TRANSPORTATION MANAGEMENT PLAN_NORTHERN AQUEDUCT PHASE 4

EXECUTIVE SUMMARY

The eThekwini Water Services (EWS) branch of eThekwini Local Authority is responsible for the water supply to the greater Durban region. In recent years, unprecedented growth in water demand in the Western, Northern and North Eastern supply areas has led to infrastructure capacity problems. Planning studies carried out by EWS have indicated that the optimal solution to address the capacity problems is the installation of a new bulk supply pipeline from Umlaas Road through the Outer and Inner Western areas and to Ntuzuma, from where it can be extended eastwards to serve the proposed Blackburn development and Umhlanga as well as a northwards extension towards Phoenix and Ogunjini. Minor changes to existing infrastructure in the region of Phoenix 1 and 6 reservoirs and from Canelands to the Nyaninga reservoir can improve supply as well. These extensions and changes are collectively named the Northern Aqueduct Augmentation (NAA) which obtained approval from the Department of Agriculture, Environmental Affairs and Rural Development (DAEARD) in August 2012. The approved NAA has been divided into three Phases, namely, NAA Phase 1, NAA Phase 2 and NAA Phase 3.

Because the construction of the WA (Phase 2) has been put on hold, an alternative link (NAA Phase 4 (or the Engineers Phase 3) is currently being proposed. This is to provide water from the EXISTING Northern Aqueduct (NAX) into NAA Phase 1, so that Cornubia and other developments in the north of Durban, can be provided with water within the next 18 months, as the construction of the WA Ph2 will only reach the starting point of the NAA Ph2 (at Emachobeni) in five years time (optimistically). It is thus proposed that a new 1.2m pipe be laid in parallel with the existing pipelines (to remove the bottleneck in the system) **between Duffs Road and Phoenix 2 Reservoir**. This pipeline forms Phase 4 (See Diagram below) (in the Environmental Report) of the NAA and is required to be commissioned at the same time as NAA Ph 1, i.e. 2014.

The construction of the Northern Aqueduct Augmentation Phase 4 pipeline and pipework will have some impact on the road network during the construction period, as

approximately 18 roads (inclusive of minor and major roads) are proposed to undergo trenching or pipejacking activities depending on use and size of the road itself. The purpose of this Transportation Management Plan (TMP) in the construction of the Northern Aqueduct Augmentation Phase 4 project is to ***propose a set of coordinated transportation management strategies that will help to mitigate the impact of construction of the Northern Aqueduct Augmentation Phase 4 project on the current road network***. This TMP is a multi-faceted plan to maintain acceptable levels of traffic flow during the construction of the Northern Aqueduct Augmentation Phase 4 project. The transportation management strategies include Temporary Traffic Control measures (TTC) and Transportation Operations Strategies (TOS). The key benefits of the TMP are to promote mobility and to improve work zone safety for the travelling public and construction workers.

The manner in which the road network will be affected by the construction of the Northern Aqueduct Augmentation Phase 4 project varies considerably. Considering the sheer magnitude of the construction, a Public Information and Outreach Campaign will be developed to help mitigate the impacts of the construction on safety and mobility. The Public Information and Outreach Campaign and the TMP are complimentary to each other and will be executed in tandem.

Contingency Plans are a key part of the TMP as it describes processes to transform an unplanned event into a planned response. It will be the responsibility of the Contractor to develop contingency plans as the construction progresses through each area. The Contingency Plan will ensure that the right people are in the right place, at the right time with the right information and resources, to deal with all eventualities as a result of unpredicted scenario’s that may arise.

Monitoring the performance of the TMP during the construction is important to ascertain how closely the predicted impacts resemble the actual conditions in the field and whether the strategies of the TMP are adequate in managing the impacts. The monitoring of the TMP shall be the joint responsibility of the Engineer and the Contractor. If the performance requirements of the TMP are not met within reasonable tolerances, the Engineer and the Contractor must revisit the TMP.

Once the pipeline has been constructed, no negative impact will remain on the road network.

CONTENTS

LIST OF ABBREVIATIONS

EWS	eThekwini Water and Sanitation
PIC	Public Information Campaign
TMP	Transport Management Plan
TO	Transport Operations
TTC	Temporary Traffic Control
KZN DOT	KwaZulu Natal Dept of Transport
RTI	Road Traffic Inspectorate
ETA	eThekwini Transport Authority
NAA	Northern Aqueduct Augmentation project
NAA Phase 4	Northern Aqueduct Augmentation Phase 4
NAX	Existing Northern Aqueduct
NAC JV	Northern Aqueduct Consultants Joint Venture
TOS	Transportation Operation Strategies
TSO	Traffic Safety Officer

1 PROJECT DESCRIPTION

1.1 PROJECT BACKGROUND

EThekwini Water and Sanitation (EWS) is currently in the process of constructing a new bulk water pipeline from Cato Ridge to Inchanga, Pinetown, Tshelimnyama and Ntuzuma (and surrounds) with gravity-fed potable water (The Western Aqueduct (WA)). The pipeline ties into Umgeni Water's existing bulk water infrastructure beyond the municipal boundary, which receives potable water from the Midmar Dam system. The pipeline currently under construction consists of a steel pipe of varying diameters (1.6m – 0.6m). Construction of Phase 1 of the WA has been completed, but construction of Ph2 of the WA is on hold.

Application was made to the Department of Environmental Affairs, and a positive Record of Decision received, for the NAA which will inject water from the WA into the NAA system via an off-take at KwaDabeka. This will involve the construction of a new bulk water pipeline from Emachobeni to Umhlanga via the proposed Blackburn Reservoir, supplying areas north of the Umgeni River, south of the Ohlanga River and east of Ntuzuma (and surrounds) with gravity-fed potable water. The 50km pipeline recently authorised, will consist of a steel pipe of varying diameters, and will be named the 'Northern Aqueduct Augmentation'.

Phase 4, which is now being proposed, is named NAA Phase 3 by the engineers (for reasons un-necessary to describe here). There is an existing Northern Aqueduct (NAX), which will be augmented by the NAA. Once completed, Phase 1 of the NAA project will provide an important link between the existing NAX and the new developments in the north including Cornubia, Umhlanga, Waterloo and Nyaninga. The NAX however is presently operating very close to its maximum capacity and does not have spare capacity to supply the new developments such as Cornubia. The problem when the new demands are tagged onto the end of the system is the high velocities that will occur in the trunk mains running from Durban Heights to Phoenix 2 Reservoir via Duffs Road. This in turn results in high friction losses and inadequate flow through the system.

The most severe bottleneck in the existing NAX occurs in the section of trunk mains between Duffs Road and Phoenix 2 (linking the NAX to the NAA Phase1). This section of the existing system consists of a 525mm diameter pipe in parallel with a 450mm pipe between Duffs Road and the Phoenix 1 off-take and thereafter, a 450mm pipe in parallel

with a 375mm pipe up to Phoenix 2 Reservoir. These pipelines are completely inadequate for the purposes of providing a water supply into the NA Phase 1.

Because the construction of the WA (Phase 2) has been put on hold, an alternative link (NAA Phase 4 (or the Engineers Phase 3) is currently being proposed. This is to provide water from the EXISTING NAX into NAA Phase 1, so that Cornubia and other developments in the north of Durban, can be provided with water within the next 18 months, as the construction of the WA Ph2 will only reach the starting point of the NAA Ph2 (at Emachobeni) in five years time (optimistically).

It is thus proposed that a new 1.2m pipe be laid in parallel with the existing pipelines (to remove the bottleneck in the system) **between Duffs Road and Phoenix 2 Reservoir**. This pipeline forms Phase 4 of the NAA and is required to be commissioned at the same time as NAA Ph 1, i.e. 2014.

The existing two pipes within the servitude will continue to be used (current daily volume approximately 50,000m^3). The new bigger pipe will merely augment the existing pipelines which are presently a bottleneck in the system. The old pipes are much smaller (450 – 500mm) in diameter, and as such when the new pipe is tied into the system, the water will prefer the path of least resistance, and thus most of it, will ‘choose’ the bigger pipe. The ultimate 30-year demand in the system will result in a total flow of about 120,000 m^3 per day, of which 100,000 m^3 per day will flow in the new (bigger) pipe as a result of its lower friction loss.

