

POLOKWANE MUNICIPALITY

#### BID NUMBER: PM80-24/25

TENDER DESCRIPTION:	PROVISION OF THE PUBLIC TRANSPORT MANAGEMENT SYSTEM (PTMS)FOR THE POLOKWANE IRPTS FOR PERIOD OF THREE (03) YEARS

NAME OF BIDDER:
CSD NUMBER:
CONTACT NUMBER
EMAIL ADDRESS:

TOTAL BID AMOUNT: \_\_\_\_\_

Document Prepared by:

CLOSING DATE:	27 June 2025 @ 10H00
	0699
	Polokwane
	Corner Landdros Mare and Bodenstein Street
	Polokwane Municipality

Documents must be deposited in the bid box not later than **10:00 on 27 June 2025** when bids will be opened in public.

# Bidders must contact the following officials for any enquiries:

• Technical enquiries: Ms. Nomfundo Mashele: (015 290 2375) nomfundom@polokwane.gov.za

• Supply chain enquiries: Mr. Tiro Pilusa: (015 290 2148) tirop@polokwane.gov.za

#### • Bids will remain valid for a period of 90 days after the closing date.

Bids received after the closing date and time will not be considered. Polokwane Municipality does not bind itself to accept the lowest or any other bid in whole or in part.

# VERY IMPORTANT NOTICE ON DISQUALIFICATIONS

A bid that does not comply with the peremptory requirements stated hereunder will be

regarded as not being an "acceptable bid", and such a bid will be rejected. An "acceptable bid" means any bid which, in all respects, complies with the conditions of the bid and the

specifications as set out in the bid documents, including the conditions as specified in the

preferential procurement policy framework Act and The Preferential Procurement Regulation, 2022 and related legislation, in terms of which provision is made for this policy

1. If any pages have been removed from the bid document and have therefore not been submitted.

2. If the bid document is completed using a pencil. Only black ink must be used to complete the bid document.

3. The bidder attempts to influence or has in fact influenced the evaluation and/or awarding of the contract.

4. The bid has been submitted after the relevant closing date and time.

5. If any bidder who, during the last five years, has failed to perform satisfactorily on a previous contract with the municipality, municipal entity or any other organ of state after written notice was given to that bidder that performance was unsatisfactory.

6. The accounting officer must ensure that, irrespective of the procurement process followed, no award may be given to a person –

(a) who is in the service of the state;

(b) if that person is not a natural person, of which any director, manager, principal shareholder or stakeholder is a person in the service of the state; or

(c) who is an advisor or consultant contracted to the municipality in respect of a contract that would cause a conflict of interest.

7. Bid offers will be rejected if the bidder or any of his/her directors are listed on the Register of Bid Defaulters in terms of the Prevention and Combating of Corrupt Activities Act, 2004 (Act 12 of 2004) as a person prohibited from doing business with the public sector.

8. Bid offers will be rejected if the bidder has abused the Polokwane Municipality supply chain management system.

9. Failure to complete and sign the certificate of independent determination or disclosure of wrong information.

Failure to comply with the above will lead to immediate disqualification.

"Polokwane Municipality is committed to maintaining the highest standards of honesty, integrity and ethical conduct and has adopted a zero tolerance to fraud and corruption. Thus, Polokwane municipality urges all stakeholders and potential service providers to exercise extreme caution and be vigilant of imposters in the name of the Polokwane Municipality.

Service Providers are reminded of the importance of verifying the authenticity of any requests for personal information and avoid engaging with unsolicited communications, particularly those involving financial matters or the promise of tenders and jobs. Any suspicious activity, including fraudulent calls or messages, should be reported immediately to the relevant authorities and the police for investigation. Polokwane Municipality does not request potential service providers to pay any gratification to individual in any way whatsoever in exchange for the appointment to render services for the Municipality."

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Signed by Bidder



PART A INVITATION TO	) BID			NA	TURAL	LY PR	OGRESSI	/E		MBD	01
YOU ARE HEREBY	<b>INVIT</b>	ED TO B	ID FOR R	EQUIREN	<b>MENTS</b>	OF T	HE (NAME	OF MUN	NICIPALITY/ MUN	VICIPAL ENTITY)	
			CLOSIN	G							
BID NUMBER:	PM80	-24/25	DATE:	-	27 Ju	ne 202	25	CLOSIN	G TIME:	10:00	
	PRC	VISIO	OF '	THE P	UBLI	C TR	ANSPO	RT MA	ANAGEMEN	T SYSTEM	
DESCRIPTION	(PTI	MS)FOF	R THE I	POLOK	WAN	IE IR	PTS FO	R PER	IOD OF THF	REE (03) YEA	RS
THE SUCCESSFUL	BIDD	ER WILL	BE REQ	UIRED TO	) FILL	IN AN	D SIGN A V	VRITTE	N CONTRACT FO	ORM (MBD7).	
BID RESPONSE DO	OCUM	IENTS MU	JST BE D	DEPOSITE	ED IN T	THE B	ID BOX SI	TUATED	AT Polokwane	Municipality, Civic	centre,
corner Bodenstein a	ind Lai	nddros Ma	are Street	not later t	han 10	:00 on	27 June 2	025			
An official and com	npulso	ory will no	ot be app	licable fo	r this p	oroject	t				
The Bid box is gener	rally o	pen 24 ho	urs, 7 day	/s a week.							
Completed Bid docu	iment,	fully price	d and sig	ned must	be seal	led in a	an envelope	e markeo	I " Bid number ar	nd Bid description"	
Bidders should ensu	ire that	bids are c	delivered t	imeously	to the c	orrect	address. If t	he bid is	late, it will not be	accepted for consi	deration.
Bids documents co	ontain	ing the C	onditions	s of Bid a	nd oth	er req	uirements i	in terms	of the Supply C	hain Managemer	nt Policy
will be downloaded	d from	e-tender	Publicat	ion Porta	l at <u>ww</u>	w.ete	nders.gov.:	<mark>za</mark> at no	fee.		
SUPPLIER INFORM	IATIO	N									
NAME OF BIDDER											
POSTAL ADDRESS	5										
STREET ADDRESS	5										
TELEPHONE											
NUMBER	(	CODE					NUMBER				
CELLPHONE											
NUMBER				1							
FACSIMILE NUMBE	R (	CODE					NUMBER				
E-MAIL ADDRESS											
VAT REGISTRATIO	ON										
NUMBER											
TAX COMPLIANCE						_					
STATUS		TCS PIN:				OR	CSD No:		1		
						ARE	E YOU A				
						FOF	REIGN BAS	ED			
	:   [					SUF	PPLIER FOR	R THE			
FOR THE GOODS	l					GO	ODS /SERV	/ICES			
/SERVICES	l   r	IF YES EI	NCLOSE	PROOF1		OFF	ERED?		IF YES, ANSV	VER PART B:31	
OFFERED?											
TOTAL NUMBER O	)F										
ITEMS OFFERED						TOT	TAL BID PR	RICE	R		
SIGNATURE OF											
BIDDER						DA	ΓE				
BIDDING PROCE	DURF	ENQU		AY BE	TEC	HNIC			MAY BE DIREC	TED TO:	

DIRECTED TO:			
			Ms. Nomfundo Mashele
DEPARTMENT	SCM	CONTACT PERSON	
CONTACT PERSON	Mr. Tiro Pilusa	TELEPHONE NUMBER	015 290 2375
TELEPHONE			
NUMBER	015 290 2148	FACSIMILE NUMBER	N/A
FACSIMILE NUMBER		E-MAIL ADDRESS	nomfundom@polokwane.gov.za
E-MAIL ADDRESS	tirop@polokwane.gov.za		

#### PART B TERMS AND CONDITIONS FOR BIDDING

# 1. BID SUBMISSION: 1.1. BIDS MUST BE DELIVERED BY THE STIPULATED TIME TO THE CORRECT ADDRESS. LATE BIDS WILL NOT BE ACCEPTED FOR CONSIDERATION. 1.2. ALL BIDS MUST BE SUBMITTED ON THE OFFICIAL FORMS PROVIDED (NOT TO BE RE-TYPED) OR ONLINE 1.3. THIS BID IS SUBJECT TO THE PREFERENTIAL PROCUREMENT POLICY FRAMEWORK ACT AND THE PREFERENTIAL PROCUREMENT REGULATIONS THE GENERAL CONDITIONS OF CONTRACT (GCC) AND, IF APPLICABLE. ANY OTHER SPECIAL CONDITIONS OF CONTRACT. TAX COMPLIANCE REQUIREMENTS 2. 2.1 BIDDERS MUST ENSURE COMPLIANCE WITH THEIR TAX OBLIGATIONS. 2.2 BIDDERS ARE REQUIRED TO SUBMIT THEIR UNIQUE PERSONAL IDENTIFICATION NUMBER (PIN) ISSUED BY SARS TO ENABLE THE ORGAN OF STATE TO VIEW THE TAXPAYER'S PROFILE AND TAX STATUS. 2.3 APPLICATION FOR THE TAX COMPLIANCE STATUS (TCS) CERTIFICATE OR PIN MAY ALSO BE MADE VIA E-FILING. IN ORDER TO USE THIS PROVISION. TAXPAYERS WILL NEED TO REGISTER WITH SARS AS E-FILERS THROUGH THE WEBSITE WWW.SARS.GOV.ZA. 2.4 FOREIGN SUPPLIERS MUST COMPLETE THE PRE-AWARD QUESTIONNAIRE IN PART B:3. 2.5 BIDDERS MAY ALSO SUBMIT A PRINTED TCS CERTIFICATE TOGETHER WITH THE BID. 2.6 IN BIDS WHERE CONSORTIA / JOINT VENTURES / SUB-CONTRACTORS ARE INVOLVED. EACH PARTY MUST SUBMIT A SEPARATE TCS CERTIFICATE / PIN / CSD NUMBER. 2.7 WHERE NO TCS IS AVAILABLE BUT THE BIDDER IS REGISTERED ON THE CENTRAL SUPPLIER DATABASE (CSD). A CSD NUMBER MUST BE PROVIDED. 3. QUESTIONNAIRE TO BIDDING FOREIGN SUPPLIERS YES NO 3.1. IS THE ENTITY A RESIDENT OF THE REPUBLIC OF SOUTH AFRICA (RSA)? 3.2. DOES THE ENTITY HAVE A BRANCH IN THE RSA? ☐ YES ☐ NO 3.3. DOES THE ENTITY HAVE A PERMANENT ESTABLISHMENT IN THE RSA? YES NO 3.4. DOES THE ENTITY HAVE ANY SOURCE OF INCOME IN THE RSA? YES NO 3.5. IS THE ENTITY LIABLE IN THE RSA FOR ANY FORM OF TAXATION? 🗌 YES 🗌 NO IF THE ANSWER IS "NO" TO ALL OF THE ABOVE, THEN IT IS NOT A REQUIREMENT TO REGISTER FOR A TAX COMPLIANCE STATUS SYSTEM PIN CODE FROM THE SOUTH AFRICAN REVENUE SERVICE (SARS) AND IF NOT **REGISTER AS PER 2.3 ABOVE.**

# NB: FAILURE TO PROVIDE ANY OF THE ABOVE PARTICULARS MAY RENDER THE BID INVALID. NO BIDS WILL BE CONSIDERED FROM PERSONS IN THE SERVICE OF THE STATE.

SIGNATURE OF BIDDER:	
CAPACITY UNDER WHICH THIS BID IS SIGNED:	
DATE:	

# SCHEDULE OF CONTENTS

**BID NOTICE** 

**RESPONSIVENESS AND EVALUATION CRITERIA** 

- FORM "A" BID FORM
- FORM "B" GENERAL UNDERTAKING BY THE BIDDER
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- FORM "D" GENERAL PROCEDURES
- FORM "E" SPECIAL CONDITIONS OF CONTRACT (IF ANY)
- FORM "F" BID SPECIFICATIONS
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- MBD 6.1 PREFERENTIAL PROCUREMENT FORM
- ANNEXURE "A" EVALUATION PROCESS AND CRITERIA
- MBD 4 DECLARATION OF INTEREST
- MBD 5 DECLARATION FOR PROCUREMENTABOVE R10 MILLION
- MBD 8 DECLARATION OF BIDDER'S PAST SUPPLY CHAIN MANAGEMENT PRACTICES
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#### BID NO: PM80-24/25

# BID DESCRIPTIONS: PROVISION OF THE PUBLIC TRANSPORT MANAGEMENT SYSTEM (PTMS)FOR THE POLOKWANE IRPTS FOR PERIOD OF THREE (03) YEARS

#### DIRECTORATE: TRANSPORTATION SERVICES

#### **BUSINESS UNIT: INTELLIGENT TRANSPORT SYSTEMS MODELLING**

Bids are hereby invited for the **PROVISION OF THE PUBLIC TRANSPORT MANAGEMENT SYSTEM** (PTMS)FOR THE POLOKWANE IRPTS FOR PERIOD OF THREE (03) YEARS

Bidders should ensure that bids are delivered timeously to the correct address. If the bid is late, it will not be accepted for consideration

#### THIS BID IS SUBJECT TO THE, PREFERENTIAL PROCUREMENT POLICY FRAMEWORK ACT AND THE PREFERENTIAL PROCUREMENT REGULATION, 2022, AND THE GENERAL CONDITIONS OF CONTRACT (GCC) AND, IF APPLICABLE, ANY OTHER SPECIAL CONDITIONS OF CONTRACT.

The Municipality shall adjudicate and award bids in accordance with preference points of 80/20-point system, 80 points for the price and 20 points for specific goals. Prospective bidders must accept that the bid will be adjudicated, according to the said legislation. Bids will remain valid for 90 (ninety) days. The Council also reserves the right to negotiate further conditions and requirements with the successful bidder

N.B: NO BIDS WILL BE CONSIDERED FROM PERSONS IN THE SERVICE OF THE STATE [AS DEFINED IN REGULATION 1 OF THE LOCAL GOVERNMENT: MUNICIPAL SUPPLY CHAINS MANAGEMENT REGULATIONS]

MS. THUSO NEMUGUMONI MUNICIPAL MANAGER CIVIC CENTRE LANDDROS MARE STREET

# **RESPONSIVENESS AND EVALUATION CRITERIA**

# POLOKWANE MUNICIPALITY WILL CONSIDER NO BID UNLESS ITS MEETS THE FOLLOWING RESPONSIVENESS CRITERIA

- The bid must be properly received in a sealed envelope clearly indicating the description of the service and the bid number for which the bid is submitted.
- The bid must be deposited in the relevant bid box as indicated on the notice of the bid on or before the closing date and time of the bid.
- A valid Central Supplier Database Number (CSD)
- Bid forms must be completed in full and each page of the bid initialed.
- Submission of a Joint Venture Agreement, where applicable, which has been properly signed by all parties.
- Proof of payment of municipal rates and taxes or letter from tribal authority or valid lease agreement must be attached.
- Complies with the requirements of the bid and technical specifications.
- Adheres to Pricing Instructions.
- Comply in full and observe the requirements of the Notice to Bidders
- Experience with similar work demonstrate a track record of a projects of similar scope and size

# **EVALUATION OF BIDS**

- a) All bids received shall be evaluated in terms of the Supply Chain Management Regulations, Polokwane Municipality Supply Chain Management Policy (on request from Municipality), the
- b) preferential procurement regulation, and other applicable legislations.

The Council reserves the right to accept all, some, or none of the bids submitted – either wholly or in part – and it is not obliged to accept the lowest bid.

# PLEASE NOTE

# The Municipal Manager may reject the bid or quote of any person if that person or any of its directors has:

- a) The person committed a corrupt or fraudulent act during the procurement process or in the execution of the contract, or
- b) An official or other role player committed any corrupt or fraudulent act during the procurement process or in the execution of the contract that benefited that person.
- c) Failed to pay municipal rates and taxes or municipal service charges and such rates, taxes and charges are in arrears for more than three months;
- Failed, during the last five years, to perform satisfactorily on a previous contract with the Polokwane Municipality or any other organ of State after written notice was given to that bidder that performance was unsatisfactory;
- e) Abused the supply chain management system of the Municipality or have committed any improper conduct in relation to this system;
- f) Been convicted of fraud or corruption during the past five years;
- g) Willfully neglected, reneged on or failed to comply with any government, municipal or other public sector contract during the past five years; or
- b) Been listed in the Register for Tender Defaulters in terms of section 29 of the Prevention and Combating of Corrupt Activities Act (No. 12 of 2004) or has been listed on National Treasury's database as a person prohibited from doing business with public sector.

#### BID NO: PM80-24/25

I/We, the undersigned:

- a) Bid to supply and deliver to Polokwane Municipality all or any of the supplies and to render all the articles, goods, materials, services or the like described both in this and the other Scheduled to this Contract;
- b) Agree that we will be bound by the specifications, prices, terms and conditions stipulated in those Schedules attached to this bid document, regarding delivery and execution;
- c) Further agree to be bound by those conditions, set out in Forms, MBD's,SBD's and the Annexures attached hereto, should this bid be accepted in whole or in part;
- d) Confirm that this bid may only be accepted by the Polokwane Municipality by way of a duly authorized Letter of Acceptance; and,
- e) Declare that, the relevant authorized person thereto will initial each page of the bid document and amendments.
- f) Declare that all information provided in respect of the bidder as well as the bid documents submitted are true and correct.
- g) Declare that documentary proof regarding aspects of the bid process or accidental thereto will, when required, be submitted to the satisfaction of the Municipality.

Signed at ...... Day of ...... (Year)

Signature of the Bidder:

Name of Bidder:

#### Professional Registration No, if any, attach proof)

Address:		
Date:		
As Witness:	1.	
	2.	

# Particular of Sole Proprietors and partners in partnerships

Name	Identity Number	Personal Number	Income	Tax

(Attach of identity Document, if bidder is a Sole Proprietor and/or partners in partnership)

State in cases where the bidder is a Company, Corporation of Firm by what authority the person signing does so, whether by Articles of Association, Resolution, Power of Attorney or otherwise.

I/We the undersigned am/are authorized to enter into this contract of behalf of:

by virtue of	
dated	a certified copy if which is attached to this bid.
Signature of author	ized person:
Name of Firm: _	
Postal Address:	
Date:	
As witness:	1
	2

# Please Note:

The prices at which bids are prepared to supply the goods and materials or perform the services must be placed on the column on the Form provided for that purpose.

Failure on the part of the bidder to sign the Form of Bid and initial each page of this bid document will result in a bid being disqualified.

Bank account details of bidder:

Bank:			

Branch: \_\_\_\_\_

Branch Code:	
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Accounting Number: \_\_\_\_\_

Type of Account: \_\_\_\_\_

PROOF THAT MUNICIPAL ACCOUNT IS PAID IN FULL TO BE ATTACHED (ARRANGEMENTS MADE WITH COUNCIL WILL BE TAKEN INTO CONSIDERATION).

NOTE: THE AUTHORIZED SIGNATORY MUST SIGN ANY ALTERATIONS TO THE

BIDDER DOCUMENT IN FULL

ANY COMPLETION OF THE BIDDER DOCUMENT IN ERASABLE INK WILL NOT BE ACCEPTED

# **BIDDING INFORMATION**

Details of person responsible for bidding process	
Name	
Contact number	
Address of office submitting bid	
Telephone	
Fax no	
E-mail address	
VAT Registration Number	

Mr/Ms.

# **AUTHORITY FOR SIGNATORY**

Signatories for close corporation and companies shall conform their authority by attaching to this form a duly signed and dated copy of the relevant resolution of their members or their board of directors, as the case may be.

"By resolution of the board of directors passed on \_\_\_\_\_ 20\_\_\_\_

Has been duly authorized to sign all documents in connection with the bid for

Contract\_\_\_\_\_No\_\_\_\_\_

And any Contract, which may arise there from on behalf of

Signed on behalf of the company:

In his/her capacity as:							
Date:							
Signature of	signatory						
As witness:	1.		 				
	2.						

FORM "B"

# **GENERAL UNDERTAKINGS BY THE BIDDER**

# DEFINITION

- 1. "Acceptable bid" means any bid, which in all respects, complies with conditions of bid and specifications as set out in the bid document, including conditions as specified in the Preferential Procurement Regulation (of 2011).
- 2. "Chairperson" means the chairperson of the Polokwane Municipality Bid Adjudication Committee.
- 3. "Municipal Manager" means the Municipal Manager of the Municipality.
- 4. Committee" refers to the Bid Adjudication Committee.
- 5. "Council" refers to Polokwane Municipality.
- 6. "Member" means a member of the Bid Adjudication Committee.
- 7. **Service providers**" refers to the bidders who have been successful in being awarded Council contracts.
- 8. **SMMEs**"(Small, medium and Micro Enterprises) refers to separate and distinct business entities, including co- operative enterprises and NGOs, managed by one owner or more, as defined in the National Small Business (Act 102 of 1996.
- 9. **Contract**" refers to legally binding agreement between Polokwane Municipality and the service provider.
- 10. **Bid** "means a written offer in a prescribed or stipulated form in response to an invitation by the Municipality for the provision of services or goods.
- 11. Contractor" means any natural or legal person whose bid has been accepted by the Council.
- 12. "Closing time" means the date and hour specified in the bid documents for the receipt of bids.
- 13. "Order" means an official written order issued for the supply of goods or the rendering of a service in accordance of the accepted bid or price quotation.
- 14. "Written" or "in writing," means hand written in ink or any form of mechanical writing in printed form.
- 15. "Highest acceptable tender" Means a tender that complies with all specifications and conditions of tender and that has the highest price compared to other tenders
- 16. "Historically Disadvantaged Individual (HDI)" means a South African Citizen (1) who, due to the apartheid policy that had been in place, had no franchise in national elections prior to the introduction of the Constitution of the Republic of South Africa, 1983 (Act No 110 of 1983) or the Constitution of the Republic of South Africa, 1993 (Act No 200 of 1993) ("the Interim Constitution"); and/or (2) Who is a female; and /or (3) Who has a disability; Provided that a person who obtained South African citizenship on or after the coming to effect of the Interim Constitution, is deemed not to be an HDI;
- 17. "Lowest acceptable offer" Means a tender that complies with all specifications and conditions of tender and that has lowest price compared to other tenders
- 18. "Specific goals" Means specific goals as contemplated in section 2(1)(d) of the Act which may include contracting with persons, or categories of persons, historically disadvantaged by unfair discrimination on the basis of race, gender and disability including the implementation of programmes of the Reconstruction and Development Programme as published in Government Gazette No. 16085 dated 23 November 1994
- 19. "Tender for income-generating contracts" Means a written offer in the form determined by an organ of state in response to an invitation for the origination of income-generating contracts through any method envisaged in legislation that will result in a legal agreement between the organ of state and a third party that produces revenue for the organ of state, and includes, but is not limited to, leasing and disposal of assets and concession contracts, excluding direct sales and disposal of assets through public auctions

# INTERPRETATION:

- 1. In this agreement clause headings are for convenience and shall not be used in its interpretation and, unless the context clearly indicates a contrary intention:
- 2. An expression which denotes:-
- 3. Any reference to any statute, regulation or other legislation or official policy shall be a reference to that statute, regulation or other legislation or national policy as at the signature date, and as amended or re-enacted from time to time;
- 4. When any number of day is prescribed, such shall be reckoned exclusively of the first and inclusively of the last day, unless the last day falls on a day which is not a business day, in which case the last day shall be the next succeeding day which is a business day;
- 5. Where any term is defined within a particular clause, other than the interpretation clause, that term shall bear the meaning ascribed to it in that clause wherever it is used in this agreement.

I/we hereby tender:

To supply all or any of the supplies and/or to render all or any of the services described in the attached documents {Forms, Schedule(s) and/or Annexure(s) to the Polokwane Municipality.

On the terms and conditions and accordance with the specifications stipulated in the bid documents (and which shall be taken as part of and incorporated into, this bid);

At the prices and on the terms regarding time for delivery and/or execution inserted therein.

I/we agree further that:

The offer herein shall remain binding upon me/us and open for acceptance by the Polokwane Municipality during the validity period indicated and calculated from the closing time of the bid.

This bid and its acceptance shall be subject to the terms and conditions contained in the Forms, Schedule(s) and/or Annexure(s) attached hereto with which I am /we are fully acquitted.

Notwithstanding anything to the contrary in the Form(s), Schedule(s) and /or Annexure(s) attached hereto:

- If I/we withdraw my/our bid within the period for which I/we have agreed that the bid shall remain open for acceptance, or fail to fulfill the contract when called upon to do so, the Polokwane Municipality may, without prejudice to its other rights, agree to the withdrawal of my/our tender or cancel the contract that may have been entered into between me/us and the Municipality;
- In such event, I/we will then pay to the Municipality any additional expenses incurred by the Municipality for having either to accept any less favourable bid or, if new bids have to be invited, the additional expenditure incurred by the invitation of new bids and by the subsequent acceptance of any less favourable bid;

The Municipality shall also have the right in these circumstances, to recover such additional expenditure by set-off against monies which may be due or become due to me/us under this or any other bid or contract or against any guarantee or deposit that may have been furnished by me/us or on my/our behalf for the due fulfillment of this or any other bid or contract;

Pending the ascertainment of the amount of such additional expenditure the Municipality may retain such monies, guarantee or deposit as security for any loss the Municipality may sustain, as determined hereunder, by reason of my/our default.

Any legal proceedings arising from this bid may in all respects be launched or instituted against me/us and if/we hereby

undertake to satisfy fully any sentence or judgment which may be obtained against me/us as a result of such legal proceedings and I/we undertake to pay the Polokwane Municipality legal costs on an attorney and own client;

If my/our bid is accepted that acceptance may be communicate to me/us by letter or facsimiles and that proof of delivery of such acceptance to SA Post Office Ltd or the production of a document confirming that a fax has been sent, shall be treated as delivery to me/us.

The law of the Republic of South Africa shall govern the contract created by the acceptance to this tender.

I/we have satisfied myself/ourselves as to the correctness and validity of this tender, that the price(s) and rate(s) quoted cover all the work/items(s) specified in the tender documents and that the price(s) and rate(s) cover all my/our obligations under a resulting contract and that I/we accept that any mistakes regarding price(s) and calculations will be at my/our risk.

I/we accept full responsibility for the proper execution and conditions defaulting on me/us under this agreement as the principal(s) liable for the fulfillment of this contract.

I/we declare that I/we have participated /no participated in the submission of any other bid for the supplies/services described in the attached documents. If your answer here is yes, please state the names(s) of the other Bid(s) involved: \_\_\_\_\_

FORM "C"

# **General Conditions of Contract**

# **1 DEFINITION**

# The following terms shall be interpreted as indicated:

- 1.1 "Closing time" means the date and hour specified in the bidding documents for the receipt of bids
- 1.2 "**Contract**" means the written agreement entered into between the purchaser and the supplier, as recorded in the contract form signed by the parties, including all attachments and appendices thereto and all documents incorporated by reference therein.
- 1.3 "**Contract price**" means the price payable to the supplier under the contract for the full and proper performance of his contractual obligations.
- 1.4 "Corrupt practice" means the offering, giving, receiving, or soliciting of anything of value to influence the action of a public official in the procurement process or in contract execution.
- 1.5 "**Countervailing duties**" are imposed in cases where an enterprise abroad is subsidized by its government and encouraged to market its products internationally.
- 1.6 "Country of origin" means the place where the goods were mined, grown or produced or from which the services are supplied. Goods are produced when, through manufacturing, processing or substantial and major assembly of components, a commercially recognized new product results that is substantially different in basic characteristics or in purpose or utility from its components.
- 1.7 "Day" means calendar day.
- 1.8 "Delivery" means delivery in compliance of the conditions of the contract or order.
- 1.9 "Delivery ex stock" means immediate delivery directly from stock actually on hand.
- 1.10 **"Delivery into consignees store or to his site**" means delivered and unloaded in the specified store or depot or on the specified site in compliance with the conditions of the contract or order, the supplier bearing all risks and charges involved until the goods are so delivered and a valid receipt is obtained.
- 1.11 **"Dumping"** occurs when a private enterprise abroad market its goods on own initiative in the RSA at lower prices than that of the country of origin and which have the potential to harm the local industries in the RSA.
- 1.12 **"Force majeure"** means an event beyond the control of the supplier and not involving the supplier's fault or negligence and not foreseeable. Such events may include, but is not restricted to, acts of the purchaser in its sovereign capacity, wars or revolutions, fires, floods, epidemics, quarantine restrictions and freight embargoes.
- 1.13 **"Fraudulent practice"** means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of any bidder, and includes collusive practice among bidders (prior to or after bid submission) designed to establish bid prices at artificial non-competitive levels and to deprive the bidder of the benefits of free and open competition.
- 1.14 "GCC" means the General Conditions of Contract.
- 1.15 **"Goods"** means all of the equipment, machinery, and/or other materials that the supplier is required to supply to the purchaser under the contract.
- 1.16 **"Imported content**" means that portion of the bidding price represented by the cost of component parts or materials which have been or are still to be imported (whether by the supplier or his subcontractors) and which costs are inclusive of the costs abroad, plus freight and other direct importation costs such as landing costs, dock dues, import duty, sales duty or other similar tax or duty at the South African place of entry as well as transportation and handling charges to the factory in the Republic where the goods covered by the bid will be manufactured.
- 1.17 **"Local content**" means that portion of the bidding price, which is not included in the imported content provided that local manufacture does take place.
- 1.18 **"Manufacture"** means the production of products in a factory using labour, materials, component and machinery and includes other related value-adding activities.
- 1.19 **"Order"** means an official written order issued for the supply of goods or works or the rendering of a service.
- 1.20 **"Project site,"** where applicable, means the place indicated in bidding documents.

- 1.21 **"Purchaser"** means the organization purchasing the goods.
- 1.22 "**Republic**" means the Republic of South Africa.
- 1.23 "SCC" means the Special Conditions of Contract.
- 1.24 **"Services"** means those functional services ancillary to the supply of the goods, such as transportation and any other incidental services, such as installation, commissioning, provision of technical assistance, training, catering, gardening, security, maintenance and other such obligations of the supplier covered under the contract.
- 1.25 **"Supplier**" means the successful bidder who is awarded the contract to maintain and administer the required and specified service(s) to the State.
- 1.26 "Tort" means in breach of contract.
- 1.27 **"Turnkey**" means a procurement process where one service provider assumes total responsibility for all aspects of the project and delivers the full end product / service required by the contract.
- 1.28 "Written" or "in writing" means hand-written in ink or any form of electronic or mechanical writing.

# 2. Application

- 2.1 These general conditions are applicable to all bids, contracts and orders including bids for functional and professional services (excluding professional services related to the building and construction industry), sales, hiring, letting and the granting or acquiring of rights, but excluding immovable property, unless otherwise indicated in the bidding documents.
- 2.2 Where applicable, special conditions of contract are also laid down to cover specific goods, services or works.
- 2.3 Where such special conditions of contract are in conflict with these general conditions, the special conditions shall apply.

# 3. General

- 3.1 Unless otherwise indicated in the bidding documents, the purchaser shall not be liable for any expense incurred in the preparation and submission of a bid. Where applicable a nonrefundable fee for documents may be charged.
- 3.2 Invitations to bid are usually published in locally distributed news media and on the municipality/municipal entity website.

# 4. Standards

4.1 The goods supplied shall conform to the standards mentioned in the bidding documents and specifications.

# 5. Use of contract documents and information inspection

- 5.1 The supplier shall not, without the purchaser's prior written consent, disclose the contract, or any provision thereof, or any specification, plan, drawing, pattern, sample, or information furnished by or on behalf of the purchaser in connection therewith, to any person other than a person employed by the supplier in the performance of the contract. Disclosure to any such employed person shall be made in confidence and shall extend only so far as may be necessary for purposes of such performance.
- 5.2 The supplier shall not, without the purchaser's prior written consent, make use of any document or information mentioned in GCC clause 5.1 except for purposes of performing the contract.
- 5.3 Any document, other than the contract itself mentioned in GC Clause 5.1 shall remain the property of the purchaser and shall be returned (all copies) to the purchaser on completion of the supplier's performance under the contract if so required by the purchaser. The supplier shall permit the purchaser to inspect the supplier's records relating to the performance of the supplier and to have them audited by auditors appointed by the purchaser, if so required by the purchaser.

