and offset settings of the junction" is approved.

Signed:		Signed		In operation	Intersection Name:
Name:	A G Brislin	Name:	J A Wilken	Time Plan: PM Peak Plan 2	Republic and Bram Fischer (Hendrik Verwoerd)
Position:	Engineer (Pr Eng)	Position:	Man: Traff Sig Design (Pr Tech Eng)	Cycle: 90	
Pr: 980355		Pr: 201470193		From-To: 15:30 - 18:30	
		Date:	31-Oct-14	Operation: Fixed Time Plan	Intersection No. R1627
				Offset: 14"	
				Version: 4	

Johannesburg Roads Agency

Republic and Bram Fischer (Hendrik Verwoerd) — *Version 4*

Fixed Time Plan

Stage	Start	Gr	FRed	FIGr	Ext	Yel	AR	Total
V1	0	20.0				3.0	2.0	25.0
V1R	25			5.0		3.0	2.0	10.0
V2R	35			5.0		3.0	2.0	10.0
V2	45	19.0				3.0	3.0	25.0
								0.0
								0.0
								0.0
P1	0	4.0	13.0					17.0
P2	45	4.0	15.0					19.0
								0.0
CYCLE								70

Stage Movements

NOTES

Version 4

Republic east approach upgraded by adding a short exclusive left turn lane and moving corner kerb. Timings to remain as per version 3, including offsets except FRM

National Road Traffic Regulation 287A. It is hereby declared that the "phasing, time plans and offset settings of the junction" is approved.

Signed		**Signed**	
Name:	A G Brislin	**Name:**	J A Wilken
Position:	Engineer (Pr Eng)	**Position:**	Man: Traf Sig Design (Pr Tech Eng)
Pr:	980355	Pr: 20147019	
		Date:	31-Oct-14

In operation

Time Plan :	Off Peak Plan 3
Cycle :	70
From-To:	See Event Table
Operation:	Fixed Time Plan
Offset:	7 "
Version:	4

Intersection Name: Republic and Bram Fischer (Hendrik Verwoerd)

Intersection No. R1627

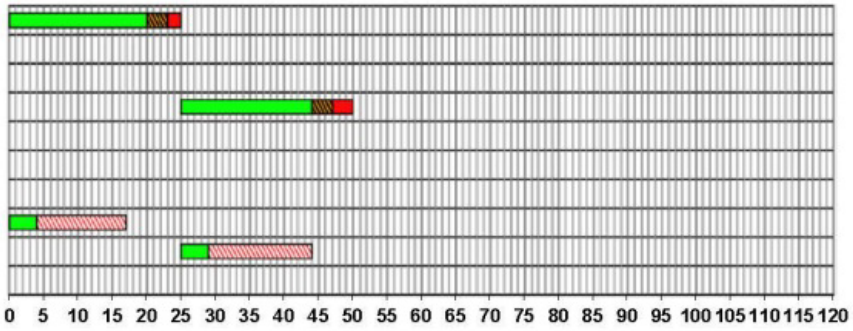
Johannesburg Roads Agency

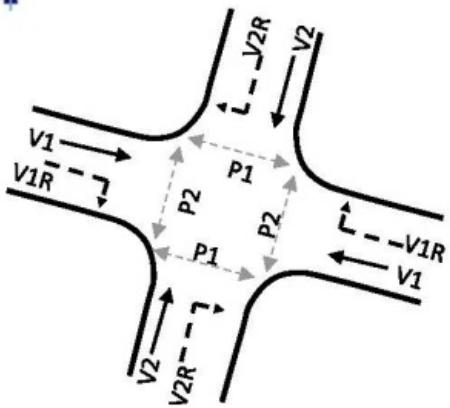
Republic and Bram Fischer (Hendrik Verwoerd) — Version 4

Time

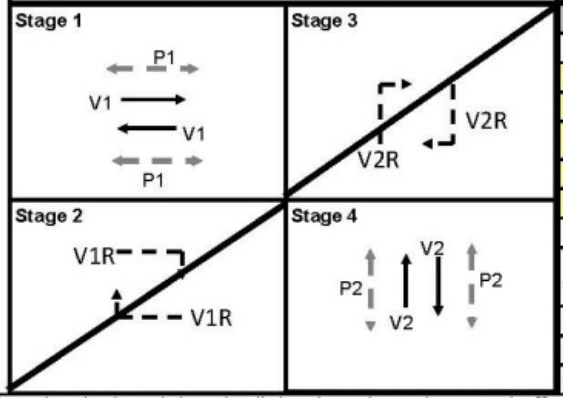
Stage	Start	Gr	FRed	FlGr	Ext	Yel	AR	Total
V1	0	20.0				3.0	2.0	25.0
V1R								0.0
V2R								0.0
V2	25	19.0				3.0	3.0	25.0
								0.0
								0.0
								0.0
P1	0	4.0	13.0					17.0
P2	25	4.0	15.0					19.0
								0.0
CYCLE								50

Fixed Time Plan





Stage Movements



NOTES

Version 4

Republic east approach upgraded by adding a short exclusive left turn lane and moving corner kerb. Timings to remain as per version 3, including offsets except FRM

National Road Traffic Regulation 287A. It is hereby declared that the "phasing, time plans and offset settings of the junction" is approved.

Signed	
Name:	A G Brislin
Position:	Engineer (Pr Eng)
Pr: 980355	

Johannesburg Roads Agency

Signed	
Name:	J A Wilken
Position:	Man: Traff Sig Design (Pr Tech Eng)
Pr: 201470193	
Date:	31-Oct-14

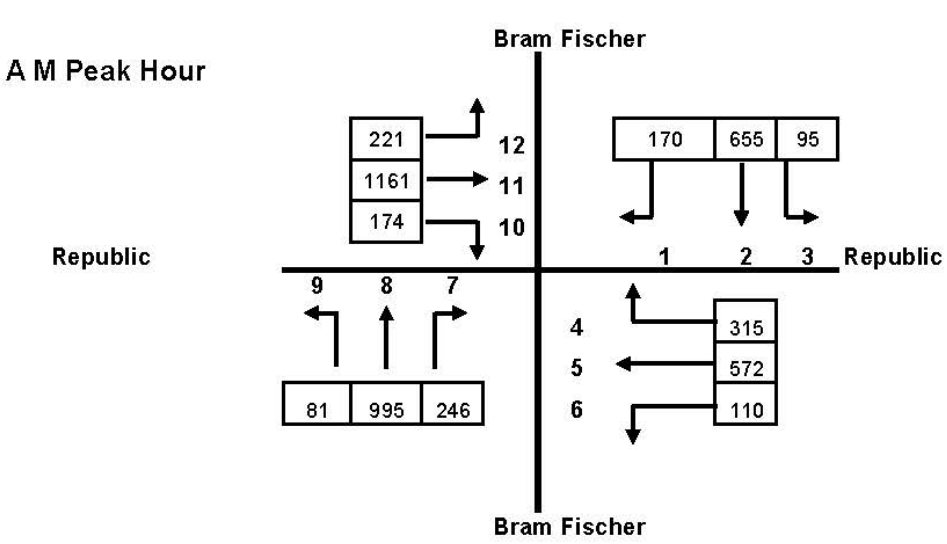
In operation	
Time Plan :	Night Plan 4
Cycle :	50
From-To:	See Event Table
Operation:	Fixed Time Plan
Offset:	44 "
Version:	4

Intersection Name:
Republic and Bram Fischer (Hendrik Verwoerd)