1.2 PROJECT AREA

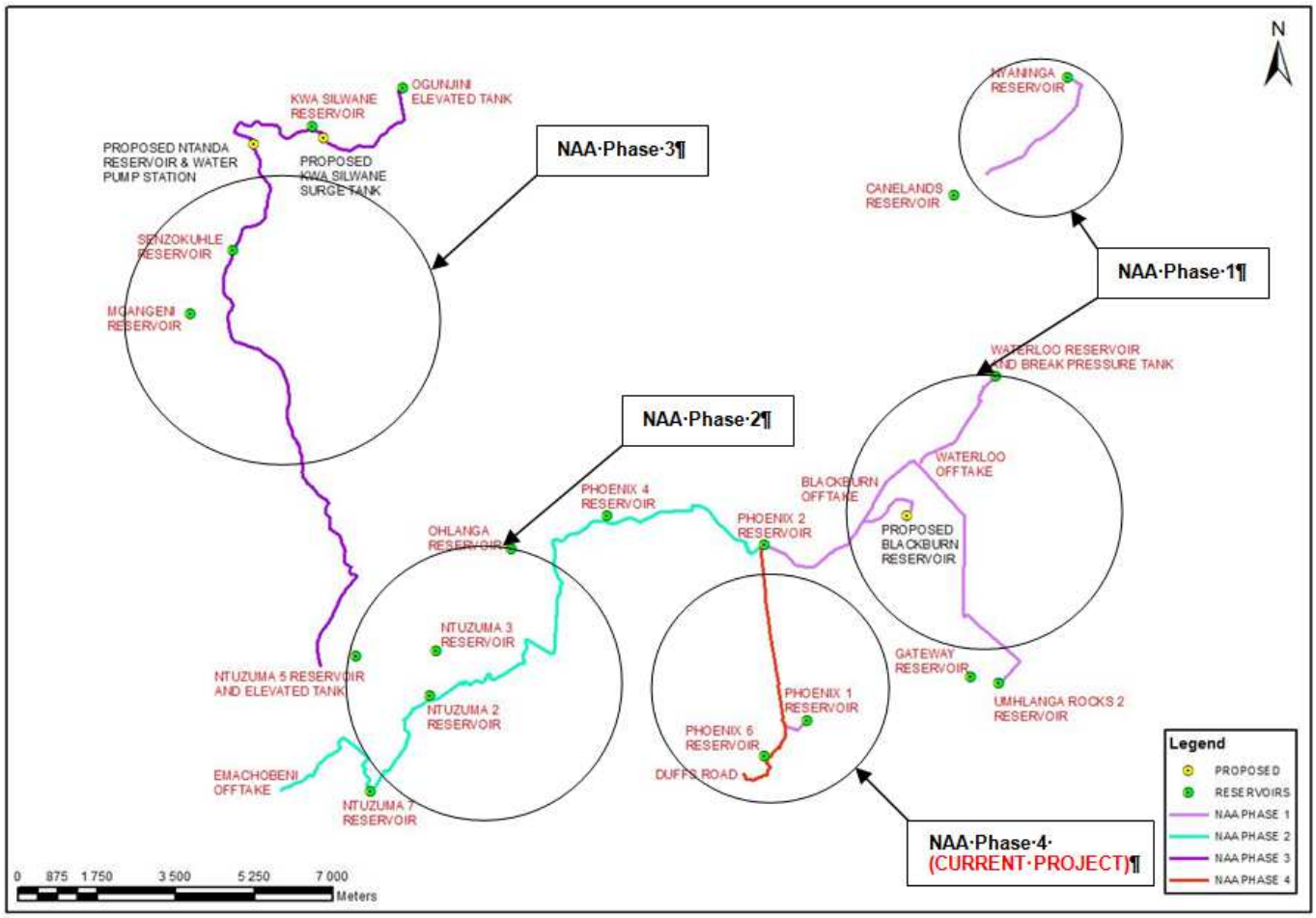

Figure 1.1: Phases of the Northern Aqueduct Augmentation Project (Phase 4 is in the colour red)

1.2.1 LOCATION

The proposed pipeline augmentation will take place in the eThekwini Municipality, Province of KwaZulu-Natal. The Northern Aqueduct Augmentation (Ph4) is to start on the western bank of the Umhlangane River, between Curnick Ndlovu Highway and the R102, at an off-take from the existing NAX and will terminate on the southern side of Phoenix Highway, opposite Phoenix 2 reservoir. This section of proposed pipeline is virtually straight and continuously moving north, within an existing servitude for most of the way. This portion of pipeline will feed into the Phoenix 2 Reservoir, in order to bypass NAA Phase 2 and the WA Phase2, which are still some years 'in the making'. The current land-use in this area is mostly open veld servitude, adjacent to medium to high density formal residential and business areas, with scattered sports fields, and some watercourse and road crossings.

1.3 NEED FOR A TRANSPORTATION MANAGEMENT PLAN (TMP)

Considering the impact of the NAA Phase 4 construction on the existing road network, it is imperative to have an effective Transport Management Plan. The purpose of this Transportation Management Plan (TMP) is to have a set of coordinated transportation management strategies that will help to mitigate the impact of construction of the NAA on the current road network. The TMP is a multi faceted plan of operational and demand management strategies to maintain acceptable levels of traffic flow during the construction of Phase 4 of the NAA.

2 QUALITATIVE SUMMARY OF ANTICIPATED WORK ZONE IMPACTS

The construction of the NAA Phase 4 may have an adverse impact on the transportation system in the vicinity of the project. Approximately 18 major and minor roads are proposed to be impacted upon during the construction phase. The impacts of the work zone on the transportation system are listed below:

- The trenching across roads will result in road closures, in part or total. Although these closures will last short periods, it will be disruptive to traffic.
- Longitudinal trenching along certain roads will result in the partial or total closure of these roads which will create a degree of congestion.
- During construction, large abnormal load vehicles will be used to deliver the pipe sections to the work zones. The large dimensions of these abnormal vehicles and their slow operating speed will further exacerbate the congestion.
- The pipe will be laid in selected bedding material. The bedding material will be imported onto the site while spoil material will be removed from the site. The transportation of the bedding and spoil material will generate a substantial volume of heavy vehicle trips.
- A substantial volume of water, for construction purposes, will have to be transported to the various work fronts and this will generate a substantial volume of heavy vehicle trips.
- The specialised pipe laying equipment utilised, will further impact upon traffic.
- Detours will have to be planned where possible. These detours need to be operated and maintained as a result of pipe laying activities, road re alignment activities where required and road rehabilitation activities.
- During the morning and afternoon peaks, the large numbers of workers arriving and leaving the site will possibly have an effect on the existing traffic conditions.
- Pedestrian flow patterns will be disrupted and needs to be catered for, which in turn could have an impact on traffic flow patterns.
- During peak hour traffic, increased capacity demand and restricted flow capacity at work sites will cause congestion of traffic.

The purpose of the Transport Management Plan (TMP) is to mitigate the impact of the above affects on the road network. The TMP includes Temporary Traffic Control measures (TTC) and Transport Operations (TOS) strategies. The key benefits of the TMP are to:

- Address the broader safety and mobility impacts of construction work zones at a local and network level.
- Promote more efficient and effective construction phasing and minimize contract duration and control costs.
- Improve work zone safety for construction workers and the travelling public.
- Improve efficiency within and around the construction zone.
- Improve public awareness.
- Identify roles and responsibilities of all stakeholders involved which will improve intra and inter agency coordination.
- Minimise the complaints from the travelling public, local businesses and communities.

3 TEMPORARY TRAFFIC CONTROL STRATEGIES

The construction of the NAA Phase 4 project will have an adverse affect on the road network along certain parts of the route. Sections of road might be re aligned to accommodate the pipeline. As envisaged, a linear development of this nature, may have a serious impact on Traffic Flow patterns during construction, as there will be various work fronts along the linear development. The majority of the pipeline route will traverse existing electrical servitude, however, there will be certain sections along the route, that may traverse or cross road servitude. Proper Temporary Traffic Control (TTC) strategies must be implemented by the Contractor to ensure the safe and efficient movement of traffic and pedestrians around the construction fronts, as well as in the general construction areas. The purpose of this section is to outline the procedures to be followed and define the responsibilities of the Contractor to achieve safer construction fronts and general construction areas, with minimal impact on the travelling public. Careful consideration of the impact of construction work on traffic flow patterns shall be given when the Contractor draws up his programme and method statements. Public compliance with these guidelines will benefit road users by minimising delays, reducing accidents and providing greater safety for all project stakeholders.