# 6. Patent Rights

6.1 The supplier shall indemnify the purchaser against all third-party claims of infringement of Patent, trademark, or industrial design rights arising from use of the goods or any part thereof by the purchaser.

6.2 When a supplier developed documentation / projects for the municipality / municipal entity, the intellectual, copy and patent rights or ownership of such documents or projects will vest in the municipality / municipal entity.

# 7. Performance security

- 7.1 Within thirty (30) days of receipt of the notification of contract award, the successful bidder furnish to the purchaser the performance security of the amount specified in SCC.
- 7.2 The proceeds of the performance security shall be payable to the purchaser as compensation for any loss resulting from the supplier's failure to complete his obligations under the contract.
- 7.3 The performance security shall be denominated in the currency of the contract or in a freely convertible currency acceptable to the purchaser and shall be in one of the following forms:
  - a) a bank guarantee or an irrevocable letter of credit issued by a reputable bank located in the purchaser's country or abroad, acceptable to the purchaser, in the form provided in the bidding documents or another form acceptable to the purchaser; or
  - b) a cashier's or certified cheque.
- 7.4 The performance security will be discharged by the purchaser and returned to the supplier not later than thirty (30) days following the date of completion of the supplier's performance obligations under the contract, including any warranty obligations, unless otherwise specified.

# 8. Inspections, tests and analyses

- 8.1 All pre-bidding testing will be for the account of the bidder.
- 8.2 If it is a bid condition that goods to be produced or services to be rendered should at any stage be subject to inspections, tests and analyses, the bidder or contractor's premises shall be open, at all reasonable hours, for inspection by a representative of the purchaser or organization acting on behalf of the purchaser.
- 8.3 If there are no inspections requirements indicated in the bidding documents and no mention is Made in the contract, but during the contract period it is decided that inspections shall be carried out, the purchaser shall itself make the necessary arrangements, including payment arrangements with the testing authority concerned.
- 8.4 If the inspections, tests and analyses referred to in clauses 8.2and 8.3 show the goods to be in accordance with the contract requirements, the cost of the inspections, tests and analyses shall be defrayed by the purchaser.
- 8.5 Where the goods or services referred to in clauses 8.2 and 8.3 do not comply with the contract requirements, irrespective of whether such goods or services are accepted or not, the cost in connection with these inspections, tests or analyses shall be defrayed by the supplier.
- 8.6 Goods and services which are referred to in clauses 8.2 and 8.3 and which do not comply with the contract requirements may be rejected.
- 8.7 Any contract goods may on or after delivery be inspected, tested or analysed and may be rejected if found not to comply with the requirements of the contract. Such rejected goods shall be held at the cost and risk of the supplier who shall, when called upon, remove them immediately at his own cost and forthwith substitute them with goods, which do comply with the requirements of the contract. Failing such removal the rejected goods shall be returned at the suppliers cost and risk. Should the supplier fail to provide the substitute goods forthwith, the purchaser may, without giving the supplier further opportunity to substitute the rejected goods, purchase such goods as may be necessary at the expense of the supplier.
- 8.8 The provisions of clauses 8.4 to 8.7 shall not prejudice the right of the purchaser to cancel the contract on account of a breach of the conditions thereof, or to act in terms of Clause 22 of GCC.

# 9. Packing

9.1 The supplier shall provide such packing of the goods as is required to prevent their damage or deterioration during transit to their final destination, as indicated in the contract. The packing shall be sufficient to withstand, without limitation, rough handling during transit and exposure to extreme temperatures, salt and precipitation during transit, and open storage. Packing, case size weights shall take into consideration, where appropriate, the remoteness of the goods' final destination and the absence of heavy handling facilities at all points in transit.

9.2 The packing, marking, and documentation within and outside the packages shall comply strictly with such special requirements as shall be expressly provided for in the contract, including additional requirements, if any, and in any subsequent instructions ordered by the purchaser.

#### 10. Delivery and documents

10.1 Delivery of the goods and arrangements for shipping and clearance obligations, shall be made by the supplier in accordance with the terms specified in the contract.

#### 11. Insurance

11.1 The goods supplied under the contract shall be fully insured in a freely convertible currency against loss or damage incidental to manufacture or acquisition, transportation, storage and delivery in the manner specified.

#### 12. Transportation

12.1 Should a price other than an all-inclusive delivered price be required, this shall be specified.

# **13. Incidental Services**

- 13.1 The supplier may be required to provide any or all of the following services, including additional services, if any:
  - a) Performance or supervision of on-site assembly and/or commissioning of the supplied
  - b) goods;
  - c) Furnishing of tools required for assembly and/or maintenance of the supplied goods;
  - d) Furnishing of a detailed operations and maintenance manual for each appropriate unit of the supplied goods;
  - e) performance or supervision or maintenance and/or repair of the supplied goods, for a period of time agreed by the parties, provided that this service shall not relieve the supplier of any warranty obligations under this contract; and
  - f) Training of the purchaser's personnel, at the supplier's plant and/or on-site, in assembly, start- up, operation, maintenance, and/or repair of the supplied goods.
- 13.2 Prices charged by the supplier for incidental services, if not included in the contract price for the goods, shall be agreed upon in advance by the parties and shall not exceed the prevailing rates charged to other parties by the supplier for similar services.

# 14. Spare parts

- 14.1 As specified, the supplier may be required to provide any or all of the following materials, notifications, and information pertaining to spare parts manufactured or distributed by the supplier:
  - a) such spare parts as the purchaser may elect to purchase from the supplier, provided that this election shall not relieve the supplier of any warranty obligations under the contract; and;
  - b) in the event of termination of production of the spare parts:
    - (i) advance notification to the purchaser of the pending termination, in sufficient time to permit the purchaser to procure needed requirements; and
    - (ii) following such termination, furnishing at no cost to the purchaser, the blueprints, drawings, and specifications of the spare parts, if requested.

# 15. Warranty

- 15.1 The supplier warrants that the goods supplied under the contract are new, unused, of the most recent or current models, and that they incorporate all recent improvements in design and materials unless provided otherwise in the contract. The supplier further warrants that all goods supplied under this contract shall have no defect, arising from design, materials, or workmanship (except when the design and/or material is required by the purchaser's specifications) or from any act or omission of the supplier, that may develop under normal use of the supplied goods in the conditions prevailing in the country of final destination.
- 15.2 This warranty shall remain valid for twelve (12) months after the goods, or any portion thereof as the case may be, have been delivered to and accepted at the final destination indicated in the contract, or for eighteen (18) months after the date of shipment from the port or place of loading in the source country, whichever period concludes earlier, unless specified otherwise.
- 15.3 The purchaser shall promptly notify the supplier in writing of any claims arising under this warranty.
- 15.4 Upon receipt of such notice, the supplier shall, within the period specified and with all reasonable speed, repair or replace the defective goods or parts thereof, without costs to the purchaser.
- 15.5 If the supplier, having been notified, fails to remedy the defect(s) within the period specified, the purchaser may proceed to take such remedial action as may be necessary, at the supplier's risk and expense and without prejudice to any other rights which the purchaser may have against the supplier under the contract.

#### 16. Payment

- 16.1 The method and conditions of payment to be made to the supplier under this contract shall be specified.
- 16.2 The supplier shall furnish the purchaser with an invoice accompanied by a copy of the Delivery note and upon fulfillment of other obligations stipulated in the contract.
- 16.3 Payments shall be made promptly by the purchaser, but in no case later than thirty (30) days after submission of an invoice or claim by the supplier.
- 16.4 Payment will be made in Rand unless otherwise stipulated.

# 17. Prices

16.5 Prices charged by the supplier for goods delivered and services performed under the contract shall not vary from the prices quoted by the supplier in his bid, with the exception of any price adjustments authorized or in the purchaser's request for bid validity extension, as the case may be.

#### 18. Variation orders

18.1 In cases where the estimated value of the envisaged changes in purchase does not vary more than 15% of the total value of the original contract, the contractor may be instructed to deliver the goods or render the services as such. In cases of measurable quantities, the contractor may be approached to reduce the unit price, and such offers may be accepted provided that there is no escalation in price.

# 19.Assignment

19.1 The supplier shall not assign, in whole or in part, its obligations to perform under the contract, except with the purchaser's prior written consent.

#### 20. Subcontracts

20.1 The supplier shall notify the purchaser in writing of all subcontracts awarded under this contracts if not already specified in the bid. Such notification, in the original bid or later, shall not relieve the supplier from any liability or obligation under the contract.

#### 21. Delays in the performance

21.1 Delivery of the goods and performance of services shall be made by the supplier in accordance with the time schedule prescribed by the purchaser in the contract.

- 21.2 If at any time during performance of the contract, the supplier or its subcontractor(s) should encounter conditions impeding timely delivery of the goods and performance of services, the supplier shall promptly notify the purchaser in writing of the fact of the delay, its likely duration and its cause(s). As soon as practicable after receipt of the supplier's notice, the purchaser shall evaluate the situation and may at his discretion extend the supplier's time for performance, with or without the imposition of penalties, in which case the extension shall be ratified by the parties by amendment of contract.
- 21.3 The right is reserved to procure outside of the contract small quantities or to have minor essential services executed if an emergency arises, the supplier's point of supply is not situated at or near the place where the goods are required, or the supplier's services are not readily available.
- 21.4 Except as provided under GCC Clause 25, a delay by the supplier in the performance of its delivery obligations shall render the supplier liable to the imposition of penalties, pursuant to GCC Clause 22, unless an extension of time is agreed upon pursuant to GCC Clause 22.2 without the application of penalties.
- 21.5 Upon any delay beyond the delivery period in the case of a goods contract, the purchaser shall, without cancelling the contract, be entitled to purchase goods of a similar quality and up to the same quantity in substitution of the goods not supplied in conformity with the contract and to return any goods delivered later at the supplier's expense and risk, or to cancel the contract and buy such goods as may be required to complete the contract and without prejudice to his other rights, be entitled to claim damages from the supplier.

# 22. Penalties

22.1 Subject to GCC Clause 25, if the supplier fails to deliver any or all of the goods or to perform the services within the period(s) specified in the contract, the purchaser shall, without prejudice to its other remedies under the contract, deduct from the contract price, as a penalty, sum calculated on the delivered price of the delayed goods or unperformed interest rate calculated for each day of the delay until actual delivery or performance. The purchaser may also consider termination of the contract pursuant to GCC Clause 23.

# 23. Termination for default

- 23.1 The purchaser, without prejudice to any other remedy for breach of contract, by written notice of default sent to the supplier, may terminate this contract in whole or in part:
  - a) if the supplier fails to deliver any or all of the goods within the period(s) specified in the contract, or within any extension thereof granted by the purchaser pursuant to GCC Clause 21.2;
  - b) If the supplier fails to perform any other obligation(s) under the contract; or
  - c) If the supplier, in the judgment of the purchaser, has engaged in corrupt or fraudulent practices in competing for or in executing the contract.
- 23.2 In the event the purchaser terminates the contract in whole or in part, the purchaser may procure, upon such terms and in such manner, as it deems appropriate, goods, works of service similar to those undelivered, and the supplier shall be liable to the purchaser for any excess costs for such similar goods, works or services. However, the supplier shall continue performance of the contract to the extent not terminated.
- 23.3 Where the purchaser terminates the contract in whole or in part, the purchaser may decide to impose a restriction penalty on the supplier by prohibiting such supplier from doing business with the public sector for a period not exceeding 10 years.
- 23.4 If a purchaser intends imposing a restriction on a supplier or any person associate time period of not more than fourteen (14) days to provide reasons why the envisaged restriction should not be imposed. Should the supplier fail to respond within the stipulated fourteen (14) days the purchaser may regard the supplier as having no objection and proceed with the restriction.
- 23.5 Any restriction imposed on any person by the purchaser will, at the discretion of the purchaser, also be applicable to any other enterprise or any partner, manager, director or other person who wholly or partly exercises or exercised or may exercise control over the enterprise of the first- mentioned person, and with which enterprise or person the first mentioned person, is or was in the opinion of the purchaser actively associated.
- 23.6 If a restriction is imposed, the purchaser must, within five (5) working days of such imposition, furnish the National Treasury, with the following information:
  - (i) The name and address of the supplier and / or person restricted by the purchaser;
  - (ii) The date of commencement of the restriction

- (iii) The period of restriction; and
- (iv) The reasons for the restriction. These details will be loaded in the National Treasury's central database of suppliers or persons prohibited from doing business with the public sector.
- 23.7 If a court of law convicts a person of an offence as contemplated in sections 12 or 13 of the Prevention and Combating of Corrupt Activities Act, No. 12 of 2004, the court may also rule that such person's name be endorsed on the Register for Tender Defaulters. When a person's name has been endorsed on the Register, the person will be prohibited from doing business with the public sector for a period not less than five years and not more than 10 years. The National Treasury is empowered to determine the period of restriction, and each case will be dealt with on its own merits. According to section 32 of the Act the Register must be open to the public. The Register can be perused on the National Treasury website

# 24. Antidumping and countervailing duties and rights

24.1 When, after the date of bid, provisional payments are required, or anti-dumping or countervailing duties are imposed, or the amount of a provisional payment or anti-dumping or countervailing right is increased in respect of any dumped or subsidized import, the State is not liable for any amount so required or imposed, or for the amount of any such increase. When, after the said date, such a provisional payment is no longer required or any such anti-dumping or countervailing right is abolished, or where the amount of such provisional payment or any such right is reduced, any such favourable difference shall on demand be paid forthwith by the supplier to the purchaser or the purchaser may deduct such amounts from moneys (if any) which may otherwise be due to the supplier in regard to goods or services which he delivered or rendered, or is to deliver or render in terms of the contract or any other contract or any other amount which may be due to him.

# 25. Force Majeure

- 25.1 Notwithstanding the provisions of GCC Clauses 22 and 23, the supplier shall not be liable for forfeiture of its performance security, damages, or termination for default if and to the extent that his delay in performance or other failure to perform his obligations under the contract is the result of an event of force majeure.
- 25.2 If a force majeure situation arises, the supplier shall promptly notify the purchaser in writing of such conditions and the cause thereof. Unless otherwise directed by the purchaser in writing, supplier shall continue to perform its obligations under the contract as far as is reasonably practical, and shall seek all reasonable alternative means for performance not prevented by the force majeure event.

# 26. Termination for insolvency

26.1 The purchaser may at any time terminate the contract by giving written notice to the supplier if the supplier becomes bankrupt or otherwise insolvent. In this event, termination will be without compensation to the supplier, provided that such termination will not prejudice or affect any right of action or remedy, which has accrued or will accrue thereafter to the purchaser.

# 27. Settlement of Disputes

- 27.1 If any dispute or difference of any kind whatsoever arises between the purchaser and the supplier in connection with or arising out of the contract, the parties shall make every effort to resolve amicably such dispute or difference by mutual consultation.
- 27.2 If, after thirty (30) days, the parties have failed to resolve their dispute or difference by such mutual consultation, then either the purchaser or the supplier may give notice to the other party of his intention to commence with mediation. No mediation in respect of this matter may be commenced unless such notice is given to the other party.
- 27.3 Should it not be possible to settle a dispute by means of mediation, it may be settled in a South African court of law.
- 27.4 Notwithstanding any reference to mediation and/or court proceedings herein,
  - a) The parties shall continue to perform their respective obligations under the contract Unless they otherwise agree; and
  - b) The purchaser shall pay the supplier any monies due the supplier for goods delivered and / or services rendered according to the prescripts of the contract.

# 28. Limitation of Liability

- 28.1 Except in cases of criminal negligence or willful misconduct, and in the case of infringement pursuant to Clause 6;
  - a) the supplier shall not be liable to the purchaser, whether in contract, tort, or otherwise, for any indirect
    or consequential loss or damage, loss of use, loss of production, or loss of profits or interest costs,
    provided that this exclusion shall not apply to any obligation of the supplier to pay penalties and/or
    damages to the purchaser; and
  - b) The aggregate liability of the supplier to the purchaser, whether under the contract, in tort Or otherwise, shall not exceed the total contract price, provided that this limitation shall not apply to the cost of repairing or replacing defective equipment.

# 29. Governing language

29.1 The contract shall be written in English. All correspondence and other documents pertaining to the contract that is exchanged by the parties shall also be written in English.

# 30. Applicable law

30.1 The contract shall be interpreted in accordance with South African laws, unless otherwise specified.

# 31. Notices

- 31.1 Every written acceptance of a bid shall be posted to the supplier concerned by registered or certified mail and any other notice to him shall be posted by ordinary mail to the address furnished in his bid or to the address notified later by him in writing and such posting shall be deemed to be proper service of such notice.
- 31.2 The time mentioned in the contract documents for performing any act after such aforesaid notice has been given, shall be reckoned from the date of posting of such notice.

# 32. Taxes and duties

- 32.1 A foreign supplier shall be entirely responsible for all taxes, stamp duties, license fees, and Other such levies imposed outside the purchaser's country.
- 32.2 A local supplier shall be entirely responsible for all taxes, duties, license fees, etc., incurred until delivery of the contracted goods to the purchaser.
- 32.3 No contract shall be concluded with any bidder whose tax matters are not in order. Prior to the award of a bid SARS must have certified that the tax matters of the preferred bidder are in order.
- 32.4 No contract shall be concluded with any bidder whose municipal rates and taxes and municipal services charges are in arrears.

# 33. Transfer of contracts

33.1 The contractor shall not abandon, transfer, cede assign or sublet a contract or part thereof without the written permission of the purchaser

# 34. Amendment of contracts

34.1 No agreement to amend or vary a contract or order or the conditions, stipulations or provisions thereof shall be valid and of any force unless such agreement to amend or vary is entered into in writing and signed by the contracting parties. Any waiver of the requirement that the agreement to amend or vary shall be in writing, shall also be in writing.

# 35. Prohibition of restrictive practices

- 35.1 In terms of section 4 (1) (b) (iii) of the Competition Act No. 89 of 1998, as amended, an agreement between, or concerted practice by, firms, or a decision by an association of firms, is prohibited if it is between parties in a horizontal relationship and if a bidder(s) is / are or a contractor(s) was / were involved in collusive bidding.
- 35.2 If a bidder(s) or contractor(s) based on reasonable grounds or evidence obtained by the Purchaser has / have engaged in the restrictive practice referred to above, the purchaser may refer the matter to the Competition Commission for investigation and possible imposition of administrative penalties as contemplated in section 59 of the Competition Act No 89 0f 1998.
- 35.3 If a bidder(s) or contractor(s) has / have been found guilty by the Competition Commission of the restrictive practice referred to above, the purchaser may, in addition and without prejudice to any other remedy provided for, invalidate the bid(s) for such item(s) offered, and / or terminate the contract in whole or part, and / or restrict the bidder(s) or contractor(s) from conducting business with the public sector for a period not exceeding ten (10) years and / or claim damages from the bidder(s) or contractor(s) concerned.

#### FORM "D"

#### **GENERAL PROCEDURES**

#### 1 General Directives

- 2.1 The following general procedures contained in this document have been laid down by the Council and are applicable to all bids, orders and contracts, unless otherwise approved by the Council prior to the invitation of the bids.
- 2.2 Where applicable, special conditions or procedures are also laid down by the Council to cover specific supplies or services.
- 2.3 Where such special conditions or procedures are in conflict with the general conditions and procedures, the special conditions or procedures shall apply.
- 2.4 The bidder shall satisfy himself/herself with the conditions and circumstances of the bid. By bidding, the bidder shall deem to have satisfied himself/herself as to all the conditions and circumstances of the bid.
- 2.5 Formal contract are concluded with the contractors only where this requirement is stated in the bid invitation.
- 2.6 All bids with regard to the bidding of a service e.g. materials, cleaning services; professional services, etc. shall be subject to the negotiation of a Service Level agreement between the successful contractor and the Municipality. The acceptance of this Service Level Agreement is subject to the approval by the Council of the Municipality.
- 2.7 The written acceptance of bid shall be posted to the bidder or contractor concerned by registered or certified mail.

#### 2 Issuing of bid documents

On the date that the advertisement appears in the Municipality's Tender Bulletin, and or media, prospective bidders may request copies of the tender documentation.

The Supply Chain Management Unit will keep a register and potential bidders should sign for receipt of the bid documentation. If a fee is payable, an official receipt must be issued before the bid document is handed to the bidder.

No bid responses from any bidder should be accepted if sent via the Internet, e-mail or fax.

Only the Supply Chain Management Unit will have direct communication between the potential bidders and will facilitate all communication between potential bidders and the Municipality with regard to any advertised bid. No line function staff should be allowed to communicate with potential bidders without the approval by the Manager: Supply Chain Management Unit.

The Supply Chain Management Unit will only consider request for the extension of the closing dates of advertised bid if the postponed date can be advertised in the media used to advertise before the original closing date. The closing time may be postponed only if all potential bidders can be advised of the postponed time, in writing, before the original closing time.

The decision to extend the closing date or time rests with the Manager: Supply Chain Management Unit, who must ensure compliance with all relevant rules and regulations and must confirm prior to the action being taken.

#### 3 Payment of bid documents

Bids documents containing the Conditions of Bid and other requirements in terms of the Supply Chain Management Policy will be downloaded from e-tender Publication Portal at www.etenders.gov.za at no fee.

#### 4 Public Invitation for competitive bids

The following are procedures for the invitation of competitive bids:

4.1 Invitation to prospective providers to submit bids must be by means of a public advertisement in the national treasury publication portal www.etenders.gov.za, the website of the municipality or any other appropriate ways (which may include an advertisement in Polokwane Municipality Notice board)

#### 5 Public advertisement must contain the following:

The closure date for the submission of bids, which may not be less than 30 days in the case of transactions over R10 million (Vat included), or which are of a long term nature, or 14 days in any other case, from the date on which the advertisement is placed in a newspaper; subject to (iii) below; and

- 6 Accounting officer may determine a closure date for the submission of bids which is less than the 30 or 14 days requirement, but only if such shorter period can be justified on the grounds of urgency or emergency or any exceptional case where it is impractical or impossible to follow the official procurement process.
- 7 Bids submitted must be sealed.

#### 8 The following information must appear in any advertisement:

- Bid number;
- Description of the requirements;
- The place where the bid documents can be obtained;
- The date, time and venue where site inspection/briefing session will be (if applicable);
- Closing date and time;
- The fee applicable that must be paid before the bid documents will be issued; and
- The name and telephone numbers of the contact person for any enquiries

#### 9 Site meetings of briefing sessions (if applicable)

A fully explanatory site inspection must be conducted before the close of the bids to ensure that the bidders understand the scope of the project and that they can comply with the conditions and requirements.

It should be a condition that prospective bidders attend a site inspection and non-attendance should invalidate a bid, where a site inspection/briefing session is applicable.

#### 10 Handling of bids submitted in response to public invitation

#### 10.1 Closing of bids

All bids will close at **10H00** on a date as stipulated on the advertisement, which must be reflected in the bid document.

Bids are late if they are received at the address indicated in the tender documents after the closing date and time.

A late bid should not be admitted for consideration and where practical should be returned unopened to the bidder accompanied by explanation.

# 10.2 Opening of bids

Bids are opened in public as soon as possible after the closure in the presence of the Manager: Supply Chain Management or his/her delegate.

The official opening the bids should in each case read out the name of the bidder and the amount of the bid.

The bid should be stamped with the official stamp of the Municipality and endorsed with the signatures of the person opening it and of the person in whose presence it was opened.

Bids should be recorded in a register kept for that purpose.

# 10.3 Validity Period of the bids

The validity periods should not exceed 90 (ninety) days and is calculated from the date of bid closure endorsed on the front cover of the bid document.

Should the validity period expires on a Saturday, Sunday or Public holiday, the bid must remain valid and open for acceptance until the closure on the following working date.

# 10.4 Consideration of bids

- The Council takes all bids duly admitted into consideration.
- The Council reserves the right to accept the lowest or any bid received.
- The decision by the Municipality regarding the awarding of a contract must be final and binding

# 10.5Evaluation of bids

The following are criteria against which all bids responses will be evaluated:

# 11 Compliance with bid conditions

# 12 Meeting technical specifications and comply with bid conditions;

#### 13 Financial ability to execute the contract; and

(i) The number of points scored for achieving specific goals objectives and points scored for price.

#### 14 Evaluation of bids on functionality and price

- 14.1 All bids received will be evaluated on functionality and price.
- **15** The conditions of bid may stipulate that a bidder must score a specified minimum number of points for functionality to qualify for further evaluation.
  - I. The number of points scored for achieving specific goals objectives must be calculated separately and must be added to the points scored for price.
  - II. Only bid with the highest number of points will be selected.

# 16 Acceptance of bids

Successful bidders must be notified at least by registered post of the acceptance of their bids, but that acceptance however, will only take effect after completion of the prescribed contract form.

The successful service provider will be required to sign the service level agreement.

Unsuccessful bids should not be returned to bidders, but should be placed on record for audit purposes.

A register or records should be kept of all bids accepted

#### 17 Publication of bids results

The particulars of the successful bidders should be published in the Municipality's Tender Bulletin, website as well as the newspaper on which the bid was advertised.

# 18 Cancellation and re-invitation of bids

- I.In the event that in the application of the 80/20 preference point system as stipulated in the bid documents, all bids received exceed the estimated Rand Value of R50 000 000.00, the bid invitation must be cancelled. If one or more of the acceptable bid(s) received are within the R50 000 000.00 threshold, all bids received must be evaluated on the 80/20 preference point system
- II.In the event that, in the application of the 90/10 preference point system as stipulated in the bid documents, all bids received are equal to or below R50 000 000.00, the bid must be cancelled. If one or more of the acceptable bid(s) received are above the R50 million threshold, all bids received must be evaluated on the 90/10 preference point system

If a bid was cancelled as indicated above, the correct preference point system must be stipulated in the bid documents of the re-invited bid.

Municipal Manager may, prior to the award of a bid, cancel the bid if:

Due to changed circumstances, there is no longer a need for the services, works or goods requested.

Municipal Manager must ensure that only goods, services or works that are required to fulfil the needs of the institution are procured. Or

Funds are no longer available to cover the total envisaged expenditure. Municipal Manager must ensure that the budgetary provisions exist prior to inviting bids: or

No acceptable bids are received (If all bids received are rejected, the institution must review the reasons justifying the rejection and consider making revisions to the specific conditions of contract, design and specifications, scope of the contract, or a combination of these, before inviting new bids)

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#### BID NUMBER: PM80-24/25

# BID DESCRIPTION: PROVISION OF THE PUBLIC TRANSPORT MANAGEMENT SYSTEM (PTMS)FOR THE POLOKWANE IRPTS FOR PERIOD OF THREE (03) YEARS

# SPECIAL CONDITIONS OF CONTRACT

All equipment shall be certified by recognized certification authorities, including those required by governing South African law. This includes but is not limited to:

- 1. South African Bureau of Standards (SABS)
- 2. South African National Standards (SANS)
- 3. Independent Communications Authority of South Africa (ICASA)
- 4. Institute of Electrical and Electronics Engineers (IEEE)
- 5. International Electrotechnical Commission (IEC)
  - 6. European Committee for Standardization (CEN).
  - 7. European Committee for Electrotechnical Standardization (CENELEC).
  - 8. European Telecommunications Standards Institute (ETSI).
  - 9. Underwriters Laboratory (UL).
  - 10. Underwriters Laboratory Canada (ULC).
  - 11. Canadian Standards Association (CSA).
  - 12. International Organisation for Standardisation (ISO).
  - 13. Society of Automotive Engineers (SAE).

N.B\* The DR (Disaster Recovery) should be on cloud platforms hosted preferably by either AWS, Telkom or any recognized organizations with Offices representation in Polokwane Municipal area.

N.B.\*\*The Cloud Data centre should have on top of the firewall an Anti-Virus protection, and the Backoffice should have that protection too including a VPN with limited access to only a few LLP approved engineers (technical people)

N.B\*\*\* The Contractor shall maintain the equipment to the specifications of the OEM and report any obsolete devices, and after the period of 3years all equipment shall be handed over to the Municipality, including all Software Licences in good order. This will also be in accordance with the FIDIC contractual governance, Design Built Operate Maintain

# BID NUMBER: PM80-24/25: PROVISION OF THE PUBLIC TRANSPORT MANAGEMENT SYSTEM (PTMS)FOR THE POLOKWANE IRPTS FOR PERIOD OF THREE (03) YEARS DURATION OF THE PROJECT

The duration of the project will be three (03) years after the signing of the service level agreement

# 1. DETAILED SPECIFICATIONS:

# PTMS Statement of Work

DESIGN, SUPPLY, INSTALLATION, COMMISSIONING, MAINTENANCE AND OPERATIONAL SUPPORT OF THE POLOKWANE INTEGRATED RAPID PUBLIC TRANSPORT SYSTEM (IRPTS) PUBLIC TRANSPORT MANAGEMENT SYSTEM (PTMS) FOR THREE YEARS

# **TECHNICAL SPECIFICATION**

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# List of Acronyms

ADSL	Asymmetric Digital Subscriber Line
AFC	Automatic Fare Collection
AP	Access Point
APC	Automatic Passenger Counter
API	Application Programming Interfaces
PTMS	Public Transport Management System
ASA	Automatic Stop Annunciation
AVL	Automatic Vehicle Location
BI	Reporting System
BOC	Bus Operating Company
BoQ	Bill of Quantities
BRT	Bus Rapid Transit
CAN	Controller Area Network
CBD	Central Business District
СВР	Current Best Practice
CCTV	Closed Circuit Television
CEN	European Committee for Standardization
CENELEC	European Committee for Electrotechnical Standardization
CoO	Concept of Operations
COTS	Commercial Of The Shelf
CSA	Canadian Standards Association
DB	Database
DSRC	Dedicated Short Range Communications
DVMS	Digital Video Management System
ECCM	Essential Care and Condition Monitoring
EMI	Electromagnetic Interference
EMS	Emergency Medical Services
ESRI	Environmental Systems Research Institute
ETSI	European Telecommunications Standards Institute
FAT	Functional Acceptance Test
FO	Fibre Optic
FOC	Fibre Optic Cable
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FTM	Fixed Time Maintenance
GIS	Geographic Information System
GPS	Global Positioning System
GSM	Global System for Mobile Communications
	General (Google) Transit Feed Specification: defines a common format
GTFS	for public transportation schedules along with geographic data.
HW	Hardware
ICASA	Independent Communications Authority of South Africa
ICT	Information and Communications Technology
ID	Identification
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronic Engineers
iLO	Integrated Light Out
IP	Internet Protocol

IP	Ingress Protection
IRPTN	Integrated Rapid Public Transport Network
IRPTS	Integrated Rapid Public Transport System
ISO	International Organisation for Standardisation
IT	Information Technology
ITS	Intelligent Transport Systems
KPI	Key Performance Indicator
LAN	Local Area Network
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LOM	Lights Out Management
LTE	Long Term Evolution
MDT	Main Driver Terminal
MS	Microsoft
MTBF	Mean Time Between Failure
MWR	Mobile Wireless Router
NAS	Network Attached Storage

NOPTIS	Nordic Public Transport Interface Standards
NTCIP	National Transportation Communications for ITS Protocol
NVR	Network Video Recorder
OBU	On-Board Unit
ODBC	Open Database Connectivity
OEM	Original Equipment Manufacturer
PA	Public Address
PC	Personal Computer
PDA	Personal Digital Assistant
PID	Passenger Information Display
PIS	Passenger Information System
РМ	Preventive Maintenance
POE	Power Over Ethernet
PPE	Personal Protective Equipment
PRG	Priority Request Generator
PRS	Priority Request Server
PT	Public Transport
PTMS	Public Transport Management System
PTZ	Pan Tilt Zoom
QA	Quality Assurance
RAID	Redundant Array of Independent Discs
RAN	Radio Access Network
RF	Radio Frequency
RFI	Radio Frequency Interference
RTIG	Real Time Information Group
RTU	Remote Terminal Unit
SABS	South African Bureau of Standards
CMS	Schedule Adherence and Control
SAE	Society of Automotive Engineers

SAN	Storage Area Network
SANS	South African National Standard
SAPS	South African Police Services
SAT	System Acceptance Test
SIM	Subscriber Identity Module
	Service Interface for Real Time Information: A European interface standard for exchanging information about the planned, current or projected performance of real-time public transport operations between
SIRI	different computer systems.
SIT	System Integration Test
SMS	Short Message Service
SOAP	Simple Object Access Protocol
SOP	Standard Operating Procedure
SW	Software
TCIP	Transit Communications Interface Profiles
TETRA	Terrestrial Trunked Radio
TFT	Thin Film Transistor
ТМС	Transport Management Centre
TMIS	Traffic Management Information System
тос	Taking Over Certificate
TSP	Traffic Signal Priority
UMTS	Universal Mobile Telecommunications System
UPS	Uninterruptable Power Supply
USSD	Unstructured Supplementary Service Data
UTC	Urban Traffic Control
VCM	Vehicle Configuration Manager
VDM	Vehicle Docking Manager
VDV	Verband Deutscher Verkehrsunternehmen
VLAN	Virtual LAN
VMS	Variable Message Sign
VOC	Vehicle Operating Company
VoIP	Voice over IP
VPN	Virtual Private Network

VSS	Video Surveillance System
VUM	Video Upload Management
WAN	Wide Area Network
Wi-Fi	Wireless Fidelity
WLAN	Wireless Local Area Network
XHTML	eXtensible Hyper Text Markup Language
XML	Extensible Markup Language

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# 1 Description of Works

# 1.1 Introduction

The Polokwane Integrated Rapid Public Transport System (IRPTS) was approved by the Polokwane Local Municipality in 2013. The system will be known as *"Leeto la Polokwane"*, which means the Journey of Polokwane and forms part of the City's Technical Operational Plan.