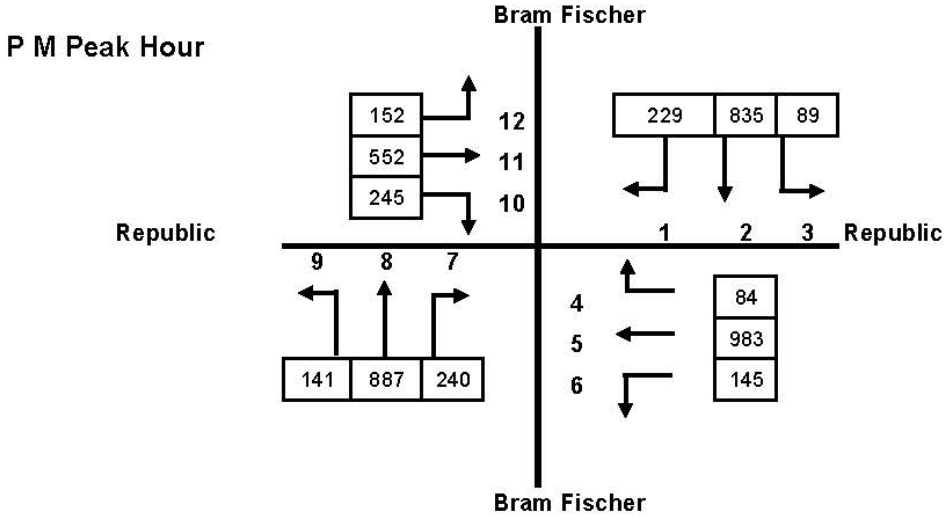
Intersection No.
R1627

Republic and Bram Fischer (Hendrik Verwoerd) *Version 4*

A M Peak Hour



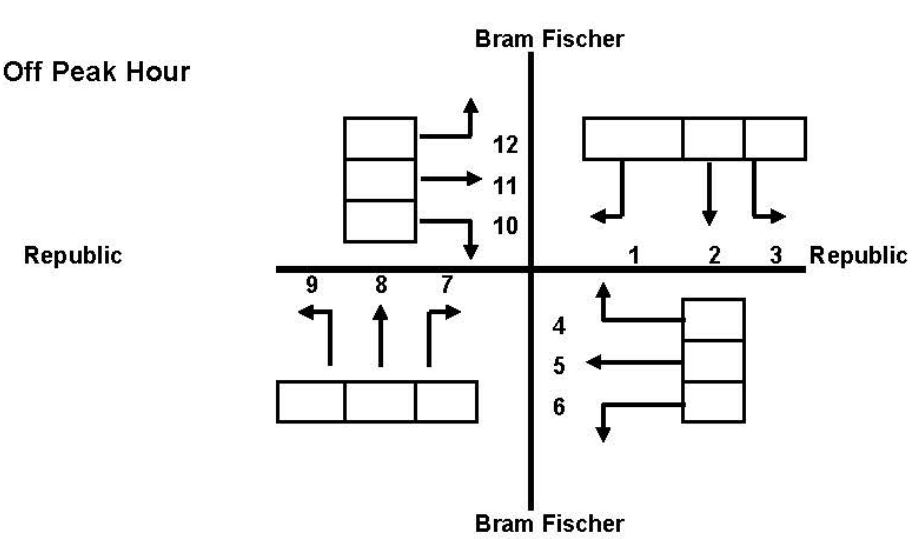
P M Peak Hour



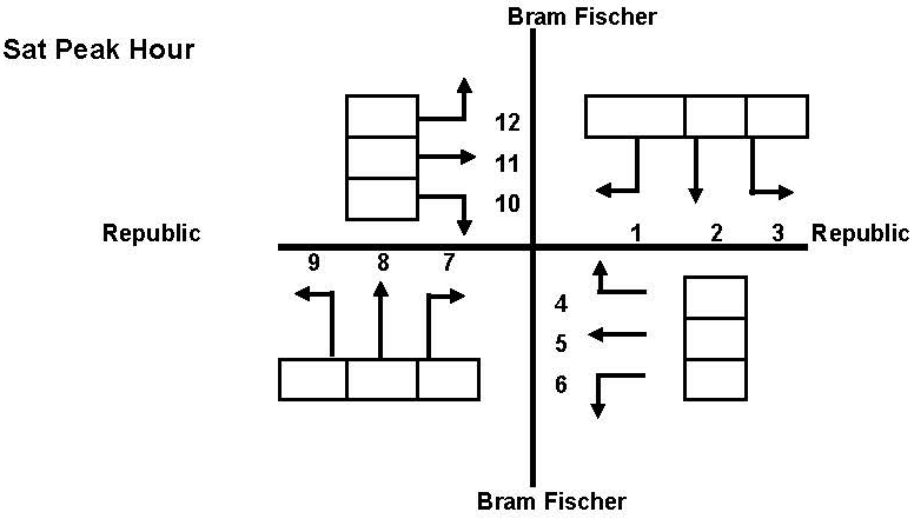
Signed:		Johannesburg Roads Agency	**Signed:**		**Intersection Name:**
Name:	A G Brislin		**Name:**	J A Wilken	**Republic and Bram Fischer (Hendrik Verwoerd)**
Position:	Engineer (Pr Eng)		**Position:**	Man: Traff Sig Design (Pr Tech Eng)	
Pr: 980355			**Pr: 201470193**		**Intersection No.:**
			Date:	31-Oct-14	**R1627**

Republic and Bram Fischer (Hendrik Verwoerd) *Version 4*

Off Peak Hour



Sat Peak Hour



Signed:		Johannesburg Roads Agency	Signed:		Intersection Name:
Name:	A G Brislin		Name:	J A Wilken	Republic and Bram Fischer (Hendrik Verwoerd)
Position:	Engineer (Pr Eng)		Position:	Man: Traff Sig Design (Pr Tech Eng)	
Pr: 980355			Pr: 201470193		Intersection No.:
			Date:	31-Oct-14	R1627

Republic and Bram Fischer (Hendrik Verwoerd) *Version 4*

Intersection intergreen calulations

Intersection name : Republic and Bram Fischer (Hendrik Verwoerd)
Site Number : R1627

Approach :		Approach Speed [km/hr]	Grade [%]	Clearance Distance	Yellow interval required [sec]	All red interval required [sec]	Yellow interval to be used [sec]	All red interval to be used [sec]
North :	Bram Fischer	60	-1%	31.0	3.0	2.7	3.0	3.0
East :	Republic	60	1%	25.5	3.0	2.2	3.0	2.0
South :	Bram Fischer	60	2%	31.0	3.0	2.5	3.0	3.0
West :	Republic	60	3%	25.5	3.0	2.1	3.0	2.0

All intergreen values to be used must be rounded to the nearest second.As a general guide allocate portions of the yellow interval to the all-red interval required to round off

Design and Comments

Data look-up tables

Speed limit or advisory speed	Recommended steady yellow interval (seconds) for gradients of Steep Downhill <- 8%	Downhill -8% to -4%	Flat and uphill >- 4%
≤ 60 km/h	4	3.5	3
70 km/h	4.5	4	3.5
≥ 80 km/h	5	4.5	4

Intersection Width W (m)	15	22.5	30	37.5	45	52.5	60
All-red period (seconds)	2	2.5	3	3.5	4	4.5	5

Signed:		Johannesburg Roads Agency	**Signed:**		**Intersection Name:**
Name:	A G Brislin		**Name:**	J A Wilken	**Republic and Bram Fischer (Hendrik Verwoerd)**
Position:	Engineer (Pr Eng)		**Position:**	Man: Traff Sig Design (Pr Tech Eng)	
Pr: 980355			**Pr: 201470193**		**Intersection No.:**
			Date:	31-Oct-14	**R1627**

Republic and Bram Fischer (Hendrik Verwoerd) *Version 4*

Pedestrian Crossing Calculations

YES	NO
✓	

1. Are pedestrian signal heads required?

2. Calculation of distances and crossing times.

Approach to cross		Direction of	Crossing Distance		Walking Speed	Flashing Red Man required	Min Green Man	FRM Used
			Non Staged(m)	Staged (m)	(m/s)	(sec)	(sec)	(sec)
North:	Bram Fischer	E-W	24.5	15	1.2	12.5	4	13
East:	Republic	N - S	30	18	1.2	15.0	4	15
South:	Bram Fischer	E - W	20	10	1.2	8.3	4	13
West:	Republic	N - S	21.5	12.5	1.2	10.4	4	15

3. Design Comments and Notes :

Pedestrian clearance times for the E-W and N-S movements have been assumed to be staged as median islands have been provided on all approaches.

Signed:		Johannesburg Roads Agency	**Signed:**		**Intersection Name:**
Name:	A G Brislin		**Name:**	J A Wilken	**Republic and Bram Fischer (Hendrik Verwoerd)**
Position:	Engineer (Pr Eng)		**Position:**	Man: Traff Sig Design (Pr Tech Eng)	
Pr: 980355			**Pr: 20147019**		**Intersection No:**
			Date:	31-Oct-14	**R1627**

Republic and Bram Fischer (Hendrik Verwoerd) *Version 4*

EVENTS TABLE

Day of the Week	Start Tim	End Time	Plan No.	Cycle	Offset
Weekday	00:00	06:00	4 (Nght)	50	25
Weekday	06:00	09:00	1 (AM)	100	70
Weekday	09:00	15:30	3 (OFF)	70	7
Weekday	15:30	18:30	2 (PM)	90	14
Weekday	18:30	20:00	3 (OFF)	70	7
Weekday	20:00	24:00	4 (Nght)	50	25
Sat/Sunday	00:00	06:00	4 (Nght)	50	25
Sat/Sunday	06:00	09:00	3 (OFF)	70	7
Sat/Sunday	09:00	14:00	5(Sat)	80	10
Sat/Sunday	14:00	20:00	3 (OFF)	70	7
Sat/Sunday	20:00	24:00	4 (Nght)	50	25

Signed:		Johannesburg Roads Agency	**Signed:**		**Intersection Name:**
Name:	A G Brislin		**Name:**	J A Wilken	**Republic and Bram Fischer (Hendrik Verwoerd)**
Position:	Engineer (Pr Eng)		**Position:**	Man: Traff Sig Design (Pr Tech Eng)	
Pr: 980355			**Pr: 201470193**		**Intersection No.:**
			Date:	31-Oct-14	**R1627**

Republic and Bram Fischer (Hendrik Verwoerd) *Version 4*

APPENDIX C : TRAFFIC SIGNAL CHECKLISTS

C.1 TRAFFIC SIGNAL LAYOUT CHECKLIST (1/3)

SECTION	REQUIREMENT	CHECKED
	GENERAL	
1.2	Location of installation, north arrow	✓
1.2	Drawing to scale, Scale shown	✓
30	Version number	✓
1.2	Signature of responsible registered professional engineer or technologist	✓
	SIGNAL WARRANTS	
2.2	Minimum requirements for installation of traffic signals met	E/S
2.3	Alternatives that may obviate the need for traffic signals not viable or feasible	E/S
2.4.2	Queue length warrants met	E/S
	SPEED LIMITS	
3.10	Speed limits given. No limit exceeds 80km/h	✓
3.10	Measures on high-speed roads considered (traffic circles, etc.)	E/S
	BASE PLAN	
26.4	Property boundaries and fences	N/A
26.4	Roads, islands, medians and paint markings	✓
26.4	Approach gradients	✓
26.4	Paved sidewalks, driveways	N/A
26.4	Drainage structures	N/A
26.4	Plants and vegetation	N/A
26.4	Engineering services	N/A
26.4	Roadside furniture	N/A
26.4	Structures and buildings	N/A
	GEOMETRIC DESIGN	
5.2.3	Spacing of signalised junctions acceptable	E/S
5.2.4	Intersection angle minimum 70 degrees, including slipways	E/S
5.2.5	Sight distance requirements met (stopping, traffic signal faces, right-turn)	E/S
5.3.4	Right-turn sight distance adequate (particularly on wide medians/curves)	E/S
5.2.6	Design vehicle swept paths	E/S
5.2.7	Lane widths (approach and exit sides)	✓
5.2.8	Median widths (minimum 1,2m, but 2m minimum when pedestrians)	E/S
5.2.9	Junction corner radius (8 to 10m radii preferred), Barrier kerbs	E/S
5.3.1	Auxilliary through lane (100m beyond junction)	N/A
5.3.2	Left-turn lane provided when there is an opportunity for separate phase	N/A
5.3.3	Right-turn lane where possible, should be provided when speed exceeds 60km/h	✓
5.3.6	Auxiliary lane designs and lengths	N/A
5.3.5	Double and triple turn requirements(triple only at T-junctions and one-way streets)	N/A
5.3.7	Slipway design requirements met, 70 degrees maximum	N/A
3.3	Slipways separated from main junction by means of a constructed island	N/A
26.4	Parking space for signal maintenance vehicles	✓

Signed :		Johannesburg Roads Agency	**Signed :**		Intersection Name:
Name:	A G Brislin		**Name:**	J A Wilken	Republic and Bram Fischer (Hendrik Verwoerd)
Position:	Engineer (Pr Eng)		**Position:**	Man: Traff Sig Design (Pr Tech Eng)	
Pr: 980355			Pr: 201470193		Intersection No.:
			Date:	31-Oct-14	R1627

Republic and Bram Fischer (Hendrik Verwoerd) *Version 4*

APPENDIX C : TRAFFIC SIGNAL CHECKLISTS

C.1 TRAFFIC SIGNAL LAYOUT CHECKLIST (2/3)