The manner in which the road network will be affected by the installation of the NAA Phase 4 varies considerably. Therefore, it is impractical to provide a temporary Traffic Control Strategy and layout diagram for every metre of the pipeline construction. Hence, it is important for the Contractor to use the guidelines and adapt the layout diagrams, which are provided in this section, in a manner that best suits the situation as it presents itself. Where special conditions, instructions or additional notes are provided, then these must be strictly adhered to. The Contractor shall develop a systematic approach to the development of TTC strategies, such that the proposed interventions present the driver with one change at a time. In this way, the reaction of the driver can be anticipated and catered for with an acceptable degree of certainty and effectiveness.

The various proposed Traffic Control Strategy, for each specific location, shall be presented to the Engineer, by the Traffic Safety Officer appointed by the Contractor, for approval, one week in advance of implementing same at any specific location.

3.1 OBJECTIVES OF THE TEMPORARY TRAFFIC CONTROL STRATEGIES

In order to achieve the safest possible environment for the travelling public and construction workers, the Contractor shall establish a standard pattern of Temporary Traffic Control (TTC) strategies that are simple and clear to understand. The objectives of these strategies are to:

- Develop in drivers extra vigilance, by means of exclusive temporary construction signs that creates a high level of awareness about the upcoming construction.
- Maintain roadway capacity and traffic flow at the highest achievable level to minimise congestion, delays and accidents due to the construction.
- Provide drivers with adequate information to re-direct them in instances where detour routes are available.
- Maintain a high degree of discipline in the management of the construction zone on a daily basis.

Where a roadway is either partially or totally closed, the new alignment to be followed by vehicles must be sufficiently visible by means of delineators, cones, barricades or an appropriate combination of these devices. This traffic accommodation should be continuous and consistent both night and day. These devices should be kept free of anything which could create a hazard if struck by a passing vehicle. The Contractor shall have an emergency response team available on a 24 hour basis, which can respond to public complaints related to insufficient or deteriorating devices as mentioned.

3.2 COMPONENTS OF A TEMPORARY TRAFFIC CONTROL ZONE

This section goes beyond just merely providing typical layout diagrams for the various scenarios. The rationale for the systematic layout of the construction zone is explained in detail. This systematic breakdown of any construction zone into standardised components results in more efficient and safe site operations, as it allows the Contractor an opportunity to clearly understand the traffic operations of all construction sites. A typical TTC layout is shown in Figure 3.2. As shown in this typical layout, the construction zone must be divided into five components as follows:

1. Advance warning area
2. Transition area
3. Buffer zone
4. Work zone
5. Termination area

3.2.1 ADVANCE WARNING AREA

The advanced warning area is used to advise motorists of the temporary and possibly adverse conditions that lie ahead, which requires particular vigilance. Furthermore, it provides adequate time for motorists to reduce their speed. At the beginning of the warning zone, an incremental decrease in speed is invariably signposted, at approximately 200m intervals until the desired speed is attained. It is good practice to repeat the final

speed once more. The length of the warning zone is generally proportionate to the approach speed and should be realistic enough to facilitate the required reduction in speed. For speeds between 80 km/h– 120km/h, the recommended range for the warning area length should be between 600m – 1000m. Due to the limited space in urban areas, as well as the fact that design speeds in these areas are substantially lower, it is rather difficult and not required to achieve long advanced warning zones. It is recommended that for arterials roads a distance of 300m – 600m is used and for lower order roads a range of 75m – 150m should be used.

3.2.2 TRANSITION AREA

The transition area allows drivers to take an action such as:

- Merge two lanes into one (lane drop)
- Cross the centre median (cross over)
- Enter a detour
- Shift position in the current lane.

The transition area is clearly defined using delineators and should conform to the layout of the guidance signs that precede it. In complex situations more than one transition zone can be used. The length of a transition zone is dependent on the approach speed and the amount of shift required by the transition.

3.2.3 BUFFER ZONE

The principle function of the buffer zone is to separate the traffic from the workers before entering the work area in the interests of worker safety. The provision of longitudinal and lateral buffer zones within the work zone is considered as fundamental to worker safety.

3.2.4 WORK AREA

The work area is adequately defined by delineators in simple situations and temporary barriers in more complex and demanding situations. If the parallel detour lane configuration is asymmetrical then drivers should be informed using lane arrangement signs. If the work area is rather lengthy then these signs should be repeated regularly.

3.2.5 TERMINATION AREA

This area involves the return of traffic to normal flow conditions through a rapid taper in simple situations and a much longer one in complex situations. Signs of gratitude, thanking the travelling public for their compliance must be displayed in this area.

NOTE: All sections of road which require traffic control measures as a result of construction activities shall comprise of the components for temporary traffic control as listed above, adapted and applied to suit the specific requirements of the construction activities.

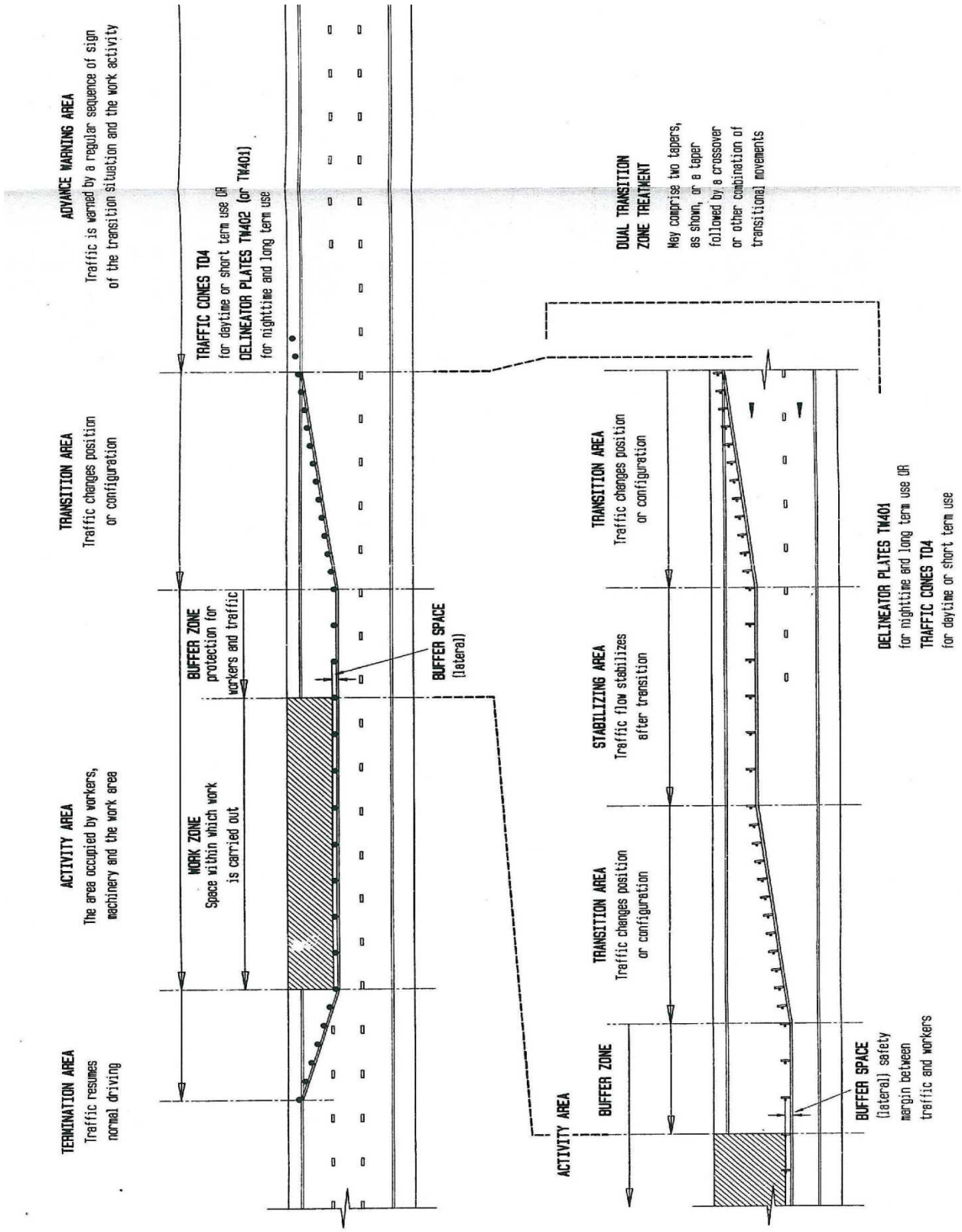

Figure 3.1: Components of a Temporary Traffic Control Zone

3.3 TYPICAL ROADWORKS LAYOUT DIAGRAMMES

The alignment of the pipeline within the road reserve varies as the pipe proceeds from one point to another and therefore each scenario will impact on the movement of traffic in a varied way. It is incumbent upon the Contractor to assess each scenario uniquely and devise a TTC strategy in accordance to the needs of that particular situation. It is envisaged that the Traffic Safety Officer, as appointed in terms of the specifications for this project, will play a major role in the assessment of conditions which leads to the compilation of a specific TTC strategy.