As part of the Polokwane Local Municipality's (PLM) Integrated Rapid Public Transport Network (IRPTN) the Bus Rapid Transit (BRT) Public Transport Management System (PTMS)will be implemented.

The scope of work is given in this section of the tender document (Part C3) and includes a three (3) year contract for the design, supply, installation, commissioning, maintenance and operational support of all BRT PTMS systems and sub-systems forming part of the following high-level components:

- 1. Transport Management Centre (TMC)
- 2. Vehicles (21 Buses (12m) and 15 Midi-Buses (9m)) and a possible 20 to 60 taxis
- 3. Trunk stations
- 4. Bus depot and layover
- 5. Communications network (only Mobile APN) Fiber optic Network where possible with Micro link connection

According to the Technical Operational Plan of Polokwane Local Municipality, the IRPTS will be rolled out in Phases. The objective is to make the system affordable and financially sustainable for the City while enhancing the integrated public transport network and ensuringall operators are included, hereby minimising competitive behaviour.

The phases of the City of Polokwane BRT include several trunk routes, as summarised in Table 1 below. The grey highlighted phase 1A forms part of this tender scope of work.

	Phase 1A	Phase 1B	Phase 2
		T2	
Trunk	Τ7	T1A	T1
Stations		Т3	2A/2B
		T4	3A/3B
		T5	
		Т6	
TOTAL	1	5	3

	Route					
	ID	Qty Stops	Route ID	Qty Stops	Route ID	Qty Stops
	F2A	13	F1	15	TE8	6
	F2B	18	F3	11	TE9	6
	F4	13	F5	8	TE10	8
Trunk Extension	TE5	7	F6a	13	TE11	
and Feeder	TE6	10	F6b	11	TE12	
Routes	TE7	7	F6c	11		
			DS1	2		
			TE1	7		
			TE2	8		
			TE3	5		
			TE4	7		
TOTAL	6	68	11	98	5	20

	Feeder	Trunk	Feeder	Trunk	Feeder	Trunk
12m Buses		30		TBD		TBD
9m Midi-			TBD		TBD	
Buses						
Mini-Bus			TBD		TBD	
Тахі						
TOTAL		30		)	-	ГВ D

## Table 1: Phases of the envisaged BRT for Polokwane

Please refer to Part C4 SITE INFORMATION for a detailed geographical representation of phase 1A.

Please take note that City of Polokwane reserves the rights to continue, or not to continue with the phases after Phase 1A. This PTMS tender will focus on the Leeto la Polokwane for Phase 1A, which are schematicallyshown in Figure 1, the golden routes.



Figure 1: Overview of Leeto la Polokwane Phase 1A

## Phase 1A

This phase aims to establish the system's foundation and, therefore, includes the construction of the TMC, Depot and trunk corridor between stations T2 and T7. For Phase 1A, only Stations T2 and T7 will be built. Three trunk extensions (TE5, TE6 & TE7) and feeder routes (F2A, F2B & F4) are to be serviced by 21 Trunk Buses and 15 Midi-Buses, respectively, with a total of 24 stops along the trunk extensions. Polokwane Local Municipality has the rightto confirm the number of stations.

## Phase 1B

This phase includes the further development of the service along the trunk corridor by the construction of a further 6 trunk stations (T1A, T3, T4, T5 & T6) as well as the addition of a further 4 trunk extensions (TE1, TE2, TE3 & TE4) and 4 feeder routes (F1, F3, F5 & F6), with an additional 99 feeder stops. The bus fleet will be increased to cover the extended services by an additional 33 Trunk Buses and about 20 Midi-buses.

## Phase 2

This phase includes the extension of the trunk corridor to Seshego and the addition of a trunkstation (T1) as well as an additional 4 trunk extensions (TE8, TE9 & TE10) with an additional 31 stops. The bus fleet will be increased to cover the extended services by the addition of 84trunk buses.

## **Ownership Model**

Polokwane is proposing an industry transition process whereby the four associations does notfunction alone but will be merged under one company. The four associations will hold the shares of the new company. The new company proposed will be VOC – Vehicle Operating Company.

The difference between the conventional BRT implementation and the Proposed Polokwane IRPTS is the ownership of the operating company model. The VOC will consist of the 4 taxi associations that will be the contracting party and will be responsible for all contractual public transport services for the transport authority.

## 1.2 **Purpose of the project**

The Leeto la Polokwane IRPTS aims to provide reliable, efficient, safe and affordable public transport, encouraging the entire spectrum of South African commuters to use the system.

The purpose of the PTMS is to support the management of the service and to provide Key Performance Indicator (KPI) data for monitoring service providers. The system shall be capable of providing real-time monitoring and schedule management and flexible and accurate reporting capabilities for the operators and the Vehicle Operating Company (VOC). In addition, the system shall provide accurate and easily accessible passenger information to the public. Further, assist the AFC part of the project in reporting correct ridership and correcting productive KM for the VOC

The Contractor shall implement, maintain under a service level agreement (SLA) and provide operational support such that the system will consistently outperform Key Performance Indicators (KPIs).

ITS systems (Figure 2) are to be installed through this contract and serve an integral and crucial purpose in the overall operations and management of the BRT systems. Systems integration refers to the functional linking of sub-systems. Shared infrastructure refers to physically linking systems or allowing one entity (contractor) to utilise the infrastructure installed by another.



Figure 2: ITS systems, Stake Holders and Systems Integrations

Once implemented, the BRT operations will be managed from the TMC from where inputs from the transport system, including field devices (buses, stations etc.) will be monitored and measured against expected performance indicators for e.g. schedule adherence. According to Standard Operating Procedures (SOP's) action can then be taken by means of advice, control and intervention.

## **PTMS Process Overview**

The PTMS process flow can be viewed as a closed-loop feedback system, with the view of optimising system performance. This overview is shown in Figure 3 below.



Each of the processes above impact system operations and performance and must be aligned with the other processes to ensure coherent system performance. Planning provides an inputto the Compliance Monitoring System. Information is then exchanged between the Compliance Monitoring System and Passenger Information Systems (PI). Reports can be generated to evaluate system performance against objectives upon which existing planning can be adjusted or new planning initiated.



Fig 3.1 Process of the PTMS Input/Output Expectations and Reporting

## 1.3 Overview of the works

The PTMS works are divided into five main elements:

- 1. Planning
- 2. Monitoring and Management
- 3. Reporting
- 4. Passenger Information
- 5. Safety and Security

Next, each of the elements will be described briefly, and the various items included in this PTMS tender will be listed.

## 1.3.1 PTMS Planning Elements

Typically, the City of Polokwane will be responsible for advising on much of the planning data, asthey will dictate bus routes, stops and schedules. It is advised that Polokwane consider the creation of a systems planning group within Polokwane that will be closely involved in the implementation of the scheduling and planning. Ideally, Polokwane must have a designated systems scheduler available from the PTMS Contract's inception and throughout BRT operations.

The PTMS system is designed to receive basic planning data in order for compliance monitoring to compare real-time data with planned data. This will allow schedule adherence to be determined. All planning data must be recorded in a single centralised database.

The schedule and planning system will be included in the PTMS specification as a rateonly item. Scheduling will be considered a source of data and can be provided in several formats, e.g. xls, CSV, SIRI or GTFS. The scheduling can be done as part of fleet operations or provided as a service by a consultant.

The compliance monitoring systems will be users of the data and must provide for the importation of the planning data in various formats, e.g., XLS, CSV, SIRI, or GTFS.

A proper professional scheduling system integrated and forming part of the PTMS software is essential for the data integrity of the compliance monitoring system, which shall perform static and dynamic schedules.

Training will be required to operate this new schedule and planning system; the methods are simpler to learn compared to the specialised knowledge required for the complex software packages. As was suggested above, the provider's option to assist the VOC for a specific period of time to allow the VOC to be proficient with the system will apply.

## Define routes and stops

Leeto La Polokwane will be responsible for the route definitions and stop definitions. As part of systems planning, stops and bus routes are identified. This information, including stop names, coordinates and distance between stops, route direction and name, must be entered into the planning system. Differentiation is required between productive and unproductive links; e.g. depot runs are normally considered unproductive mileage. Variouscombinations of productive and unproductive routes must be grouped together to generate unique blocks to be serviced daily. Leeto La Polokwane must be closely involved and advise on the requirements so that all necessary data can be captured through its Operations advisers

## **Route surveys**

Route surveys are be required to capture accurate data. This involves driving the planned route to determine stopping point coordinates and driving time between stops under various conditions such as peak periods, weekdays and weekend days. This will be the responsibility of Leeto La Polokwane operations advisers.

## **Schedules & Timetables**

Schedules are normally associated with different day types, such as normal weekdays, Saturdays, Sundays and public holidays. Travel times must be determined and recorded, including times between each stopping point and to/from the depot as required. Stopping timesat every stopping point are also required. Various factors will affect travel times, such as buses operating in dedicated bus lanes, mixed traffic, and AM and PM peak times.

LLP will take ownership and must advise on the requirements so that all necessary data can be captured. The contractor is asked to provide scheduling support and advice on this tender.

## **Vehicle Scheduling**

A certain number of buses will be required to service all the stops in order to keep to the planned schedules. Every bus is, therefore, linked to a specific route and must depart from every stop at a predefined time based on the schedule. Layover and layover times are also specified, and minimum and maximum layovers can be defined. As optional, the system may include basic analysis to warn of possible scheduling errors, for example, stop skips or very short departure times between stops, more than one bus on the same block, etc. Vehicle schedulingfunctionality is used to assign the appropriate number and type (size) of buses in order to keepto the desired schedule adherence times. Manual scheduling is not helpful, and it was tried in the past, so integrating that data for compliance monitoring will not assist PTMS performance and justify its use.

## **Schedule Publication**

Schedule publication provides functionality to create a certain layout of timetables for publication purposes. These timetables are normally displayed at stops and can be handed out ordistributed electronically, typically as a PDF file. Polokwane Corporate Identify (CI) and marketing must advise on the layout, colours, logo, structure, etc., to be used. The contractor to provide advice and support for Scheduled publication.

## **Driver Duty Scheduling**

Driver duty scheduling involves the creation of shifts and shift types, assigning driver duties, assigning duties associated with day types, and conducting a simulation to check if driver duties fit vehicle schedules. Withphase 1A only having 21 buses and 15 Midibuses, this function can be done using the provided Scheduling software package Contractor to support and guide Polokwane Local Municipality. Contractor to provide motivation if specialised software is offered. The number of vehicles, including taxis, will be close to or more than 100, so starting with a permanent solution will make sense.

## Vehicle and Driver Dispatching

This functionality assists in creating driver rosters and dispatch sheets, which can be used to show specific runs with start and end locations and times. Rosters show driver work times with route allocations. The contractor will provide support and guidance to the Polokwane Local Municipality.

## 1.3.2 PTMS Compliance Monitoring and Management

Compliance monitoring will be done via the Main Driver Unit system on the bus, which has all schedules, shifts, and routes. It will analyse data on the route, and any differences from the schedules will be recorded. The Controller at the Polokwane TMC, located at Peter Mokaba Stadium, will change certain aspects of the schedules to allow buses to be on schedule. These operators, also known as bus controllers, monitor the live tracking of every bus. Thecontrollers can communicate with bus drivers and the Vehicle Operating Company(VOC). Controllers, together with the controller supervisor, can intervene by instructing a bus driver to slow down, inform him of an incident along the route, and instruct him to change his route or, in agreement with the BOC, dispatch another bus.

Controllers can also update passenger information to inform commuters of incidents

or delayed departure times. In summary, the PTMS system is designed for bus controllers to have all required real-time information available to make informed decisions about any required intervention.

Compliance monitoring typically involves a specialised system with a uniform interface, including different maps and incident displays and an interface to log incidents and communicate with bus drivers.

## Automatic Vehicle Location (AVL)

Vehicle tracking or AVL, is possible via a GPS receiver installed on every bus and feeder bus. The accuracy of the GPS receiver may be augmented by additional parameters such as odometer input and dead-reckoning algorithms, but GPS performs the primary method of location.

The real-time bus locations are then sent to the control centre via the cellular network. This should be done via a dedicated Access Point Name (APN) connection with sufficient bandwidth. The APN ensures a high quality of service and high levels of security. The Contractor will provide a solution for AVL.

#### Real-time map display

The back-end of the system provides a user interface with a map display to show the real-time geographic location of every bus. This should also show current adherence to the bus schedule. The Contractor will provide a solution for real-time map display.

#### Monitor distance travelled

The distance travelled per bus is shown in the system. This is not shown in real time but will be included in the report. Separation has to be made between productive and unproductive kms. Monitor-distance travel forms part of the scope of this tender.

## Monitor Did Not Operate (DNO)

DNO events will be identified where the BOC fails to send a vehicle to service a particular route or misses a trip. Monitor did not operate events that form part of the scope of this tender.

#### **Driver communications**

Voice communication is possible from the TMC. Voice calls can only be initiated by the control centre. The driver can send a request to the TMC via a Request-To-Talk (RTT) button. The control centre can advise drivers of any required action and/or incidents through voice. Driver communications for the 21 buses and 15 Midi-buses form part of the scope of this tender. Please also consider that an additional 60 taxis will be operational as feeders by the end of the three-year period.

#### **Station Communications**

Station Communications provide the TMC with a link to each station so they can call and communicate directly with station personnel. Station communications form part of the scope of this PTMS tender. This will typically be an IP Phone installed at the station.

#### Schedule adherence monitoring

Schedule adherence monitoring is used to compare planned data with real-time data. This comparison is available in real-time on the map displays and also as part of the reporting. The contractor provides LLP with a schedule adherence monitoring functionality.

## Strip diagram display

Visualisation of bus and stop point locations presented in a strip diagram for easy reference. This typically also shows current schedule adherence per bus. Contractor to provide solutions to LLP.

## **Incident monitoring**

An incident table will show active incidents to which a bus controller must respond. Typical incidents related to PTMS include RTT and driver panic button events. Contractor to provide a solution to LLP.

## Vehicle Configuration Manager (VCM)

The Vehicle Configuration manager provides the TMC operators to update the ODU on the buseswith the latest data via the GSM APN network. Contractor to provide a solution.

## 1.3.3 PTMS Reporting System

All planning and real-time system data are logged in one or more databases. Various combinations of reports can be drawn from both sets of data. It is critical that both PolokwaneLocal Municipality and the VOC sign off on the report details since this will be used to manage the contract between Polokwane and the BOC.

Reports are used to manage the SLA agreements. Reports are used to help with planning anddecision-making. The reporting system will have no advanced Business Intelligence functionality, such as a dashboard interface.

## **Mileage report**

The mileage report will distinguish between productive and unproductive mileage and can beused to manage the Contract with the VOC. Statistical analysis is possible to look at total and average kms per bus, per route, etc. Mileage reports form part of the scope of this tender.

## Did Not Operate (DNO) report

DNO events will be identified where the BOC fails to send a vehicle to service a particular route or misses a trip. These events will be available in a report. This forms part of the scope of this tender.

## Schedule deviation report

This report will show actual bus arrival and departure times against planned departure and arrival times. This report can be used to manage the Contract between Polokwane Local Municipality and the BOC. The schedule deviation report does form part of the scope of this tender.

#### Incident and exception report

This report will show any incident over a specified period. If logged in the system, an incident can be classified broadly as any event, such as a driver's request to talk, panic button events or accidents. Incident and exception reports do form part of the scope of this PTMS tender.

## 1.3.4 PTMS Passenger Information System

The Passenger Information System provides information to commuters, both real time and forplanning purposes. Passenger information, both planned and real-time, will be made available in a standard format, e.g., GTFS or SIRI. Additional data feeds can also provide service alerts.

The most effective way to provide passenger information is via mobile devices, including legacy and smartphones. Data will be made available to third parties to develop Apps and informationservices independently. For this purpose, a data interface must be provided. This will encourage a competitive environment for different service providers to develop services.

Information displays can also be installed in buses at a relatively small cost to provide next-stopinformation or on stations to inform the passengers about the status of the operations.

## Vehicle next stop display

An internal next-stop display will be installed in the bus, which shows the route number and next stop to be updated shortly after a bus departs from every stopping point. This is done by an LED matrix sign, which can use paging or scrolling text if required. This forms part of the scopeof this tender.

## Mobile App / USSD

An application for smartphones will be made available for commuters to plan their trip and view real-time information. This must ideally be done by selected third-party suppliers to whom data is made available. A USSD interface can provide the same service as the App for legacy phone users. This forms part of the scope of this PTMS tender.

## Data to 3rd party information providers

Real-time and planning data should be made available to selected third-party suppliers who can develop Apps and USSD services in a competitive environment. Polokwane Local Municipality should avoid signing a Contract with one service provider to develop an App and USSD interface, as this will remove any competition. This forms part of the scope of this PTMS tender.

## Vehicle destination display

An external display will be installed on the bus, which will show the route number and final route destination. This is done by an LED matrix sign, which can use paging or scrolling text if required. The vehicle destination display will be part of the bus tender. However, the PTMS contractor Must interface with the display control to display accurate route data from the schedule.

## Station Passenger Information Display (PID)

The stations will have two PIDs installed per station, which show the travelers the next bus departure times.

## Station voice announcements

Passenger information will be made available at the stations via voice announcements.

#### Bus next-stop announcements

Next stop and other passenger information announcements will be made on the buses (not midi-buses) to inform the passengers.

#### 1.3.5 APMTS Safety and Security Systems

Safety and security systems are comprised mostly of cameras installed in buses, stations, and along BRT routes. CCTV cameras are expensive and generate large volumes of data that require streaming back to the control centre and storage and archiving for later retrieval. All of this adds a significant cost to the implementation of any system. These systems are not an integral part of PTMS, and the primary focus is crime prevention and possible analysis of any incidents. For the purpose of PTMS, basic CCTV coverage is still provided but is designed to reduce implementation costs and minimise any additional resources, such as high bandwidth fibre and large storage.

## Driver panic button

A covert button will be installed close to the bus driver on every bus. This signal will interface with the PTMS systems and will send a high-priority message to the TMC so that system controllers can become aware of the incident. Controllers must follow a standard operating procedure (SOP) to handle such events.

## CCTV camera on-board

Two CCTV cameras will be installed on the vehicle, to view the driver and the front entrance with AFC pay point. CCTV cameras will use an SD card as storage.

#### **CCTV** recorder on-board

To keep costs down, edge recording (by SD card in the camera itself) will be done. This avoids the installation of an expensive Network Video Recorder (NVR). Storage space will be less, and recorded CCTV footage will be overwritten within a specified period of time, typically a few days. No network video recorder will be installed on-board.

#### Station security guards

Polokwane should deploy security guards at the stations to be present 24/7 to ensure a safe environment for commuters.

#### **Kiosk IP phone**

An IP phone in the kiosk will allow direct communication with operators in the TMC. The IP phone in the kiosk forms part of the scope of this PTMS tender.

#### **Station CCTV**

Two CCTV cameras will be installed per station, monitoring the kiosk and platform. Video will be stored at the station on a local network video recorder.

#### Station CCTV recorder

Each station will have a local network video recorder to store the CCTV footage locally. The NVR will be located at the station in the designated equipment room.

## **On-Route CCTV (rate only) – Optional**

The PLM will have the option to add route CCTV on the trunk route in case it is required during the project. The bidder is required to price "rate only" for the element of the on-route CCTV, which includes Poles, Lightning protection, Power Supply (connection fees), backup power supply, enclosure, Network Switch and all cabling (excl. fibre).

The high-level technical overview of the PTMS elements per location is summarised in the following Figure.



Figure 4: High-Level overview of the PTMS elements per location

## 1.3.6 PTMS General Items

The PTMS system shall be intuitive and easy to use, requiring minimum development and configuration during implementation. With an emphasis on necessary functionalities, the following shall be key features of the PTMS system:

- 1. It shall be possible to import stop information (coordinates) directly from GIS data. It shall not be necessary to carry out route surveys in setting up data for the stop locations.
- 2. The primary location mechanism shall be GPS. Vehicle odometer pulses shall not bea pre-requisite for the system but, if available, shall be used by dead-reckoning algorithms in the event of loss of GPS satellite signals.
- 3. All data and system configurations shall be centrally managed. Configuration uploads to the vehicles and data downloads from the vehicles shall be exclusively via the cellular 5G/4G/LTE networks.
- 4. Driver log-on shall be mandatory, and where a driver does not log on the systems shall operate.
- 5. The central system shall be web-based and shall support browser access acrossmultiple workstations.
- 6. The system shall provide mobile apps for the provision of information to the public.
- 7. The system shall support the export of public transport information in GTFS and SIRIformat.
- 8. Flexible reporting is a requirement. Operators shall easily create and configure new reports.

The system shall be capable of importing vehicle schedules from 3rd party public transport vehicle scheduling systems. Tenderers shall provide details of which scheduling systems are supported and the data standards applicable to the imported schedule data. A schedule planning system is included as a pay item, but the client reserves the right to exclude this item.

The specification below provides a minimum set of requirements unless otherwise indicated in the text as optional. Failure to clearly explain in the tender that these minimum requirements will be met will result in the bid being deemed non-responsive – refer to Special Conditions of tender.

It is important that the engineer fully understands what is offered to assess the tender. Tenderers must provide full details of their compliance with the clauses below and indicate what additional functionality they can provide.

A diverse number of subsystems to be implemented and integrated under this contract to form part of the following high-level components:

- 1. Transport Management Centre (TMC).
- 2. Vehicles (trunk buses and midi-buses), including on-board PTMS.
- 3. Trunk stations: Passenger information via passenger information displays and mobiledevices.
- 4. Bus depots and layovers.
- 5. Cellular APN for communications with vehicles, depot, layover areas and stations.

Communications, including the core network switches in the control centre, fibre optic cable along the BRT routes and network switches in the stations, will be planned, designed and procured by the ICT department under existing contracts. Station electronics such as fire detection and evacuation will be procured under the station superstructure contracts.

Because of the diverse scope of work involved in the deployment of the PTMS, the Contractor shall be required to cooperate with, liaise with, meet with and share information with other contractors and role players in order to implement a fully integrated PTMS system.

## 1.3.7 High-level scope of work for the PTMS

The high-level scope of work for the PTMS project includes but is not limited to the following specific work elements:

- 1. Deployment of an on-board PTMS on the entire fleet. The Contractor is responsible for the integration of all hardware deployed on the vehicles with the operations in the Transport Management Centre (TMC) at the following levels:
  - Tracking of vehicles in the control centre using GPS coordinates transmitted by all vehicles via GSM/UMTS.
  - Driver voice communications and messaging.
  - Main driver Unit.

- Managing the bus fleet in real-time utilising the schedules input or imported.
- On-board visual/audio announcement of route, destination, and ext. stop the approach to the installation of on-board systems and the close cooperation with vehicle manufacturers and other contractors is described in paragraph 1.3.8.
- Deployment of a Central PTMS Control System with the necessary software, central data servers and workstations for use by system operators and managers in order to fulfil the following functions:
  - Import of vehicle schedules.
  - Driver Voice and Text Communications.
  - Public transport operations and management.
  - Reporting of monitoring and compliance functionality.
  - Passenger Information (see item 4 below).
- 3. Deployment of information technology and communication systems to integrate the on-board systems and the Central Control System via GSM/UMTS/5G/4G/LTE communications. These systems shall include:
  - Provision of a complete GSM/UTMS/5G/4G/LTE APN solution including service provider APN, routers, link to TMC and securely provisioned SIM cards with voice/data contracts.
  - Conclusion and implementation of a service level agreement (SLA) with a cellular service provider to ensure network coverage and uptime.
- 4. Implementation of an Advanced Traveler Information System (ATIS) providing static and real-time public transport information via the following media:
  - Mobile phones.
  - Data interface to 3rd party passenger information systems.
- 5. Data Transfer and Interfacing capabilities, including but not limited to
  - Import of vehicle schedule data (static timetables and bus schedules)
  - Import geocoded stop and route mapping data using industry-standard file formats.
  - Data interface for third-party public transport traveller information systems, including next bus arrival information signs at stops, internetbased real-time bus arrival and display systems, and interactive voice response systems keyed to specific stops.

These items should operate in a fully integrated manner and shall provide for external interfacesto other systems as described herein. In addition, the deployment shall allow for expansion over time and compatibility with other similar systems, including increases in the number of vehicles, stops, and operators and the addition of enhanced or improved functionality. Further, the scope includes the design, supply, installation, setup, adjusting, configuration, customisation, commissioning, and maintenance and operational support of all systems, sub-systems, hardware and software as specified in this document. It shall be the responsibility of the PTMS Contractor to bid a complete system and provide equipment, all hardware, software, licenses and services necessary to ensure a fully functioning system as described by this specification.

This requirement includes permits, authorisations, inspections, designs, licenses, wayleaves and/or other activities necessary to install equipment on vehicles or at Polokwane Municipality facilities. The Polokwane Municipality will reasonably assist the Contractor in obtaining the required clearances and approvals, but this will not in any way absolve the PTMS Contractor from providing a complete and operational system that meets the requirements given in this document.

## 1.3.8 Interacting and Interfacing with Other Contracts

The PTMS Contractor shall be required to cooperate with, liaise with, meet with and share information with other contractors and role players to implement one fully integrated PTMS system. The PTMS contractor shall undertake to engage with all other PTMS contractors in accorporative manner with the primary objectives to:

- Co-ordinate installation.
- Identify and define interfaces.
- Determine test procedures for all installations and interfaces.
- Solve problems timeously.

Other PTMS contracts with which there might be dependencies and interfaces are shown in Figure 4 and described below:



Figure 4: Overview of other related contracts

## 1.3.8.1 Existing contracts

The network for IRPTN Communications will be installed by contractors employed by Polokwane under existing contracts. This includes fibre optic cables (backbone and last mile) along the IRPTN routes and terminations as well as all network switches in the TMC, depots and stations. A network management system will also be included. Ducts and manholes for the fibre optic cables will be installed under the route infrastructure contracts.

The communications network will have the following topology:

- 1. Will follow the IRPTN trunk lines
- 2. Will terminate in at least the following locations:
  - Equipment room in each trunk station.
    - Depots and layover areas
    - IRPTN TMC
- 3. A logical redundant ring topology using single-mode Fibre Optic.

The network will comprise layer 3 switches at each station and depot as well as dualcore at layer 3 switches at the TMC. The dual-core will provide redundancy. Physical Route redundancy is required on all fibre routes.

## 1.3.8.2 IRPTN Vehicles Manufacture Contracts

These contracts will include the manufacture of new vehicles. The buses will not be part of this tender. This tender will include the on-board systems for the buses. Tenderers should note that certain new vehicles on board PTMS and related components will be supplied under the vehicle contracts and installed by the vehicle manufacturer. These components include:

- 1. Driver Microphone,
- 2. Speakers,
- 3. Bus Destination Displays,
- 4. Vehicle Next Stop Display

Close operation between the PTMS contractor and vehicle manufacturers is required. Close cooperation between the PTMS contractor and the Vehicle manufacturers will be required, particularly with respect to the following:

- Determination of space, brackets and ventilation requirements for PTMS equipment
- Determination of position and provision of cutouts/access for dash mounted PTMSequipment
- Determination of mounting points and provision of penetrations for roof mountedantenna
- Provision of power supplies to PTMS equipment
- Access and connections to vehicle status and door signals
- Coordination in order that PTMS equipment and wiring is installed at the correct stage on the production line of the new vehicles. It is proposed that the wiring for thePTMS be included in the pre-assembled vehicle wiring looms to be installed on the production line
- OBU and Destination display integration requirements.
- Integration and testing of PTMS equipment in conjunction with equipment suppliedand installed by the vehicle manufacturer including:
  - Power supplies and Ignition Switch
  - Odometer
  - Reverse Gear Selector
  - Door Open Switches (Left and Right)
  - Driver duress (covert footswitch)
  - Driver Microphone and Speakers

## 1.3.8.3 IRPTN Integrated Fare Management System IFMS Contract

This contract will include all the components for card sales, station access control and validation, on-board validation and the fare management back office. These are already provided for under the AFC contract.

Close cooperation between the PTMS contractor and the IFMS Contractor will be required, particularly with respect to:

- 1. Providing Route and Schedule Information to the IFMS Contractor.
- 2. Providing geo-referenced stop information to the IFMS Contractor.
- 3.

## 1.3.8.4 IRPTN Stations Superstructure Contracts

These contracts will include the construction of the complete IRPTN station, power distribution (including UPS), and building electronics such as fire detection and evacuation.

Close cooperation between the PTMS contractor and the Stations Superstructure Contractor(s) will be required particularly with respect to:

- Provision of power supplies for the CCTV.
- Cable routing on the station.
- Location/space of equipment room.

# 2 Project Programme

As part of the works, the Contractor shall submit a baseline program within the requirements of the general and particular conditions of the contract. This program shall identify each element of the project, including but not limited to the following:

- Design, development, supply, setup, configuration and installation of equipmentand software.
- Development of Reports.
- Establishment of acceptance testing routines Installation inspections, Functional Acceptance Testing (FAT), Systems Integration Testing (SIT), SystemAcceptance Testing (SAT) & Commissioning.
- Training
- Work sections shall be completed as provided in Section C1.2.3 "DATAPROVIDED BY THE EMPLOYER"
- This program shall tie in with the existing programmes from other contracts where services are used or integration is required.
- Coordination of different roles and responsibilities shall be considered in the Contractors program.

The program shall clearly indicate which systems will be installed and operational by each milestone shown in the Engineers Preliminary Construction Programme. Tenderers shall use these milestones as the basis for their baseline programme.

The program (in Microsoft Project) shall show start and end dates, resource allocation, delivery milestones, critical paths, etc. The existing program, including key dates related to the availability of infrastructure, buses and others, can be found in Part C4.

The PTMS Tender documentation will be ready by November 2024. The PTMS tender will openin February 2025. The negotiation and award of contract will happen from March 2025 – June 2025. The PTMS contract will be for a total of 36 months starting in July 2025 (estimate).

The Go-Live date is set as October 2025, with 21 buses, 20-60 taxis and 15 midi-buses. Very high-level dates for all parties (available) are shown (to be updated with contract signature)

#### POLOKWANE BRT - OVERALL PROGRAMME AND INTERFACES

N o	SECTION	202 4								2025															
		J	F	М	Α	Μ	J	J	Α	S	0	Ν	D	J	F	М	Α	Μ	J	J	Α	S	0	Ν	D
1	Buses (21x 12m) procurement																								
2	Buses (15 x 9m) procurement																						_		
3	Station Contract 1 (foundation)																								
4	Station Contract 2 (Top structure)																								
5	VOC																								
6	PTMS Tender																								
7	AFC Tender																								
8	ICT																								
																									1
9	ТМС																								

#### Estimate prepared on 12 June 2018

In terms of other contracts, the AFC will follow the same timeline as the PTMS.