SECTION	REQUIREMENT	CHECKED	
	ROAD SIGNS AND MARKINGS		
3.4/5.4	Road signs that may and may not be used with traffic signals		
5.4	Pedestrian prohibited sign R218 provided where required	N/A	
5.4	Traffic signal ahead warning signs provided where required (new signals, 70km/h, etc.)	N/A	
5.5.1	Stop lines		
5.5.2	Pedestrian crossing lines (should be provided, except where sign R218 used)		
5.5.3	Lane direction arrows		
5.5.3	Regulatory road markings		
5.5.4	Warning road markings		
5.5.5	Guidance road markings	N/A	
5.3.4	When signal face S1R used, right-turn lanes separated by painted island or similar	N/A	
	TRAFFIC SIGNAL FACES		
3.8	Only prescribed traffic signal faces used		
3.7	No duplicate light signals on one face		
3.8	Signal arrow signs ST1 to ST5 only used when faces S1L and S1R used	N/A	
3.8	Signal face S1 not used on same approach as S2, S3, S4, S5, S6 and S7		
3.8	Signal face S1R and S1L without ST3 and ST2 on slipways, otherwise with ST3 and ST2	N/A	
3.8	Signal faces S2, S3, S4, S5, S6 and S7 only when specific turns not allowed	N/A	
3.8	Signal faces S2, S6 and S7 not when there is an opposing conflicting movement	N/A	
3.8	Signal faces S10R and S10L preferably not in a stand-alone location	N/A	
	PRINCIPAL SIGNAL FACES		
1.2.4	Number, type and location of traffic signal faces		
3.9.1	Two signal faces containing a red signal on the far side of stop line		
3.9.1	Additional far-side signal faces when further apart than 20m (preferable 16m)		
3.9.1	One signal face with red signal on near side (recommended at pedestrian crossings)		
3.9.1	Two faces with flashing green signals for turning phases (one far side, other far or near)		
3.9.1	Far-side signal faces not nearer than 6m from stop line (10m preferable)		
3.9.1	Far-side signal faces not less than 3m apart, nor further than 20m (16m preferable)		
3.9.2	Near-side signal faces not further than 3m from stop line		
	SUPPLEMENTARY SIGNAL FACES		
1.2.4	Number, type and location of traffic signal faces		
3.11	At least two signal faces visible over minimum sight distances		
3.11	At least two signal faces on far side visible over minimum distance of 50m		
3.11	At least one signal face visible in cone of vision		
3.11	At least one signal face visible for right-turning vehicles waiting within junction		
3.11	Additional faces provided for consistency and uniformity		
3.12.3	Overhead signals on high-speed roads or to ensure consistency/uniformity		
	MOUNTING OF TRAFFIC SIGNAL FACES		
3.11	No distracting advertisements and features near signal faces		
3.12.1	Minimum clearance distance (0,5 or 0,1m on medians when crossfalls fall away)		
3.12.2	Maximum lateral distance (not further than 2m from left edge of roadway)		
3.12.5	Overhead signals on left-hand side of road		

Signed:		Johannesburg Roads Agency	**Signed :**		**Intersection Name:**
Name:	A G Brislin				Republic and Bram Fischer (Hendrik Verwoerd)
Position:	Engineer (Pr Eng)		**Name:**	J A Wilken	
Pr: 980355			**Position:**	Man: Traff Sig Design (Pr Tech Eng)	
Signed:			**Pr: 20147019:**		**Intersection No.:**
Name:			**Date:**	31-Oct-14	R1627
Position:					

APPENDIX C : TRAFFIC SIGNAL CHECKLISTS

C.1 TRAFFIC SIGNAL LAYOUT CHECKLIST (3/3)

SECTION	REQUIREMENT	CHECKED	
	PEDESTRIAN AND PEDAL CYCLIST SIGNALS		
1.2	Number, type and location of pedestrian signal faces		
4.6	Location of pedestrian signal faces		
4.3	Push buttons provided and pedestrian signals demand dependent	N/A	
4.7	Push button locations and directions	N/A	
4.6	Staggered crossing considered	N/A	
	SIGNAL ASPECTS AND POSTS		
8.5	Luminous intensity (normal or high - high on roads with speed limit 70 km/h or greater)		
16.2.3	Aspect sizes (210 or 300 mm)		
16.3	Signal louvres and visors		
16.4	Background screens (optionally with white retro-reflective borders)		
16.5	Yellow retro-reflective strips for signal posts (optional)		
	VEHICLE DETECTION		
7	Vehicle-actuated control type and methodology		
7.8/20.5	Number, type and location of vehicle detectors		
20.4	Detector operations (latching or non-latching)		
	CONTROLLER AND ELECTRICAL		
18.7	Location of controller (according to requirements)		
22	Source of power		
22.4	Cable ducts and draw boxes		
22.2	Wiring, Number of cores		
5.6	Road lighting considered		

REMARKS

Signed:		Johannesburg Roads Agency	**Signed :**		**Intersection Name:**
Name:	A G Brislin		**Name:**	J A Wilken	Republic and Bram Fischer (Hendrik Verwoerd)
Position:	Engineer (Pr Eng)		**Position:**	Man: Traff Sig Design (Pr Tech Eng)	
Pr: 980355			Pr: 201470193		**Intersection No.:**
Signed:			**Date:**	31-Oct-14	R1627
Name:					
Position:					

Republic and Bram Fischer (Hendrik Verwoerd) *Version 4*

APPENDIX C : TRAFFIC SIGNAL CHECKLISTS

C.2 TRAFFIC SIGNAL PHASING AND TIMING CHECKLIST (1/1)

SECTION	REQUIREMENT	CHECKED	
	GENERAL		
1.2/6.16	Signal configuration diagrams provided	✓	
30	Version number	✓	
1.2	Diagrams signed by responsible engineer or technogolist	✓	
	TRAFFIC LIGHT SIGNALS		
3.5.1	Basic sequence of light signals (green, yellow, red)		
3.5.1	Differently coloured signals not displayed together to the same movement		
3.5.3/6.8	Yellow signal not to right-turn movement at same time as opposing traffic receives green		
3.5.1	Yellow arrow may be omitted under specific circumstances	N/A	
3.5.1	Yellow signal not in flashing mode		
3.5.4	Steady green right arrow not used when there is an opposing movement	N/A	
3.5.4	Steady green arrow and green disc light signals not displayed on the same approach	N/A	
3.5.4	Flashing green arrows not used when there is an opposing movement		
3.5.4	Pedestrian signals recommended when flashing green arrows used		
3.5	Green light signal not used in both steady and flashing modes		
3.6	No flashing signals in place of normal traffic signal operations		
3.6	Start-up procedure for traffic signals		
	PEDESTRIAN AND PEDAL CYCLISTS		
4.3.2	Pedestrian green - 4 to 7 seconds		
4.3.3	Pedestrian walking speed of 1,2 or 1,0 m/s		
4.3.3	Flashing red man reduced and replaced by steady red man (max 75% or intergreen)		
4.3.3	Flashing red man terminate before parallel all-red period		
4.3.3	Pedestrian green phase not in conflict with flashing vehicular green		
	TRAFFIC SIGNAL TIMING AND PHASING		
6.6	Recent traffic counts, Counts to standards	N/A	
6.5	Signal timing plans		
6.9	Left-turn phases (check pedestrians)	N/A	
6.10/6.11	Right-turn phases where required		
5.3.7	Protected-only right-turn phase when signalised slipway provided	N/A	
6.10.3	Leading/lagging right-turn phase appropriate, single lagging right-turn phase checked		
3.5.4	Green light signals minimum safety requirements		
3.5/6.12	Yellow and all-red intervals		
6.12.4/6.8	Longer all-red intervals on slipways (and when main phase followed by left-turn phase)	N/A	
6.13.4	Critical movement analysis used in signal timings	N/A	
6.14	Signal co-ordination acceptable (queues and platoon dispersion taken into account)		
6.14.6	Progression speed acceptable, possibility of speeding checked		
6.14.8	Possibility of obstructive (damaging) queue lengths checked		

Signed:		Johannesburg Roads Agency	**Signed :**		Intersection Name:
Name:	A G Brislin		**Name:**	J A Wilken	Republic and Bram Fischer (Hendrik Verwoerd)
Position	Engineer (Pr Eng)		**Position:**	Man: Traff Sig Design (Pr Tech Eng)	
Pr: 980355			Pr: 201470193		Intersection No.:
Signed:			**Date:**	31-Oct-14	R1627
Name:					
Position:					

Republic and Bram Fischer (Hendrik Verwoerd) *Version 4*

APPENDIX C : TRAFFIC SIGNAL CHECKLISTS

C.3 TRAFFIC SIGNAL COMMISSIONING CHECKLIST (1/2)

SECTION	REQUIREMENT	CHECKED
	GENERAL	
1.2	As-built layout plans and timing diagrams. Modifications shown and approved.	
1.2	Layout plans and timing diagrams signed by responsible engineer or technologist.	
	GEOMETRIC DESIGN, ROAD SIGNS AND CIVIL ENGINEERING	
5	Layout and geometric design of junction or crossing	E/S
5	Road works as per civil engineering requirements	
5	Road signs and markings	
5	Parking space for signed maintenance vehicle	
5	Final clean up and finishing off, removal of waste material.	
	TRAFFIC SIGNAL HEADS AND FACES	
3.5.1	Signal heads marked out during installation, and other junction control in place	E/S
3	Types of traffic signal faces, signal symbols (disc, arrow, etc)	
16.4	Background screens (backboards) provided, white retro-reflective border if specified	
16.2.3	Signal aspect sizes, lenses, reflectors	
16.3	Signal visors (and louvres)	
16.2.2	Luminous intensity (normal or high)	
3.11	Alignment of signal axis	
3.11	Signal faces intended for specific movements not be mistaken by other movements.	
3.7	All vehicuLar light signals on same horizontal level	
	Installation, damage, cleanliness, etc	
	POSITION OF SIGNAL HEADS AND FACES	
3	Locations and directions of traffic signal faces	
3.9.1	Far-side signal faces not nearer that 6m from stop line (10m preferable)	
3.9.1	Far-side signal faces not less than 3m apart, nor further than 20m (16m preferable)	
3.9.2	Near-side signal faces not further than 3m from stop line	
3.12.1	Minimum clearance distance - 0,5 or 0,1 m on medians where crossfall falls away	
3.12.2	Maximum lateral distance - not further than 2m from left edge of roadway	
3.12.2	Post minimum/ maximum mounting heights - 2,3m/3,0m - 2,1m pedestrian minimum	
3.12.2	Totem mounting heights - 1m separation	
3.12.2	Overhead minimum/maximum clearance/ mounting heights - 5,2m/6,2m	
3.12.5	Overhead preferably on left hand side of road	
	PEDESTRIAN SIGNAL FACES AND PUSHBUTTONS	
4.6	Locations and directions of pedetrian signal heads	
4.7	Red man signal not higher than vehicular green signal (may not be on the same height)	
4.7	Locations and directions of push buttons, 1,1m heights	
4.7	Pedestrian symbols on pushbuttons	
	Correct operation by testing each button.	
	Installation damage	
	SIGNAL POSTS	
16.5	Foundations, anchor bolts, size and depth, backfill, concrete strength (where used)	
	Conduit entry, capping before pouring of concrete	
	Vertical alignment of posts, cantilevers and gantries	
16.5	Yellow retro-reflectorised strips provided if specified	
	Paint work, damage	

Signed:		Johannesburg Roads Agency	**Signed :**		Intersection Name:
Name:	A G Brislin		**Name:**	J A Wilken	Republic and Bram Fischer (Hendrik Verwoerd)
Position:	Engineer (Pr Eng)		**Position:**	Man: Traff Sig Design (Pr Tech Eng)	
Pr: 980355			**Pr: 20147019**		Intersection No.:
Signed:			**Date:**	31-Oct-14	R1627
Name:					
Position:					