The alignment of the pipeline will traverse the road reserve either longitudinally i.e. parallel to the roadway or perpendicular i.e. across the roadway. Furthermore, the longitudinal alignment of the pipe also varies as the pipe may be installed in the verge, shoulder, lane or in a combination of these areas. In certain instances, complete road re alignments are required. Each of the above scenarios requires a different traffic control strategy. The TTC strategies which are most applicable to the construction of the NAA Phase 4 are shown in Figures 3.2 to 3.7.

Figure 3.2: Partial Lane Closure – this application will be typically used when the alignment of the pipeline encroaches into the verge or shoulder and partially into one lane. The width of the work zone will not warrant the full closure of a lane but merely a partial closure of the affected lane. A dual traffic operation is still possible although the lane widths are reduced, therefore, reduced speed limits and flagmen are a necessity.

Figure 3.3: Full Lane Closure – The use of this application is warranted in instances where the alignment encroaches onto the lane of the road and the subsequent work zone will require the entire width of the lane. Two-way traffic is no longer possible. Therefore, a Stop and Go system needs to be introduced. However, it is imperative to ensure that a stop and go operation is not used during dusk or darkness. Instead the stop and go operation must be replaced by temporary signals during dusk or dawn.

Figure 3.4: Temporary Traffic Light – Temporary traffic signals will be used on two way roads that have been reduced to one lane during roadworks. The use of temporary signs is appropriate at all times subject to the cost effectiveness of the operation. Their use is highly recommended during the hours of dusk and darkness.

Figure 3.5: Trench Across the Roadway - Temporary Closure (10min) – In instances where the pipe crosses a road perpendicularly, the road will be closed off for approximately five to ten minutes while a trench is opened. Thereafter, steel spans will be laid across the trench after which traffic will return to normal.

Figure 3.6: Dual Carriage Way Road: Left Lane Closure – On certain two lane dual carriageway roads the aqueduct will be installed in one of the carriageways. This will warrant the total closure of the lane. Should the left lane have to be closed, it is important to note that the technique requires that the 'Fast' lane is dropped first. This slows the faster travelling vehicles and facilitates the merge with the slower moving traffic in the transition area. Traffic is allowed to settle down in the stabilising area and thereafter goes through the second transition area where all traffic is moved onto the remaining lane.

Figure 3.7: Long Term Road Closure – In some instances the contractor will be forced to close the road totally. In this scenario, the road closure must be implemented as depicted in Figure 3.7.

It is unlikely that Figures 3.2 – 3.7 will fit exactly every situation faced by the Contractor on site, as the road geometry and traffic may not permit it. It is therefore necessary for the contractor to use these typical layouts as a guideline to develop a unique TTC strategy. Prior to the start of construction, the Engineer will assess the contractor-developed traffic control plans and sequences and assess these plans in relation to the guidelines stipulated in this TMP. The approval of the contractor's traffic management plans is contingent upon the balancing of safety, mobility, construction efficiency and road user needs.