# 3 Existing ICT contracts

The client (PLM) has existing contracts for supplying of certain ICT equipment. This includes personal computers, laptops, servers, wireless access points (APs), network cabling, equipment racks, storage devices, network switches, certain software, CCTV, etc.

Although this tender includes specifications and payment items for such equipment, the client reserves the right to procure from the ICT contractor. The existing ICT contractor will also configure and install these items. Where existing contractors are involved, the PTMS Contractor shall liaise and cooperate with them regarding integration issues. The PTMS Contractor must request and be granted approval by the Employer (PLK), before acquiring ICT equipment.

# 4 System compatibility

The IRPTN network will be expanded in the future. For this reason it is critical that all hardware and software solutions shall be modular and scalable. Systems shall be compatible with other similar products (also from other vendors, manufacturers or developers) and shall not limit future expansion of any part of the PTMS system due to proprietary hardware, software or protocols.

All systems shall be based on open platforms and standards as far as possible. Where this is not the case, the supplier/Contractor shall provide the client with all interfaces, standards and/or protocols without limitations, such that future interfacing/expansion to other third-party products for any part of the system is possible. Furthermore, the Contractor shall provide detailed technical information on how integration is possible.

Where available, the Tenderer shall provide detailed technical information to show how the offered systems have been integrated with other systems (from different vendors, manufacturers, or developers). Preference will be given to systems where this can be proven.

Interfaces between different components of the central control system shall be made available. These interfaces shall be made available, without any limitations, to the client and shall allow third-party systems to be integrated with all the systems supplied.

Standard, commercial-off-the-shelf (COTS) components shall be used wherever possible.

All functionally identical modules, assemblies and components shall be fully interchangeable between like modules for all equipment acquired under this contract.

System components shall be identical in mounting characteristics and inter-unit cabling across the entire system so that a replacement piece of equipment is installable without modification.

Given the system compatibility requirements above, the international data and information standards shall be considered for all systems, sub-systems, hardware and software as part of this contract. Tenderers shall make it clear in their response which standards all systems and sub-systems comply with exactly.

Tenderers shall specifically state the standards applicable to the import of vehicle schedules into the PTMS offered. Tenderers shall also state their capability and commitment to provide a fully integrated system that can be expanded with third-party hardware and software applications.

Given the reasons above, the following data and information standards shall be considered for all systems, sub-systems, hardware and software as part of this contract.

The Contractor shall make it clear in his response as to exactly which standard all systems and sub-systems comply with to promote and ensure a fully integrated system that can be expanded by third-party hardware and software applications as stated in this section.

Preference shall be given to South African or international standards listed below:

- Intelligent Transport Systems (ITS) Standards:
  - 1. National Transportation Communications for ITS Protocol (NTCIP) (details at www.ntcip.org).
  - 2. Nordic Public Transport Interface Standard (NOPTIS) (details at www.noptis.org)
  - 3. Verband Deutscher Verkehrsunternehmen (VDV) (detailsat http://mitglieder.vdv.de/en/wir\_ueber\_uns/vdv\_projekte/index.html)
  - 4. Transit Communications Interface Profiles (TCIP) (details at http://www.aptatcip.com/)
  - 5. Transmodel-related standards (details at www.transmodel.org)
  - 6. Real Time Information Group (RTIG) standards (details at www.rtig.org.uk)
  - 7. Institute of Electrical and Electronics Engineers (IEEE) (details at www.ieee.org)
- Data Metadata Standards
  - Apply ISO/ TC211 as the core standards specified for geographic information, methods, tools and services for data management (including definition and description), acquiring and processing, analysing, accessing, presenting and transferring data in digital/electronic between different users, systems and locations.
  - 2. Adopt ISO metadata standards as the basis for standards.
  - 3. Expand ISO metadata definitions to include definitions from other standards when necessary. For instance, the Federal Geographic Data Committee (FGDC) promotes the coordinated development, use, sharing and dissemination of geospatial data.
  - 4. Provide a clear approach, methodology, and tools to define, build and manage a Metadata model utility with insert, update and viewing capabilities in tabulated and readied data into the database.
  - 5. Support Application Programming Interfaces (API) that connect to other applications or services.
  - 6. Support SQL (not SQL spatial) and ArcSDE (Spatial Data Engine).
- OGC Spatial Standards

Apply an Open GIS Consortium (OGC) approach to standardised processes. This should cover, in particular, Geography Markup Language (GML) and GML schema definitions, Web services involving Web Map Service (WMS), World Standards Federation (WSF), Web Coverage Service (WCS) and other services as defined by the OGC.

The city has an ESRI Suite of products platform standard with web-based viewers (Map Services) developed on ArcGIS Server 10 software (development in Flex).

• Engineering standards

Address prevailing engineering / Web standards and their applicability, for example, the Internet Engineering Taskforce (www.ietf.org), which develops and maintains specifications for many Internet-related applications, transport, routing, and security standards.

• Building Information model standards

Assess the applicability of recognized standards by Engineering Societies spatial / engineering object descriptions, symbols and models.

• Web Internet Standards

Apply acknowledged international standards provided by the World Wide Web consortium W3C (www.w3.org) for the development of common protocols and specifications for web graphic file formats, XML and metadata and web services, in particular

# **5** Design requirements

The elements of design and configuration work to be carried out by the PTMS contractor shall include but not be limited to the items specified below.

The pricing schedules include pay items for these design and configuration tasks. Payment shall be made strictly against receipt of all the specified deliverables and approval of these by the Engineer.

## 5.1 High-level conceptual design

The primary deliverable of the high-level conceptual design shall be a high-level system design document, including diagrams and drawings issued in both hard copy and electronic format in PDF to the client. The minimum items to be addressed as part of the high-level design are listed below:

- 1. Provide a full compliance traceability matrix showing the extent to which the system and design offered comply with each and every requirement of this specification, i.e. *clause by clause.* This document shall be updated throughout the project's full duration and shall be used as a reference during system acceptance testing. Each of the specified items shall be linked to a test case.
- 2. An overall system architecture diagram identifying functional blocks and data and information flows.
- 3. A PTMS central system process flow diagram and software description. The PTMS central system software applications shall be described in detail, especially where customisation is to be provided.
- 4. Functional and physical descriptions of all proposed hardware elements.
- 5. Preliminary user interface information, drawings, flow charts, messages, and menus.
- 6. Description of all system security features.
- 7. Preliminary equipment mounting arrangements, dimensions and installation requirements. The Contractor shall include with this initial estimate of installation time.
- 8. Hardware and software interfaces with other systems.
- 9. System backup and recovery procedures.
- 10. List and outline all manuals, training materials and other system and operational documentation.

Within 1 month of the contract being awarded, the Contractor shall produce the high-level design specified above.

The Engineer will review the high-level design document and provide feedback to the Contractor within 3 weeks. The Contractor may request amendments to the design. After this, the Contractor shall arrange a design review meeting. This shall evaluate the progress and technical competence of the design and any further required amendments, after which a final high-level design document will be submitted to the client for approval and sign-off.

# 5.2 Detailed design

All detailed design documentation, including reports, drawings, diagrams, schematics, or other information, shall be submitted to the Engineer and shall be subject to approval by the client.

At the time of tender, the following items require direct detail design, integration, customisation and development from the Contractor. These items are the minimum required at the time of tender and may vary during the contract period.

## 5.2.1 Transport Management Centre (TMC)

The Contractor shall customize, design and develop at least the following to cover all design requirements stated or implied in Section 8:

- 1. Determination of hardware and OS configurations and equipment rack layouts for allworkstations and servers. Refer to section 8.7.
- 2. Setting up, customizing and configuring Vehicle Configuration Manager (VCM)Refer to Section 8.9.
- 3. PTMS central system (refer to Section 8.10) architecture design.
- 4. PTMS schedule planning system (refer to Section 8.10.1) setup and customization including but not limited to:
  - a) Set up and customise the schedule planning system module.
  - b) Set up and customise the scheduled publication and printing module.
  - c) Setup and customisation of vehicle scheduling together with the client and/orthe Vehicle Operating Company (VOC)
  - d) Setup and customisation of duty scheduling together with the client and/orVOC
  - e) Setup and customisation of export module together with the client and/orBOC and/or Integrated Fare Management System Agent (IFMSA).
- 5. PTMS Compliance Monitoring (CMS) system (refer to Section 8.10.2) setup and customisation including but not limited to:
  - a) Import all required stopping point coordinates from GIS and capture other information required for all routes and stops. If the offered PTMS system requires that physical route surveys be done, these shall be pricedunder this pay item.
  - b) Setting up, customising, and configuring the Compliance Monitoring (CMS) system with the client and/or Vehicle Operating Company (VOC).
  - c) Setting up, customising and configuring text and voice communications to bus drivers with the client and/or Vehicle Operating Company (VOC).
  - d) Develop an interface for the CMS system with passenger information systems.
- 6. PTMS Passenger Information System (PI) (refer to Section 8.10.3) setup and customisation including but not limited to:
  - a) Setting up, customisation and configuration of a mobile passenger informationsystem as specified in Section 8.10.3.1.
  - b) Development of data interface for third-party public transport passenger information systems as specified in Section 8.10.3.4.
- 7. All activities to obtain the PTMS baseline information are required to set up, adjust, customise, and configure the supplied systems, sub-systems, and software to guarantee optimised system performance.
- 8. The Contractor shall submit a report to the client identifying all information required from the client to do the work listed in points 1 to 7 above. This shall be submitted 21 days before the work's planned commencement.

#### 5.2.2 On-board equipment

The Contractor shall customise, design and develop at least the following to cover all design requirements stated or implied in Section 9:

- 1. Bus wiring and interfacing diagram, including interaction with bus manufacturers and obtaining approval from bus manufacturers.
- 2. Research antenna types for various bus applications and design of optimum bus locations.
- 3. Design layout of equipment on buses and brackets for mounting various kinds of equipment (also refer to Section 9.2, Section 9.3 and Section 9.4).
- 4. Integration of PTMS OBU (Drver Main Terminal) with driver microphone and speaker to allow clear audible communication with the driver, including interaction with bus suppliers, specified in Section 9.5.4.2.

#### 5.2.3 Stations

The Contractor shall customise, design and develop at least the following to cover all design requirements stated or implied in Section 10: This section is already in place, albeit missing CoC and wiring Line diagrams:

- 1. The station wiring and interfacing diagram includes interaction with the station superstructure contractor.
- 2. Equipment datasheets.
- 3. Equipment configuration information.
- 4. Documentation of software used.

#### 5.2.4 Depots/layover areas

The Contractor shall customise, design and develop at least the following to cover all design requirements stated or implied in Section 11: The determination of hardware and OS configurations for all depot workstations.

#### 5.2.5 Station/Depot/Vehicle Communications Networks

The PTMS system shall utilise the communications network (fibre-based) implemented by the client's contractor. The PTMS Contractor shall provide detailed requirements and design input with respect to port requirements and MAC addresses of all equipment to be connected. The PTMS Contractor shall design and integrate the GSM/UTMS APN for cellular wireless communications with vehicles. The PTMS Contractor shall design and integrate the GSM/UTMS APN for cellular wireless communications. The GSM/UTMS APN for Stations/Depot backup cellular wireless communications. The GSM/UTMS APN is designed to be the backup communications. If the fibre network is not ready in time, the GSM/UTMS APN will be used.

#### 5.2.6 Detail design deliverables

Deliverables from the design shall be indicated in the Contractors programme and shall include as a minimum but not be limited to:

- 1. Detail design reports.
- 2. Drawings, schematics and diagrams (including Geographical layouts).
- 3. Calculations.
- 4. Equipment Specification.
- 5. Equipment Data Sheets.
- 6. All Software information.
- 7. Any other relevant information.

All the above shall be made available to the client in both hard copy and electronic formats.

# 6 Project Management, Quality Assurance, Health & Safety and General Obligations

## 6.1 Project Management

The Contractor shall provide a nominated Project Manager (PM) for the duration of the design, supply, installation, commissioning, maintenance and operational support of this entire contract.

- 1. The PM shall have at least 10 years' experience in similar projects.
- 2. The PM shall be familiar with the FIDIC conditions of the contract. At least one of his contracts in the past 10 years shall have been governed by the FIDIC conditions of the contract.
- 3. If the PM does not have the required FIDIC experience, the contractor shall, at his own expense, send the PM to a recognised accredited FIDIC course with a duration of at least two (2) days within 5 weeks after receiving the Client's Letter of Acceptance.
- 4. Note that regardless of whether the PM has FIDIC experience, it remains a key requirement that he/she has at least 10 years of experience on similar projects, as stated in point 2 above.
- 5. The Tenderer shall submit the resume/CV of his proposed PM together with the tender.
- 6. The PM shall be responsible for the project's day-to-day management and act as the main interface between the Contractor's project team and the client and/or his representative.
- 7. Project management shall be an ongoing and continuous service provided by the Contractor to ensure that the client requirements are met within program dates and proposed costs.
- 8. A series of regular meetings shall be held as part of the ongoing monitoring of the project's progress.
- 9. The PM shall be present at all project meetings.
- 10. The Contractor's key technical and training or other staff shall be available in person orby teleconference (if agreed by the Engineer) to discuss specific items as needed.
- 11. The Contractor shall be required to attend various meetings, including but not limited to the following:
  - a) Monthly contractual and progress meetings. To be held in clientdesignated offices. The agenda is to be agreed upon with the client.
  - b) For the duration of the design period, 2-weekly technical and design meetings. The design period will start at contract inception and end on approval of allhigh-level and detailed designs.
  - c) After the period in b. above, monthly technical and installation meetings.
  - d) Monthly maintenance meetings during the maintenance period
  - e) Any other meetings may become necessary.

- 12. The Contractor shall submit a monthly progress report the day prior to each contractmeeting. This progress report shall include and/or address at least the following:
  - a) Milestones achieved.
  - b) Milestones not achieved.
  - c) Risk and risk mitigation.
  - d) Constraints.
  - e) Imminent activities.
  - f) Percentage of completion of sections.
  - g) Program update.
- 13. Other reports shall also be presented as and when the client may reasonably request. This includes but is not limited to:
  - a) Design reports.
  - b) Installation reports.
  - c) Training reports.
  - d) Test reports.
  - e) Health and safety reports.
  - f) Environmental impact report.
  - g) Maintenance report.
  - h) Any other report deemed necessary by the client.
- 14. To assist the Contractor, client will ensure that the Contractor shall have reasonable access to all locations to enable the Contractor to execute his responsibilities.
- 15. The Contractor is required to liaise with and coordinate with the client and other contractors as and when required to integrate systems, share infrastructure and perform his work timeously, efficiently, with excellent workmanship and without interfering with the work of other contractors.
- 16. The PM shall not have non-Polokwane IRPTN PTMS business responsibilities. managing other projects simultaneously. The PM committed 100% of his time to the Polokwane Local Municipality PTMS project.
- 17. The tendered price shall be a monthly rate to perform all duties listed here.

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## 6.2 Quality Assurance and Quality Management System

- 1. Tenderers shall indicate if their organisations and any of their subcontractors are listed as ISO 9001:2008.
- 2. Tenderers shall provide details of their existing Quality Management Systems.
- 3. These obligations include the appointment of a quality manager for the project.
- 4. The quality assurance obligations pertain to the main and all subcontractors or all JV partners.

- 5. The Contractor shall develop and provide a quality assurance plan to the client for approval. This plan shall identify internal processes for creating and reviewing deliverables, including parties responsible and respective time frames. The quality assurance plan shall include procedures with checklists for:
  - a) High-level conceptual design.
  - b) Detailed Design.
  - c) Procurement.
  - d) Equipment Manufacture and Factory testing.
  - e) Installation Processes.
  - f) Software design, development, customisation, configuration and testing.
  - g) Software version control and traceability.
  - h) Backup and system recovery, including disaster recovery and business continuity.
  - i) Commissioning and Testing, including functional, integration and system acceptance testing.
  - j) Documentation control.
  - k) Software configuration management and upgrade policy.
  - I) Training.
  - m) Maintenance.
  - n) Operational Support.
- 6. These procedures include hold points for approval and witness testing by the Engineer.
- 7. The Contractor shall prepare Quality Assurance Test and Acceptance schedules for all items of equipment and software to be tested. These schedules, completed and signed, shall provide a record of acceptance of the systems.
- 8. Test and Acceptance Schedules for various test stages, including Functional Acceptance Tests (FATs), System Integration Tests (SITs), Installations Inspections and System Acceptance Tests (SATs), shall be prepared by and submitted forapproval 28 days prior to commencement of the tests.
- 9. A test case shall be established for a sub-system for each of the test stages defined in the specifications Section 13.3. A test case and traceability matrix (refer Section 5.1 item 1.) shall be set up by the contractor in consultation with the Engineer to link eachof these test cases with the relevant specification clauses and the test results. For each test case, the test documentation for each test stage shall be dealt with as set out in the preceding paragraph.
- 10. Successful completion of tests for each test case and acceptance by the Engineer is a requirement for taking over the systems.

## 6.3 Health and Safety Obligations

The works shall be carried out in accordance with the requirements of all the relevant Government Acts and Regulations. In particular, the Contractor shall comply with the OHS Act (Act 85 of 1993) and itsRegulations. Tenderers shall complete RDC19 (Part T2), and the PTMS Contractor shall sign the Health and Safety Agreement.

- 1. The Contractor shall be responsible for the safety and security of his personnel during installation, testing and maintenance.
- 2. The Contractor shall prepare a Health and Safety Plan for the project. The plan shall include a detailed hazard risk assessment with mitigation measures.
- 3. Specific hazards that could be encountered on this project, in addition to the healthand safety hazards normally associated with electrical and electronics constructionwork, include the following:
  - Lifting and handling heavy equipment
  - Working with open false flooring
  - Working at height
  - Working in operational depots with continuous movement of buses
  - Working on top of or under vehicles
  - Working on a vehicle manufacturing line
  - Working on building and infrastructure construction sites
  - Construction vehicles operating on the construction sites.
  - Working in operational stations with the associated requirement to keep plantand equipment away from pedestrians and children and to safely and securelybarricade the works.
  - Working in areas of potential criminal activity

## 6.4 Office and Workshop Accommodation

The Contractor shall establish project offices and workshops near the client for the duration of the contract. The office and workshop shall be safe and secure.

## 6.5 Dayworks

The Contractor shall give hourly rates for the following specific dayworks:

- a) Unskilled labour
- b) Electrician
- c) Fibre Optics Technician
- d) Electronics Technician
- e) Communications Network Engineer
- f) Systems Engineer
- g) Systems Integrator
- h) Scheduling Specialist

These amounts will only be expended on specific instruction by the Engineer to the Contractor for additional tasks that Personnel may require during normal working hours at the tendered rate. Daywork Materials will only be expended on specific instruction by the Engineer to the Contractor for additional material that may be required. The contractor is to propose a lump sum value.

# 7 Detailed specification: General

## 7.1 Scope of specifications

These specifications define the requirements and technical specifications for the various work elements listed in Section 1.3.1 as applicable to the following high-level IRPTN components:

- Transport Management Centre (TMC)
- Vehicles (both buses and midi-buses) on-board PTMS
- Trunk stations PTMS
- Bus depots and Layover areas
- Cellular APN for communication

All equipment shall be designed for use in the transit industry, with specific attention to ergonomics, the environment in which the equipment will be installed, reliability, efficiency, vandal resistance and safety for passengers, operators, maintenance personnel and other system users.

The Contractor shall:

- 1. Make required site improvements where applicable.
- 2. Supply and install all required structures, hardware, brackets, ventilation and cooling requirements, cabling, wiring, connectors, terminations, splicing, sealant, all accessories, all sundry material and services for equipment or elements to be installed at all sites.
- 3. Hand-over a complete and fully functional, fully integrated system.

## 7.2 Product and Installation Quality Requirements

Equipment furnished under these specifications shall be the latest model in current production, as offered to commercial trade, conform to quality workmanship standards, and use materials consistent with public transport industry requirements. The Tenderer shall guarantee that all equipment to be offered under these specifications is new.

- 1. All PTMS system components shall be built per best commercialand transit operation practices. As a minimum, the design and construction shall provide for:
  - a) Reliable and stable operation under heat, vibration and fluctuating power supply voltage conditions.
  - b) Minimum maintenance and alignment procedures.
  - c) Minimum number and variety of assemblies and spare parts.
  - d) Maximum attention to human engineering.
  - e) Simplified design and rapid fault isolation to reduce the requirement for highlyskilled maintenance personnel.

- f) Operation under a wide range of and varying supply voltages.
- 2. All onboard systems shall be resistant to continuous vibration with at least the following mitigation measures applied:
  - a) Shock mounts for all hard disk drives.
  - b) Lock nuts for securing all assemblies, sub-assemblies and components.
  - c) Secure locking connectors for all plug-in cable connections.
- 3. No self-tapping screws shall be used unless specifically approved. Cable ties and/or double-sided tape are not an acceptable means to fix equipment or any part thereof.
- 4. Equipment and sub-components shall be identified by a part number and/or serial number, permanently and legibly affixed directly to the surface of the unit.
- 5. Wherever the Contractor is required to label cabling, components or any other device, the client shall agree on numbering schemes.
- 6. Retrofitting of equipment shall be avoided as far as possible. To mitigate retrofitting, the Contractor shall liaise and cooperate with other contractors to do installations at the most appropriate times. For instance, PTMS equipment and cable looms shall be installed in buses during their assembly. LLP buses are already in use and have equipment that needs removing, so installation shall happen in coordination with the manufacturer's advice team.
- 7. Under exceptional circumstances where retrofitting cannot be avoided or where a post-delivery change must be made to one item of one type of equipment. This shallbe reviewed with the client, and upon approval, changes shall be made identically to allunits (except modifications that the Contractor and the client clearly understand be experimental and applied to less than five units).
- 8. Equipment shall be designed to prevent unauthorised access and to facilitate authorised access only.
- 9. The Contractor shall provide a complete, integrated, operational system as measured during real-time system operation. The Contractor shall ensure that all the systems in or at the field or on buses are integrated with those in the control centre.

## 7.3 Technical standards and certification

All equipment shall be certified by recognised certification authorities, including those required by governing South African law. This includes but is not limited to:

- 1. South African Bureau of Standards (SABS)
- 2. South African National Standards (SANS)
- 3. Independent Communications Authority of South Africa (ICASA)
- 4. Institute of Electrical and Electronics Engineers (IEEE)
- 5. International Electrotechnical Commission (IEC)
- 6. European standards including:
  - European Committee for Standardization (CEN).
  - European Committee for Electrotechnical Standardization (CENELEC).
  - European Telecommunications Standards Institute (ETSI).
- 7. Underwriters Laboratory (UL).
- 8. Underwriters Laboratory Canada (ULC).

- 9. Canadian Standards Association (CSA).
- 10. International Organisation for Standardisation (ISO).
- 11. Society of Automotive Engineers (SAE).

The Contractor shall be responsible for obtaining approval and certification from all parties involved, for all devices that will form part of the PTMS system, and for the costs involved. If a device is not certified, or if the current certification is not approved by South African law or is not applicable, it shall be the responsibility of the Contractor to obtain the required relevant certification. The Contractor shall state the type and level of certification of all equipment on offer. All wireless and GSM communications equipment shall carry the relevant ICASA certifications.

## 7.4 Electrical Requirements

All electrical installations shall comply with at least the following SANS standards:

- SANS 10142 -1: 2012 (The wiring of premises Part 1: Low-voltage installations).
- SANS 62305 -1: (Protection against lightning Part 1: General principles).
- SANS 10313 (Protection against lightning Physical damage to structures and life hazard).
- 1. All device enclosures shall contain an easily accessible master circuit breaker that will remove power from the equipment when tripped.
- 2. Circuit breakers shall clearly indicate when they have been tripped.
- 3. All enclosures, chassis, assemblies, panels, switch boxes, terminal boxes, and similar enclosures or structures shall be grounded.
- 4. Protective grounding shall be provided to ensure that all exposed metal equipment and metal fixtures are connected to a common ground point in the electrical cabinet.
- 5. Wire dress shall allow sufficient slack for three additional "re-terminations" without excess tension.
- 6. Wire splices are not permitted.
- 7. Wire and cable ties shall not be so tight as to cause indentation and damage to the insulation.
- 8. Adhesive-mounted bases shall not be used to support wire ties or cable supports.
- 9. All conductors within each enclosure shall be installed free from metal edges, bolt heads, and other sharp or interfering points.
- 10. All conductors providing connections between components shall be provided with strainrelief and be clear of moving objects that could damage either the conductor or the object.
- 11. All terminations and cables shall be clearly indexed, labelled and schematically identifiable according to the Polokwane Local Municipality's standard practice.
- 12. All wire labels shall be non-metallic and shall resist standard lubricants and cleaning solvents.
- 13. When components must be connected through individual wires, the wiring shall be incorporated into a wiring "harness," where each circuit branch can be separated from others for troubleshooting.
- 14. Protection shall be provided against Radio Frequency Interference (RFI) and Electromagnetic Interference (EMI) emission sources and internal conductive or inductive emissions.
- 15. The Contractor shall certify the electromagnetic compatibility of equipment to be furnished at the Contractor's expense.
- 16. Overvoltage: The Contractor shall provide overvoltage protection for all equipment installed as part of the PTMS System.

17. All devices and installations shall be protected against lightning according to the relevant standards listed above.

## 7.5 Software requirements

All the software used for management and surveillance in the control centre will be fully functional via a web interface that is accessible from any remote location.

- 1. All software shall be written in a common, well-known, modern, high-level, highlystructured language.
- 2. All software shall be the latest release at the time of installation (software versions to be approved by the Polokwane Local Municipality) unless specifically approved otherwise by the City.
- 3. All software shall contain version control numbers.
- 4. Features shall be provided to identify the software version on each device, and verify that it is the correct or most recent version for that device.
- 5. Software shall be organised in a modular, configurable manner to the extentreasonable.
- 6. It shall be possible to navigate with keystrokes in lieu of mouse action. A library ofkeystrokes and shortcuts shall be provided.
- 7. Adjustable, Polokwane-specific, and configurable parameters shall not be hard-codedonto the source code. They shall be user-modifiable.
- 8. Application software (both user and system) shall not be portable, i.e., the source code shall not be transferable to other computers using the same hardware and operating system without any modifications or use of hardware key.
- 9. The application software shall be reasonably scaleable to newer, higherperformance hardware or operating systems.
- 10. Applications shall be developed with non-proprietary open standards, allowing forfuture integration by third parties.
- 11. Applications shall have industry-standard open Application Programming Interfaces (APIs).
- 12. All applications shall be supported with off-line tutorials as part of operator training.
- 13. All application software shall be self-diagnostic.
- 14. All applications utilise typical Windows-style graphical user interface conventions such as resizable windows, point-and-click, right-click context menus, drop-down menus, toolbars, colour displays, icons, drag and drop, scroll bars, scroll wheel mouse, status bars, etc.
- 15. All applications shall include a user interface that is user-friendly, accessible, and intuitive for all users.
- 16. Passwords shall not be displayed unencrypted on displays.
- 17. All central system user interfaces shall have online help features.
- 18. The system date and time shall adjust automatically for possible daylight savings, leapyear, and holidays.
- 19. The system date and time shall provide the same date for service times associated with a complete "Public Transport Day", where the number of hours in one day is based on the start and end of service regardless of service extending past midnight.

- 20. The system shall maintain both 24-hour timestamps and 30-hour timestamps matchingthe 30-hour clock used by some scheduling software if the tenderer proposes that.
- 21. Data transferred from a device or system shall not be purged or written over until atleast one successful transfer is confirmed and a record of confirmation is available.
- 22. Features shall be provided to ensure that all system-created files are uniquely identified and that no files are lost or missed during data transfer.
- 23. Verification features shall be provided to confirm that there have been no losses ofdata at any point in the system.
- 24. The system shall be capable of remote paging of software alarms with an escalation process.
- 25. The Contractor shall provide a comprehensive data backup and recovery plan.
- 26. The Contractor shall provide a data backup system for data archiving and recovery.
- 27. The data backup system shall include capabilities for the Polokwane Local Municipalityto back up data through network-wide backup.
- 28. It shall be possible to recover and transfer data files in the event of a primary data storage failure through a secondary standardised PC interface such as an RS-232port.
- 29. All software shall be free of defects in design and workmanship and will performaccording to the specifications.
- 30. All software shall not contain any timers, counters, or pre-programmed devices that willcause the software to be erased, inoperable, or incapable of performing as specified.
- 31. All software shall contain an appropriate security and control system for protecting thesoftware and the data from unauthorised use.
- 32. All software shall be free of "back doors" and all other known methods of softwareaccess that bypass the normal system security features.

# 8 Detailed specification: PTMS System

## 8.1 Transport Management Centre (TMC)

The TMC will accommodate the central system and operators for the PTMS. The TMC is located in the Peter Mokaba stadium Building, floor 1. Figure 6 below shows the locality of the TMC.



Figure 5: BRT TMC Location- 1st floor Peter Mokaba Stadium

The TMC will provide seating for four PTMS operators in the control room as well as space in the air-conditioned server room for the PTMS racks. The proposed layout of the TMC control room is shown in Figure 7.





Figure 6: TMC floor layout and Architectural Drawings

## 8.2 Functional description

The PTMS system will be managed from the Transport Management Centre (TMC). The tenderer shall ensure that all PTMS systems deployed in the field are fully integrated with the Central PTMS in the TMC. These are the systems described in this document (but may also include other systems not mentioned in this document) and include as a minimum:

- 1. On-board PTMS systems.
- 2. Passenger Information is available for the applications.
- 3. Cellular APN for Communications with vehicles
- 4. Any other system(s) required in order to achieve a fully functional, integrated and highly efficient PTMS system keeping the purpose and objective given in Section 1.2in mind.

The figure below shows the high-level architecture of the TMC.



Figure 8: TMC high-level architecture

The figure above is intended to aid understanding of systems to be installed which are relevant to the BRT system. Not all systems and/or role players are necessarily represented above. The figure is not prescriptive in terms of quantities, physical locations or required components. The architecture and equipment installed may differ.

The following shall be supplied, installed and configured under this contract:

- 1. Various server hardware, operating systems and software
- 2. Database and storage hardware and software
- 3. Various workstation PC hardware, operating systems and software

4. All PTMS applications software and hardware, including but not limited to:

a) Schedule planning

b) Driver Voice and Text Communications

- 5. Public Transport Operations and Management including Compliance Monitoring(CMS)
- 6. Reporting
- 7. Passenger Information Systems (PI)
- 8. Complete the GSM/UTMS APN solution, including service provider APN, routers, link to TMC, and securely provision SIM cards with voice/data contracts.
- 9. All related software applications
- 10. All related software licenses

It is important to note that the overall objective of the TMC goes beyond the PTMS system. Other systems and role players directly involved in the TMC include (but are not limited to):

- **1.** Urban Traffic Control (UTC).
- 2. AFC system tenderer is contracted to do this function.
- 3. Vehicle Operating Companies (VOC).
- 4. IRPTN Station Management Services.
- 5. Information Systems (IS).
- 6. Metro Police (crime surveillance).
- **7.** Traffic Surveillance.
- 8. Emergency and Medical Services (EMS).

The PTMS Contractor shall liaise with and cooperate with any and all other contractors and/or role players involved in the TMC to guarantee seamless integration of all systems within the respective required programmes.

## 8.3 General systems requirements

The following shall apply:

- 1. A server-client architecture shall be implemented in the TMC.
- 2. All servers/services provided by the Contractor shall be integrated with and shallbe part of existing IT and Security infrastructure.
- 3. The client will be responsible for all network security management, including any newservers provided by the Contractor.
- 4. Central site servers, client workstations, storage and backup shall be installed ina designated location at the TMC.
- 5. All systems and devices shall allow only authorised users access.
- 6. The system shall provide access control based on the establishment of groups, users and roles
  - 7. Groups, users and roles shall be assigned during system

implementation asdirected by the client.