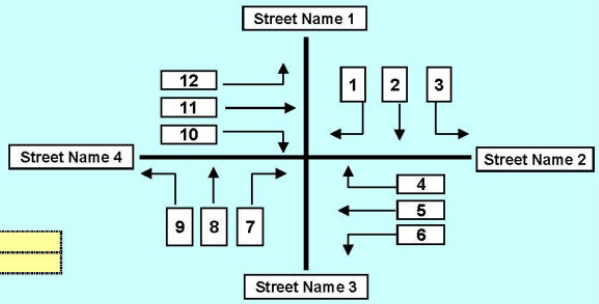
APPENDIX C : TRAFFIC SIGNAL CHECKLISTS

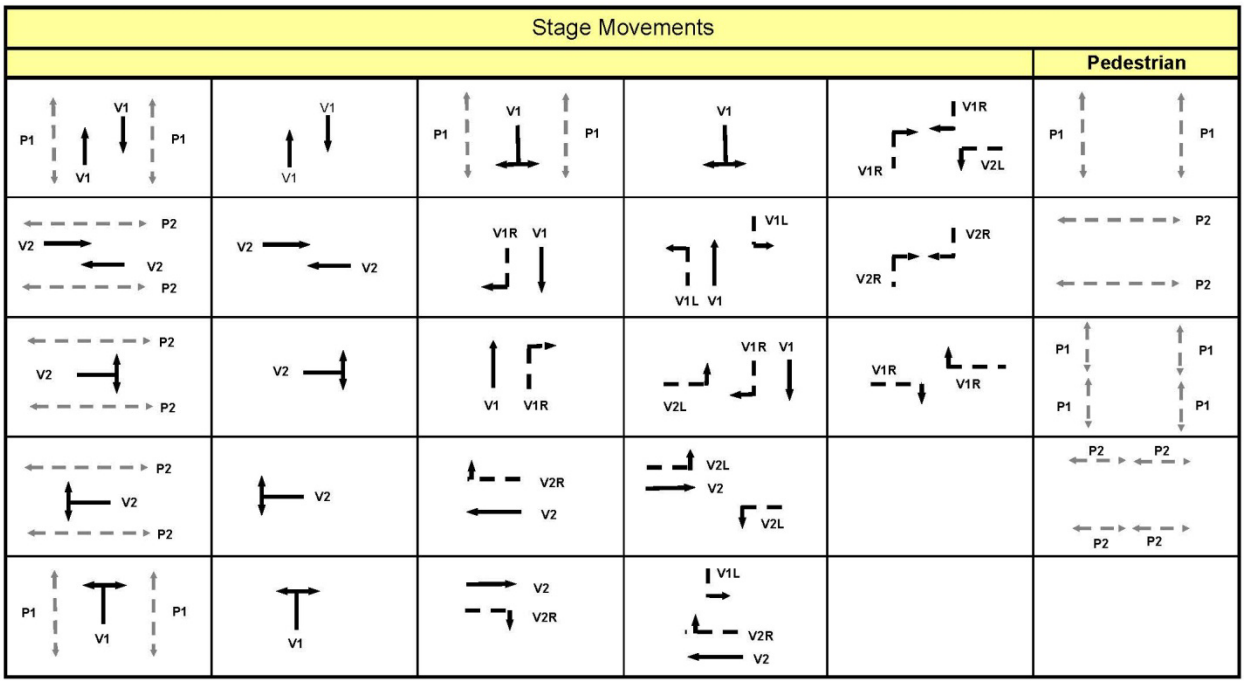
C.3 TRAFFIC SIGNAL COMMISSIONING CHECKLIST (2/2)

SECTION	REQUIREMENT	CHECKED
	VEHICLE DETECTORS (CHECKED DURING INSTALLATION)	
20.5.2	Location, dimensions and layout	
20.5.3	Saw cut width and depth, Debris, dirt and moisture removed	
20.5.3	Correct loop wiring, no splicing, no damage, no sharp corners, correct depth	
20.5.3	Proper sealing of slot, proper adherance to pavement	
20.5	Correct operation by using actual vehicle or a metal sheet that simulates a vehicle	
	TRAFFIC SIGNAL CONTROLLER	
18.7	Location of controller	
	Foundations and fixing, alignment	
18	Controller type	
	Cables entering cabinet (adequately sealed)	
18.7	Sealing and waterproofing, operation of cabinet doors	
	Cleanliness, damage, paint work	
6	Operation, signal plans, phases and timing, co-ordination, fallback plan	
	Manual control panel operation	
19.5	Communication with central control system, synchronisation	
18.4	Conflict monitoring	
18	Signal start- up sequence, Restart after power failure (retention of signal timings)	
18.5	Fault monitoring, red lamp monitoring	
30	Maintenace record in cabinet	
	DUCTS, DRAW BOXES AND TRENCHES (CHECKED DURING CONSTRUCTION)	
22	Location and sizes, materials, damage and cleanliness	
22	Provision of draw wire in all ducts	
22	Excavation trench width and depth, preparation of trenches and beds	
22	Compaction of excavations, backfill material, Asphalt reinstatement	
26	Sidewalks, paving, plants and grass	
26	Damaged services	
	ELECTRICAL (ALL ELECTRICAL WORK TO BE APPROVED BY A QUALIFIED ELECTRICIAN)	
22	Power supply (source of power)	
22	Earthing, ground rods	
	Conduits - size and type, collapsed sections, bending, joints	
	Cables and wiring, colour coding and tags, damage	
22	Provision of drip loops	
22	No unauthorised splicing of cables	
	Wiring tested for continuity and electrical leaks	
22	Wiring certificate issued	
	REMARKS	

Signed:		Johannesburg Roads Agency	**Signed :**		**Intersection Name:**
Name:	A G Brislin		**Name:**	J A Wilken	**Republic and Bram Fischer (Hendrik Verwoerd)**
Position:	Engineer (Pr Eng)		**Position:**	Man: Traff Sig Design (Pr Tech Eng)	
Pr: 980355			**Pr: 20147019**		**Intersection No.:**
Signed:			**Date:**	31-Oct-14	**R1627**
Name:					
Position:					

Traffic Counts:	AM	PM	OFF	SAT
Movement 1	170	229		
Movement 2	655	835		
Movement 3	95	89		
Movement 4	315	84		
Movement 5	572	983		
Movement 6	110	145		
Movement 7	246	240		
Movement 8	995	887		
Movement 9	81	141		
Movement 10	174	245		
Movement 11	1161	552		
Movement 12	221	152		
Peak Hour Factor				
Peak Time				
Street Name N	Bram Fischer			
Street Name E	Republic			
Street Name S	Bram Fischer			
Street Name W	Republic			





APPENDIX E7.1

(Refers to Chapter 7: Roads Design)

CONTENTS

CHECKLIST FOR INFORMATION ON DETAIL DESIGN DRAWINGS

NOTE: THIS AN EXTENDED LIST BASED ON AN EARLIER VERSION

SEE ITEMS IN RED

Drawing No.:		**Date:**	
Township:			
Extension/Erf No.:			
		Check 1	**Check 2**
1	**PLAN: NEW INFORMATION**		
1.1	Property subdivisions, numbers and road names		
1.2	**Reference line**, peg distances, road edge/kerb, road names/number		
1.3	Dimensions (a) Width of road		
	(b) Distance from centre line to road reserve		
	(c) Distance from centre line to staked line		
	(d) Width of road reserve		
1.4	Radius of bell-mouths to be shown if not equal to 10 m		
1.5	Water pipes (a) Primary		
	(b) Secondary		
	(c) Joint numbers		
1.6	Drainage (a) Kerb inlets with sizes, numbers and invert levels		
	(b) Pipes and sizes		
	(c) Manholes and invert levels		
1.7	Attenuation pond dimensions and capacity		
1.8	Intersections of streets in blocks with peg distances		
1.9	Intersection angles		
1.10	True north		
1.11	Title and reference pegs		
1.12	Bus bay details		
1.13	Split ducts for existing services		
1.14	Labelling of kerbing type where different or changes		
1.15	Typical cross-sections		
1.16	Legend		

			Check 1	Check 2
2	**PLAN: EXISTING SERVICES**			
2.1	Communications: overhead poles, underground cables and distribution boxes			
	(a) Telkom			
	(b) Neotel			
	(c) Dark Fibre Africa/MTN			
	(d) Cell C			
	(e) Vodacom			
	(f) City Connect			
2.2	Sewer pipes with sizes – mark size e.g. Existing 150 Ø			
2.3	Water pipes with sizes – mark size 100 Ø and larger			
2.4	**City Power** Electricity	(a) Sleeves/ducts/pipes with sizes		
		(b) Overhead poles		
		(c) Underground cables		
		(d) Sub-stations		
2.5	**Traffic Signals**	**(a) Sleeves/ducts/pipes with sizes**		
		(b) Traffic signal control box		
		(c) Underground cables		
		(d) Signal Poles and heads		
2.6	**Eskom Electricity**	**(a) Sleeves/ducts/pipes with sizes**		
		(b) Overhead poles		
		(c) Underground cables		
		(d) Sub-stations		
2.7	Stormwater:			
	(a) Sizes of pipes/culverts – mark size e.g. Existing 450 Ø, etc.			
	(b) Relationship to new stormwater drains			
	(c) Invert levels			
	(d) Kerb inlets			
2.8	**Nodes** (Manholes)	**(a) Joburg Water (Water & Sewer)**		
		(b) Rand Water Board		
		(c) Stormwater (JRA)		
		(d) Telkom		
		(e) Neotel		
		(f) Dark Fibre Africa/MTN		
		(g) Cell C		
		(h) Vodacom		
		(i) City Connect		
2.9	**Gas**	**(a) Egoli Gas**		
		(b) Sasol Gas		
2.10	Rand Water Board pipes			
2.11	Parks Department (irrigation)			
2.12	Notes on affected services			

		Check 1	Check 2
3	**LONGITUDINAL and CROSS SECTIONS**		
3.1	Datum		
3.2	Natural ground line profile		
3.3	New road centre line profile		
3.4	Intersecting roads with peg distance		
3.5	New **nodes** (manholes) and kerb inlets centre line peg distances		
3.6	New **nodes** (manholes) and kerb inlets with invert levels		
3.7	Sizes of new pipes or culverts		
3.8	**Node numbers**		
3.9	Begin Vertical Curve (BVC), End Vertical Curve (EVC) and Point of Vertical Intersection (PVI)		
3.10	Existing stormwater pipes and culverts		
3.11	Existing sewers at correct depths		
3.12	Existing water mains at correct depths		
3.13	Existing Rand Water Board pipes		
3.14	Typical cross sections		
3.15	**Kerb types**		
4	**ROAD DESIGN INFORMATION**		
4.1	Grades		
4.2	Vertical curves		
4.3	Existing **reference and/or** centre line levels		
4.4	New road levels LHS (or note for cross fall)		
4.5	New road levels centre line		
4.6	New road levels RHS (or note for cross fall)		
4.7	Horizontal curves on **reference line and/or** centre line		
4.8	BTC, BC, EC, ETC peg distances on **reference line and/or** centre line		
4.9	Pavement design		

		Check 1	Check 2
5	**DRAINAGE DESIGN INFORMATION**		
5.1	**Conduit** (Pipe, **box culvert etc.**) size and length		
5.2	**Conduit type (e.g. spigot & socket, ogee)**		
5.3	Grade		
5.4	**Pipe class**		
5.5	**Bedding class**		
5.6	Design runoff in m^3/sec and velocity in m/sec		
5.7	Critical flow depth and velocity		
5.8	Pipe capacity in m^3/sec		
5.9	**Node type (e.g. manhole, kerb inlet, field outlet)**		
5.10	**Node number**		
5.11	**Node cover type/detail no.**		
5.12	Invert levels		
5.13	Attenuation pond capacity		
5.14	Attenuation pond inlet and outlet details		
6	**NOTES ON DRAWING**		
6.1	Notes		
6.2	Scale		
6.3	**Consulting Engineer's Name/Contact details**		
6.4	Designed by signature		
6.5	PrEng. signature		
6.5	Date		
6.7	Title		
6.8	Drawing Number		
6.9	**JRA reference number**		

NOTE:
1. More than one service plan should be used as necessary to avoid detail congestion.