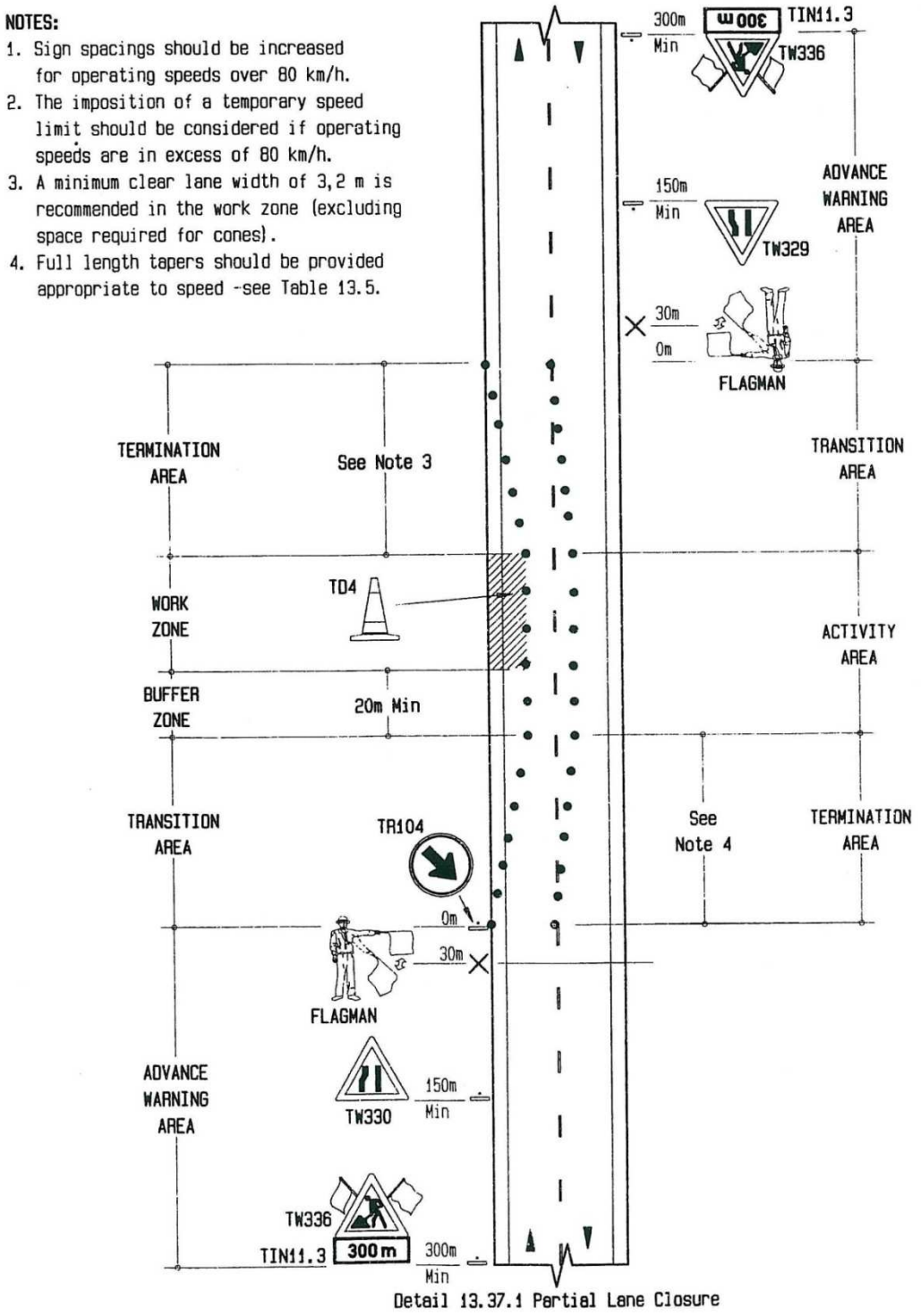

Figure 3.2: Partial Lane Closure

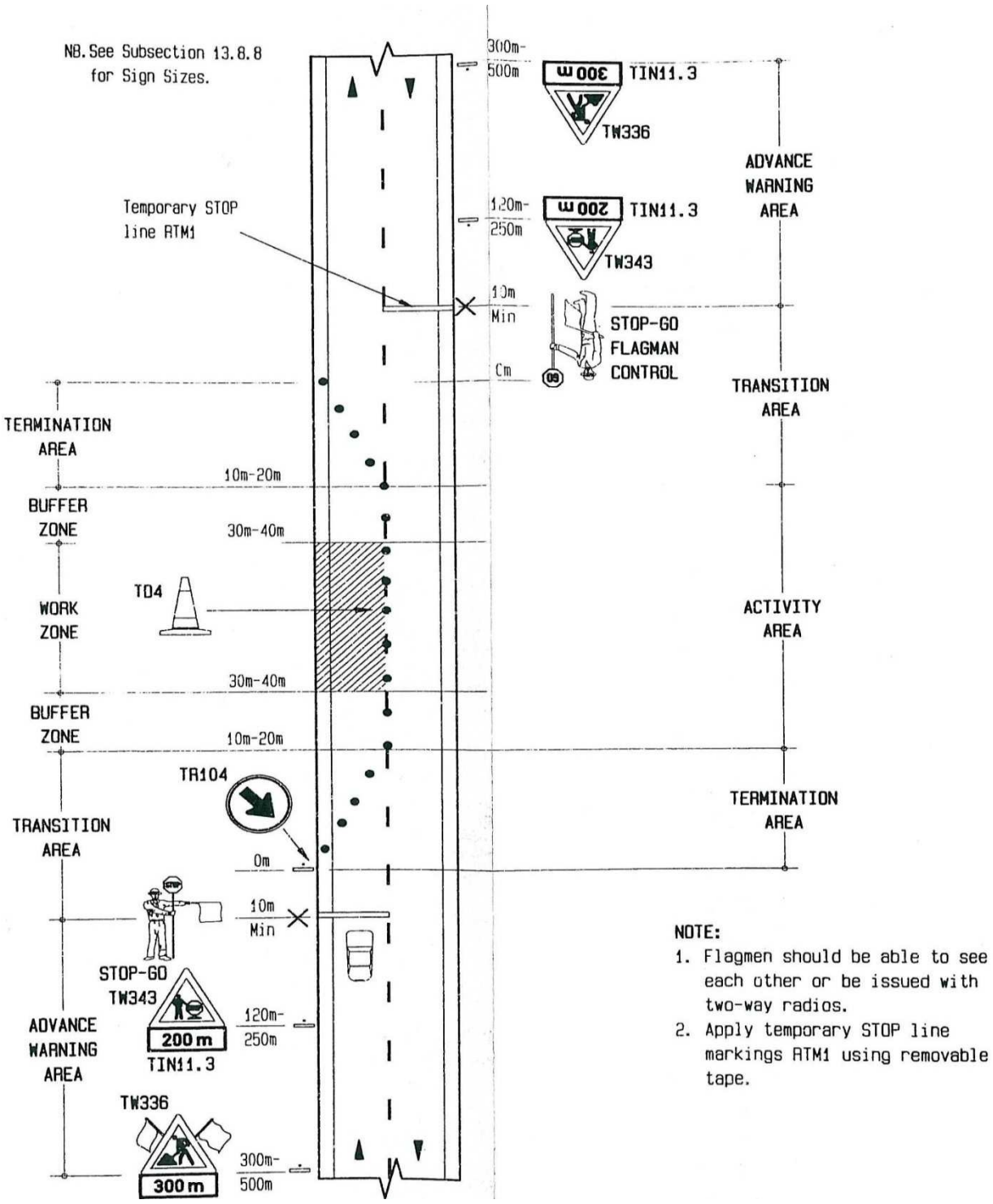

Figure 3.3: Full Lane Closure