- 8. User access levels shall be configurable such that different people and positionsonly have access to selected features and data as the client decides.
- 9. A minimum of 5 levels of access shall be allowed.
- 10. A minimum of ten groups shall be provided for.
- 11. It shall be possible to assign each user a unique identification and password or a unique one for each group at the client's discretion.
- 12. The system shall include flexibility to add new groups, roles and users, redefine groups and roles, and reassign access permission as part of normal system operations.
- 13. The System Administrator shall assign access permission.
- 14. All system access shall be logged.
  - 15. The client shall approve All hardware and software supplied under this Contract before procurement.
  - 16. The system shall have the capability of hardware and software extension to include new or additional features.
  - 17. The system shall be designed to migrate to updated hardware and software operating system versions.
  - 18. Any faults or errors that occur during the automatic conversion or transfer of dataeither within internal subcomponents of the central system or from external data sources to internal subcomponents shall be logged, and critical operational items automatically emailed to a predefined client email distribution list.
- 19. The system shall support at least 3 separate displays per workstation.
  - 20. The system shall be designed for continuous operation without manually " rebooting" computers or devices. Scheduled automated reboots are acceptable, provided that such reboots shall not be required more than once in a 24-hour period. Such scheduled reboots shall be outside operating hours.
- 21. System availability shall be 97% or better, measured monthly. For central systems, availability shall be determined by dividing total out-of-service time bytotal operating time. Out-of-service time shall include system maintenance that occurs outside of the normal maintenance window. The contractor shall utilise a software tool to monitor the system and report any deviations from agreed service thresholds

## 8.4 Electrical requirements

All equipment installed in the TMC shall operate from a nominal line voltage of 230 VAC, within voltage tolerances of +10% to -20%, and a frequency range of 47 Hz to 53 Hz without equipment damage.

The client will provide electrical supply. The PTMS Contractor shall liaise and cooperate with the control centre contractor to ensure the provision of electrical supply points. The PTMS contractor shall be responsible for the terminations at these supply points.

## 8.5 Environmental requirements

Floor space in the server rooms will be made available to the Contractor to install the necessary hardware and shall adhere to the following specifications:

- 1. The equipment shall maintain specified performance while operating in a controlled environment of +5°C to +33°C, with relative humidity (non-condensing) less than 90% at 33°C for intermittent and continuous periods.
- Equipment shall maintain specified performance after being stored, nonoperating, in a temperature environment of -10°C to +50°C and shall maintain specified performance after storage exposed to a relative humidity of 90%, non-condensing, at +50°C for both intermittent and continuous periods.
- 3. All computer equipment shall have a minimum 10 000 hours of mean time between failures (MTBF).

## 8.6 Hardware and operating system requirements

#### 8.6.1 Operator workstations

Power-efficient operator workstations shall be supplied, installed and configured under this contract. The final type of operator workstations and their flexibilities will depend on the functionality of the supplier's software and will be determined after approval from the client. Operator workstations shall be used for at least the following:

- 1. Schedule planning.
- 2. Public transport operations and management, incl.
  - a. Vehicle Tracking and Automatic Vehicle Location (AVL).
  - b. Compliance Monitoring (CMS).
  - c. Text and voice communications.
- 3. Reporting of monitoring and compliance functionality.
- 4. Management of Passenger Information Systems (PI).

For the purpose of tender, the workstations shall have the following minimum specifications:

- a. Intel Pentium-based
- b. CPU: Intel I7 or latest available; min. 3 GHz
- c. Main memory: min. 32GB
- d. HDD: min. 500 GB hard disk
- e. Housing: Floor stand
- f. Sound card
- g. Gigabit LAN Ethernet connection
- h. Graphic card for multi-monitor operation (at least 2 monitors shall beaccommodated)
- i. 2 x 24 inch TFT monitors with LED backlight
- j. Wireless keyboard
- k. Wireless mouse/navigation devices

- I. Cabling and sundry material
- m. All other equipment or software for a complete and fully functional system.
- n. Operating system: Latest version of Windows for client
- workstations after approval from the client.
- o. Email client: MS Outlook

The Contractor shall supply, install, and configure the operating system, email client, and standard MS Office components.

#### 8.6.2 Servers

All server hardware and software shall be compatible with existing infrastructure. The client shall approve all server hardware and software before procurement. Remote server management shall be supported using Lights Out Management (LOM) tools such as Integrated Lights Out (iLO) equivalent or better. The PTMS Contractor shall set up and configure all servers and include all operating systems and/or relevant software for a fully functional system. All servers, wiring, network, and backup power/filtering units shall fit within the supplied 19-inch racks, and all wiring shall be clearly labelled and physically supported using support devices that are compatible with the supplied racks. Plans for rack layout shall be submitted in advance for approval by the client.

- Servers shall be at least 3U high.
- Server units shall have 1U spacing between servers after installation in the rack.
- Virtual servers shall be installed, unless the Contractor specifies that certain servers cannot be virtualised, in which case discreet servers are acceptable.

#### 8.6.2.1 Discrete servers

For tender purposes, it is anticipated that the servers listed in this section cannot be virtualised, and discrete servers will be required. At least the following servers shall be supplied, installed, setup and configured under this contract:

- 1. PTMS database server\*
- 2. PTMS applications server
- 3. Device communications server
- 4. Vehicle Configuration Manager (VCM) server
- 5. Backup server
- 6. Any other server required for a complete fully functional PTMS system.

\* The PTMS DB server shall meet the following minimum requirements:

- 1. CPU: Intel Xeon; min. 2.5 GHz.
- 2. Main memory: min. 128GB.
- 3. HDD: RAID 5 Configuration with minimum 2TB capacity partitioned for OS and Data(upgradable to 5TB).
- 4. Dual Gigabit network ports.
- 5. Windows Server 2012, or the latest available, with the latest service packs.
- 6. VMware vSphere with High Availability (HA) release 6.0 or later.
- 7. Hot-swappable disk drives.
- 8. Hot-swappable power supply.
- 9. Hot-swappable fan.

All other discrete servers shall meet the following minimum requirements:

1. CPU: Intel Xeon; min. 2.5 GHz.

- 2. Main memory: min. 64GB.
- 3. HDD: RAID 5 Configuration with minimum 500GB capacity partitioned for OS andData (upgradable to 5TB).
- 4. Dual Gigabit network ports.
- 5. Windows Server 2012 or the latest available, with the latest service packs (R2).
- 6. VMware vSphere with High Availability (HA) release 6.0 or later#
- 7. Hot-swappable disk drives.
- 8. Hot-swappable power supply.
- 9. Hot-swappable fan.

<sup>#</sup> VMware vSphere with HA is excluded from the web and backup servers.

The following servers shall have hot standby servers.

- PTMS database server.
- PTMS applications server.
- Device communications server
- Vehicle Configuration Manager (VCM) server

#### 8.6.2.2 Virtual servers

Where possible, servers shall be virtualised. It is anticipated that the following servers can be virtualised using one or two hardware units.

- 1. Virtual servers include:
  - a. Reporting server
  - b. Passenger information server
  - c. Scheduling and planning server
  - d. Voice over IP (VoIP) server
  - e. Intranet server (incl. file server)
  - f. Any other virtual server as possible or as may be required.

The physical servers for the virtual servers shall meet the following minimum requirements:

- 1. CPU: Intel I7 or latest available; min. 3.4GHz
- 2. Main memory: min. 128GB
- 3. HDD: RAID 5 Configuration with minimum 2TB capacity partitioned for OS and Data(upgradable to 5TB)
- 4. Dual network ports
- 5. Windows Server 2012 or the latest available, with the latest service packs (including the number of required instances for every virtual server)
- 6. VMWare vSphere with High Availability (HA) release 6.0 or later
- 7. Hot-swappable disk drives
- 8. Hot-swappable power supply
- 9. Hot-swappable fan

The Contractor shall identify any other servers that can be virtualised and shall inform the Client accordingly.

#### 8.6.3 Data and backup storage

The following shall apply:

- 1. Backup storage media, drives, and software shall be provided for the servers aslisted in 8.6.2
- Disk mirroring and other techniques shall be utilised to minimise loss of data in the current configuration data. To avoid the limitations of disk mirroring in the face of ransomware attacks, you can consider several alternative backup strategies that offer enhanced protection: Air-Gapped Backups, Immutable Backups, Cloud Backups
- 3. This media shall be Network Attached Storage (NAS) architecture, subject toapproval by client.
- 4. The Contractor shall provide sufficient media to provide server storage and backup capacity as follows: NAS architecture with 20TB storage, upgradable to 200TB.
- 5. The Contractor shall provide all required hardware and software for accessingarchived or backed-up data.
- 6. Permanent archiving of certain data (to be agreed upon with the client) shall be doneat an interval to be agreed upon with the client.
- 7. Disk capacity shall be sufficient to store the applications, maps, data and associatedfiles required for the operation with 100% expansion capacity.
- 8. Data storage shall be of RAID 5 array configuration or similar approved by the client.

#### 8.6.4 Network Switches

The PTMS contractor shall supply, install and configure two network access switches in the TMC. The core switches in the TMC and in all stations along the route shall be installed by the communications contractor.

In the final topology, these network access switches shall only connect client workstations and IP telephony devices. However, in the project's initial phase, they shall be used as a dual-function interim core and access switch with connected servers and workstations.

The TMC Network access switches shall be Layer 3 switches and shall support at least the following:

- IPV4 and IPV6
- Network Access Control (NAC)
- 802.3at (for PoE switches)
- Slots for four uplink (GE or 10GE) Modules
- Dual redundant, modular power supplies and fans
- IPV4 and IPV6 routing, multicast routing, advanced QoS and security features inhardware
- Baseline Enterprise access Layer 3 switching features
- Virtual Routing and Forwarding (support for multiple VPNs with overlapping IP addresses).
- SNMPv1/2/3

Switches shall be approved equivalent to or better than:

- Cisco 3850 (IP Base feature set) with 48 PoE 10/100/1000 Base-T ports and 4 slots for uplink modules.
- GE or 10GE SFP modules as listed in the Pricing Schedules

The contractor ensures sufficient port count on the switch and makes a recommendation to the client during detailed design if the proposed switch does not suffice. The Contractor shall liaise with the Communications contractor and/or client regarding network design and required switch configuration, including VLAN, Port and IP address allocation.

#### 8.6.5 Firewall

A firewall shall be supplied, setup, configured and installed. This shall be of type Fortinet FortiGate-200B or better or equivalent approved. The firewall shall have routing capabilities.

#### 8.6.6 Equipment Racks

The Contractor is reminded that installations shall comply with the requirements set out in Section 7.2, point number 2. The exact cabinet to be installed in the TMC shall be determined during the detailed design stage. The following cabinets shall be considered and priced by the Contractor.

43U floor standing - 600mm wide x 1000mm deep. Rack to
have 2 x 5-way dedicated power distribution unit with one
circuit breaker per unit, 4 fans, a 300mm cable tray
installed vertically within rack for cable reticulation. Front and rear doors to be perforated. Plinth & Removable sides
43U floor standing - 600mm wide x 1200mm deep. Rack to
have 2 x 5-way dedicated power distribution unit with one
installed vertically within the rack for cable reticulation. Front and rear doors to be perforated. Plinth & Removable sides

Furthermore, the cabinet shall comply with the following:

- Lockable Perforated door
- Lockable swing frame
- Lockable and removable sides
- Integrated cable management system
- All doors of the cabinet shall be able to close after cable installation has been done.

The racks shall be equipped with Ethernet-based KVM console switches with sufficient ports to handle all servers supplied. A 1U 19" rack-mount monitor/keyboard shall be supplied in one of the racks to manage the servers.

Additionally, one rack shall be equipped with an environment monitoring device (e.g. NetBotz or equal approved equivalent), allowing at least humidity, temperature, and door contacts to be remotely monitored. Other requirements, including but not limited to cabinet placement, layout, patching, labelling, etc., shall be according to the client's standard specifications.

#### 8.6.7 UPS

The client's computer room will have a full UPS and generator power backup available. However, there are occasions when this equipment is taken down for maintenance purposes. To provide backup during these periods a small UPS shall be installed in the 43U racks to meet the following requirements and specifications:

Item	Specification
Capacity	7.5 kVA single phase 230V AC
Backup time	60 mins
Operating modes	Full on-line with manual bypass
Mounting	Rack mounted
Monitoring	Integrated network port with monitoring, alarm and logging software

## 8.7 Software requirements

The following minimum software shall be supplied, installed and configured as part of this contract:

- 1. Operating systems and database
  - a. Windows 10 Professional or Linux or equivalent approved (to be included withall workstations)
  - b. Windows Server 2016
  - c. MS SQL Server (preferably Server 2016) or approved equivalent.
  - d. PTMS database (ODBC or OLE-DB compliant relational database engine) orequivalent approved.
- 2. Applications
  - a. Vehicle Configuration Manager (VCM)
  - b. Schedule planning system (Option)\*
  - c. Compliance Monitoring (CMS).\*
  - d. IP Phone Communications
  - e. Backup
  - f. Antivirus for all servers and desktops
  - g. Applications to setup, configure and for real-time interaction with PassengerInformation Systems (PI).\*
  - h. Any other applications required for a fully functional, fully integrated PTMS system.
  - i. Standard Windows applications, e.g. MS Office, MS Outlook, Internet Explorer, etc. or equivalent approved (included in Hardware pricing)

## 8.8 Licenses and software (SW) support

The following shall apply:

- 1. All Software licences shall be in the name of the client such that any proprietary rights in respect of such Software licence vest in the client.
- 2. All licences shall be once-off licences and shall be valid indefinitely.
- 3. All version upgrades and support for five (5) years from the date of issue of the Taking over certificate shall be included in the initial software licence pricing. Software support shall include at least the following:
  - a. All SW updates in full and bug fixes.
  - b. Major functional updates at substantially discounted prices.
  - c. Hotline and support number.
  - d. E-mail support.
  - e. Online technical forums
- 4. The license key shall not be node-locked to hardware (i.e. a floating license shall be supplied).
- 5. A floating license shall provide full functionality of the applications and database to atleast 10 clients and shall be upgradable to an unlimited number of clients.
- 6. A comprehensive software support and management system shall support all applications, including change control, bug tracking, priority levels, etc. Thiscan be of the type FogBugz, equivalent or better.
- 7. Major new releases of software applications shall be backwards compatible.
- 8. Previous releases shall be supported for at least 3 years from the date of the new software release.
- 9. All software applications shall be installed automatically through an installer file which will do all required installation and configuration for the SW to operate on the required platform.
- 10. No manual installation shall be required to install the application, such as copying of certain files to certain locations, etc. Installation shall be a completely automated process.
- 11. The Contractor shall place the source code for all custom or purposedeveloped software and associated design, installation, user and support documentation (the Escrow package) into Escrow within 30 (thirty) days after the Taking Over Certificatehas been issued

## 8.9 Vehicle Configuration Manager (VCM)

The following shall apply:

- 1. The VCM server shall be set up, installed and configured at the TMC.
- The VCM shall download data from the control centre to the buses (e.g. schedules, announcements, etc.) and shall manage the upload of data from all onboard devices (except CCTV) to the TMC.
- 3. The VCM-vehicle data download/upload shall take place via the cellular 5G/4G/LTE data network.
- 4. VCM applications shall allow the definition of at least 5 different user groups with configurable privileges.
- 5. The VCM user interface shall be web-based.
- 6. If the upload or download procedure is interrupted (e.g. if the vehicle modem loses cellular data signal), the upload/download shall pause and resume

automatically. In the event that any upload or download procedure is not successfully completed, the operator at the TMC and/or depot shall be notified.

7. The VCM shall provide full configuration management of all vehicle OBU, including the display of current configuration status and the facility to schedule configuration updates to take place at a future date/time.

## 8.10 PTMS Central system

The PTMS central system refers to all systems, sub-systems, hardware, software and processes implemented in the TMC to have a fully functional, fully integrated PTMS system according to the scope stated in Section 1. All components of the PTMS central system shall be web-based, allowing thin clients to exist at various different locations.

The PTMS central system is dynamic, and a core requirement is that the system shall be designed for optimisation in future rollouts, addressing:

- 1. Schedule planning (Option)
- 2. Automatic Vehicle Location (AVL)
- 3. Compliance Monitoring (CMS)
- 4. Reporting System
- 5. Passenger Information Systems (PI)

Planning data shall be inputted into the Compliance Monitoring System. Information shall be exchanged between the Compliance Monitoring System and Passenger Information Systems (PI). Reports shall be generated to evaluate system performance against objectives upon which existing planning can be adjusted or new planning initiated. The following sections will describe each of the four process elements in the figure above.

#### 8.10.1 Schedule planning system functional requirements

A schedule planning system is included in the specification and pay items, but tenderers should note that the client reserves the right to exclude this item from the scope of the PTMS contract. The schedule planning system deals with pre-defined scheduling and system planning.

The Contractor shall cooperate with the client and any other relevant role players to set up and configure the planning system. A minimum list of design and configuration tasks has been specified in Section 5.2.1. The schedule planning system shall include but not be limited to modules for:

- 1. Setting up and configuration of schedules.
- 2. Schedule publication to timetables, including a schedule documentation configuration and printing module (map and timetable module). It shall be possible to issue schedules electronically, such as both data tables and published schedules, in a variety of formats, including but not limited to .xls and .pdf.
- 3. Vehicle scheduling, including timetable management, specification of blocks, trips, unproductive trips, etc.
- 4. Duty scheduling. This shall include customisable parameters, for e.g. shift times, break times, preparation times, salary requirements for overtime, public holidays, etc.
- 5. Duty scheduling optimisation.

- 6. Bus and driver dispatching.
- 7. Driver work instruction.
- 8. Export of schedule route/stops and planning data to CMS module.
- Export of scheduled routes/stops and planning data to Automated Fare Collection (IFMS) system (IFMS to be provided by others). Close coordination is a key requirement to ensure efficient data exchange between the systems. The followingshall apply:
  - a) The PTMS Contractor shall ensure, to the satisfaction of the Engineer, that data isprovided to the IFMS system in the data format and/or data standard required by the IFMS system.
  - b) The PTMS Contractor is responsible for determining this format and/or data standard.
- 10. Export of schedule route/stops and planning data to Google Transit.

The schedule planning system shall include a graphical user interface. During the setup of schedules, the system shall warn and/or not allow unrealistic scheduling. Some examples are over-scheduling of buses or drivers, assigning one driver to two buses simultaneously, scheduling buses in service, scheduling drivers on leave, etc. Schedules used on the system should be able to distinguish Weekdays, Saturdays, Sundays and Public Holidays as well as Event days.

A scheduled naming convention shall be agreed upon with the client. Such a naming convention shall use version numbers and other information to avoid confusion, ambiguity, duplication, etc. Before a schedule is issued for operations purposes, it shall be approved by the client. A process for approval shall be agreed upon with the client. Historic schedules shall be backed up in an industry-standard format, i.e. there shall be a complete record of all historical schedules.

#### 8.10.2 Compliance Monitoring System (CMS)

The system shall be capable of importing vehicle schedules from 3rd party public transport vehicle scheduling systems. Tenderers shall provide details of which scheduling systems are supported and the data standards applicable to the imported schedule data. A unique number shall identify all routes and include start, end and all-way points. The CMS system deals with real-time scheduling, schedule adherence and dispatch changes.

#### 8.10.2.1 Monitoring and Compliance Functionality

The following shall apply:

- 1. The Compliance Management System (CMS) shall include but not be limited to functionality for:
  - a) Import of schedule and planning data from the schedule planning system(batch process)
  - b) Automatic Vehicle Location (AVL) updated every one minute with real timemap display
  - c) Route and schedule compliance monitoring and management
  - d) Exception and deviation alarms and reports
  - e) Interface with mobile passenger information systems (refer to clause 8.10.2.7)
- 2. The Compliance Management System shall aid controllers/dispatchers in managing the fleet and shall include GIS mapping, historical reports, and real-time alerts.

- 3. At least the following monitoring and compliance reporting functionality shall be allowed:
  - a. Driver identification by means of driver tag or log-on.
  - b. Measurement and reporting of travelled kilometres. productive andunproductive (dead mileage).
  - c. Route compliance monitoring with route deviation alarms and reports.
  - d. Schedule compliance monitoring with schedule deviation alarms and reports (compliance tolerances to be user-configurable)
  - e. Identification of Did Not Operate (DNOs) i.e. routes and trips that did not takeplace based on schedule.
  - f. The detection and allocation of a particular vehicle to a particular route and tripshall preferably be automatic, using keyway points and time windows and including the detection of alternative vehicles taking over a route after a breakdown. The Tenderer shall fully describe the process in which a vehicle is associated with a route.
- 4. The system shall notify the client and/or the BOC automatically of significant service disruptions, such as unusual delays, reroutes, missed trips or alarm activated. Thecriteria to determine "significant" shall be configurable by the client and/or the BOC.
- 5. The Compliance Management System stop and station database (including stopping points) shall utilise a stop identification numbering system as assigned by the client.
- 6. A single integrated software application is preferred. If different applications are proposed, there shall be complete and simple integration between the applications.
- The CMS system shall allow for multiple operators, including thin clients at multiple locations over the Local Area Network (LAN)/Wide Area Network (WAN).
- 8. CMS functional capabilities shall be the same or configured differently based on access privileges across all operator workstations and thin clients provided for the system.
- 9. The system shall track/keep a record of the actions of each controller automatically and provide a daily, weekly, and monthly report that can be sent to the client's officials or other interested parties.

#### 8.10.2.2 User interface

- 1. The CMS shall provide at least the following basic views:
  - a. Map displays (allowing for multiple map windows and zoom settings).
  - b. Route displays (strip-line type diagrams) indicating vehicles in relation to stopsalong a route.
  - c. Lists & tables of delays, re-routes (for work assigned to operator or bus-specific)
- 2. The operators shall be able to select and view one or multiple vehicles in real time.Upon selection, the following information shall be available: date, time, speed, direction, route, schedule information (e.g. schedule adherence) and vehicle and driver identification.
- 3. The CMS shall provide representation and management of fixed route services by the following:
  - a. Route refers to a series of stops with a start and end point
  - b. Trip refers to specific one-way travelling of a bus related to start/end timesalong a route
  - c. Route Variant refers to the points designating a particular path orpaths

that define the route variant or pattern.

- 4. The CMS displays vehicles via coloured icons in a map view (as wellas vehicles indicated in a list).
- 5. Vehicle icons shall clearly indicate position in relation to the map and direction of travel. A minimum of 5 vehicle icon types shall be available for configuration. Clicking on the icon shall provide additional details relating to the bus & status.
- 6. Vehicle icons shall allow for the display of vehicle status, such as:
  - a. In-service and on-schedule (by a configurable period)
  - b. Behind schedule (by a configurable period)
  - c. Running early (by a configurable period)
  - d. Emergency/panic alarm activated
  - e. Off-route (by a configurable distance)
- 7. Operators shall be able to call up "flags" noting vehicle IDs, operator name, trip number, bus number, and route number.
- 8. The CMS shall provide tables displaying all current schedules by route.

#### 8.10.2.3 CMS map display requirements

The system shall provide a usable map display (e.g. Google Transit Maps), which will indicate typical background features (boundaries, roads, parks ...etc.) as well as stations, depots, layover areas, transfer points and other required points.

- 1. The tenderer shall indicate whether the maps are/can be optionally cached on a localserver to avoid slow internet problems.
- 2. The operator shall optionally be able to centre a map view on a vehicle or track avehicle by:
  - a) Selecting the vehicle on the map display.
  - b) Entering the vehicle, operator ID or trip/route number.
  - c) Selecting the vehicle from a list of vehicles.

#### 8.10.2.4 CMS real-time status

The location of each bus shall be updated at the TMC at least once every 30 seconds. It shall be possible to configure this update interval from the TMC. The update period shall not be affected if the number of buses increases.

- 1. The system shall log the departure in the TMC whenever a bus departs from a stop.
- 2. The CMS system shall allow the operator or dispatch supervisor to adjust the thresholds under which a vehicle is considered:
  - a) Running early by number of minutes
  - b) Running late by number of minutes

The default criteria for "running late" shall be configurable in minutes behind schedule.

In addition, the CMS shall provide a separate configurable "late" parameter specifically to support public transport and other needs.

3. The system shall display the vehicle's average speed along the route.

#### 8.10.2.5 Text and voice communications with the driver

The following shall apply:

- 1. The proposed solution shall offer two-way communication from the client TrafficManagement Centre (TMC) and depots to the driver via the OBU (specified in Section 9.5) and driver terminal, microphone and speaker.
- 2. The functionality proved shall include:
  - a) Voice communication hands-free (request to talk).
  - b) Text communication two-way text messaging shall use GSM data, with SMS as a fallback.
  - c) Driver alerts/messages.
  - d) Driver panic/duress/emergency button (AVL function)
  - e) Driver schedule assistance ahead or behind or schedule indicator, route and schedule display.
  - f) Driver navigation assistance e.g. in case of route deviation (optionalrequirement).
- 3. The driver shall not be able to send messages while driving.
- 4. When an operator receives a text message from a bus driver the system shall displaythe driver's name, employee number, trip number, bus number, route number, route variant, route direction, vehicle location, and the time of the message.
- 5. Voice communications shall be initiated by the TMC and/or other locations but may be requested from the driver through the push of one soft button on the driver device.
- 6. All voice communication shall be recorded and stored at the TMC for a period of 30days.

#### 8.10.2.6 Remote access

Authorised personnel shall be provided with remote access to the CMS via web interface. The system shall also support the expansion of this functionality to other users as directed by the client.

Remote functionality shall include, at minimum:

- a) Text messaging.
- b) Service summary displays.
- c) AVL map/vehicle status displays.

#### 8.10.2.7 Data transfer and interfacing to other systems

- 1. The system shall provide data transfer capabilities in order to load schedules andother data required from flat files or web services and to be able to send real-time and other data to support systems. Full details shall be provided in the clauses below, with the tender reply.
- 2. The system shall provide for the import of:
  - a) Geo-coded stop and route mapping data using industry-standard file formats.
  - b) static timetables and bus schedules
- 3. The Tenderer shall indicate whether his system can interface with other 3rd party tracking systems.

4. The system shall include a data interface for third-party public transport passenger information systems, including next bus arrival information signs at stops, internet-based real-time bus arrival and display systems, and interactive voice response systems keyed to specific stops.

The interface shall supply data in an XML format, which shall include, at a minimum:

- a) Real-time vehicle location information (absolute or relative to stops) alongwith bus ID, route number, trip number, and trip number
- b) Real-time schedule variance
- c) PT system time
- d) Service changes, re-routes and suspensions
- e) Delays or disruptions noted by operators.
- f) Outputs real-time bus locations, departure details from stations,
- 5. Tenderers shall confirm compliance with and availability of APIs for:
  - a) GTFS: General (Google) Transit Feed Specification
  - b) SIRI: Service Interface for Real-Time Information
- 6. The successful Tenderer shall make provisions to supply an interface control document describing the data and message format, content ranges, and the agency, which details the format and structure of this data for integration with other systems. client shall have full rights to release this information to third-party contractors, including Google Transit.

#### 8.10.3 Passenger Information Systems (PI)

Passenger information systems deal with providing the travelling public with accessible, relevant real-time public transport information that is essential to enhancing the user experience.

The aim of the IRPTN project is to provide PI via mobile devices using smartphone applications and USSD services for legacy devices. The client will initiate a website which will provide the public with all travel information relating to IRPTN.

The following shall apply:

- 1. The tenderer shall indicate whether his system provides any existing mobile PI appsand provide corresponding details and costs on these. The target devices are Android; however, the tenderer shall indicate what additional operating systems are supported.
- 2. A requirement of the system is that data be available for a mobile solution. This shall include at least the following:
  - a) Dynamic timetables showing departure times of the next three buses updatedin real-time
  - b) Alerts e.g. service disruptions
- 3. A further requirement of the system will be to provide:
  - a) Passenger Information Displays (PID) on the trunk stations showing bus arrivals/departures.

- b) PID on boardthe trunk buses indicate next stop.
- 4. The data transfer requirement to 3<sup>rd</sup> party passenger information systems is specified n 8.10.2.7 above.
- 5. The PI System shall utilise robust predictive real-time bus arrival and departure time algorithms that continually track, compile and recalculate predicted bus arrival/departure times based on vehicle location, heading (i.e., direction), speed, and otherfactors such as known causes of recurrent traffic delays along the route.
  - a) The system shall independently monitor each bus on each route and calculate arrival times at each stop along the route. The arrival and departurealgorithm(s) shall consider real-time conditions and historic average arrival and departure data to improve accuracy in the predictive function.
  - b) The PI system shall not be dependent on pre-defined schedules to function. e.g. the monitoring and prediction algorithms shall work even if vehicles run headways without schedules loaded into the PI system.
  - c) Where schedules are set up and loaded, these shall be published via the PI system. Departure times shall be overwritten by the real-time predictions as as are calculated by the algorithm(s).
  - d) Fill-in buses (extra buses placed on a route) and special event buses that arewithout defined schedules shall be monitored by the predictive algorithm and included in the PI data and displays.

#### 8.10.4 Communications to station platforms and buses

Under certain conditions to be determined by the PLM, it shall be possible to:

- 1. Make live voice announcements to all platforms of any/all stations directly from the control centre.
- 2. Make live voice announcements to any or all buses directly from the control centre.
- Make pre-recorded scheduled announcements to all platforms of any/all stationsdirectly from the control centre.
- 4. Make pre-recorded scheduled announcements to all buses directly from the controlcentre.
- 5. It shall be possible to make live and pre-recorded announcements to either one entity ata time or to a selected batch of entities.

#### 8.10.5 Reporting System (RS) Requirements

The following minimum general requirements shall be met.

- 1. The system shall provide a flexible, user-configurable reporting capability with pre-defined reports including:
  - a) Daily/monthly bus movement report (departure/arrival times at stops, drivingtime, driver).
  - b) Daily/Monthly driver movement report.
  - c) Daily/Monthly PT events report.
  - d) Route compliance report.
  - e) Km travelled report (including productive Km and unproductive Km).

- f) Schedule compliance report (with filters for vehicle/driver & route)
- g) Contract management and payment report.
- h) Did not operate (DNO) report.
- i) Reports on text messages developed in and sent through the CMS system.
- j) System fault reports by type, time of day, duration and repairs.
- k) Report on communications activities and interruptions between the CMSsystem and the vehicles.
- 2. The Reporting System module shall interface and integrate with the Compliance Monitoring (CMS) system.
- 3. Reporting functions shall be supported from all system workstations for unlimited workstations.
- 4. The system shall utilise a commercial off-the-shelf reporting utility capable of producing standardised or regular reports and custom reports to be agreed with the client. The utility shall include ASCII, delimited text file, XML (eXtensible Markup Language), DBF (dBase file extension) table export capabilities. It is possible to generate and/or convert reports to CSV, MS Excel, and PDF formats.
- 5. The RS module shall provide a means for client staff to develop and generate customised reports. It shall be possible for client staff to develop daily, weekly, monthly, quarterly, and annual customised reports. Contractor involvement shall not be required to generate new, customised reports. However, during training on reportdevelopment, the Contractor shall assist the client in the development of up to twenty (20) custom reports in addition to the reports listed in 1a. to k. above.
- 6. All reports shall be easily accessed, viewed, and printed from workstations with reporting software by selecting the reports from a list, menu, or other standard windows method.
- 7. Reports shall be available in text, xls, doc and pdf format.
- 8. The Contractor shall indicate in his program when the reports are to be developed. However, it is a specific requirement that the Km travelled report is available from the very first trip of each vehicle after the OBU has been installed. Driver log-on shall not be mandatory for recording and reporting travelled km.
- 9. All reports shall be submitted to the client and/or others for approval. The client reserves the right to request changes to reports to include all required information, comparisons, etc. as required. Other reports and requirements.

#### **Other requirements**

- 1. The system shall provide the capability to query off-route exception data by ranges ofdates/times, day of the week, route, route variant and trip number, bus operator, etc.
- 2. The system shall include the ability to record actual bus pull-out times compared to the route's scheduled pull-out time and actual bus pull-in time (at the end of the route variant and trip) compared to the route's scheduled pull-in time. The system shall also document the bus number, assigned route/route variant number, trip number, and bus operator name and run linked to the record of pull-out and pull-in times.
- 3. The system shall record the leaving and entering of the depot or layover and the deviation from the scheduled times.