APPENDIX E7.2

(Refers to Chapter 7: Roads Design)

CONTENTS

JOHANNESBURG ROADS AGENCY	ROADS & STORMWATER DETAIL DESIGN	E-7.2.2
Client:	Project No.:	
Project Name:	Description: General	

DWG. NO.	REV. NO.	18. NORTH POINT	19. DRW. & BAR SCALES	20. DWG. NO. INCL. REV.	21. TITLE BLOCK	22. PURGE DRAWING	23. FOOTER	24. A3 COPY IN FILE	25. FULL SIZE COPY IN CABINET	A CHECKED BY	B. CHECKED SIGNATURE	C. DATE	D. APPROVED BY	E. APPROVAL SIGNATURE	F. DATE
		Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N						

JOHANNESBURG ROADS AGENCY
JOHANNESBURG ROADS AGENCY
Client:
Project Name:
ROADS & STORMWATER DETAIL DESIGN
Project No.:
Description: Key Plan (1:5000 or 1:10000)
E-7.2.3
DWG. NO.
REV. NO.
1. PROPOSED ROUTE & RD RESERVE
2. BRIDGES (EXISTING & PROPOSED & NO'S)
3. ROUTE/ROAD NUMBERS and/or STREET NAMES
4. EXISTING ROADS & PUBLIC OR ACCESS ROADS
5. ROADS TO BE CLOSED OR DEVIATED
6. Km MARKINGS (every km) – SHOWN PROMINENTLY
7. SUB-DIVISION OF PROPERTIES & FARM NAMES
8. MUNICIPAL & DISTRICT BOUNDARIES
9. RIVERS & NAMES, RAILWAY LINES
10. BUS/MINI-BUS TAXI STOPS
11. RADII OF HORIZONTAL CURVES
12. LIST OF DETAIL DESIGN PLANS WITH NO'S & DESCRIPTIONS
13. POSITIONS OF LAYOUT PLANS & NUMBERS
14. GRID LINES & CO-ORDINATE VALUES
15. LOCALITY SKETCH TO SUITABLE SCALE i.e. 1:250 000
16. LIMITS OF CONSTRUCTION
17. DESTINATIONS
18. NORTH POINT
19. DRAWING SCALE & BAR SCALE
20. DRAWING NO. INCLUDING REVISION
21. TITLE BLOCK
22. PURGE DRAWING
23. FOOTER
24. A3 COPY IN FILE
25. FULL SIZE COPY IN CABINET
A CHEKED BY
B CHECKED SIGNATURE
C DATE
D APPROVED BY
E APPROVAL SIGNATURE
F DATE

JOHANNESBURG ROADS AGENCY
JOHANNESBURG ROADS AGENCY
Client:
Project Name:
ROADS & STORMWATER DETAIL DESIGN
Project No.:
Description: Locality Plan (1:50000)
E-7.2.4
DWG. NO.
REV. NO.
1. REFERENCE TO ORIGINAL 1:50000 SHEET NO. i.e. 2528AA
2. EXIST. RDS. INDICATED THINNER THAN SUJECT ROUTE WITH NUMBERS
3. ROUTES / ROADS (not in report) INVESTIGATE / APPROVED (broken line)
4. EXISTING / PROPOSED INTERCHANGE POSITIONS
5. DESCR. IN ABRIDGED TITLE BLOCK IF INCL. IN KEY PLAN OR FULL TITLE IN SEP. LOC. PLAN
6. GRID LINES & CO-ORDINATE VALUES
7. DESTINATIONS
8. LIMITS OF PLANNING / CONSTR.
9. NORTH POINT
10. DRAWING SCALE & BAR SCALE
11. DRAWING NO. INCLUDING REVISION
12. TITLE BLOCK
13. PURGE DRAWING
14. FOOTER
15. A3 COPY IN FILE
16. FULL SIZE COPY IN CABINET
A. CHECKED BY
B. CHECKED SIGNATURE
C. DATE
D. APPROVED BY
E. APPROVAL SIGNATURE
F. DATE

JOHANNESBURG ROADS AGENCY	ROADS & STORMWATER DETAIL DESIGN	E-7.2.5
Client:	Project No:	
Project Name:	Description: LAYOUT PLAN (1:1000)	

DWG No.	REV. No	1. PROPOSED ROUTE		2. BRIDGES, Nr's & INTERCHANGES		3. RD Nr's and/or STREET NAMES		4. EXISTING ROADS, STREETS & SERVICE RDS		5. RDS TO BE CLOSED OR DEVIATED		6. km MARKINGS (every 200m) – SHOWN PROMINENTLY		7. NORTH POINT		8. MUNICIPAL AND DISTRICT BOUNDARIES, SUB-DIVISIONS OF PROP. & FARM NAMES, RIVERS & RAILWAY LINES		9. DESTINATIONS		10. ROAD RESERVE BOUNDARY & WIDTHS		11. RADII OF HORIZONTAL CURVES		12. TABULATED HORIZ. CURVE RADIUS, LENGTH, DEFL ANGLE, TRANSITION & TANG. LENGTH		13. POSITIONS OF PIs		14. BEGINNING & END OF HORIZ. CURVES & COORDS.		15. TRAVELLED WAY & SHOULDER WIDTHS		16. REST & STOP AREAS		17. DIRECTION OF TRAFFIC FLOW		18. EXTENT OF CUTS & FILL		19. GUARDRAILS		20. CULVERTS (SIZE, SKEW, km, FLOW DIRECTION), DRAINAGE PERIMETRE BANKS, BERMS, LENGTH OF EMBANKMENT		21 CATCHPITS		22. INTERSECTIONS & ACCESSES		23. ANGLES OF INTERSECTIONS		24. DISTANCE BETWEEN CROSSWAYS		25. COORDS OF BC, EC, PI		26. LIMITS OF PLANNING		27. DRAWING No INCLUDING REVISION		28. TITLEBLOCK		29. PURGE DRAWING		30. FOOTER		31. A3 COPY IN FILE		32. FULL SIZE COPIED IN CABINET		A. CHECKED BY	B. CHECKED SIGNATURE	C. DATE	D. APPROVED BY	E. APPROVALS SIGNATURE	F. DATE
		Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N						

JOHANNESBURG ROADS AGENCY
JOHANNESBURG ROADS AGENCY
Client:
Project Name:
ROADS & STORMWATER DETAIL DESIGN
Project No.:
Description: SHIFT SERVICES (1: 1000)
E-7.2.6
DWG. NO.
REV. NO.
1. ELECTRIC POWER LINES & CABLES
2. COMMUNICATIONS LINES & CABLES
3. SEWER PIPES
4. WATER, GAS & OIL PIPES
5. CULVERTS & BRIDGES
6. MANHOLES & KERB INLETS
7. SIDE DRAINS, CANALS & SUB SURFACE DRAINS
8. GUIDE BLOCKS, DROP INLETS & SUB SURFACE DRAINS
9. PIPE CONDUITS FOR TRAFFIC SIGNAL CABLES @ INTERSECTIONS
10. NORTH POINT
11. GRID LINES & VALUES
12. TITLE BLOCK
13. DRAWING NO. INCLUDING REV.
14. PURGE DRAWING
15. FOOTER
16. A3 COPY IN FILE
17. FULL SIZE COPY IN CABINET
A. CHECKED BY
B. CHECKED SIGNATURE
C. DATE
D. APPROVED BY
E. APPROVAL SIGNATURE
F. DATE

JOHANNESBURG ROADS AGENCY

ROADS & STORMWATER
DETAIL DESIGN

E-7.2.7

Client:

Project No.:

Project Name:

Description: **Setting Out (1:200/500/1000)**

DWG. NO.	REV. NO.	1. PROPOSED ROUTE	2. BRIDGES & NO.'S & INTERCHANGES	3. ROUTE/ROAD NO.'S and/or STREET NAMES	4. DESTINATIONS	5. DIRECTION OF TRAFFIC MOVEMENT	6. Km MARKINGS (every 200 m) SHOWN PROMINATELY	7. TABLE OF DETAILS OF HORIZ. CURVES: RAD., LENGTH, DEFL., TANGENT & TRANS. LENGTHS	8. RADII OF HORIZONTAL CURVES	9. BEGIN & END OF HORIZONTAL CURVES & COORDS	10. POSITIONS OF PI.'S	11. TABLE OF DETAILS GUARDRAILS: LENGTH, KM DIST., TYPE ETC.	12. CADASTRAL BOUNDARIES WITH BEACONS, NO.'S & CO-RDS	13. NEW BRIDGE NO.'S	14. LIMITS OF CONSTRUCTION	15. NORTH POINT	16. SHEET NO. OF TOTAL NO. OF SHEETS	17. DRAWING NO. INCLUDING REV.	18. DRAWING SCALE & BAR SCALE	19. TITLE BLOCK	20. PURGE DRAWING	21. FOOTER	22. A3 COPY IN FILE	23. FULL SIZE COPY IN CABINET			A. CHECKED BY	B. CHECKED SIGNATURE	C. DATE	D. APPROVED BY	E. APPROVAL SIGNATURE	F. DATE
		Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N						

JOHANNESBURG ROADS AGENCY
ROADS & STORMWATER
DETAIL DESIGN
E-7.2.8
Client:
Project No:
Project Name:
Description: LONG SECTION PLAN (H 1:1000 V 1:100)
DWG No.
REV. No
1. POSITION OF PEGS & REF. PEGS WITH ELEVATIONS
2. ELEVATION OF STAKED GROUND LINE (FOR DUAL CWAYS & FREEWAYS)
3. BRIDGE & INTERCHANGE POSITIONS AND No's
4. DESTINATIONS
5. KILOMETER DISTANCES (km)
6. DATUM LEVEL
7. GRADIENTS (%)
8. LENGTH OF VERTICAL CURVES
9. K VALUES OF VERTICAL CURVES
10. BEGINNING & END OF VERTICAL CURVES
11. VERTICAL POINTS OF INTERSECTION (VPI) & THEIR LEVELS (ELEVATIONS)
12. DETAILS OF SUPER ELEVATIONS
13. RD LEVELS ON RD CLINE & L. R & CENTRE TRAVELLED WAY
14. SETTING OUT DETAILS (AT TOP OF UNSECTION FOR SINGLE CWAY)
15. GROUND LEVELS ON STAKED LINE (TO NEAREST 0.01m) & RD CLINE
16. BEGINNING & END ETC OF HORIZ. CURVES
17. CULVERTS & DRAIN PIPES (m DISTANCE, SIZE, SKEW, HEADWALLS, CATCHPITS & No's
18. DESIGN SPEED
19 POSITION OF INTERSECTIONS &ACCESS ROADS & SIGHT DISTANCES
20 EARTHWORK QUANTITIES (SINGLE CWAYS)
21 GUARDRAILS
22 BARRIER LINES (FOR SINGLE CWAYS)
23 SURFACED SHOULDERS
24 KERBING
25. NORTH POINT
26 LIMITS OF PLANNING
27 DRAWING SCALE & BAR SCALE (HORIZONTAL & VERTICAL) WITH LEGEND & UNITS
28 TITLE BLOCK
29 DRAWING No. INCL REV.
30 PURGE DRAWING
31 A3 COPY IN FILE
32 FULL SIZE COPIED IN CABINET
A. CHECKED BY
B. CHECKED SIGNATURE
C. DATE
D. APPROVED BY
E. APPROVAL SIGNATURE
F. DATE