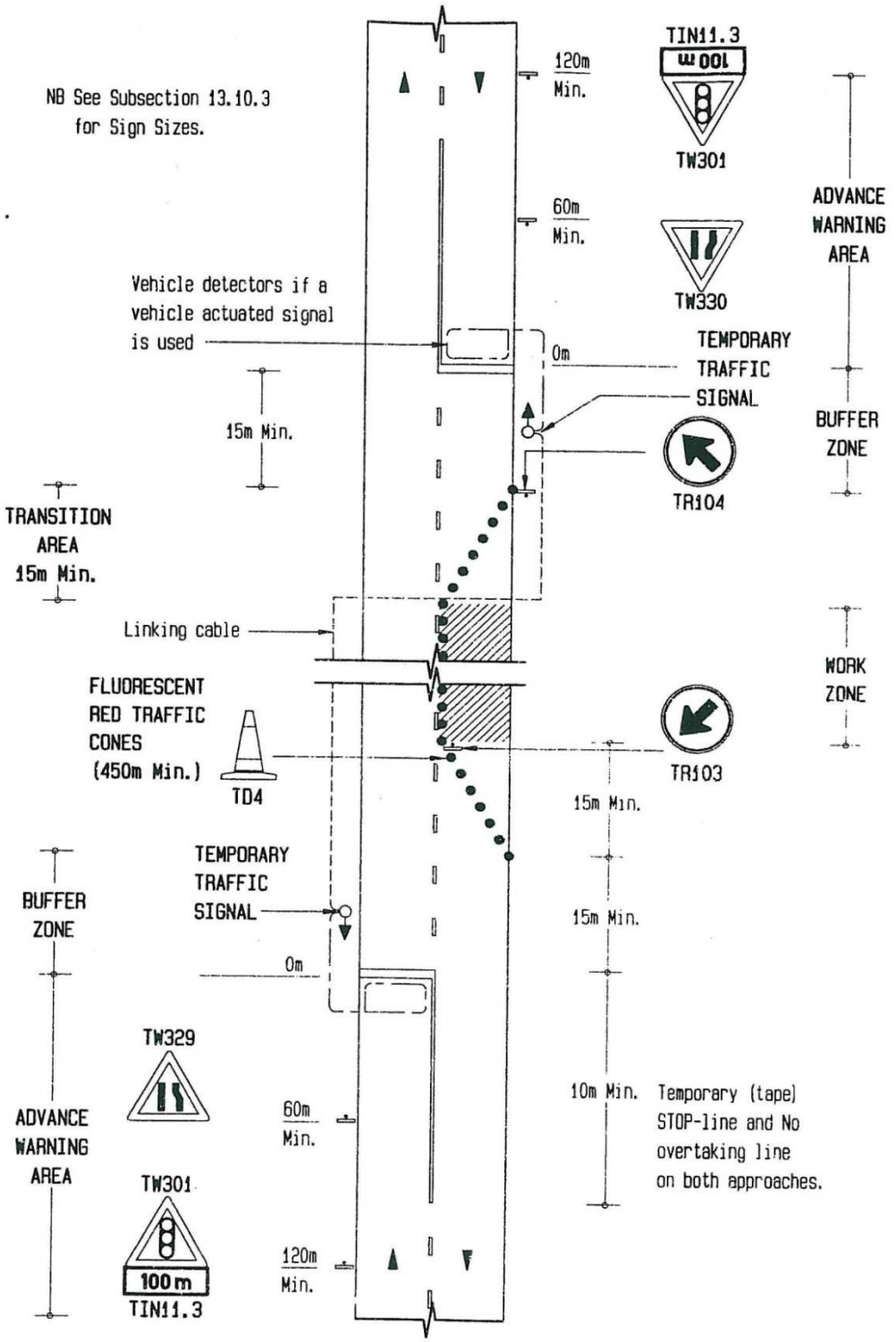

Figure 3.4: Temporary Traffic Light

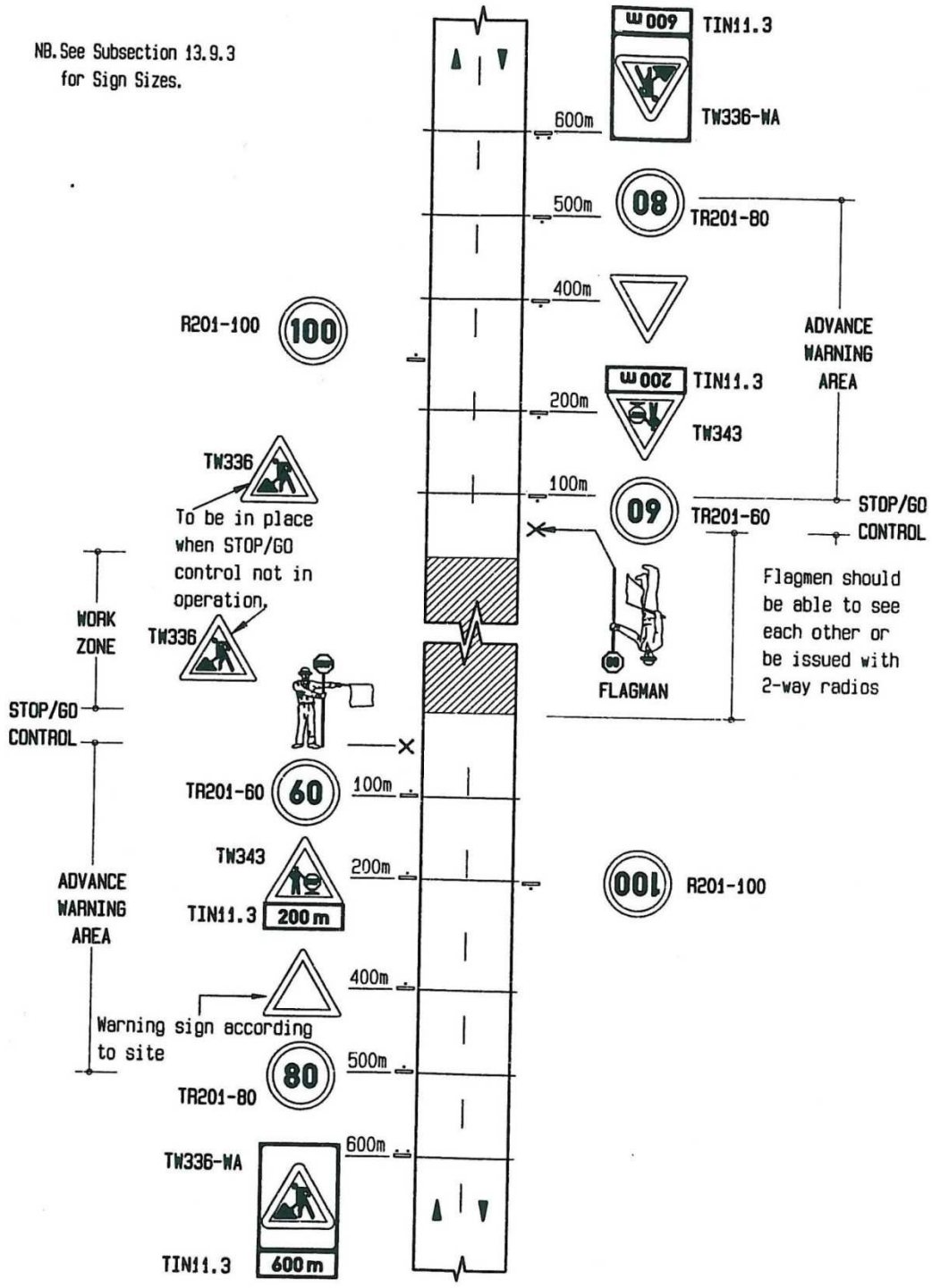

Figure 3.5: Trench Across the Roadway - Temporary Closure (10min)