- 4. The reporting function for text messages shall summarise and display all fields for all incidents within a selected time.
- 5. The reporting function for text messages shall allow separate views and summaries for reports by message types (including emergency calls), noting the start time, end time, and resolution.
- 6. The reporting function for text messages shall indicate the time from initiation of the message by an operator to the response to that message by the operator separated by an operator.

#### 8.10.6 Video wall

The video wall is to be procured through a separate process, and a nominated subcontractor will be appointed under this contract. A large video wall will be installed in the control room in order to display information from the PTMS system. The video wall content shall be provided via HDMI ports from PTMS client workstations (display clients). The video wall will be procured through a separate procurement process, and the successful supplier shall be appointed as anominated sub-contractor by the PTMS Contractor.

The PTMS Contractor shall be responsible for the management and administration of this nominated subcontractor and shall be paid a percentage (2.5%) under Section 8 in the pricing schedule, pay item 8.b. The video wall shall preferably make use of the HD LED rear projection technology or the latest available technology at the time of procurement.

### 8.11 Additional requirements pertaining to software

All the software used for management and surveillance in the control centre shall be fully functional via a web interface that is accessible from any remote location.

- 1. All software shall be written in a common, well-known, modern, high-level, highly structured language.
- 2. All software shall be the latest release at the time of installation unless specifically approved otherwise by the client.
- 3. All software shall contain version control numbers, and the Contractor shall set up and use a software configuration management application to manage the configurations on all servers and workstations.
- 4. Features shall be provided to identify the software version on each device and verify that it is the correct or most recent version for that device.
- 5. Software shall be organised in a modular, configurable manner to the extent reasonable.
- 6. It shall be possible to navigate with keystrokes in lieu of mouse action. A library of keystrokes and shortcuts shall be provided.
- 7. Adjustable, client-specific, and configurable parameters shall not be hardcoded onto the source code. They shall be user modifiable.
- 8. Application software (both user and system) shall be portable, i.e., the source code shall be transferable to other computers using the same hardware and operating system without any modifications or use of the hardware key.
- 9. The application software shall be reasonably scalable to newer, higher-

performance hardware or operating systems.

- 10. Applications shall be developed with non-proprietary open standards, allowing forfuture integration by third parties.
- 11. Applications shall have industry-standard open Application Programming Interfaces (APIs).
- 12. All applications shall be supported with off-line tutorials as part of operator training.
- 13. All application software shall be self-diagnostic.
- 14. All applications utilise typical Windows-style graphical user interface conventions such as resizable windows, point and click, right-click context menus, drop-down menus, toolbars, colour displays, icons, drag and drop, scroll bars, scrollwheel mouse, status bars, etc.
- 15. All applications shall include a user interface that is user-friendly, accessible, and intuitive for all users.
- 16. Passwords shall not be displayed unencrypted on displays.
- 17. All central system user interfaces shall have online help features.
- 18. The system date and time shall adjust automatically for possible daylight savings, leap year, and holidays.
- 19. The system date and time shall provide the same date for service times associated with a complete "Public Transport Day", where a number of hours in one day is based on the start and end of service regardless of service extending past midnight.
- 20. The system shall maintain both 24-hour timestamps and 30-hour timestamps matching the 30-hour clock used by some scheduling software if the tenderer proposes that.
- 21. Data transferred from a device or system shall not be purged or written over until atleast one successful transfer is confirmed and a record of confirmation is available.
- 22. Features shall be provided to ensure that all system-created files are uniquely identified and that no files are lost or missed during data transfer.
- 23. Verification features shall be provided to confirm that there have been no losses of data at any point in the system.
- 24. The system shall be capable of remote paging of software alarms with an escalation process.
- 25. The Contractor shall provide a comprehensive data backup and recovery plan.
- 26. The Contractor shall provide a data backup system for data archiving and recovery.
- 27. The data backup system shall include capabilities for the client to back up data through network-wide backup.
- 28. It shall be possible to recover and transfer data files in the event of a primary data storage failure through a secondary standardised PC interface such as an RS-232 port.
- 29. All software shall be free of defects in design and workmanship and will perform according to the specifications.
- 30. All software shall not contain any timers, counters, or pre-programmed devices that will cause the software to be erased, inoperable, or incapable of performing as specified.
- 31. All software shall contain an appropriate security and control system for protecting the software and the data from unauthorised use.

- 32. All software shall be free of "back doors" and all other known methods of software access that bypass the normal system security features.
- 33. All software shall be compatible and be able to integrate with "Munsoft" Software seamlessly. More details are available from the PLK ICT department.

## 8.12 Fleet Management System

In his tender response, the contractor shall indicate that his system can be used purely as a stand-alone fleet management system (FMS). The Municipality has a fleet of 498 vehicles for which fleet management is required, including at least:

- Tracking
- Fuel consumption
- Driver behavior
- Speeding
- Harsh breaking
- Emergency notification
- Interface with control centre and operators
- View and report results
- Analyse performance data

Information is to be sent via the 5G/4G+ cellular network to allow real-time operations. No interfacing with a scheduling system is required, and it is anticipated that the above can be achieved with a simplified and cost-effective PTMS installation. In his Tender response, it shall be made clear whether separate hardware and back-office systems are required, if the same onboard unit will be used and if this can be hosted on the same back-office system.

Any special pre-requisites for installing an FMS standalone system shall be clearly stated. It is not a pre-requisite for the PTSM system to support stand-alone FMS operations, but the Municipality would consider using the same system for both applications if possible. The Municipality does not guarantee that any FMS implementation will be procured or installed under this Contract.
# 9 Detailed specification: On-board systems

# 9.1 Functional description

The main features required of the vehicle on-board systems are as follows:

- 1. GPS Tracking and AVL with dead-reckoning
- 2. GSM/UMTS APN links to the control centre for VL/tracking and driver communications.
- 3. Communication with driver: text and voice (via driver microphone and speaker –Bluetooth or wired)
- 4. Driver "panic button"
- 5. Voice Announcements
- 6. Next stop display

The following minimum on-board equipment shall be installed on vehicles under this contract.

- 1. PTMS on-board unit (OBU) integrated with the Main Driver Terminal (MDT)
- 2. Combination (WLAN, GSM/UMTS and GPS) antennae

The following equipment will be supplied under the Vehicle manufacture contracts. The PTMS Contractor shall take note of the following responsibilities of the vehicle manufacturer specified in the vehicle manufacture tender:

- 1. Provide space and support for equipment, including a lockable, ventilated ITS compartment for PTMS and IFMS equipment
- 2. Provide sufficient electrical supply (in the form of an additional auxiliary battery), both permanent and switched via ignition.
- 3. Provide Vehicle status signals, including "Ignition on", "Reverse gear selected"
- 4. Provide Odometer pulses
- 5. Provide an interface to Engine Management Computer via CAN bus
- 6. Provide Door Open Switches (Left and Right) signals
- 7. Provide Terminal block with signals from bus systems connected to one side of these terminals
- 8. Provide Driver microphone (without switch) and Driver Speakers wired to terminals or Bluetooth enabled
- 9. Provide Saloon (passenger) Speakers wired to terminals
- 10. Provide External route/destination display and Internal next-stop displays with controller
- 11. Provide Cat 6 cabling and mounting for CCTV cameras
- 12. Install and test all equipment listed above
- 13. Provide the required mounting brackets complete with the reinforcement for any of the displays that is required for the driver and possible passenger displays. This must include possible sun hoods etc.
- 14. Facilitate and provide access for installation of other PTMS and IFMS equipment during vehicle manufacture.
- 15. Driver duress button (covert footswitch)



## The following figure shows a high-level functional architecture of the on-board systems.

PTMS and AFC Equipment.

The figure above is intended to aid understanding of systems to be installed on the vehicles and is not prescriptive in terms of quantities, physical locations or required components such as a separate network switch. The architecture and equipment installed on trunk and feeder buses may differ slightly.

# 9.2 General requirements

- 1. The design, functionality and layout of on-bus equipment shall consider optimal driver visibility and possible driver distraction. Layout and positioning of equipment shall be optimised by placing it in a position that mitigates driver distraction.
- 2. in liaison with the vehicle manufacturer, the Contractor shall be responsible for determining the final location of all onboard equipment (considering point 1 above) to be supplied under this contract on each bus type and configuration. Final equipment locations are subject to client approval.
- 3. Installation of PTMS onboard systems on new vehicles shall take place on the production line during the assembly of the vehicle and will be facilitated by the vehicle manufacturer contractors. The PTMS Contractor shall liaise with and fully cooperate with the vehicle manufacturer contractors in order to install all equipment seamlessly, efficiently, and according to best practice standards within the vehicle manufacturers' programme.
- 4. In the unforeseen event that the installation cannot proceed, as stated in point 3 above, the PTMS Contractor shall liaise with the client and Vehicle Operating Company (VOC) as to the best time and place to do the installation.
- 5. Installation of PTMS onboard systems on existing vehicles shall take place at the depots(s) when the vehicles are not in service and may entail after-hours work. The PTMS Contractor shall liaise with and fully cooperate with the client Fleet department to install all equipment seamlessly, efficiently, and according to best practice standards and within the vehicle's operating programme.

Figure 9: General high-level functional architecture of on-board

- 6. The installation of any antenna on a vehicle shall be done only after consultation with the antenna manufacturer, considering installation requirements to guarantee optimumperformance. As a minimum, this shall include consideration for:
  - a) Ground plane size
  - b) Ground plane shape
  - c) Location of antenna on the ground plane
  - d) Ground plane feed point.
  - e) Antenna ground planes for all vehicles with fibreglass roofs.
- 7. In addition to point 5 above, the suppliers of the PTMS OBU shall confirm in writing that their equipment is fully compatible with the proposed antenna. Obtaining this written confirmation shall be the responsibility of the PTMS Contractor.
- 8. The Contractor shall document and report his investigations from points 6 and 7 above and shall submit the report to the client for approval. A copy of this report shall be given to the BOC. The client reserves the right to approve an antenna or to request further investigation until satisfied.
- 9. The antenna installation shall be water tight and sealed with a washer and with a sealant from Sika or equivalent reputable products.
- 10. No water shall leak through any mounting point in any way during vehicle washing or driving rainstorms.

## 9.3 Electrical requirements

- 1. Specific compliance to standards shall include but not be limited to:
  - SANS 10142-1:2012 (The wiring of premises Part 1: Low-voltage installations)
  - ISO7637-2 Road vehicles -- Electrical disturbances from conduction and coupling -- Part 2: Electrical transient conduction along supply lines only
  - SAE J1113 Conducted Immunity, 250 kHz to 400 MHz, Direct Injection of Radio Frequency (RF) Power
- 2. Wiring and Installation:
  - The Contractor shall provide wiring/installation diagrams for in-vehicle systems for all types of vehicles. These shall be submitted to the client forapproval by the vehicle manufacturer and client. Installation shall not commence until these have been approved.
  - All terminals shall be of the spring-loaded blade type
  - Wiring shall be colour-coded to assist in the identification of connections.
  - Unless otherwise approved, all devices, cables and connectors shall beshielded and grounded.
  - Wire dress shall allow sufficient slack for three additional "reterminations" without excess tension.
  - Wire splices are not permitted.
  - Wire and cable ties shall not be so tight as to cause indentation and damageto the insulation.

- Adhesive-mounted bases shall not be used to support wire ties or cable supports.
- All conductors within each enclosure shall be installed free from metal edges, bolt heads, and other sharp or interfering points.
- All conductors providing connections between components shall be provided with strain relief and be clear of moving objects that could damage either theconductor or the object.
- All terminations and cables shall be clearly indexed, labelled and schematically identifiable according to the client's standard practice.
- All wire labels shall be non-metallic and shall resist standard lubricants and cleaning solvents.
- When components must be connected through individual wires, the wiring shall be incorporated into a wiring "harness," where each circuit branch can be separated from others for troubleshooting.
- 3. Overvoltage and Undervoltage:
  - On-board components shall be able to withstand sustained voltage levels of up to 48 VDC for up to ten (10) minutes.
  - On-board components shall not suffer corruption of data, failure or damage when the power dips below 9 VDC.
  - On-board components shall not be damaged by very high (twenty [20] times nominal voltage) short duration (up to ten [10] milliseconds) peak voltage.
  - The Contractor shall provide overvoltage and undervoltage protection for all equipment installed as part of the PTMS System.
- 4. The Contractor shall provide effective fuses, circuit breakers, power regulators/conditioners/filters and low-voltage cut-out relays for all in-vehicle equipment. Fuses and circuit breakers shall clearly indicate when they have been tripped.
- 5. Protective grounding shall be provided to ensure that all exposed metal equipment and metal fixtures are connected to a common ground point in the electrical cabinet.
- 6. Operation of equipment shall not be affected by electromagnetic effects present during normal public transport operations.
- Operation of equipment shall not affect or be affected by vehicle components, such asengine ignition, or other on-board equipment including vehicle power supplies, radios, automatic vehicle location systems, fare collection systems, W-Fi communications, and on-board data collection and processing equipment.
- 8. Data shall not be corrupted as a result of short-term power interruptions (e.g. vehicle startup) or power down.
- 9. Devices shall not "freeze up" in the event that power is applied in the incorrect order (ignition sense versus continuous power on the load side of the master switch) or power is interrupted/dropped during startup (e.g. from activating the vehicle ignition).

# 9.4 Environmental requirements

On-board equipment shall meet or exceed the following minimum conditions unless otherwise specified for specific components:

- 1. In general all on-board equipment shall be robust and be able to withstand the vibrations and impacts associated with poor road conditions without losing any data or without affecting normal system operation.
- 2. Operating Temperatures between -20° and +65°C
- 3. Storage Temperatures between 30° and +80°C
- 4. Humidity: 0 98% relative humidity (condensing)
- 5. Shock: 30g of 6 milliseconds and up to 5g sustained.
- 6. Operating Vibration: 1.5g RMS, 5 to 150 Hz
- 7. Endurance Vibration: 8g RMS, 100 to 1,100 Hz
- 8. Dust and Water Ingress Protection to IP 54 for all equipment inside the bus.
- 9. All exterior equipment shall be sealed and weatherproof to a rating of IP 67.
- 10. Inclination: 0 to 10 deg off vertical.
- 11. Resistance to water spray on equipment as a result of cleaning activities, industrialsolvents, rain, mud, hail, snow and slush, all of which may contain salts that may come into contact with equipment.
- 12. All equipment mounted on the outside of a bus shall be designed for and suitablyprotected against exposure conditions prevalent in the area.
- 13. Enclosures shall include any provisions necessary to maintain the internal equipment at the manufacturer's specified temperature and humidity.
- 14. All parts shall be made of corrosive-resistant material, such as plastic, stainless steel, anodised aluminium or brass. All external screws, bolts, nuts, and locking washers shall be stainless steel or an approved alternate non-corrosive material.
- 15. All external connectors shall be weather-tight and designed for use in a mobile environment subjected to dirt, water, oil, cleaning solvents and continuous vibrations.
  - 16. The Contractor shall include reasonable provisions to protect all equipment and components from common vandalism and physical abuse as may be expected onbuses and at stations in the South African environment.
  - 17. Unless otherwise specified, all on-board equipment shall have a minimum of 25 000 hours MTBF (Mean Time Between Failures).
- 18. On-board equipment shall be capable of being disassembled to fit through a standard vehicle door.

- 19. On-board equipment shall be installed in designated compartment(s) as provided by the vehicle manufacturer (new vehicles) or Fleet (existing vehicles). The PTMS Contractor shall check and confirm if these compartments are adequately ventilated to guarantee sufficient cooling of all devices, ensuring normal system operations. If not the PTMS contractor shall install additional circulation or extractfans to ensure sufficient cooling.
- 20. None of the onboard equipment shall experience any defects, data corruption or abnormal behaviour such as shut down, "freezing", or restart conditions due to overheating.

If the Contractor's equipment has been tested to specifications different from those defined above, the Contractor shall identify the environmental testing requirements utilised and the results that were obtained. Such alternatives will be considered but are subject to approval by the client.

# 9.5 PTMS On-Board Unit (OBU)

## 9.5.1 General Requirements

The PTMS OBU shall be a modular on-board computer acting as central processing unit with processing power required to control, monitor, and record and oversee all systems installed on the bus in real-time. More specific detail of required functionality is provided throughout this section.

The PTMS on-board unit (OBU) shall include at least the following:

- 1. Automatic Vehicle Location (AVL)
- 2. GPS including advanced algorithms such as dead reckoning
- 3. GSM/UMTS voice communications
- 4. 5G/4G/LTE modem
- 5. Wi-Fi subscriber unit (2.4 or 5.8 GHz (5.8 preferred))#
- 6. Ethernet network switch with at least 2 x 10/100 Mbits/sec ports (M12 connectors)
- Driver text and voice communications with integrated microphone/speakerconnections or Bluetooth capability
- 8. Interface to Bus Destination display controller,
- 9. Interface to Vehicle next stop Display (internal),
- 10. Automatic next stop announcements.

**Note:** It is a requirement that all configuration downloads to and data uploads from the OBU are to be done via the 5G/4G/LTE modem. The Wi-Fi subscriber unit on the OBU may be used only in the future if a depot wireless installation is installed. The PTMS OBU shall be equipped with a lithium battery that shall maintain system time for at least 5 years.

The PTMS OBU shall have "power-down" timers that will keep the equipment operational for a configurable period of time (0-30 minutes) when the vehicle ignition is turned to "off" This will allow the equipment to remain operational in order to complete transfer of data during this time period.

### 9.5.2 Antenna requirements

Wireless communication at different frequencies and to different devices on and from buses will require the installation of antennae. For this purpose, the following shall apply:

- 1. A three-in-one combination of WLAN, GSM/UMTS and GPS hiperformance outdoorantennae shall be installed and mounted on the bus and connected to the PTMSOBU. The preferred wireless frequency is 5.8 GHz, but 2.4 GHz will also be considered. The antennae should be active and have LNA on board.
- 2. The antennae shall have ingress protection of at least IP67. At least 20dB isolation between antennae is required. This antenna shall be used for all:
  - a. WLAN communications
  - b. GSM/UMTS communications
  - c. GPS communications
- 3. The antenna shall have a small form factor and be mounted flush on the bus to minimise potential damage from external objects such as tree branches, etc.
- 4. Due care shall be exercised in the installation of the antennae so as not to compromise the IP rating of the antennae or the integrity of the vehicle roof. The PTMS Contractor is responsible for the correct installation of the antennae. If the PTMS Contractor makes arrangements with the vehicle manufacturer to do the antennae installation their behalf, this will in no way relieve the PTMS Contractor of their obligation to ensure that these antennae are installed correctly and function correctly.
- 5. The antennae (sample and specification) shall be submitted to the Engineer forapproval prior to procurement.
- 6. The antennae shall comply with ICASA requirements.

### 9.5.3 Real-time requirements, processing and storage

The PTMS on-board unit shall act as the real-time central processor, data storage, and device manager for:

- 1. Automatic Vehicle Location (AVL) incl.
- 2. Main Driver Terminal (MDT)
- 3. Driver voice communications and text messages
- 4. Integrated interface for driver microphone and speakers

Real-time voice communications shall be via Voice over IP over mobile data, with a fall back to GSM/UMTS voice where no data signal is present. Real-time data communications shall be via mobile data. The integrated GSM/5G/4G modem chip shall support the following standards and data throughputs:

- UMTS/3G/HSDPA/HSDPA+/4G LTE (850MHz, 1900MHz, 2100MHz)
- GSM, GPRS, EDGE (850MHz, 900MHz, 1800MHz, 1900MHz)
- 4G LTE: 300 Mbps
- HSDPA+: 168 Mbps
- HSDPA: 14 Mbps
- 5G
- UMTS: 384Kbps (Downlink/Uplink)
- EDGE: 236.8kbps (Downlink/Uplink

All information shall be stored until it can be transmitted to the TMC.

The PTMS onboard unit shall be configured to send collected route data via GSM/UMTS communications to the TMC and/or another location. The data reporting rate shall be customisable for both specific time and distance intervals. The data shall also be capable of being communicated on an exception basis, including events related to schedule adherence or component failure. It shall run diagnostics and report any problems with on-board PTMS components (including the unit itself). It shall automatically recognise any system failure or lock-up, log the problem, and attempt a restart. Real-time data exchange between the bus and the TMC and/or other locations is required as follows (but not limited to):

- 1. AVL data including but not limited to location, mileage (split between productiveand unproductive trips) and speed.
- 2. Schedule adherence.
- 3. Text messages and voice calls via IP over GSM/UMTS data.
- 4. Sending of emergency status.
- 5. Device diagnostics.

When bus doors close for departure at a stop, the PTMS OBU shall immediately update the TMC on the departure status. All configuration data shall be transferred from the VCM via the cellular data network.

The PTMS OBU shall include functionality to verify the successful transmission of data to and from the TMC before purging any data records or buffers. It shall include functionality to re-transmit data in the event of an unsuccessful transmission.

## 9.5.4 Automatic Vehicle Location (AVL) Requirements

As part of the PTMS OBU, all buses shall have an Automatic Vehicle Location (AVL) system installed, set up and configured. The following minimum requirements shall apply:

1. The AVL shall be integrated with the PTMS OBU.

- The AVL shall provide real-time position based on GPS signal (latitude/longitude), bus speed, time and compass direction data and shall be updated on the PTMS OBUevery 5 seconds or less.
- 3. The AVL shall provide positional accuracy of ±5 meters, 95% of the time or better.
- 4. In case of lost or weak GPS signal, the AVL shall utilise certain information received from the bus systems, e.g. odometer/tachometer signal and steering direction, to determine the most accurate bus location by means of algorithms such as dead reckoning.
- 5. Decrease GPS polling intervals when the vehicle is stationary or switched off to savepower and bandwidth requirements.
- 6. Provide GPS time sync to other on-board devices supplied under this Contract. The interval between time synchronisations of all devices shall be configurable.
- 7. Provide an arrival and departure time each time the bus stops.
- 8. Be integrated into the remote Compliance Monitoring (CMS) system.
- 9. Be able to operate as a stand-alone device without the connection of an MDT (i.e.and without driver log-on)

#### 9.5.5 Main Driver Terminal (MDT) Requirements

The MDT shall be integrated into the PTMS OBU or a separate unit. The MDT shall at least:

- 1. Act as the user interface between the bus driver and all in-vehicle devices connected to the PTMS OBU and to the TMC and/or another location, including providing the interface for the functions of initialisation, operation, and configuration of all devices.
- 2. Be equipped with a colour, liquid crystal display (LCD) capacitive touchscreen.
- 3. Have a resolution of VGA 800 x 600 or better
- 4. Have a screen size of 8 inches. (200 mm) diagonal
- 5. Have configurable soft keys.
- 6. Support at least 2 different language options.
- 7. Include functionality to display different font sizes and styles on the same screen.
- 8. Display both text and icon-based messages and key labels.
- 9. Be readable in direct sunlight have a low glare/anti-glare display, and be equipped with a suitable cowl to reduce reflections.
- 10. Have an automatic low-b brightness setting for nighttime operation.
- 11. Contain a small speaker and tone generator to be used to provide audio alerts.
- 12. Shall provide at least the following information to the driver:
  - Schedule adherence information. Incorporate an audible and graphical schedule adherence display, including alarms/warnings if the driver is behind or in front of the schedule by a configurable period of time in a 1-minute resolution.
  - Status of vehicle doors.
  - Self-diagnostics and any fault notifications.
- 13. Automatically configure and initialise itself for operation when the power is turned on, with the default screen being the operator log-on screen.

- 14. Initialize all in-vehicle devices integrated with the PTMS OBU in a single action as the operator enters the log-on information.
- 15. Have a programmable interface and menu structure.
- 16. Utilize a hierarchical multi-page menu structure. The MDT shall include functionalityto scroll through a page and switch between pages.
- 17. Include default (but configurable) backlight, brightness, contrast, audio and tonesettings.
- 18. Include functionality to set audio tone types, frequencies, volume and durationthrough configuration data.
- 19. Have controls to allow the bus operator to adjust backlight, brightness, contrast, and volume settings. In no event shall such controls allow the screen to be set to all brightor all dark such that the text is unreadable.
- 20. Upon start-up and log-on the system shall revert to default settings for allconfigurable parameters.
- 21. Include operator log-on and log-out functions. The log-on function of the MDT shallpermit the operator to initialize the system with a driver ID
- 22. Include functionality to select certain routes and trips.
- 23. Have a soft key which shall request the TMC and/or other locations to establish voicecommunications with the driver. For this purpose the unit shall interface to the bus PA system (to be provided by the bus supplier).
- 24. Provide simple access to at least 20 pre-programmed text messages that areconfigurable by the operators in the TMC.
- 25. Indicate that there are unread messages in the incoming message queue and howmany messages are in that queue. The MDT shall also indicate when there are nomore messages to be read.
- 26. Move priority messages received to the front of the queue and provide visual andaudible indications that a priority message has been received.
- 27. Include functionality to skip a message in the queue, delete a message from the queue only after it has been displayed, or save a message to memory for long-termstorage (until MDT shutdown).
- 28. Include a minimum of three levels of critical messages, including:
  - a. Overt/Covert Alarm (highest priority level 0)
  - b. Emergency Services Requested (high priority level 1)
  - c. Non-Emergency Assistance Requested (priority level 2)
- 29. Be configurable on a system-wide basis to provide non-priority messaging functions to the operator either at any time or only when the vehicle is below a customisable speed threshold.
- 30. Shall be able to display font sizes in the range of 16 to 30 points.
- 31. Remain active if no operator logout has occurred until the expiration of the first power down timer (refer to Section 9.5.1) in the event the vehicle master switch has been turned to "off", "night run", or "lights". Once the second power-down timer has been triggered, the MDT shall automatically log out and shut down.

## 9.5.6 Automatic Stop Annunciation (ASA) and External Destination Display (EDD)

Automatic Stop Annunciations (ASA) shall be made on all buses. ASA consists of two components, namely audio annunciations and visual annunciations, both of which are considered in this section. In addition, the Route and Destination Displays are also considered in this section.

The PTMS Contractor shall be responsible for the control logic and communications required on the PTMS OBU and integration of components supplied by others to ensure the proper, integrated operation of all the ASA and EDD components. The PTMS Contractor is further responsible for ensuring that all wiring between OBU and ASA components is correct and that the ASA/EDD display controller's firmware is correct for operation with the OBU.

The PTMS ASA system functionality shall include, as a minimum:

- 1. Automated operation that requires no interaction by the driver or an operator to trigger announcements (all triggering to be set as configuration data). This shall berequired to work as follows:
- The PTMS OBU shall store bus stop and route information and compare that to theactual GPS coordinates. At predetermined distances from the next stop, an announcement shall be triggered. The back-office application in the control centre shall configure these trigger distances. If a bus travels offroute, the system will mute all announcements until the bus returns to the route.
- 3. The PTMS OBU shall store route and destination information and shall update the EDD as soon as the driver logs on to a particular bock/route.
- 4. Announce the transfer point and connect route information at relevant stops.
- 5. Both audible and visible messages shall begin playing within one (1) second of being triggered.

#### Audio annunciation

The following audio system components have been specified for supply and installation by the vehicle manufacturer:

- 1. Driver microphone (without key button). A rudged goose neck analogue microphone is to be fitted overhead to allow the driver's voice to be picked up whilst not interfering with the driver's field of view or controls.
- 2. Driver speaker mounted overhead
- 3. Saloon speakers (8 minimum) mounted in vehicle ceiling with not more than 3m of saloon length per speaker.

Each speaker shall be installed a minimum of 500mm from any other electrical or electronic equipment. Each speaker shall be fitted with a fine plastic mesh cover plate (colour code with bus ceiling), and an acoustic / dust/drip rear cover.

1. The speakers shall comply with the following minimum specifications:

Size (driver Speaker)	100mm
Size (saloon speaker)	160mm
Impedance	4 ohms
Туре	2-way coaxial (Woofer with integrated tweeter)
Power	20W RMS
Frequency Response	55 – 20 000 Hz

- 2. The microphone and speakers shall be cabled to terminals in the ITS enclosure using a minimum of 1mm2 shielded twisted pair cables or shall be Bluetooth enabled.
- 3. The above components shall be integrated with the PTMS OBU by the PTMS Contractor. The PTMS OBU shall act as controller and amplifier for the audio system. The PTMS Contractor shall liaise with and cooperate with the vehicle manufacturer to guarantee seamless and efficient system integration within the required programme requirements of both contractors.
- 4. The volume of the internal announcements shall be adjustable to a standard level through configuration data. This level shall be determined during bus operation, taking ambient noise into consideration. The client shall approve this level. It may be the same for all buses, or under special conditions (to be determined by the client), it may be different for certain buses.
- 5. The system shall include an automatic gain control to adjust interior volumes automatically depending on interior ambient noise levels.
- 6. The system shall include a manual override, including a minimum of fivevolume level settings that can be selected by the bus operator through the MDT such that the volume can be adjusted in real time by the bus driver if required.
- 7. The message being played shall be displayed on the MDT.
- 8. The system shall provide a manual override to allow an operator to cancel or manually activate an announcement.
- 9. Messages shall be assembled out of sound bites and shall sound like continuous recorded messages. Studio recording and pre-recording of messages shall be the Contractor's responsibility and be approved by the client. The client shall approve the voice artist.
- 10. Once recorded, the Contractor shall arrange prototype messages to be approved by the client before "going live". System testing will be conducted with computer-generated sound bites before loading voice recordings.
- 11. Messages shall be announced in English and at least four other official South African languages to be determined by the client. The four other languages may be different for buses servicing different areas.

## 9.5.4.2 Visual annunciation

The following visual annunciation system components have been specified for supply and installation by the vehicle manufacturer:

	Rigid & Midi bus	Articulated bus
Forward Destination Display	1	1
Side Mounted Destination Display	1	1
Internal Next-Stop Display	1	2

The displays shall be controlled and managed by a single display controller, which shall allow:

- o Input, storage and display of predefined text, messages and symbols.
- Manual control vis a simple user interface on the controller.
- Automatic control via a communications interface to the PTMS OBU

At least 3 portable display configuration data download devices shall be supplied. The displays utilise high brightness, wide viewing angle, and amber Light light-emitting diode (LED) technology. LED brightness shall be controlled by photocells installed as part of the sign.

The displays shall consist of a 2-line Amber LED matrix with minimum sizes

Display	Minimum Character Height	Minimum number of Characters
Forward Destination Display	200mm	18
Side Mounted Destination Display	100mm	16
Internal Next Stop Display	60 mm	16

Messages on the signs shall be legible during any time of day and from any designated passenger position on the bus. If this is not possible, another sign will be installed. An additional sign shall be installed in the rear section of articulated vehicles. The displays shall be provided with a combined display controller for all signs. Using a standard display control protocol, the controller shall communicate with the PTMS OBU via Ethernet or serial RS 485.

For the internal next-stop displays, the time display shall be outside of the message display area and may be provided either through additional dot-width on display or through a separate display module integrated into the sign housing. The displays shall be capable of displaying upper- and lower-case characters with proportional fonts. Characters shall be between three (3) and five (5) dot-width, with an average (mode) of four (4) dot-width. The display shall be capable of displaying uble-stroke width (bold) fonts. The front face of the display shall be designed to minimise glare. The background shall be black, and the display housing shall include a blackborder. The position of the internal next-stop display shall not block the viewing area of onboard CCTV cameras.

The signs shall have the functionality to display time and messages in the following modes, set through configuration data:

- a. A single, non-scrolling or changing message.
- b. A right-to-left scrolling message.
- c. An alternating (between up to four states) message.

In their installed configuration, LEDs used in the onboard signs shall have a minimum service life of 80,000 hours.

The data content to be displayed shall include but not be limited to;

- Display the route number and destination of the bus.
- Next stop messages giving the next stop's location and/or name.
- Display of the current time (on a separate line).
- Display of customer service announcements and alerts.
- 1. The above components shall be integrated with the PTMS OBU by the PTMS Contractor. The PTMS Contractor shall liaise with and cooperate with the vehicle manufacturer to guarantee seamless and efficient system integration within both contractors' requirements.
- 2. The PTMS Contractor shall be responsible for the communications protocols on the OBU to ensure the proper integrated operation of all the ASA and EDD components. The PTMS Contractor is further responsible for ensuring that all wiring between OBU and display components is correct and that the firmware on the display controllers is correct for operation with the OBU. The vehicle manufacturer shall cooperate fully and assist in this regard.
- 3. The data content to be displayed shall include but not be limited to;
  - Display of the route number and destination of the bus.
  - Next stop messages giving the next stop's location and/or name.
  - Display of the current time (shall be shown with scrolling or alternatingdisplay).
  - Display of customer service announcements and alerts.
- 4. All message content shall be configurable by the client.
- 5. It shall be possible to display messages in English and at least four other official South African languages to be determined by the client. The four other languagesmay be different for buses servicing different areas.