JOHANNESBURG ROADS AGENCY
JOHANNESBURG ROADS AGENCY
Client:
Project Name:
ROADS & STORMWATER DETAIL DESIGN
Project No.:
Description: Typical X-Section
E-7.2.9
DWG. NO.
REV. NO.
1. CENTRE LINE
2. DISTANCE BETWEEN C'WAYS (DUAL & FREEWAYS)
3. MEDIAN WIDTHS
4. SIDE SLOPES
5. SIDE DRAINS
6. FORMATION WIDTH
7. RESERVE WIDTH
8. LANE & SHOULDER WIDTHS
9. KERB WIDTHS
10. DIMENSIONS
11. CROSSFALL OF ROADWAY & SHOULDERS AS %
12. ALL DEVIATIONS FROM TYPICAL X-SECTIONS TO BE SUBSTANTIATED IN REPORT
13. CLEARANCES
14. SUBSOIL DRAINAGE
15. ANY OTHER DETAILS
16. DRAWING SCALE & BAR SCALE (HOR & VER) WITH LEGEND & UNITS
17. TITLE BLOCK
18. DRAWING NO. INCLUDING REV.
19. PURGE DRAWING
20. FOOTER
21. A3 COPY IN FILE
22. FULL SIZE COPY IN CABINET
A. CHECKED BY
B. CHECKED SIGNATURE
C. DATE
D. APPROVED BY
E. APPROVAL SIGNATURE
F. DATE

JOHANNESBURG ROADS AGENCY	ROADS & STORMWATER DETAIL DESIGN	E-7.2.x
Client:	Project No.:	
Project Name:	Description: **Blank**	

DWG. NO.	REV. NO.	1.		2.		3.		4.		5.		6.		7.		8.		9.		10.		11.		12.		13.		14.		15.		16.		17.		18.		19.		20.		21.		22.		23.		24.		25.		A. CHECKED BY	B . CHECKED SIGNATURE	C . DATE	D . APPROVED BY	E. APPROVAL SIGNATURE	F. DATE
		Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N						

APPENDIX F7.3

(Refers to Chapter 7: Roads Design)

CONTENTS

Table 7.1 – Volume 2 - Part 1: Roads - CONTENTS

TEXT

DRAWINGS

1.3	ROADS: DESIGN (continued)	
	Standard Turning Circles	RD-080
	Hammerhead Turning Circles	RD-081
	Controlled Access for Security Purposes	RD-090
	Enclosed Area: Type 1 Access Detail	RD-091
	Enclosed Area: Type 2A Closure Detail	RD-092
	Time Controlled Enclosed Area: Type 2B Closure Detail	RD-093
	Enclosed Area: Type 3 Closure Detail	RD-094
	Parking Details (Sheet 1 of 3)	RD-110
	Parking Details (Sheet 2 of 3)	RD-111
	Parking Details (Sheet 3 of 3)	RD-112
	Traffic Calming/Speed Hump Detail	RD-120
	Raised Pedestrian Crossing (Sheet 1 of 2)	RD-121
	Raised Pedestrian Crossing (Sheet 2 of 2)	RD-122
	Traffic Calming Measures – Various Techniques	RD-123
	Typical Layout of Mini-Circle	RD-130
	Walkways and Cycle Tracks	RD-140

Section	Title	Number JRA-SD
1.4	COMPLETE STREETS: DESIGN	
1.4	Index Sheet - Issue	300615
	Mobility & Access	RCS-010
	Summary of Design Elements (CoJ – Complete Streets)	RCS-011
	RISFSA Class 2: Arterial/Regional Distributor – Typical Details	RCS-020
	RISFSA Class 2: Arterial/Regional Distributor – Typical Intersection with BRT Station	RCS-021
	RISFSA Class 2: Arterial/Regional Distributor – Typical Station Details Mid-Block	RCS-022
	RISFSA Class 2: Arterial/Regional Distributor – 62 m Cross Section	RCS-023
	RISFSA Class 2: Arterial/Regional Distributor – 62 m Cross Section – Additional Details	RCS-024
	RISFSA Class 2: Arterial/Regional Distributor – Road Marking Details for BRT Lanes	RDC-025
	RISFSA Class 3: District Distributor – Typical Details	RCS-030
	RISFSA Class 3: District Distributor – Typical Details with BRT	RCS-031
	RISFSA Class 4: CBD/Activity Street/Local Distributor/Boulevard – Typical Details	RCS-040
	RISFSA Class 4: Industrial Road - Typical Details	RCS-041
	RISFSA Class 5: Residential Collector - Typical Details	RCS-050
	RISFSA Class 5: Residential Streets - Typical Details	RCS-051
	RISFSA Class 6: NMT/Greenway/User Path - Typical Details	RCS-060
	Basic Types of Sidewalk Ramping for Disabled Persons at Intersections	RCS-070

1.4	COMPLETE STREETS: DESIGN (continued)	
	Typical Tactile Pedestrian Crossing – Signalised Intersection – Combination Ramping	RCS-072
	Typical Tactile Pedestrian Crossing – Signalised Intersection – Parallel Ramping	RCS-073
	Typical Tactile Paving Details in Section	RCS-074

Section	Title	Number JRA-SD
1.5	**ROADS: BRT**	
1.5	Index Sheet - Issue	300615
	Typical Cross Section between Intersections	RBRT-010
	Typical Cross Section at Intersections	RBRT-020
	Typical Cross Section at BRT Stations	RBRT-030
	Long Section – Typical Treatment to Provide BRT Station at 0.0% Grade where Existing Road is at 5% Grade	RBRT-040
	Cross Section – Typical Treatment to Provide BRT Station at 0.0% Grade where Existing Road is at 5% Grade	RBRT-041
	Long Section – Typical Treatment to Provide BRT Station at 3% Grade where Existing Road is at 5% Grade	RBRT-050
	Cross Section – Typical Treatment to Provide BRT Station at 3% Grade where Existing Road is at 5% Grade	RBRT-051
	Typical Details	RBRT-060
	Typical Pavement Structure – ES100	RBRT-080
	Typical Pavement Structure – ES030	RBRT-081
	Typical Pavement Structure – ES010	RBRT-082
	Station Modules – (Sheet 1 of 2)	RBRT-100
	Station Modules - (Sheet 2 of 2)	RBRT-101

Table 7.2 – Volume 2 - Part 2: Stormwater - CONTENTS

TEXT

DRAWINGS

Section	Title	Number JRA-SD
2.3	**STORMWATER: MAINTENANCE**	
2.3	Index Sheet - Issue	300615
	Sandton Stormwater Structures for Maintenance: Plan Kerb Inlet (Sheet 1 of 4)	SWM-001
	Sandton Stormwater Structures for Maintenance: Sections of Kerb Inlet (Sheet 2 of 4)	SWM-002
	Sandton Stormwater Structures for Maintenance: Slab Details (Sheet 3 of 4)	SWM-003
	Sandton Stormwater Structures for Maintenance: Manhole Details (Sheet 4 of 4)	SWM-004
	Johannesburg Stormwater Structures for Maintenance: Details of Precast Cover Slabs for Wide Type Kerb Inlets – (Sheet 1 of 6)	SWM-005
	Johannesburg Stormwater Structures for Maintenance: Details of Precast Cover Slabs for Wide Type Kerb Inlets – (Sheet 2 of 6)	SWM-006
	Johannesburg Stormwater Structures for Maintenance: Layout Plan & Sections – 1 (Sheet 3 of 6)	SWM-007
	Johannesburg Stormwater Structures for Maintenance: Layout Plan & Sections – 2 (Sheet 4 of 6)	SWM-008
	Johannesburg Stormwater Structures for Maintenance: Layout Plan & Sections – 3 (Sheet 5 of 6)	SWM-009
	Johannesburg Stormwater Structures for Maintenance: Additional Section Details (Sheet 6 of 6)	SWM-010

Section	Title	Number JRA-SD
2.4	**STORMWATER: RETAINING WALLS/SUB SOIL DRAINAGE**	
2.4	Index Sheet - Issue	300615
	Details of Brick Retaining Wall with Sub Soil Drain	SSD-001
	Concrete Details of Concrete Retaining Wall with Sub Soil Drain	SSD-002
	Reinforcement of Concrete Retaining Wall	SSD-003

APPENDIX G

(Refers to Chapter 8: Stormwater Management)