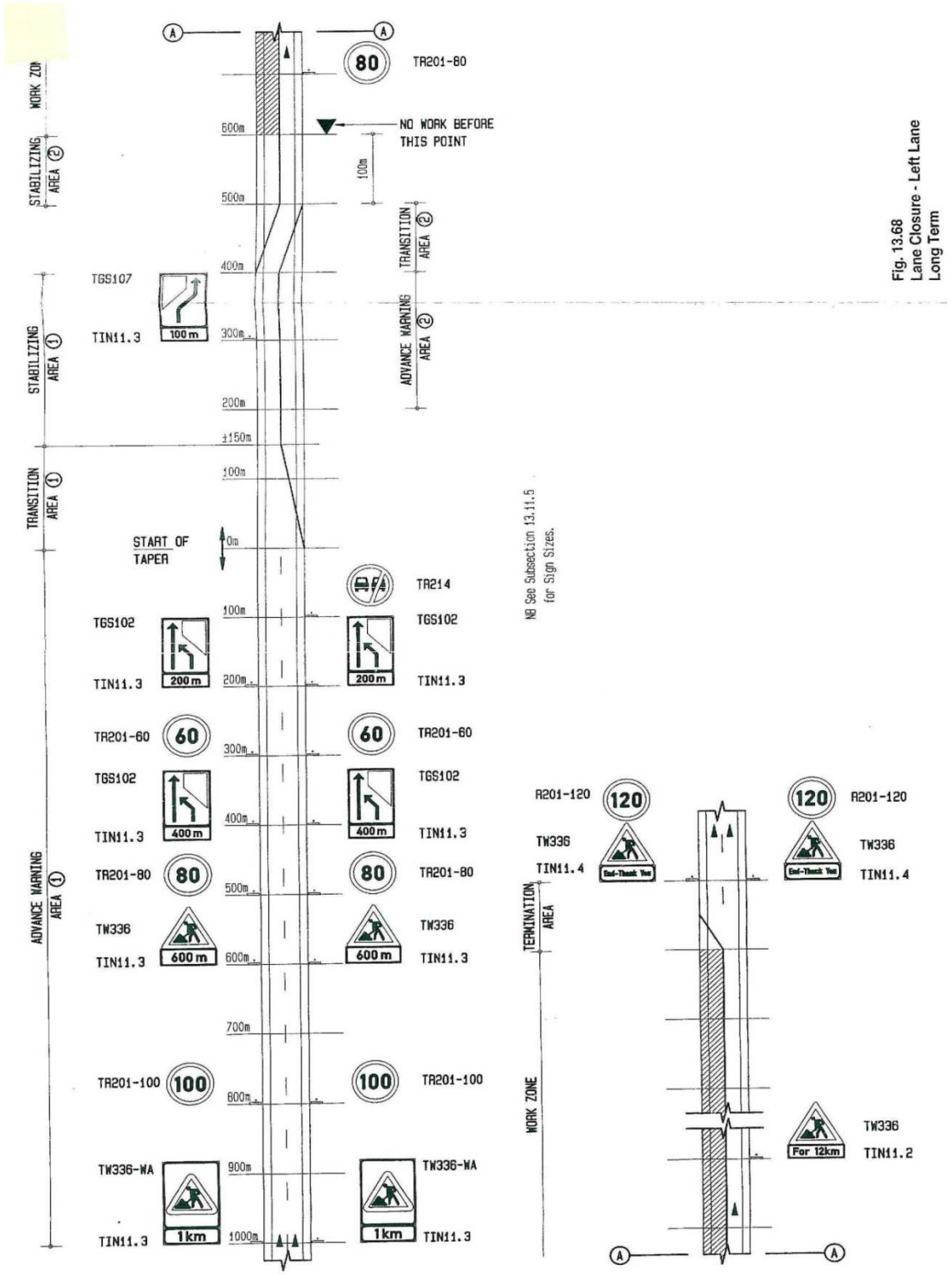

Figure 3.6: Dual Carriage Way Road – Left Lane Closure

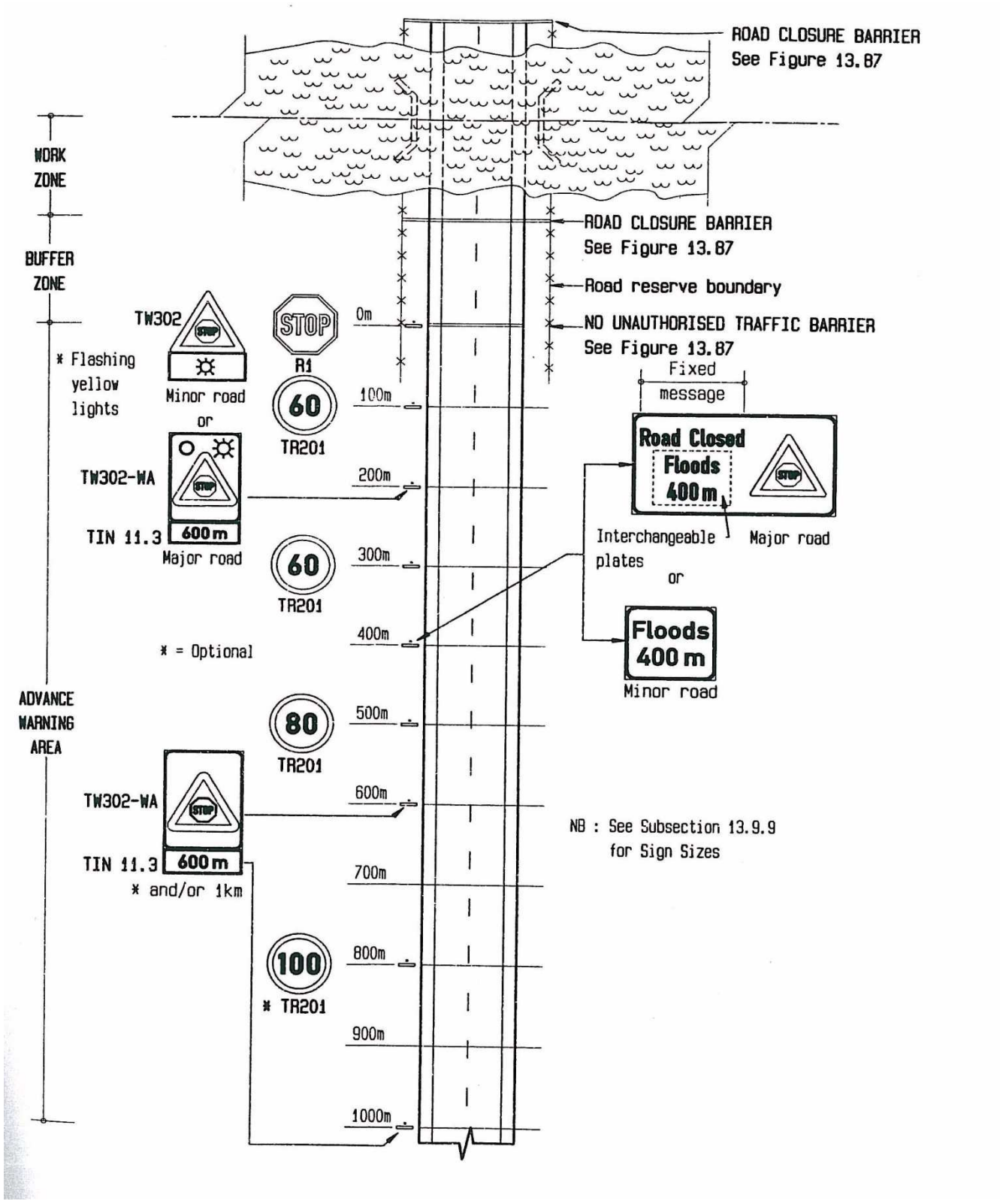

Figure 3.7: Long Term Road Closure

3.3 ROADS AFFECTED AND THEIR RESPECTIVE TTC STRATEGIES

The roads affected by the construction of the NAA Phase 4 are listed in Tables 1 to 3. Included in these tables are the relevant Road Authority, Construction Action, TTC Strategy, Necessity for Detour Drawings and Trench Lengths.

Table 3.1: Authority 1 – KZN DOT Roads

Road Name	Construction Action	Trench Length (m)	Trench Width (m)	TTC Strategy	Pipe Diameter (mm)	ROAD Authority
Offramp from M25 ro R102 (M21) Inanda Road Phoenix (South)	Pipe Jack	N/A	N/A	N/A	1200	DoT

Table 3.2: Authority 2 – eThekwini Transport Authority (ETA)

Road Name	Construction Action	Trench Length (m)	Trench Width (m)	TTC Strategy	Pipe Diameter (mm)	ROAD Authority
Offramp from M25 ro R102 (M21) Inanda Road Phoenix (South)	Pipe Jack	N/A	N/A	N/A	1200	DoT
Mount Moriah Drive	Longitudinal Trench	285.04m	2.22	Fig 3.2, Fig 3.3	1200	ETA
Simunye Avenue	Longitudinal Trench	333.67m	2.22	Fig 3.2, Fig 3.3	1200	ETA
Street 121359	Trench Crossing	9.46m	2.22	Fig 3.5	1200	ETA
Street 121359	Trench Crossing	8.29m	2.22	Fig 3.5	1200	ETA
Street 122309	Longitudinal Trench	175m	2.22	Fig 3.2, Fig 3.3	1200	ETA
Street 122318	Longitudinal Trench	46.26m	2.22	Fig 3.2, Fig 3.3	1200	ETA
Stonebridge Drive	Trench Crossing	8.91 m	2.22	Fig 3.5	1200	ETA
Ranmoor Crescent	Trench Crossing	7.89m	2.22	Fig 3.5	1200	ETA
Eastwood Road	Trench Crossing	8.62m	2.22	Fig 3.5	1200	ETA
Parkmead Avenue	Trench Crossing	9.63m	2.22	Fig 3.5	1200	ETA
Rainbird Close	Trench Crossing	121m	2.22	Fig 3.5	1200	ETA

Greenbury Drive	Trench Crossing	9.18m	2.22	Fig 3.5	1200	ETA
Rainhill Close	Trench Crossing	5.33m	2.22	Fig 3.5	1200	ETA
Cardinal Road	Trench Crossing	9.78m	2.22	Fig 3.5	1200	ETA
Cardinal Road	Trench Crossing	8.85m	2.22	Fig 3.5	1200	ETA
Phoenix Highway	Trench Crossing	10.50m	2.22	Fig 3.5	1200	ETA
Catford Crescent	Longitudinal Trench	62.41m	2.22	Fig 3.2, Fig 3.3	1200	ETA
Clayfield Drive	Trench Crossing	12.40m	2.22	Fig 3.5	1200	ETA
Calshot Crescent	Trench Crossing	9.98m	2.22	Fig 3.5	1200	ETA
Railway Crossing	Trench Crossing	N/A	N/A	Pipe jacking	1200	ETA
Eastbury Drive	Trench Crossing	9.83m	2.22	Fig 3.5	1200	ETA
Longbury Drive	Trench Crossing	14.28m	2.22	Fig 3.5	1200	ETA
Ridgecroft Drive	Trench Crossing	10.28m	2.22	Fig 3.5	1200	ETA
Drybury Place	Trench Crossing	6.18m	2.22	Fig 3.5	1200	ETA
Wynbury CRL	Trench Crossing	8.84m	2.22	Fig 3.5	1200	ETA
Northbury Avenue	Trench Crossing	18.71m	2.22	Fig 3.5	1200	ETA
Edgebury Road	Longitudinal Trench	20.76m	2.22	Fig 3.2, Fig 3.3	1200	ETA

**** *All tabulated measurements are approximates***

3.4 DETOUR ROUTES AND HAULAGE ROUTES

3.4.1 DETOUR ROUTES

Detour routes are required to alleviate the volume of the traffic passing through the construction zones where possible. The list of roads for which detours exist is tabulated in Table 4. Although detours are desirable for all sections of the road network, in certain instances detour routes are not practical or possible. In other instances detours are not required as the impact of the pipe installation and the volume of traffic are both low. It is imperative for the contractor to examine Section TMP 3.3 and the detours listed in Table 4, in conjunction with each other, before commencing with the development of TTC strategies.

Detour routes are identified for the purpose of use as detours and not for use in conjunction with haulage as such use will decrease the capacity in terms of the requirements of the detour. In some cases, detour routes do coincide with haulage routes. (See table 5 for haulage routes)

The detour drawings are attached at the end of this document.

Table 3.3: Detour Routes

DETOUR ROUTE
Zwele Street
Umkutu Place
Zinza Place
Mela Street
Rainbow Street
Street 122323

3.4.2 HAULAGE ROUTES

Haulage routes do under some circumstances, coincide with detour routes. Haulage routes will be utilised in conjunction with other road users and extreme care should be taken to ensure that the use of routes as haulage routes are well managed to ensure the safety of all road users.

Routes along the pipeline route are in general regarded as haulage routes. Haulage routes will be subjected to heavy loading and in some cases the original design of the road layers will not withstand the loading conditions to which it will be subjected. The contactor will have to effect repairs to damaged surfaces in terms of the general specifications for the contract. (See TMP 4)

It is imperative for the contractor to examine Section TMP 3.3 and the detours listed in Table 4, in conjunction with each other, before commencing with the development of TTC strategies.

Table 3.4: Haulage Routes

HAULAGE ROUTE
R 102 /Mr577 Rte
Stonebridge Drive
Phoenix Highway
Eastbury drive
Longbury Drive
N2
M41
Curnick Ndlovu Highway

3.5 DESIGNATED TRAFFIC SAFETY OFFICER

The Contractor shall appoint a designated Traffic Safety Officer (TSO) for the duration of the contract. This TSO shall have representatives where required, should work fronts be separated by long distances. It will be the responsibility of the TSO to observe traffic travelling through the construction zones and to determine if the TTC strategies that are implemented for each work front are adequate for the safety and mobility of the travelling public and pedestrians, both during the day and the night. The frequency of observations shall be guided by the level of activity and volume of traffic in that particular area. Should the TSO note locations where safety and mobility can be improved, he shall inform the Contractor to provide the necessary remedial plans and take action on the required changes and the Engineer shall be informed of the location and actions that will be taken. In addition, the TSO is to make arrangements with the local law enforcement authorities, either the Provincial Road Traffic Inspectorate or the Durban Metro Police, to patrol the construction zones on a regular basis, in order to ensure that the travelling public and construction workers comply with the rules of the construction zones. Should the law enforcement officers observe an opportunity to improve the safety and mobility of the construction zones at any given work front they could instruct the TSO to effect the required changes in this regard.