## 9.5.7 Desktop vehicle simulator

A desktop vehicle simulator shall be procured, set up and configured for use in the TMC. The simulator shall provide full onboard PTMS functionality, similar to that of a fully operational bus, but shall be installed in the TMC to test for appropriate configuration and testing of the PTMS central system, specified in Section 8.10. The simulator shall include functionality to simulate the movement of one or more buses along preselected routes with variable simulated bus speeds and discreet signals for door opening and closing operations. The simulator shall be configured and connected to the PTMS central system as may be required to test full functionality of the system.

The desktop vehicle simulator shall consist of at least the following:

- PTMS On-board Unit (OBU)
- Main Driver Terminal (MDT)
- Vehicle movement simulator with variable speeds and discreet door signals
- Any test equipment required to verify appropriate output signal from PTMS OBU asnecessary.

# 9.6 Video Surveillance System (VSS)

A visual surveillance system shall be installed on all buses to deter crime and vandalism and shall support system operations.

## 9.6.1 General Requirements

The PTMS Contractor shall supply, configure and install the following components:

• Two Fixed IP dome on-board CCTV cameras

## 9.6.2 CCTV camera requirements

- 1. Digital (IP-based) dome cameras shall be installed inside the bus.
- 2. All cameras shall be fixed dome cameras positioned and configured to provide fullcoverage of the bus interior.
- 3. Cameras shall comply with the following minimum requirements, subject to approval from the Polokwane Local Municipality.
  - Fixed varifocal lenses
  - Day/night wide dynamic range with dynamic contrast
  - Mini dome enclosure
  - Rugged, high-impact, vandal-resistant and puncture-proof domes
  - IP based with POE
  - On-board video analytics
  - H.264 video compression or equivalent
  - Minimum 1 megapixel
- 4. Cameras shall be setup, configured and installed to achieve clear and focused images with optimum coverage inside the bus.

- 5. Clear unobstructed coverage shall be provided with cameras installed in at least butnot limited to the following areas:
  - Over driver's head
  - All doors
  - AFC System validators
  - Driving view from front of bus.
  - Front of bus looking towards rear
  - Back of bus looking towards front.
  - Reverse view (reverse camera)
- 6. All cameras shall be on and record for the full duration of all revenue trips.
- 7. Under normal circumstances, cameras shall at least record video at 15 frames per second at CIF resolution. Different behaviour (higher frame rate and resolution) shallbe required for various event triggers.
- 8. Cameras will store all video data on SD card physically located on the Camera.

## 9.7 Driver panic/duress button requirements

The bus contractor installs a panic button for driver safety on the bus. This panic button shall be connected to the PTMS system, and the following shall apply:

- 1. A driver duress button will be installed by the vehicle supplier and is specified in thatcontract as follows:
  - "A driver duress button shall be installed by the bus contractor. This shall be a foot-operated switch installed on the left of the driver's footwell, close to the footrest. It shall be possible for the driver to activate this switch with his left foot in acovert way so as not to alert anyone on the bus of his action."
- 2. The driver's duress button shall activate an emergency alarm. The PTMS Contractorshall be responsible for the integration of the driver duress button and associated cabling and hardware with the PTMS OBU and other onboard systems as required.
- 3. In the event of emergency alarm activation, the bus operator and/or TMC shall be notified covertly, such that the emergency signal is identifiable only by a trained operator.
- 4. Activation of the covert alarm shall give the system response to that vehicle the highest possible priority.
- 5. The driver duress button circuit shall be monitored continuously for continuity, and any faults shall be reported on the MDT and provided to the bus operator and/or BRT CC.
- 6. The bus operator and/or BRT CC software shall display an alarm activation within 10 seconds maximum.

# 10 Detailed specification: Trunk stations

## 10.1 Functional description

The main features of the trunk station can be summarised as follows:

- Closed Station
- Ticket Sales at the station at kiosks and/or vending machines (implemented through the IFMS contract). In some cases, ticket sales may be located at retail outlets near the stations.
- Passenger infotainment displays may be implemented under a separate commercial contract.
- Passenger information displays,
- Passenger announcements.
- CCTV camera and NVR.





Figure 7: High level ITS systems infrastructure for trunk stations.

The figure above is intended to aid understanding of systems to be installed in the stations under this and various other contracts and is not prescriptive in terms of quantities, physical locations or required components to be installed under this contract. The architecture and equipment installed in different trunk stations may differ slightly. All Integrated Fare Management System (IFMS), ticketing, turnstile and card reader equipment shown above is not part of the scope of this contract and will be implemented through the IFMS contract.

# 10.2 General requirements

The following shall apply:

- 1. Installation of equipment in the stations shall commence as soon as the station infrastructure contractor has granted access.
- 2. The location of all equipment in the stations shall be determined after consultation with the Engineer and the client.
- 3. After approval from the Engineer, equipment shall be installed at optimal positions to suit their respective functionality. Where required, mounting brackets shall be designed after approval from the Engineer and procured by the PTMS Contractor.
- 4. The PTMS Contractor shall adhere to any safety regulations on-site and wear Personal Protective Equipment (PPE) as and when required.
- 5. The trunk stations are located along the major trunk routes and are all closed stations of varying widths and lengths.
- 6. The tenderer must ensure that all the systems in the trunk stations are integrated and that the systems are integrated with those in the control centre.

## 10.3 Electrical requirements

The following shall apply:

- 1. All equipment installed at stations shall operate from a nominal line voltage of 220 VAC, within voltage tolerances of +10% to -20%, and a frequency range of 47 Hz to 53 Hz without equipment damage.
- 2. The station's infrastructure contractor will provide Electrical supply, including UPS and battery backup. The PTMS Contractor shall liaise and cooperate with the station's infrastructure contractor to ensure the provision of electrical supply points and connection to the UPS and battery backup where required.

# 10.4 Environmental requirements

- 1. Operating Temperature: -10°C to +65°C.
- 2. Storage temperature: -20°C to +70°C.
- 3. Humidity: 0-90% relative humidity (condensing).
- 4. Outdoor mounted equipment which is resistant to water and solvents e.g. Water spray on equipment as a result of cleaning activities, industrial solvents, rain, mud, hail, snow and slush, all of which may contain salts that may come into contact with equipment.
- 5. All outdoor equipment shall be designed for and suitably protected against exposure conditions prevalent in the area, particularly heat and high humidity.
- 6. Enclosures shall include any provisions necessary to maintain the internal equipment at the manufacturer's specified temperature and humidity.

- 7. All parts shall be made of corrosive-resistant material, such as plastic, stainless steel, anodised aluminium or brass. All external screws, bolts, nuts, and locking washers shall be stainless steel or an approved alternate non-corrosive material.
- 8. All external connectors shall be weather-tight and designed for use in an outdoor environment subjected to dirt, water, oil, cleaning solvents and vibrations.
- 9. The Contractor shall include reasonable provisions to protect all equipment and components from common vandalism and physical abuse as may be expected on buses and at stations in the South African environment.
- 10. Enclosures shall be designed to prevent the entry of moisture during a thunderstorm and to minimize the entry of dust. The Contractor shall indicate if the housings do not meet these requirements and shall identify any alternative provisions incorporated to protect against moisture and dust, as well as requirements for installation.
- 11. Unless otherwise specified, all trunk station equipment shall have a minimum 50 000hours MTBF.

## 10.5 Backbone communications

The following shall apply:

- 1. All trunk stations will be connected to the TMC via the fibre-optic backbone to be installed by the Client's contractor. (not part of this tender)
- 2. The Client communications contractor will also supply a 19" equipment rack, splice the FO into a patch panel, and provide, configure, and install a Layer 3 network switch.
- This switch will support PoE, and ports will be allocated for use by the PTMS Contractor. The PTMS Contractor shall liaise with the contractor to ensure sufficient port count and that any specific required network configuration or design is considered.
- 4. The PTMS Contractor shall be responsible for patching his own equipment to and from the patch panel(s) and network switch.
- 5. The PTMS Contractor shall provide MAC addresses for the PTMS equipment (IP Phone) and test and commission these connections with the Communications Contractor

# 10.6 Passenger Information System (PI)

As a minimum, the following shall be priced:

- 1. LCD-TFT Passenger Information Displays (PID) to display bus departure times incident/delay messages, route data, schedules, synchronised time and other information.
- 2. Close pitch LED matrix Passenger Information Displays (PID) to display bus departure times incident/delay messages, route data, schedules, synchronised time and other information.
- 3. Integrated audio-on-demand "bus departure" announcements for the visually impaired. (Priced as a rate-only item)

### 10.6.1 Passenger Information Display (PID) Requirements

The PID shall have the following minimum features/properties:

- 1. Outdoor PIDs shall be ruggedised outdoor displays suitable for installation in harsh outdoor environments exposed to the elements with an IP rating of at least IP66. Indoor displays shall have an IP rating of at least IP 54.
- 2. Indoor display units may also be considered for certain locations.
- 3. Shall be vandal resistant.
- 4. Include embedded computer and storage with controller and internal clock.
- 5. The following format and type PIDs shall be priced as listed in the pricing schedules. The final selection, depending on the station size and layout, and quantities will be confirmed during the detailed design stage.
  - a. LCD TFT (with LED backlight) in the following sizes:
    - i. 42" (1920 x 1080 pixel resolution)
- Depending on PID location, shall have standard brightness (at least 700 cd/m2) or high brightness (at least 1500 cd/m2) with integrated brightness control using ambient light sensing photocell
- 7. Shall allow continuous operation 24/7 at temperatures of -5 degrees Celsius to 35 degrees Celsius.
- 8. Anti-glare protective display.
- 9. Integrated 100 Mbits/s network port.
- 10. Standard diagnostic software including but not limited to:
  - a. Over temperature automatic shutdown
  - b. Ambient light control brightness and contrast adjust
  - c. Control of internal voltages, backlight, fans
  - d. Shall support SNMP
- 11. Automatic temperature/fan control.
- 12. Can be used in both horizontal and vertical orientations.
- 13. It shall be possible to use for both bus scheduling and other related bus information and infotainment, such as general information provided by the client.
- 14. Depending on the station size and location in the station, different combinations of screens may be installed, like a single display, two back-to-back displays, a row of screens, rows of screens back-to-back, etc.
- 15. The Contractor shall provide the required brackets and mounting equipment for all possible combinations after approval from the client.
- 16. The PID shall include functionality to display pre-set messages and/or realtime dynamic information, including next bus departures.
- 17. Screen layout shall be configurable. It is possible to define at least various sub-areas on the screen with different fonts, different fonts, and different background colours and display different objects in different areas. It shall be possible to page between different screens at a configurable pre-set period (e.g. every 10 seconds). Screen configuration shall not be limited to only that listed here.
- 18. Screen configuration with minimum options as described in point 17 above shall bepossible from the TMC to a selected user group with designated privileges.

- 19. The client shall agree on the Final screen layout/design.
- 20. The Contractor shall provide the initial layouts for approval by City Branding andUniversal Accessibility requirements.
- 21. The PIDs shall receive input from the central system on an as-required basis:
  - a) System management commands (e.g. system status requests, etc.)
  - b) Static display information (e.g. hours of operation, bus routes, schedule, etc.)
  - c) Real-time display information (e.g. schedule, next bus, etc.)
  - d) Ad hoc information (e.g., time clock or advertisements).
  - e) Screen configuration and layout updates (only available to user groups with relevant privileges).
- 22. It shall be possible to display freeform alert messages entered by operators in the TMC (or, potentially, automatically generated by the PTMS System) to advise passengers of service disruptions or reroutes. Such messages shall alternate or otherwise be displayed in concert with predicted arrival times, and shall not pre-empt the arrival time display unless there has been a complete disruption in service to thespecific station.
- 23. It shall be possible to display scrolling messages at the bottom of the screen.
- 24. The system shall have the capacity to store static messages.
- 25. It shall be possible to display the predicted times of the next bus on each route serving the station based on information transmitted from the central system. The display shall indicate which platform the bus will depart from.
- 26. Clock functionality shall be synchronised to the central system time and shall be updated on a daily basis (minimum). Between update cycles, the clock shall have a cumulative drift of no more than 10 seconds.
- 27. It shall be possible to display the next bus departure time for at least the next threebuses. Bus departures due in less than 1 minute shall be shown with a special character (configurable).
- 28. The display shall be updated within 10 seconds to clear the old information when a bus departs.
- 29. Static information or a clock display shall be shown if the communication link is lost.

#### 10.6.2 Public Address (PA) system

- 1. An IP-based PA system shall be installed at every station so that passengers anywhere in a station can hear announcements clearly.
- 2. The PA system software in the CCC(TMC) shall allow for remote monitoring, alarm reporting, configuration and remote announcements.
- 3. Automatic volume control shall be possible based on ambient noise detection.
- 4. It is possible to override and set the speakers' volume, base, and tone directly at the station.
- 5. The following shall be supplied and installed under this contract:
  - i. Microphone
  - ii. Speakers as and where required
  - iii. PA amplifier
- 6. The PTMS Contractor shall liaise and cooperate with the Stations contractor to ensure integration of all components of the PA system.

- 7. It shall be possible to make an announcement in the following ways:
  - a. Announcements made from the microphone in the sales kiosk.
  - b. Announcements made directly from the CCC.(TMC)
  - c. Automatic announcements made through the APTMS system.
- 8. It shall be possible to configure priorities for the various announcements as specified inpoint 7 above.
- 9. It shall be possible to configure announcements to be either:
  - a. Voice announcements.
  - b. A sound to play indicating bus arrival.
  - c. A combination of both of the above.

# 10.7 Safety and Security Systems

The PTMS Contractor shall supply, configure, install and be responsible for the following:

- 1. The CCTV cameras inside the sales kiosks.
- 2. All wiring to/from cameras to/from network switch
- 3. All wiring to/from digital CCTV display unit to/from control units and to/from cameras.
- 4. All safety and security devices shall be connected to the UPS( battery backup power supply). The PTMS Contractor shall liaise with the Stations contractor (responsible for the backup power supply) to ensure this requirement is fulfilled.

#### 10.7.1 CCTV camera requirements

- 1. Cameras shall comply with the following, subject to approval from the PLM.
  - Fixed varifocal lenses
  - Day/night wide dynamic range with dynamic contrast
  - Mini dome enclosure
  - Rugged, high-impact, vandal-resistant and puncture-proof domes
  - IP based on Power Over Ethernet (POE)
  - Alarms and video analytics
  - H.264 video compression
  - At least 3 megapixels
  - Streaming video to the BRT CC
- 2. Cameras shall be set up, configured and installed to achieve clear and focused images with optimum full coverage inside the station. Clear unobstructed coverage shall be provided with cameras installed in at least but not limited to the following areas:
  - Inside every sales kiosk with a view of every sales point
  - Outside every sales kiosk with a view of every sales point

# 10.8 CCTV along the Route (optional)

## 10.8.1 Functional description

CCTV cameras shall be installed along the trunk route.

- 1. The following minimum equipment shall be supplied, installed and configured alongtrunk routes under this contract:
  - a) *CCTV fixed IP cameras* along the entire trunk route (streaming video to control centre, recording and storage of CCTV footage at CCC).
  - b) CCTV PTZ IP dome cameras with coverage of outside of stations.
  - c) Miniature network switches installed at every CCTV camera.
  - d) Pole top enclosure box.
  - e) Camera poles will be installed along the route
  - f) CCTV Cameras shall be connected to the backbone fibre optic.
  - g) Spare fibres from the FO backbone cable (to be installed by the ICT contractor)shall be used.
  - h) CCTV images shall be streamed to the control centre for viewing, recording storage and archiving.

## **10.8.2 Electrical requirements**

In addition to the requirements given, the following shall apply:

- All equipment installed along routes shall operate from a nominal line voltage of 220 VAC, within voltage tolerances of +10% to -20%, and a frequency range of 47 Hz to 53 Hz without equipment damage.
- 2. The Contractor shall be responsible for finding the closest power supply point, applying for connectivity and way-leaves and installing cabling to every pole as and where required.
- 3. A backup battery supply shall be installed at every camera for at least 4 hours of backup power.

#### **10.8.3 Environmental requirements**

- 1. Operating Temperature: -10°C to +65°C.
- 2. Storage temperature: -20°C to +70°C.
- 3. Humidity: 0-90% relative humidity (condensing).
- 4. Outdoor mounted equipment, water and solvents: Water spray on equipment as a result of cleaning activities, industrial solvents, rain, mud, hail, snow and slush, all of which may contain salts that may come into contact with equipment.
- 5. All outdoor equipment shall be designed for and suitably protected against exposure conditions prevalent in the City.
- 6. Enclosures shall include any provisions necessary to maintain the internal equipment at the manufacturer's specified temperature and humidity.

- 7. All parts shall be made of corrosive-resistant material, such as plastic, stainless steel, anodised aluminium or brass. All external screws, bolts, nuts, and locking washers shall be stainless steel or an approved alternate non-corrosive material.
- 8. All external connectors shall be weather-tight and designed for use in a mobile environment subjected to dirt, water, oil, cleaning solvents and continuous vibrations.
- 9. The Contractor shall include reasonable provisions to protect all equipment and components from common vandalism and physical abuse as may be expected on buses and at stations in the South African environment.
- 10. Enclosures shall be designed to prevent the entry of moisture during a thunderstorm and to minimise the entry of dust. The Contractor shall indicate if housings do not meet these requirements and shall identify any alternative provisions incorporated to protect against moisture and dust, as well as requirements for installation.
- 11. Unless otherwise specified, all equipment along the routes shall have a minimum of 50 000 hours MTBF.

## **10.8.4 CCTV requirements**

CCTV cameras requirements

- 1. The fixed CCTV cameras shall comply with the following minimum specifications:
  - a) Fixed day-night IP camera with wide dynamic range and dynamic contrast
    - b) Outdoor-ready, rugged, high impact, vandal resistant enclosure
    - c) Alarms and video analytics.
    - d) H.264 video compression
    - e) At least 3 megapixels
    - f) Varifocal 10 x optical zoom
- 2. The PTZ cameras shall comply with the following minimum specifications
  - a) IP based
  - b) PTZ motorised zoom, 35x optical lens
  - c) Day/night wide dynamic range with dynamic contrast
  - d) Mini dome enclosure
  - e) Rugged, high-impact, vandal-resistant and puncture-proof domes
  - f) Alarms and video analytics
  - g) Include stored pre-set positions for quick navigation.
  - h) H.264 video compression
  - i) At least 3 megapixels
  - j) Streaming video to the CCC
- 3. CCTV shall be streaming video to the CCC where footage shall be recorded, stored, archived and analysed. No Network Video Recorder (NVR) shall be required at the camera.
- 4. Cameras shall be setup, configured and installed to achieve clear and focused images with optimum coverage along the routes and outside the stations. Clear unobstructed coverage shall be provided with cameras installed in at least but not limited to the following areas:
  - a. Approximately every 500m along the route
  - b. On both sides of every station
  - c. Any other area deemed critical for LLP operations or safety and security.

- 5. All cameras shall be on and stream video 24 hours every day.
- 6. Under normal circumstances, cameras stream video with at least 25 frames per second at HD resolution (1920x1080).

#### **10.8.5 Video Analytics and Event-based Response Requirements**

The following shall apply.

- 1. The video analytics shall provide alarms including but not limited to the following:
  - a. Loitering
  - b. Human presence
  - c. Each of the functions shall be configurable for multiple zones per camera
- 2. When an incident triggers an alarm, cameras stream video footage at maximum frame rate and resolution.
- 3. During the alarm state, recording shall be at an increased frame rate and resolution (to be agreed with the City). Alarm recording shall continue for a configurable time period, after which it shall be reverted back to a lower frame rate and resolution (to be agreed upon with the City).
- 4. An event shall cause the system to protect a customisable time segment before and after the event from automatic overwriting until a systems administrator overwrites it.

#### 10.8.6 Pole-mounted electrical/electronic enclosure, power supplies and accessories

- 1. The pole-mounted CCTV electrical/electronic enclosures shall house the battery charger, battery, inverter/power supplies, fibre splice/patch box and all communicationsequipment associated with the cameras. The enclosure shall be sized to accommodateall the equipment.
- 2. The enclosures shall be tested to Ingress Protection Rating IP44.
- 3. The colour of the enclosures for the poles shall be agreed upon with the City.
- 4. The Contractor shall submit a sample for approval prior to manufacture.
- 5. The enclosure shall be fitted with a 6.3 x 50 x 200mm Cu earth bar, predrilled with holes of 6mm diameter. Each enclosure's door and mounting plate shall be bonded to the enclosure by flat Cu straps at least 2 points.
- 6. All components and circuits shall be labelled. The door of the enclosure shall be labelled with the name and number of the CCTV site. The label detail shall be agreed upon with the City.
- 7. These enclosures shall be fitted with circuit breakers, surge arrestors (power supply, IP), terminals, wiring, brackets and sundry material to provide a complete and fully functional system.
- 8. All equipment and material for these enclosures not measured elsewhere shall be costed into the rate tendered for the enclosures.
- 9. These enclosures shall be fitted with a filtered fan, panel heater and combined hygrostat/thermostat of the type Pfanenberg or equal approved. The mains shall power the panel heater before the battery charger.

- 10. The Contractor shall design a backup power supply which will give backup power to a camera site for at least 2 days.
- 11. The Contractor shall supply workshop manufacturing and wiring schematic drawings for the pole-mounted enclosures within 15 days of the award of the contract. Manufacturing of these enclosures shall commence only upon the engineer's approval of the workshop drawings.
- 12. All pole top enclosures are subject to approval from the City.

#### **10.8.7** Pole top network switches requirements

A network switch shall be installed in the pole top enclosure and the following shall apply:

- 1. Miniature Gigabit network switch.
- 2. The switch shall be Moxa EDS P510A-4PoE approved equivalent or better.
- 3. 2 x Gigabit ports
- 4. 10 x 10/100 MB ports

#### **10.8.8 Splicing requirements**

- 1. All the fibres of an optical fibre cable shall be spliced to fibre tails in a Patch Panel. Only fusion splicing shall be used to splicing in the fibre panel.
- Every fibre optic cabling link in the installation shall be tested using Fluke or Equivalent testing equipment in accordance with the field test Specifications defined by the CENELEC (Comité Européen de Normalisation Electro technique), Standard ISO/IEC 11801 or as determined by the PLM or the appropriate network application standard(s) whichever is more demanding.
- 3. All testing shall be documented and reported to the City.
- 4. Any failing link must be documented, diagnosed and corrected. The corrective action shall be followed with a new test to prove that the corrected link meets the performance requirements.
- 5. The final and passing result of the tests for all links shall be provided in the test results documentation
  - All AFC vending machines
  - View from inside the station towards every/all AFC gates
  - All AFC System validators
  - All doors
  - All Platform panic and information buttons
  - All Infotainment displays
  - Any other area deemed critical for safety and security or BRT operations
- 6. All cameras shall be on and stream video 24 hours every day.
- 7. Under normal circumstances, cameras shall stream video at 25 frames per second at HD resolution (1920x1080).

## 10.8.9 CCTV Network Video Recorder Requirements

The following shall be supplied, configured and installed:

• 1.CCTV Network Video Recorder

The above shall be installed in the station equipment room.

## 10.8 Communications systems

The PTMS Contractor shall supply, configure, install and be responsible for the following:

• IP Phone at the stations

The IP Phone will be connected to the main fibre communications network. The IP Phone

will also be connected to the Wireless backup communications.

## 10.9 Wireless backup communications

#### 10.9.1 General requirements

- 1. Wireless backup communications shall be installed at every station. This shall be one of the following types of communications or a combination of them:
  - GSM/UMTS (incl. all South African service providers. The City reserves the rightto use an existing service provider.)
  - The existing TETRA network of the Polokwane Local Municipality is in coordination with the Polokwane Local Municipality.
  - A new wireless network is to be installed by the UTC contractor (must be negotiated and confirmed in coordination with the Polokwane Local Municipalityand the UTC contractor).
  - Any other to be investigated/proposed by the Contractor.
- 2. The Contractor shall investigate all of the above for wireless backup communications at every station. The Contractor shall submit a report, including a cost proposal, to the Polokwane Local Municipality addressing the following issues for each technology listed above:
  - Availability at stations.
  - Availability of bandwidth and potential data limitations.
  - Bit rate up and download speeds and consistency of connection.
  - Will a separate integrated antenna at a suitable location (it may be outside thestation) improve reception?
  - Unit cost for data transfer.

- Besides data costs, any and all other running costs.
- Estimated capital expenditure considering expansion of coverage, procurementof new devices, etc.
- Equipment supported. Are any special devices required which may inflate capital expenditure?
- 3. For GSM/UMTS, the following are acceptable (ordered in preference of technology, pending the investigation in point 2 above):
  - i. LTE
  - ii. HSDPA/HSUPA
  - iii. 5G
  - iv. EDGE
  - v. GPRS
- 4. Before any final system and service is procured, the City shall approve of it. The City reserves the right to request further investigation to address specific issues required to make a final decision.
- 5. The wireless backup communications shall be used for the following:
  - a) Voice data from IP intercoms, phones and emergency systems.
  - b) Management data to installed devices.
  - c) Data to be displayed on information screens.
  - d) Other data as required.
- 6. Based on the report, the Polokwane Local Municipality reserves the right to choose any technology and limit the bandwidth required to reduce operating costs. In such an instance, some of the requirements above will be omitted.
- 7. The communications system shall have an interface that supports common IP protocols such as UDP/IP and TCP/IP.
- 8. The default state of the backup communications shall be "off". The backup communications shall only be activated once the primary communications are disrupted for a configurable period of time. The backup communications shall then be activated and operational within 10 seconds. However, the backup shall be tested for functionality during monthly preventative maintenance
- 9. In the case of GSM/UMTS, the Mobile Wireless Router (MWR) to be supplied with a cellular access platform designed to transport mixed-generation Radio Access Network (RAN) traffic.

This includes

- UMTS: LTE, HSPDA/HSUPA and 3G
- GSM: GPRS and EDGE
- 10. The GSM/UMTS MWR shall have the following minimum specifications.

Quantity of the Mobile Wireless Router (MWR) Minimum Specifications:

- 2x Ethernet Port
- 2x RS232 Port
- 2x SIM slots
- 3dBi Dual Band Antenna GSM 900 and GSM 1800

- 10 to 30V power connection
- DIN rail-mounted
- Power and communications status LEDs
- Built-in VPN client and firewall
- Supports SNMP
- Layer 3 Routing
- DHCP Server/Client
- NTP time server
- Firmware upgradeable via FTP or serial
- ICASA Certified
- Password protected
- Multiple simultaneous connections
- Real Time Clock (RTC)
- IP Masquerading
- Device management via a web interface

## 10.9.2 SIM card provisioning

In the case of GSM/UMTS communications, the Contractor shall be responsible for SIM card provisioning based on the following requirements. These requirements shall be finalised with the Polokwane Local Municipality before procurement of any GSM/UMTS technology.

- 1. All different mobile service providers shall be considered for this solution. The City reserves the right to use an existing service provider.
- 2. The Contractor shall investigate data costs from all service providers and submit a report on this to the Polokwane Local Municipality.
- 3. Based on data costs, a comprehensive data management solution shall be implemented to limit the amount of cost/data to be sent. This may include setting a data cap. It is anticipated that this will be a dynamic process to be refined over time as specific operational needs are known.
- 4. The wireless backup communications shall be bi-directional unless specified otherwise for certain actions and certain data.
- 5. Only incoming voice calls shall be allowed, to be agreed with Polokwane Local Municipality.
- 6. No SMS messages shall be allowed in either direction, to or from the router.
- 7. A data cap shall be set after agreeing upon this with the Polokwane Local Municipality.
- 8. No wildcard allowed (i.e. no internet access allowed).

# 11 Detailed Specifications: Bus depots and layover areas

Bus depots and layover areas are strategically located based on access to the transport corridors and available space. Bus depots serve as storage facilities for buses that are not in operation. Each depot shall be equipped with a PTMS workstation from which the vehicle operator can plan, monitor and control his portion of the vehicle fleet.

The depot workstation shall also provide a facility for text and voice communication with the drivers as specified in section 8.10.2.5. All depot–driver communications shall be visible to the TMC.

# 11.1 Workstation PC

Client workstations shall be procured, set up, installed and configured at depots and layover areas.

The client workstations shall have at least the following specifications:

- a) Intel Pentium based
- b) CPU: Intel I7 or latest available; min. 3 GHz
- c) Main memory: min. 16GB
- d) HDD: min. 500 GB hard disk
- e) Housing: Floorstanding tower or rack mount, depending on the application
- f) Sound card
- g) Graphic card for multi-monitor operation (at least 2 monitors shall be accommodated)
- h) 3 x 20 inch TFT monitors with LED backlight
- i) Wireless keyboard
- j) Wireless mouse/navigation devices
- k) Cabling and sundry material
- I) Operating system: Latest version of Windows for client workstations after approval from the client.
- m) Email client: MS Outlook

## 11.2 **IP Phone**

An IP Phone will be supplied installed, and configured at each of the depot and layover areas. The IP Phone will use the Fibre communications backbone as a main connection. TheIP Phone will use the GSM/ APN for the backup connection.

## 11.3 APN Communications

Communications to the Depot and Layover area will be supplied with a GSM APN as a backup. It will be used until Fibre Connectivity is available. Refer to Section 12 for detailed specifications.

# 12 Detailed specification: GSM/UTMS APN

# 12.1 Functional description

The scope of work under this contract includes the provision of a complete GSM/UTMS APN solution, including service provider APN, radius server, routers, link to TMC and securely provisioned SIM cards with voice/data contracts.

Tenderers shall engage with and include Cellular network/service providers in their tenders and confirm that the SP will enter into an SLA to provide network coverage and uptime. Tenderers shall confirm the extent of the cellular data coverage that will be provided and guaranteed by their selected network for each of

- GPRS/Edge
- 3G
- 3.5G: HSDPA/HSUPA
- 4G/LTE

# 12.2 Role and Responsibilities of Cellular Service Provider

The roles and responsibilities of the cellular service provider shall include but not be limited to:

- a) Supply, installation, configuration, testing and commissioning of a dedicated IRPTNAPN with direct connection to the TMC. This shall include radius server, routers, switches, patch leads and cabling necessary for a complete installation
- b) Testing of network coverage/signal strength and implementation of improvementswhere required
- c) SIM Card Provisioning
- d) Provision of data contracts and a data usage monitoring and reporting facility
- e) Provision of support to ensure APN uptime

Tenderers shall include a statement of intent from the Cellular SP in their tenders and confirm that they will enter SLAs to provide network coverage and uptime. Tenderers should note that some SPs use the existing Metro Connect network and may have connectivity to the existing TMC.

## 12.3 SIM Cards and Data Contracts

The SIM cards shall be supplied and provisioned by the SP as follows:

- a) The real-time communications shall be bi-directional unless specified otherwise for certain actions and certain data.
- b) Only incoming voice calls shall be allowed.
- c) No SMS messages shall be allowed in either direction
- d) Communications with only certain configurable IP addresses shall be allowed.
- e) No wildcard allowed (i.e. no internet access allowed).

The PTMS Contractor shall set up and pay the monthly data contracts for the SIMs. Based on data costs, a comprehensive data management solution shall be implemented to limit the amount and cost of data sent/received. This shall include data usage monitoring and reporting using a tool to be provided by the SP.

This may also include a data cap to be set with only critical data to be transferred once the cap is reached. It is anticipated that this will be a dynamic process to be refined over time as specific operational needs are known.