CONTENTS

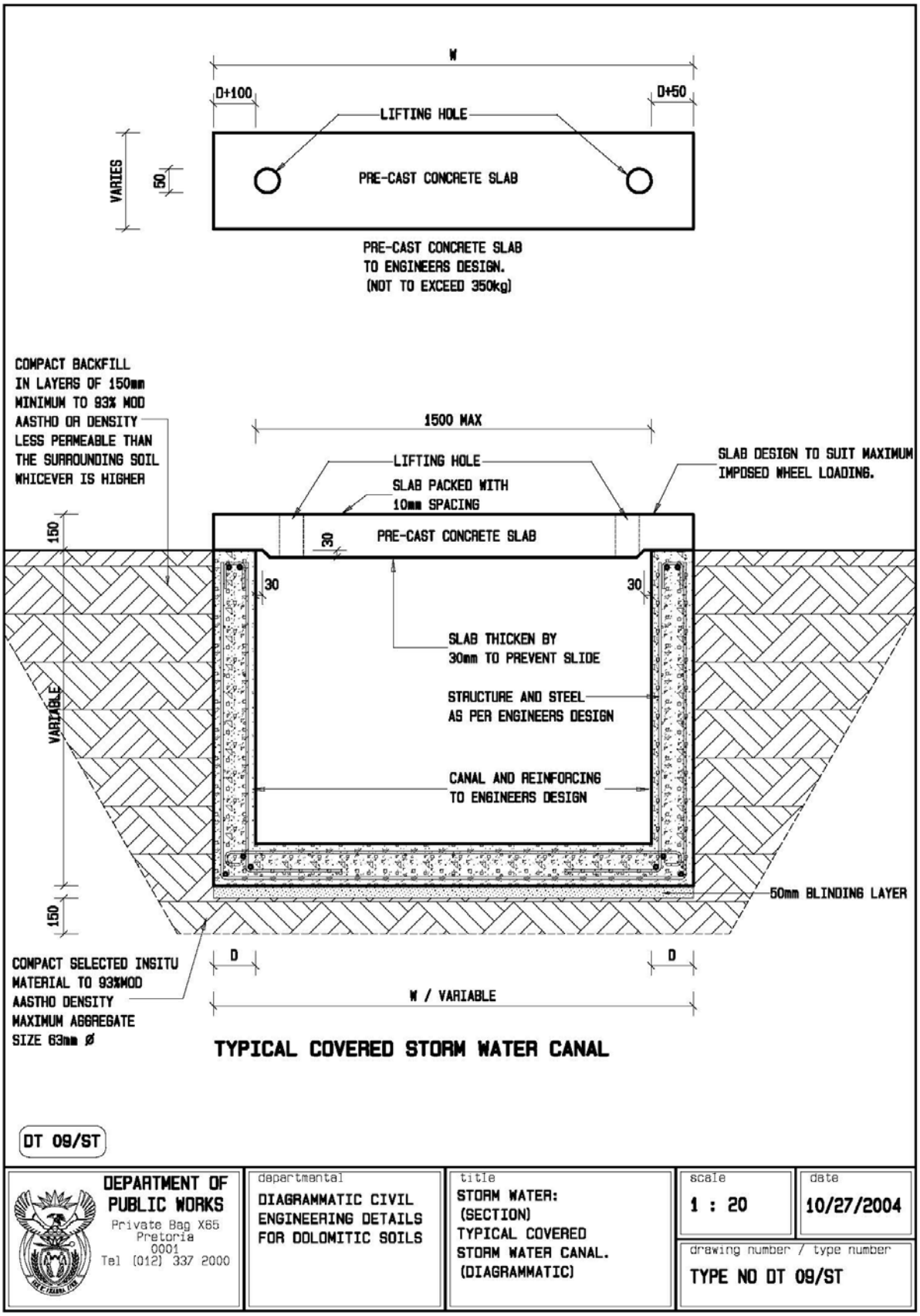


Figure G-8.1: Typical Covered Stormwater Canal for Dolomitic Areas

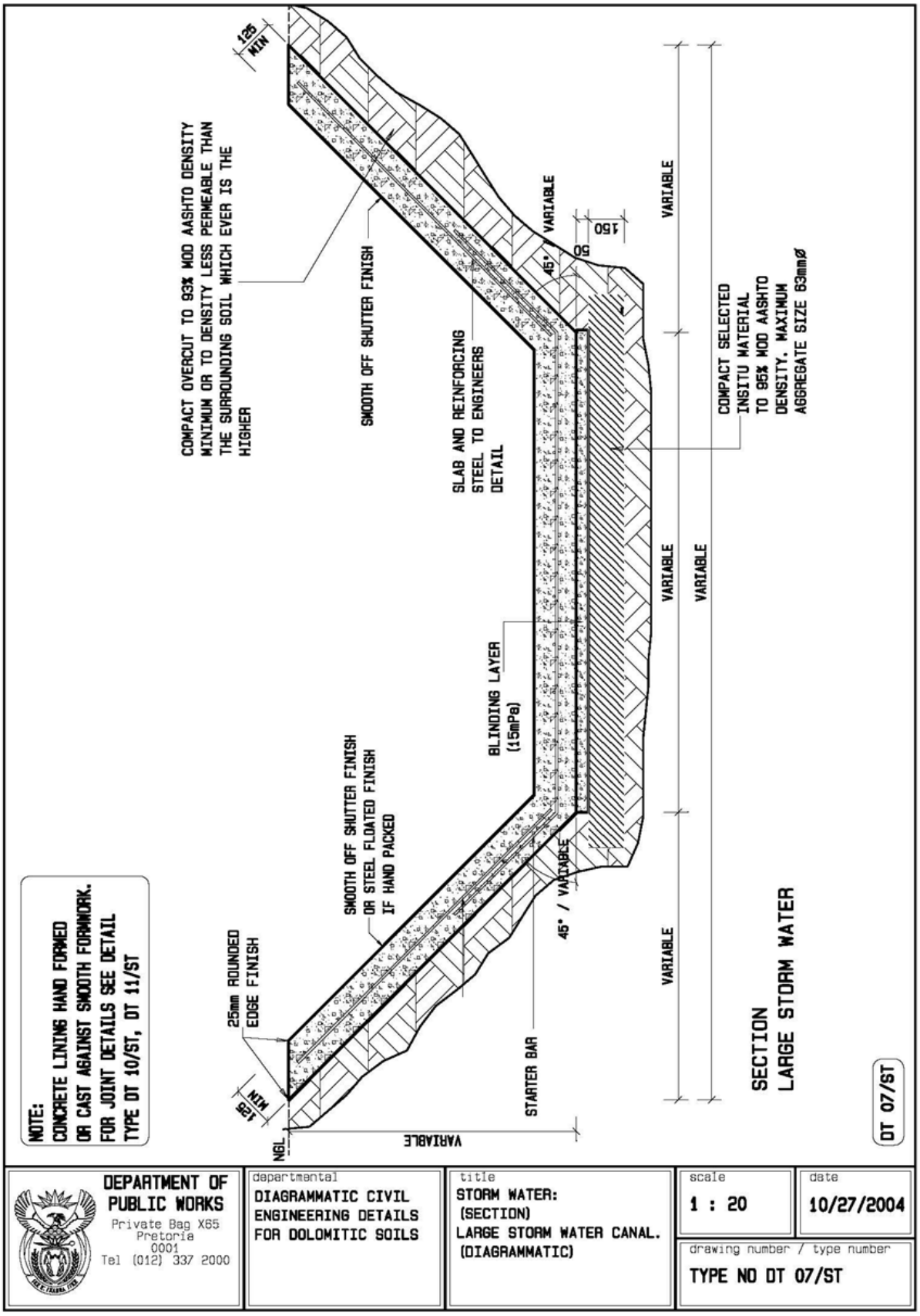


Figure G-8.2: Typical Trapezoidal Stormwater Canal for Dolomitic Areas

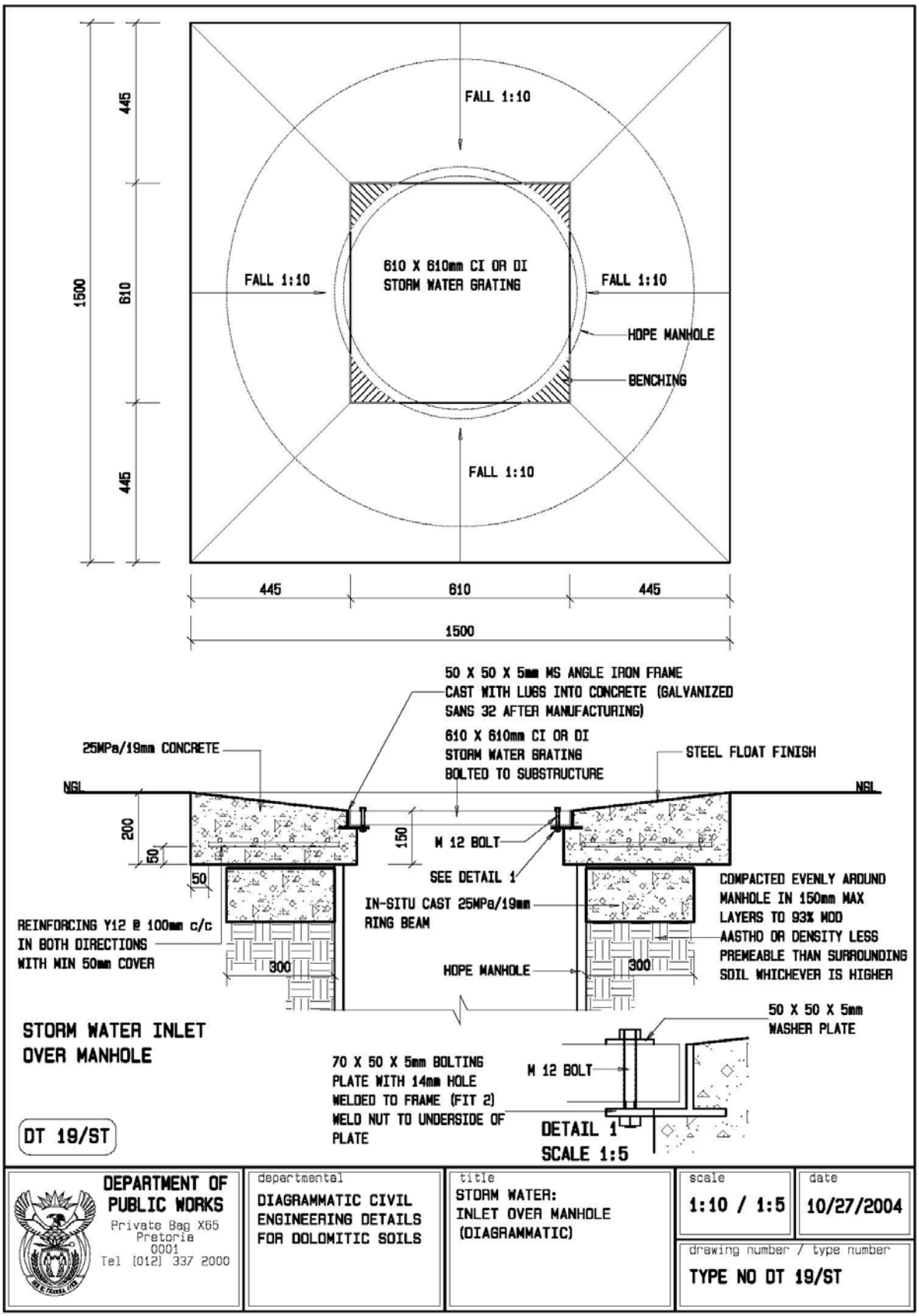


Figure G-8.3: Typical Manhole Grid Inlet

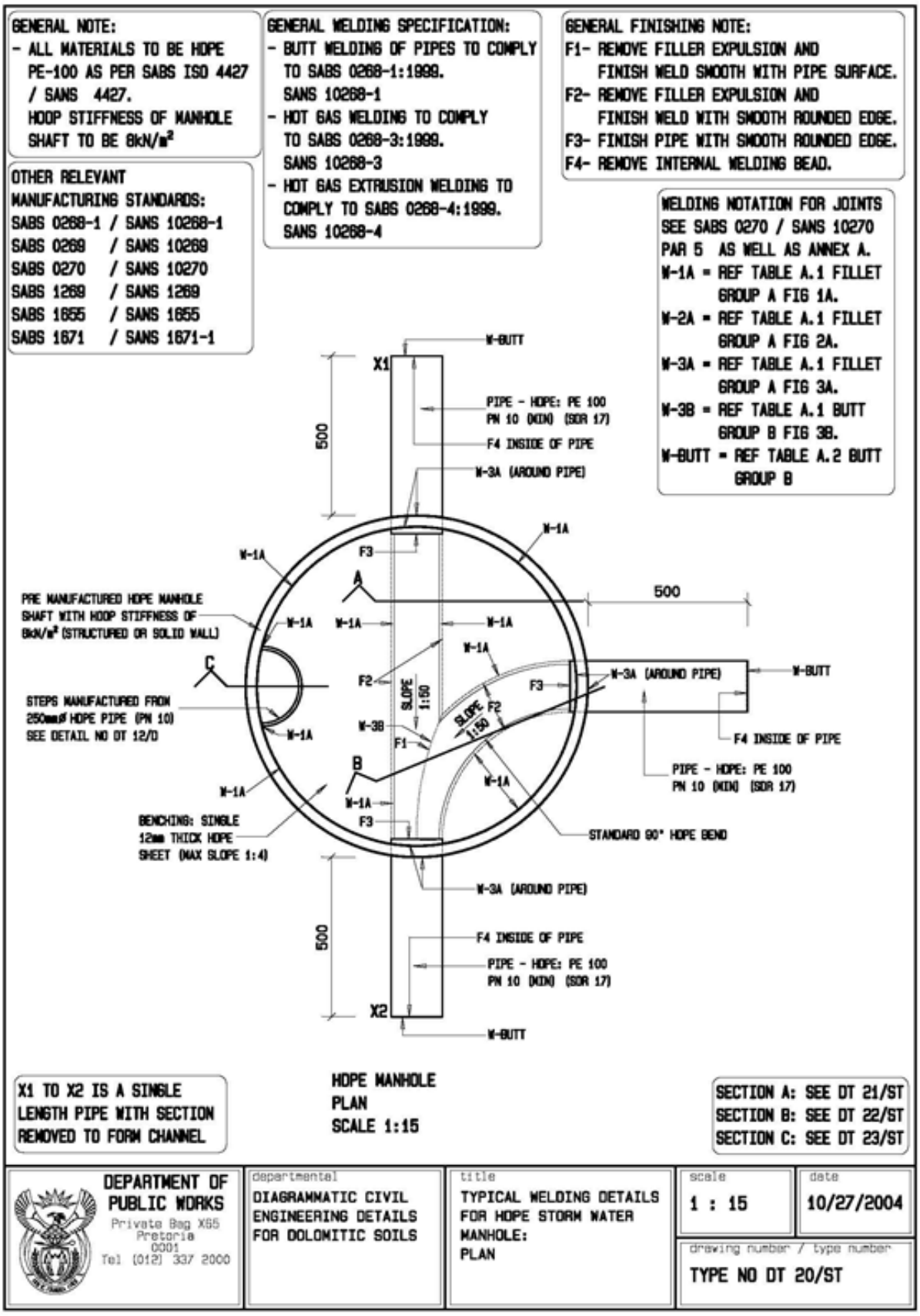


Figure G-8.4: Typical Welding Detail for HDPE Pipes in Stormwater Manhole

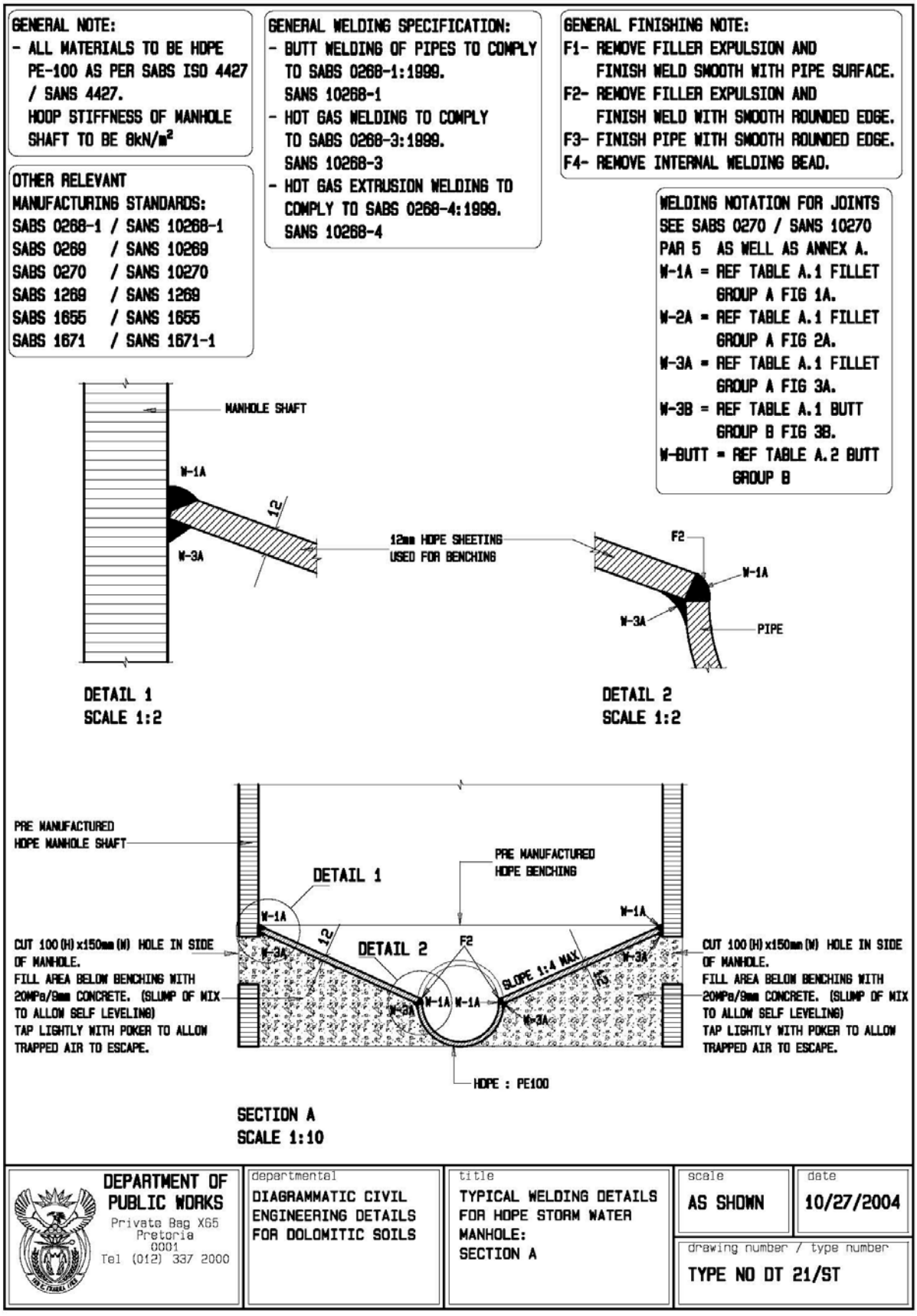


Figure G-8.5: Typical Welding Details for HDPE Pipes