3.6 FLAGMEN

Flagmen are a simple and flexible method of traffic control that will be applicable in several instances in relatively low volume roads, during the construction of the NAA. The flagmen at each end of TTC sections should be visible to each other. Flagmen stations should be located far from the work zone to ensure that drivers have sufficient distance, after having been warned of pending danger, to slow down before entering the work zone. However, the flagmen should not be placed so far that their desired impact on approaching drivers is lost. It is the responsibility of the Contractor to ensure that all flagmen are wearing distinctive safety clothing, in order to ensure that drivers recognise them for the purpose of their deployment. Flagmen shall be carefully selected and trained as their efficiency is often dependent on their aptitude, attitude, eyesight, hearing and alertness.

3.7 INCIDENTS OR ACCIDENTS

When an incident or accident occurs within the construction zone, the TSO must immediately notify the local traffic authorities and collect information related to the event. The information must be immediately reviewed in collaboration with the Contractor and the Engineer, to determine if changes to the TTC can be reasonably made to reduce the potential for future incidents or crashes. In addition the TSO must prepare contingency plans for each area to ensure that there are adequate detour routes for motorists to use in the event of an accident. The contingency plans should consider special traffic control on detours that may exhibit anticipated capacity or safety problems under construction traffic conditions. These plans must also look at critical intersections and interchanges, where additional temporary traffic control may be justified.

3.8 FURTHER RESPONSIBILITIES OF THE CONTRACTOR

In addition to the responsibilities placed on the Contractor in earlier sections of the TMP, the following responsibilities of the Contactor are obligatory to ensure the successful implementation of this Transport Management Plan. The Contractor shall:

- Ensure that all staff are trained in traffic control to a level commensurate with their responsibilities.
- Ensure that construction zones are neat, orderly and effective for the safety of workers and motorists.
- Minimize delay and disruption experienced during construction.
- Perform quality control review of construction zones to promote consistency and ensure compliance with the TMP guidelines.
- Recommend traffic control improvements to the TMP to address field conditions pertaining to traffic flow, visibility and worker and motorist safety.
- Ensure construction zone speed limits are appropriate.
- Perform quality control inspections of construction zones to promote consistency and compliance with the TMP guidelines.
- Request law enforcement officers to take appropriate measures to exercise law enforcement on a regular basis and to clear construction zone incidents as quickly as possible.

3.9 CHECKLIST

The following are examples of questions that the Contractor must address to ensure that proper construction zone plans are put in place:

- How are construction zones performing with respect to mobility and safety?

- Are motorists' expectations being met with respect to maintaining safety and mobility, minimizing business and community impacts?
- Can areas for improvement be identified?
- How have areas for improvement that were identified in the past, been addressed?
- What has both worked and not worked. This means that a log should be kept to indicate which strategies have proven to be either more or less effective in improving the safety and mobility of construction zones?
- What other strategies can be considered for implementation?
- Are there certain combinations of strategies that seem to work well? (or certain combinations which seem not to work well)
- What can be done to advocate characteristics associated with good trends? What can be done to remedy the problems associated with bad trends?

4 TRANSPORTATION OPERATIONS MANAGEMENT (TOM)

The construction of the NAA Phase 4 will generate a substantial volume of construction traffic to import the required plant and materials, to execute the project and to remove the spoil material. It is expected that the construction traffic will have a significant impact on the existing traffic flow patterns and road infrastructure. Some of the lower category roads, especially in the residential areas, were not designed to convey heavy vehicles. It is therefore anticipated that, in addition to the congestion created by the construction vehicles, numerous roads will be damaged as a result of the repetitive movement of heavy vehicles. The Contractor has obligations, in terms of the Project Specifications, to implement strategies to mitigate traffic congestion, inconvenience to road users and to maintain haulage routes and leave these routes in a condition similar to what they were in before construction commenced.

1. In order to support the requirements of the Project Specifications, the following requirements are to be met by the Contractor as far as haulage routes are concerned:

    - The Contractor shall provide the Engineer with a visual recording, on electronic media, of the conditions of all the haulage routes prior to the commencement of the hauling operations. The said electronic recording must include clear views of the pre-haul road and shoulder conditions, some type of narration as to the location, road name and direction, with adequate detail to reflect the actual road condition. The said recording and any additional notes regarding the road condition must be submitted to the Engineer at least 7 days prior to commencing the hauling operations.

    - Based upon the visual recording and visual inspection of the haulage routes, all distress and damage occurring during the construction period shall be repaired or reinstated under the Contract, to the satisfaction of the Engineer.

    - Many of the potential haulage routes have limited width and sight distance. The Contractor shall be responsible for providing; operating and maintaining equipment, services and personnel using traffic control and protective devices in a manner that facilitates the safe flow of traffic on all haulage routes.

2. The Contractor shall:

    - In conjunction with the TSO, implement the strategies as set out under TMP 3.3.

- Ensure that all the requirements of this Transportation Management Plan be met.

3. The Engineer that executes the Contract administration will ensure that:

- Regular meetings between the Engineer and the Contractor will be held to discuss the implementation of the TMP.

It is the duty of the Engineer to ensure that the Contractor meets the requirements of the TMP and the Contract Specifications. The Engineer has the power to enforce the stipulations contained in the Contract through the General Conditions of Contract applicable to the construction of the NAA Phase 4.

4. Public Relations and Publicity:

The Client will ensure that Publicity is taken care of which will include the following:

- A publicity strategy will be implemented. This will be done with the view to inform the public of intended work, work progress and duration as well as provide feedback on successes upon completion of work.
- A 24 hour complaints line will be set up with specific structures to accommodate the construction of the NAA Phase 4. These complaints will be relayed to the Contractor and will be attended to in terms of the Project Specifications which inter alia includes the availability of a 24 hour response team to rectify problems.

Public Relations:

Public relations is a joint effort between the Client and the Contractor. This will include:

- Holding of public information sessions with affected parties.
- Individual visits to affected residents where required.
- The appointment of Community Liaison Officers in different wards to effect communication to affected parties.

5 CONTINGENCY PLANS

Contingency Plans are a key part of the TMP, as it describes processes to transform an unplanned event into a planned response. Contingency Plans will ensure that the right people are in the right place, at the right time with the right information and resources. It does this by early identification of a problem. Fundamentally, Contingency Plans are designed to be a management guide as opposed to a procedural handbook for each incident. It is the responsibility of the Contractor to develop Contingency Plans as the construction progresses through each area. These Contingency Plans must be approved by the Engineer. At the very least the Contractor's Contingency Plans shall include the following:

- A set of trigger points that should be evaluated to determine whether an incident warrants the implementation of a contingency plan (i.e. accident, inclement weather, length of traffic queue exceeds threshold).
- Articulation of the lines of communication and authority.
- Well defined specific duties of all participants during lane closure operations, such as, coordination with law enforcement or local police, etc.
- The availability of the names and phone numbers for the TSO and his representatives, the Engineer, law enforcement agencies, radio stations and other applicable personnel, must be included in the contingency plan.
- A coordination strategy and special agreements, if applicable, between the above mentioned personnel must be properly articulated and documented, so that everybody knows their roles and responsibilities in the event of an accident.
- Availability of standby equipment and personnel for callout must be ensured. (24 hour response team in terms of the Project Specifications)

In the event of an incident, the Contractor shall give as much information and guidance to motorists on the use of alternative routes as possible, through the specified communication channels.
The Contractor shall continue to adopt traffic management measures after the clearance of an incident to ensure that traffic will return to normal in a smooth and swift manner. The Contractor shall monitor the traffic conditions in affected regions for effective queue management and dissipation.
The Contractor shall store records involving the types of incidents, duration, clearance time, responses, etc for evaluation and analysis to improve the accuracy of future traffic impact assessments. In addition, after every incident, debriefing sessions should be conducted, so that lessons learnt from an incident can be consolidated for future reference, to enable better handling of similar situations in the future.