Section A – Figure F-8.4

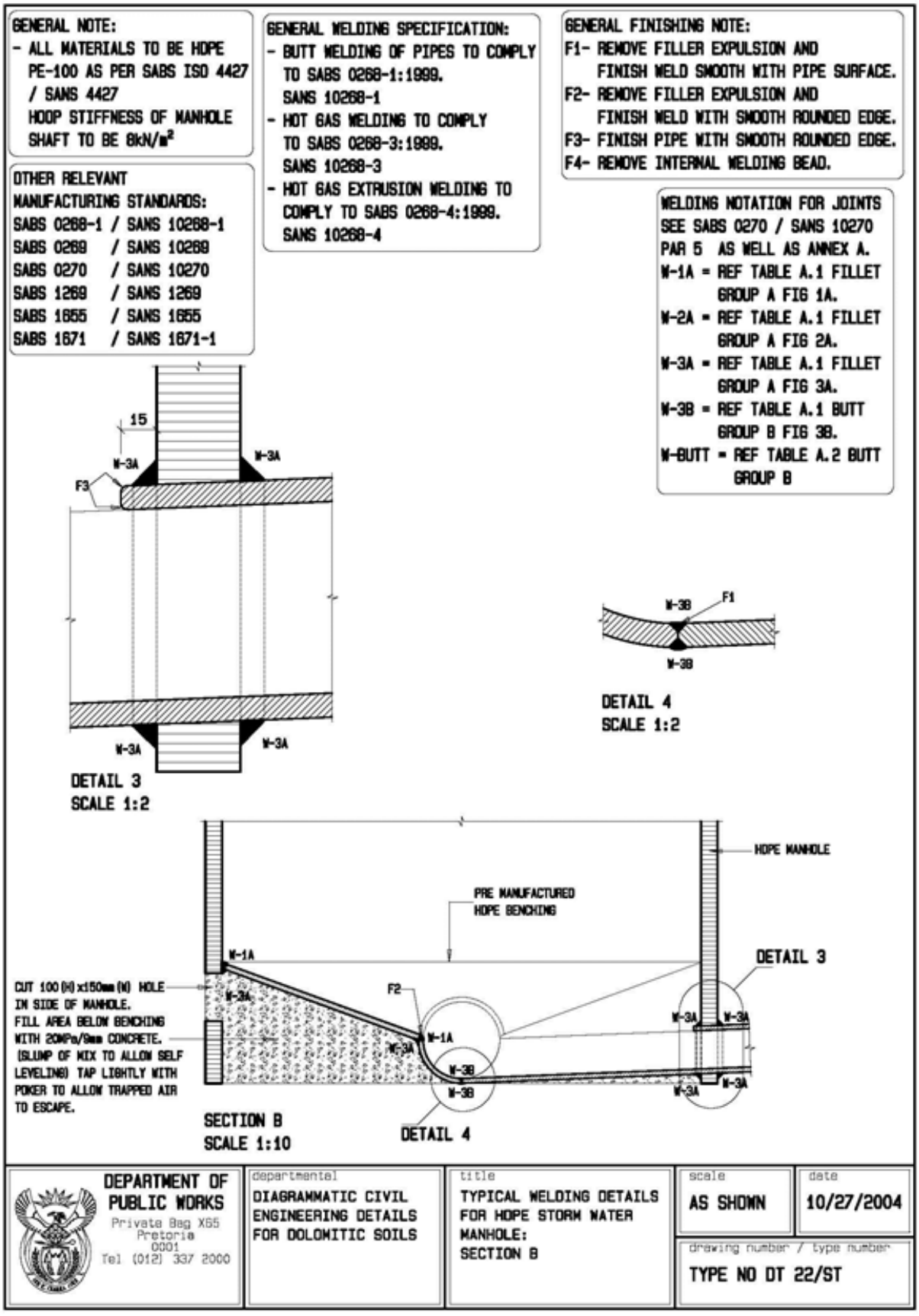


Figure G-8.6: Typical Welding Details for HDPE Pipes
Section B – Figure F-8.4

City of Johannesburg
Johannesburg Roads Agency
Reg. No. 2000/028993/07

66 Pixley Seme Street
Cnr Rahima Moosa Street
Johannesburg
2001

P/Bag x70
Braamfontein
South Africa
2017

Tel +27(0) 11 298 5000
Fax +27(0) 11 298 5178
www.joburg.org.za

Customer contact centre: 0860 562 874
@MyJra
Johannesburg Roads Agency
hotline@jra.org.za
www.jra.org.za