# 12.4 Responsibilities of PTMS Contractor

The PTMS Contractor shall be responsible to implement GSM/UMTS real-time communications to/from buses. The following shall apply and shall be the responsibility of the PTMS Contractor:

- 1. Include Cellular network/service provider(s) in their tenders and provide a letter of intent that the SP will enter into a SLA to provide network coverage and uptime.
- 2. Ensure that the SP sets up the APN and provisions the SIMs in accordance with thisspecification and the Contractor's programme
- 3. Facilitate route coverage and signal strength testing with the SP. Monitoring of coverage via the BI reporting system and resolution of problems with the SP.
- 4. Confirmation and testing that the GSM/UTMS modems in PTMS OBU are fullycompatible with the SP's network equipment
- 5. Set up and pay the monthly data contracts for the SIMs.
- 6. Implement a data management solution as specified above and report monthly to the client on data usage
- 7. Implement a trusted caller identification function (either in PTMS OBU software or on the SIM/APN). This shall block all calls other than those from pre-configured trustedcaller ID's. The outgoing lines from the control room shall be listed as trusted callers.

# 12.5 GSM/UTMS APN Locations

The GSM/UTMS APN will be installed at the following locations:

- 1. All buses (21)
- 2. All Midi-buses (15)
- 3. All taxis(20-60)
- 4. All stations (1)
- 5. Depot and Lay-over areas (2)
- 6. TMC (1)

# 13 Testing and commissioning

## 13.1 General requirements

The Contractor shall be responsible for conducting all testing as described herein. Work under this section shall include all labour, materials, setup, modification, configuration and support services required to test all hardware and software, systems and sub-systems completely.

If testing reveals that a type of equipment does not meet the specifications or requirements as stated in these Specifications (Part C3), it shall be the Contractor's responsibility to correct the problem in all units of that equipment furnished, at no additional cost to client.

The Contractor shall be responsible for the performance of all of the tests described below to satisfy the objectives of each testing phase as determined by client. Client and/or their representatives have the right to witness all tests. This may include any number from 1 to more than 5 people.

Detailed test plans for every test stage shall be submitted to the client a minimum of twentyeight days prior to the planned start of testing. Testing shall not commence until the plans have been approved.

Unless otherwise specified, all test plans shall include at a minimum the following:

- (1) Overview of test, including test objectives
- (2) Pass/fail criteria
- (3) Traceability matrix listing of all requirements and specifications from the Contract that are included/to be verified in the test and their crossreference to the specifications (Part C3).
- (4) Test setup and test measuring equipment (including descriptive diagrams)
- (5) Listing of tools, test applications, simulators, etc. required to perform the test
- (6) Entry/start-up conditions
- (7) Exit/closing conditions
- (8) Test procedures and scripts to be executed (if required)
- (9) Test recording form
- (10) Test comments form
- (11) Signatures and verification form

The client reserves the right to direct, at no additional cost, the following changes to the test plans:

- The addition of procedural changes and other reasonable tests to reasonably assure system performance and conformance to the contract specifications;
- (2) Investigation into any apparent troubles or anomalies with respect to the System;
- (3) An audit of all test reports and verification of any or all previous tests and Measurements.
- (4) Include any system or sub-system supplied under this contract to be subjected to testing.

Upon successful completion of any test, the Contractor shall prepare and submit within two

(2) weeks a report summarising the results with relevant test records appended. The client will review all such test reports, which will become the client's property.

# 13.2 Test suspension criteria and defects resolution

The following shall apply:

- a) The Contractor shall, prior to requesting a representative from the client to witness testing, perform his own testing to confirm that all equipment complies with all test requirements and present proof of this.
- b) After the Contractor is satisfied that the equipment passed all tests and the system isstable, the Contractor shall provide written notification of readiness to test for all required test stages a minimum of two (2) weeks before the testing.
- c) In case the Contractor calls the client or his representative to witness testing without having performed verification tests himself, as stated in point a. above, the client or his representative reserves the right to call an immediate stop to the test, in which case paragraphs a. and b. above shall be performed in that order.

All test failures, system defects, system errors, missing functionality, missing components/equipment, sub-standard workmanship (refer to, inter alia, the entire Section7) shall be recorded by the Contractor and assigned a "Defect Severity" rating as follows:

- Severity 1: Required functionality is substantially not available; normal inservice operation of the device or subsystem cannot be maintained; or client IRPTN operations are disrupted.
- (2) Severity 2: Functionality is substantially available however one or more subfunctions are not operating as specified; full functionality is available but performance is not within specifications. Normal in-service operation can be maintained via a workaround.
- (3) Severity 3: Minor software defect or usability problem for which there is a workaround. Substandard installation practice (for e.g. loose bracket, use of cable ties, etc.) that requires rectification.

The Contractor shall maintain a database and track the status of all defects. The client reserves the right to re-classify a defect severity based on the impact on system operation or IRPTN operations. Test continuation, suspension or restart shall be as follows:

- (1) Severity 1 Defect: Applicable test(s) shall be halted and restarted from time zero upon rectification of the Severity 1 defect. In the event that IRPTN operations are disrupted, all testing shall be suspended until the defect can be rectified.
- (2) Severity 2 Defect: Applicable test(s) shall be suspended and restarted upon rectification of the Severity 2 defect.
- (3) Severity 3 Defect: Testing may continue. Defect shall be noted in the comments section of the report and form part of a snag list.

All Severity 1 and 2 defects shall be corrected prior to completion of the stage of testing where they were identified. Test results for that stage shall not be accepted until the Contractor demonstrates that all Severity 1 and 2 defects have been resolved and tested.

Severity 3 defects may be carried forward into software or system modifications in the next stage of the project, and shall be demonstrated to be corrected in the next planned testing stage.

The Contractor shall develop and maintain a standard set of regression tests for each device or subsystem. Regression testing shall be performed in the event of system modifications or changes to guarantee that the said changes do not introduce any defects.

At the completion of every test stage, the Contractor shall submit a test completion report documenting the complete procedure and summarised results. This is over and above any defects or snag lists which shall be set, managed and maintained by the Contractor.

## 13.3 Inspections and test stages

## 13.3.1 Testing Stage 1: Functional Acceptance Testing (FAT)

Functional Acceptance Testing shall be performed to ensure that tendered equipment meets all the functional and operational requirements provided in this specification (Part C3). A client representative will be present during the FAT. All FATs shall be performed prior to ordering any of the equipment undergoing FAT, except as may be required for the FAT itself.

The Contractor shall develop a comprehensive FAT program consisting, at a minimum, of the following individual test programs:

- (1) Hardware test to test the operating parameters of all equipment per the specifications of this contract and Original Equipment Manufacturer (OEM) specifications.
- (2) Functional test to demonstrate that all functional and operational requirements and specifications applicable to the device/subsystem have been delivered.
- (3) Environmental, electrical, and electromagnetic tests demonstrate compliance with contract and regulating agency requirements, or existing valid test certificates prove the same.
- (4) Human factors test for all devices/subsystems with a user interface.

A minimum of one (1) unit of each equipment type listed in the section below unless specified otherwise, identically configured to all other units of that same equipment type, shall be subject to the FAT unless waived by the client.

• Any device certifications required by regulatory agencies shall be the Contractor's responsibility.
- All required certifications shall be submitted with each shipment of devices or subsystems.
- Any changes to the hardware configuration shall require a FAT retest.
- Tests shall be performed in at the factory or in South Africa as may be required.
- Rate including setup and configuration of equipment and contractors' own preinspections, followed by subsequent inspection by the PLM, including setup and management of snag lists and test completion reports

#### 13.3.1.1 Equipment requiring FAT

None of the equipment below shall be ordered before the FAT has been conducted and passed by the relevant equipment.

At least the following equipment shall be subject to FAT:

- GSM/UTMS APN hardware
- PTMS OBU was set up with MDT, a door-open simulation switch, and a variable speed simulator switch, and it was tested with the installed CMS system software.

The client reserves the right to add any other equipment deemed necessary for testing and/or to waive some of the equipment listed above from testing.

#### 13.3.2 Testing Stage 2: System Integration Test (SIT)

A System Integration Test (SIT) shall be conducted to verify that subsystem components meet the system-level functional requirements and specifications when integrated together.

The Contractor shall be responsible for the provision of any SIT test beds or bench test facilities, including any power supplies, hardware and/or software simulators, measurement equipment or other components and software required to conduct the tests.

The SIT configuration shall include all test equipment required to simulate data signals to and from devices noted in this Contract, such as wheelchair lifts/ramps, destination signs, emergency alarms, etc. The Contractor shall develop a comprehensive SIT program consisting, at a minimum, of the following individual test programs:

- (1) System configuration
- (2) Integrated operation of all devices and subsystems
- (3) End-to-end connectivity and correct processing/handling of data and messages
- (4) Scenario or use-case testing to demonstrate that all system-level functional and operational requirements and specifications have been delivered.

(5) As applicable, environmental, electrical and electromagnetic tests demonstrating compliance with Contract and regulating agency requirement inthe integrated form of the system or existing valid test certificates proving the same.

Rate including setup and configuration of equipment and contractors own pre-inspections, followed by subsequent inspection by the CoT, including setup and management of snag lists and test completion reports

#### 13.3.3 Equipment requiring SIT

SIT shall be completed prior to onsite installation of the relevant systems. At least the following equipment shall be subject to SIT:

- One complete set of integrated PTMS systems as required.
- GSM/UTMS APN communications to TMC
- The client reserves the right to add any other systems deemed necessary for SIT,and/or to waive some of the systems listed above from testing.

#### 13.3.4 Testing Stage 3: Installation inspections

All installations in buses, stations, depots, in the TMC, along the route, or any other place shall be checked for installation completeness and quality. The purpose of these inspections is to confirm that the correct equipment has been installed, to check the completeness of installation and to check installation quality. Basic functionality checks may also be included in the inspection.

A client representative will be present during the inspections. The Contractor shall develop a checklist of everything to be checked for all devices, systems and sub-systems, including, as a minimum:

- Quality of workmanship
- Equipment power on-test
- Screen setup and configuration of PID's or any other screen to fulfil client requirements. (rate only)
- Completeness of installation, for e.g. are ground wires installed and connected/bondedproperly, are there any loose brackets or screws, labelling, etc.
- Compliance to any general installation requirement specified in this document.
- Any other requirement as deemed necessary by the client.
- Refer to Section 7 for a minimum set of requirements. Note: The installation inspections shall not be limited to the requirements listed in Section 7.

The inspection checklist shall be submitted to the client for approval. The client reserves the right to amend the submitted document as required until it is satisfied that the inspections cover all points of installation sufficiently. The rate includes contractors' preinspections, followed by a subsequent inspection by LLP, which includes setting up and managing snag lists and test completion reports.

#### 13.3.5 Testing Stage 4: System Acceptance Testing (SAT)

The SAT is the final test to be completed and can only be initiated once all of the system elements have been installed and configured and all other tests have been successfully completed. The SAT looks at the entire system, and tests are completed to ensure that the overall functional requirements are met and that the system acts as one integrated whole.

System reliability is a key requirement and random system behaviour shall prompt investigation by the Contractor with a written report as to the reason and proposed remedy to the random action(s).

The Contractor shall develop a System Acceptance Testing plan, which shall be submitted to the client for review and acceptance at least twenty-one (21) days prior to commencement of System Acceptance Testing. The acceptance plan shall include any tests necessary to document that the system is performing in compliance with the specified requirements. The test plan shall include a traceability matrix to show that all requirements of this specification will be tested. Full functionality, compliance and integration of all systems and components shall be demonstrated at a minimum.

The acceptance test plan shall include all equipment and services placed into service to demonstrate the performance of the system. Where necessary, full system functionality shall be tested based on real-time operations and actual timetables, for instance, to demonstrate that the bus schedule has been configured correctly.

The Contractor shall, as part of the SAT's, demonstrate the accuracy, reliability, consistency and usability of the data and reports for:

- Mileage tracking, split between productive and unproductive trips for user selectabletime intervals and vehicles
- Schedule adherence and deviation
- Vehicle speeds and alarms above user definable thresholds
- GSM/UTMS APN network coverage, signal strength and communications loss

System Acceptance Testing shall be conducted over a minimum four month period, but may be staggered. During the system acceptance testing period, the Contractor shall measure and report system and subsystem performance, defects and failures, and report the same on a weekly basis.

Rate including setup and configuration of equipment and contractors own pre-inspections, followed by subsequent inspection by the CoT, including setup and management of snag lists and test completion reports

#### 13.3.4.1 Equipment Requiring SAT

At least the following equipment shall be subject to SAT:

• The entire PTMS system as specified in this contract, including all hardware, software, systems and sub-systems.

# 13.4 Commissioning

As-built documentation for the entire system shall be handed over to the client according to the FIDIC conditions of the contract.

- 1. All documentation to be provided under this Contract shall be in English. Asbuilt documentation shall include, as a minimum:
- 2. All schematics, diagrams, drawings, charts, design reports, installation reports, test reports, equipment user manuals, training material, and any other relevant as-built information for the entirePTMS system as specified in this document, including software, hardware, systems, sub-systems and any other item which may be required for a fully functional PTMS system as specified.
- 3. At least 2 hard copies of the entire as-built documentation shall be handed over together withone full electronic copy. This shall be done prior to testing or as agreed with the client.

Once the system has passed the SAT, it shall be offered for commissioning. System Acceptance will be granted when:

- 1. All System Acceptance Testing requirements have been met.
- 2. All training (as specified in Section 14) has been completed and accepted.
- 3. All as-built and final documentation has been delivered and accepted.
- 4. Subsequent to the above, once the system has been operational and stable for 5 days without fault (excluding failure outside its scope, for e.g. power failure, etc.) it shall be deemed as having passed commissioning and accepted.

System acceptance implies that the client will issue the Taking Over Certificate (TOC) in accordance with the FIDIC conditions of the contract relevant to this work, after which the Defects Liability period will commence in accordance with the FIDIC conditions of the contract.

# 14 Training

# 14.1 Training preparation

The Contractor shall be responsible for training client-designated personnel according to the requirements specified herein. Training dates shall be agreed upon with the client. The client shall be given at least 2 weeks' notice before commencement of any training session.

A detailed training programme per course shall be submitted to the client for approval at least 28 days prior to the commencement of every course. No training shall commence until the client has approved the training program. The training programme shall include, as a minimum, the following information:

- 1. The detailed curriculum, including the proposed number of classes per course and class duration.
- 2. It shall map the curriculum to the installed PTMS system.
- 3. The course goals and objectives for trainees.
- 4. Tutorials and student guides
- 5. An evaluation plan, including criteria for success of the course, based upon the goals and objectives, and evaluation steps.
- 6. Personnel's resumes are proposed as trainers for each course, demonstrating that they are experienced, effective training professionals. The Contractor shall provide experienced and qualified instructors to conduct all training sessions. The instructor shall understand and be proficient with the use of all software and technical systems.

The client will provide an appropriate training facility. It shall be the responsibility of the Contractor to provide, setup and configure, as a minimum, all relevant training aids and training materials as listed below at least one week prior to commencement of training.

- 1. Computers with relevant software installed and ready to use. Every attendee of every class shall have his own computer.
- 2. Conference room projector with DLP technology or similar approved, including appropriate display sheet/screen/wall
- 3. Installation, setup and configuration of any network connection to have access any of the relevant servers installed under this contract if required. For this purpose, tenderers are to assume that the building which houses the training facility will have access to the client network but that the training room itself may require the installation of network points.
- 4. Student guides in hard copy (one guide per attendee required)
- 5. Tutorials with step-by-step instructions to demonstrate system operation
- 6. All manuals including equipment manuals and any other manual necessary
- 7. Training presentations.
- 8. Any other training hand-outs as required
- 9. Interactive videos or demonstrations (if available)

All training sessions and any related training material shall be in English. At least one session of each different training course shall be videotaped by the Contractor onto a DVD. All training materials, hard and soft copies, are to become the property of the client at the conclusion of every training course.

# 14.2 Training Courses

The Contractor shall assume up to ten (10) persons per training class. The number of attendees shall be finalised with the client. The Contractor shall provide the following minimum training courses:

	Course/Module	Numberof Sessions	Subject of training
1	On-board operations	Х	Train-the-trainer on the operation of on- board equipment, including MDT, PTMS- OBU, etc. asspecified in Section 9.
2	Schedule planning system training (Rate only)	X	Scheduling, vehicle scheduling, duty scheduling, schedule publication, etc. Training to cover all items specified in Section 8.10.1
3	Compliance Monitoring (CMS) training	Х	Monitor and track buses, route and schedule compliance, communications with bus drivers, etc. Training to cover all items specified in Section 8.10.2
4	Reporting System (RS) training	Х	Setup, configuration, customisation of BI reports, etc. Training to cover all items specifiedin Section 8.10.4
5	System Administration and IT Training	Х	Train client staff on the configuration and administration of the system, including all applications, databases and communications.
6	Follow-up	Х	Follow-up training and consultation between 30 and 60 days after the initial training to ensure best use of the systems by the users
	Total training sessions	XX	

 Table 2: Summary of minimum requirements for training sessions.

The client reserves the right to increase or decrease the number of training sessions if required. Repeat sessions of the above training courses may be required. These shall be provided at tendered rates.

# **15 Maintenance**

### 15.1 **Definitions for Maintenance**

All maintenance on the system shall be based on the definitions and methodologies specified in this section.

#### 15.1.1 Key terms

- a) Maintenance Plan: A documented plan defining a detailed approach to system maintenance. It describes application of the maintenance program to a specific system or set of systems. It typically identifies the maintenance activities, priorities, timetables, and resource commitments and expenditures.
- b) Maintenance Activity: The sequence of actions needed to conduct preventive, periodic, or repair maintenance on a device or subsystem. Typically refers to a specific component (e.g., camera) or subsystem (e.g., network infrastructure).
- c) **Responsive Maintenance:** The repair or replacement of failed equipment and its restoration to safe, normal operation. Typically unscheduled, it is in responseto an unexpected failure or damage.
- d) **Preventive Maintenance:** Also called "routine" maintenance, it is the activity performed at regularly scheduled intervals for the upkeep of equipment. It includes but is not limited to checking, testing and inspecting, recordkeeping, cleaning, and periodic replacement when called for in the preventivemaintenance schedule.
- e) **Emergency Maintenance:** Emergency maintenance is similar to responsive maintenance in that it is initiated by a fault or trouble report. However, in this case, the fault is more serious and requires immediate action. Events such as traffic accidents, exposed electrical wires, network interruptions, theft or damaged equipment etc. are examples of event reports that may require emergency maintenance.

#### 15.1.2 Responsive Maintenance

- a) **Responsive Maintenance** refers to operations that are initiated by a fault or trouble report. The report can come from either:
  - a person or
  - software monitoring parts of the system.
- b) Most general faults fall into the responsive maintenance category. Most of these calls are responded to by the maintenance crews within the parameters of the applicable service level agreement.
- c) Responsive Maintenance is generally performed to correct a breakdown (when equipment ceases to function) or failure (when equipment condition reaches an unacceptable level, even though it may be functioning).
- d) For failure modes which lend themselves to condition monitoring (see section below), Responsive Maintenance should be the result of a regular inspection which identifies the failure in time for Responsive maintenance to be planned and scheduled.

e) When Responsive Maintenance is done, the equipment shall be inspected to identify the reason for the failure and to allow action to be taken to eliminate orreduce the frequency of future similar failures. These inspections shall be documented and included as part of Responsive Maintenance.

#### 15.1.3 Preventive Maintenance

- a) Preventive Maintenance consists of scheduled operations performed to keep systemsoperating. This includes simple operations, such as cleaning camera housing faces or adjusting the field of view, but also more sophisticated operations, such as testing wireless communications integrity, etc.
- b) Preventive Maintenance is initiated by a schedule.
- c) Preventive maintenance is also defined as the care and servicing by personnel for the purpose of maintaining equipment in satisfactory operating condition by providing systematic inspection and detection and correction of incipient failures either before they occur or before they develop into major defects.
- d) preventive maintenance aims to ensure equipment's peak efficiency and minimise deterioration. Preventive Maintenance shall be a planned and controlled program of systematic inspection, adjustment, and replacement of components, software, and databases, which includes performance testing and analysis.
- e) PM consists of three components:
  - Essential Care
  - Fixed Time Maintenance
  - Condition Monitoring.

### 15.1.3.1 Essential Care

Essential Care shall include but is not limited to the following items:

- a) Detailed cleaning: Filters, screens, enclosures, housings
- b) Replace/renew: labelling of enclosures and cabling
- c) Adjustments: Camera inside housing, wireless antenna
- d) **Operating practices:** From historical data determine better operatingpractices
- e) Installation practices: From historical data determine better installationpractices

### 15.1.3.2 Fixed Time Maintenance (FTM) / Predictable Failures

Fixed Time Maintenance (FTM)/Predictable Failures shall include but is not limited to the following items:

- a) **Manufacturer Recommendations:** Take into account specified Mean Time Between Failures (MTBF) and any other specified recommendations according to the installation/user manual.
- b) Component History: Anticipate component failure from recorded history

#### 15.1.3.3 Condition Monitoring

A full record of all condition monitoring carried out shall be kept and recorded, both as a hard copy and electronically, for future reference.

# 15.2 Maintenance Scope

The scope of the maintenance contract is for the maintenance as defined in Section 16.1 above for all equipment, hardware and software to be installed under this contract.

Maintenance on the installed systems shall be for periods of 5 years from the dates of issue of each of the Partial Taking-Over Certificates for the sections of the works as defined in Part C1 Cl C1.2.3 Data Provided by Employer. This may mean that the different maintenance periods will end on different dates. The client may extend one or more of the maintenance periods to end concurrently with the maintenance period for the section for which the last Partial Taking-Over Certificate is issued, but no later than December 2021.

Maintenance shall be carried out under a Service Level Agreement (SLA) as set out in Section 16.4 below. Once a partial taking-over certificate has been issued, the insurance risk for the works in that section passes to the Employer. The client may request the Contractor to obtain quotations for and insure the works for the defects liability and maintenance periods.

The scope of maintenance and repair under the SLA shall include but not be limited to:

- a) Responsive maintenance, performed to correct a component breakdown.
- b) Preventive maintenance or routine maintenance, including setting up and implementing procedures to service and inspect all system components systematically and according to a fixed schedule.
- c) Setup of complete maintenance plan. This shall include a list of recommended spareparts with rate-only prices. After initial setup, the maintenance plan shall be continuously updated to reflect the most recent maintenance procedures and status.
- d) The maintenance procedures shall be based on manufacturers' guidelines and installers' maintenance experience. Note that preventive maintenance shall not interfere with normal operations. The maintenance plan shall show how this will bemanaged.
- e) Set up and implemented a PTMS Computerised Maintenance Management System (CMMS) for fault reporting, logging, repair, and job card tracking.

This system shall provide at least features for the following:

- Reporting of the fault via phone, radio, e-mail, website or fax
- · Acknowledgement of receipt and expected response time via e-mail and/or SMS
- Feedback on initial assessment by e-mail
- Feedback on repair work carried out and close-out of the fault report
- Initiation, tracking and close-out a job card for the repair
- Escalation of problem when response times are exceeded
- Automatic opening of fault reports in instances of alarms generated by the system e.g. PTMS OBU fault
- Monthly fault reports shall be submitted to the client and/or others.
- Monthly maintenance performance reports shall be submitted to the client and/or others.
- Set up of an equipment register database, and tracking of all equipment removed for repair and spares used. Cables and electrical and electronics equipment shall be captured in this database. The tracking of equipment usedshall extend to all equipment sent to the manufacturers for repair. This shall bepart of the responsive maintenance.

- Serial and part numbers of all equipment shall be recorded in the system and shall be linked to the following minimum status indicators:
  - New installed installation date
  - New spares stock
  - Faulty description and date of fault, fault report and required action
  - Repaired description and date of repair installed/in-stock date of installation
- The system shall be based on a commercially available maintenance management software package and user access shall be given to at least 5 client users.
- The contractor shall provide training to client-designated personnel on the useof the CMMS.
- f) Client Fault Reporting System:

The client plans to procure a departmental fault management system to deal with faults/damage repair on all of its assets. This will be done under a separate tender process. The PTMS contractor shall be responsible for interfacing the PTMS CMMSto the client fault management system to allow them to interact so receive fault reports can be exchanged between the two systems.

g) Repair facilities:

The PTMS Contractor (in conjunction with their suppliers) shall establish repair facilities in the area for onboard equipment, including the PTMS OBU and MDT. These facilities shall be staffed with technicians trained and certified by the equipment supplier.

h) Minimum spare stock:

This includes the supply of spare stock and the replenishment of the spare stock as these are used, as well as management of the return of repaired items to the spare stock. The spares stock shall provide for change out of failed items to be sent for repair. The Tenderer shall propose for consideration by client a list of spare parts (Spare PartsList) to be provided. This list (to be provided with tenders as part of the proposed maintenance plan, See Part T2, Form RDD 4) shall include replacement parts, components or sub-assemblies for all items of equipment provided in sufficient quantities to meet the requirements of the proposed Service Level Agreement (SLA) specified in Section 15.4. The Spare Parts List shall contain all specialised tools and equipment necessary to install, calibrate, test and maintain the system. All wiring, cabling, and adapters will also be provided.

The Contractor shall ensure that the spare stock is sufficient to cover all equipment replacement necessitated by responsive maintenance, preventative maintenance and vandalism/theft.

It shall be the responsibility of the Contractor to store the spares and insure them. The client shall have the right to audit the spare stock. The Contractor shall procure and pay for the initial spare stock as part of the tendered maintenance rates. During the 3-year maintenance period, replenishment of the spare stock will be for the cost of the Contractor as part of the tendered maintenance rates. Where the Contractor can provide clear evidence of theft or vandalism (e.g. CCTV footage), replenishment of the spare stock will paid for under the contract at tendered rates plus escalation.

At the end of the maintenance period, the Contractor shall hand over the entire spare stock to the client in good working order, at a price to be agreed upon, together with the asset register/database set up for the CMMS.

# 15.3 Pricing and Payment

Pricing shall be provided for maintenance and repair as follows:

- 1. A maintenance contract Service Level Agreement (SLA) shall be setup based on the requirements specified in Section 16.4 and shall come into effect starting with the client's taking over of the works or part thereof.
- 2. Maintenance shall be provided to meet the requirements of the proposed SLA specifiedin Section 16.4 at the rates provided in the Pricing Schedules
- 3. Responsive Maintenance and Preventive Maintenance Rates: The rates provided in the Schedules shall be fully inclusive rates for all responsive maintenance, preventative maintenance and continuous improvement as follows:
  - a. Materials: Spares (initial stock and replenishment), small materials, consumables,tool and equipment as well as any extended warranties
  - b. Labour: Staff costs, transport and fuel
- 4. These rates shall include setting up of the maintenance plan and procedures, set up and operation of the CMMS and asset and spares stock control.
- 5. The monthly rates shall be for all PTMS related systems, hardware and software per defined entity (such as the TMC, a depot or bus) per month, e.g. per bus per month and shall have the unit of payment "bus-month" meaning the maintenance of one busfor one month. The same applies for other entities such as depots, station etc.
- 6. Any proven incidents of theft, vandalism or accidents will be covered by insurance (refer to Part C1, Section C1.2.2, Clause 18.1). Replacement and repairs performed under insurance shall still meet the requirements of the SLA and shall not be dependent upon payment or any other condition of an insurance claim. Labour to repair and replenishment of the spares stock will paid for under the contract at tenderedrates plus escalation. The Contractor shall however provide all information and documentation to client to facilitate the insurance claim.

# 15.4 Maintenance Service Level Agreement (SLA)

An SLA shall be agreed upon between the client and the Contractor as part of the maintenance contract. The contract shall enter into SLA for which the minimum requirements are set out in Appendix F. The Contractor shall prepare the SLA based on the Appendix F draft and submit the SLA to the client for approval.

The SLA shall provide for the maintenance of include all systems, sub-systems, components, hardware and software provided under this contract. This includes but is not limited to:

- Central Control System, workstations, servers, database, schedule planning system, Compliance Monitoring (CMS), Passenger Information Systems (PI), and Reporting System (BI), data storage and backup.
- All On-Board Systems including PTMS On-Board Unit (OBU) and MDT.

- Passenger Information System including station Passenger Information Displays (PID's) (rate only), web/mobile passenger information systems and PI data feeds to3<sup>rd</sup> parties.
- PTMS Vehicle Configuration systems at depots
- Wireless network equipment at depots & layover areas
- GSM/UTMS APN and SIM cards
- Network access switches at TMC and depots
- Any other equipment, systems or software installed under this contract.

Maintenance shall be measured against Key Performance Indicators (KPI's) with a demerit points system related to penalties as set out in the SLA.

# **16 Equipment Warranties**

For all equipment and software supplied under this contract, the following shall apply:

- 1. All equipment supplied under this contract shall carry a warranty of at least 365 days starting from the date of issue of the respective taking over certificates. (or partial taking over certificates for sections of the work).
- 2. Considering point 1. above, the Contractor is advised to negotiate with the product suppliers that the warranty come into effect at the appropriate time or to take out an extended warranty on equipment in order that all equipment is covered under warranty for the entire defects notification period of 365 days.
- 3. Any warranties extending beyond the defect notification period shall carry over into the maintenance period, which will be managed under the Service Level Agreement. In order to meet the obligations under the SLA, the Contractor is advised to enter into extended warranties to cover the full 5-year maintenance period.
- 4. The Contractor shall guarantee that the proposed technologies will be supported forat least 5 years after installation and that spare parts will be available for at least 10years.
- 5. All equipment shall be designed to provide a usable life of not less than 15 years.
- 6. The Contractor/Suppliers shall repair all equipment that faults within the warrantyperiod free of charge unless the fault is caused by conditions outside the Contractor's control, such as vandalism, accidental damage, etc.
- 7. The Contractor/Suppliers shall replace the faulty components with new items. Repaired or refurbished components shall not be acceptable.
- 8. The Contractor warrants that it has good title to the system and the right to sell to the client free of any proprietary rights of any manufacturer (if the Contractor is not the manufacturer) or other party and free of any lien or encumbrance.
- 9. The Contractor warrants that it has good title to all system software or that it has the right to license the use of such software, or both, free of any proprietary rights of anyother party and free of any other lien or encumbrance.
- 10. The Contractor shall also warrant that all installation work and system hardware shall be performed according to the specifications given in this document for the warranty period.
- 11. The Contractor shall obtain All warranties and guarantees of subcontractors, suppliers and manufacturers with respect to any such work and system hardware for the benefit of the client, regardless of whether or not such warranties and guarantees have been assigned or transferred to the client by separate agreement. The Contractor shall fully enforce such warranties and guarantees on behalf of the client.
- 12. During the Warranty Period, the Contractor, using stock from the spare parts inventory, will replace defective hardware. The Contractor shall provide new replacement units for each defective part to replenish the spare parts inventory. The replacement units shall be fully tested and certified compliant with the original part.
- 13. The cost of all transportation and insurance charges for shipping defective and replacement parts to and from the Contractor shall be borne by the Contractor.

# **17 Technical Operations Support**

The Contractor shall provide software and hardware technical support related to operation of the systems installed under this contract. Technical support shall be available in the period of the issue of the partial taking-over certificate until end of 3-year contract.

The Contractor to provide a hourly rate for a Technical Operations Specialist. It is estimated that 240 hours (approximately one month) of operational Support will be required. This will not be one day after the other but will be on demand as required during the 36 months of the contract.

The technical support shall include off-site support on all systems, including scheduling and any other systems installed under this contract. Off-site support shall be in the forms of both email and phone calls. Off-site support shall be governed by an SLA to be agreed with the client and Contractor, but at least the following is anticipated.

- 1. Support requests shall be managed by a project management system such as FogBugz or equivalent approved, including bug and issue tracking, assignment to support staff, prioritisation, etc.
- 2. Once a support request has been received, the Contractor shall acknowledge receipt of the request within 4 hours.
- 3. The Contractor shall supply a solution to the request within 48 hours. If a complete solution is not possible within this time-frame, he shall provide full feedback why no solution has been proposed and what is done to find an appropriate solution and when such a solution is feasible.
- 4. Solutions shall as a minimum:
  - a. Be clear and concise
  - b. Use screen-capture software to illustrate configuration of certain software settings or to make any concept clear.
- 5. If any replacement parts are required, provision thereof shall be governed by the maintenance agreement.
- 6. If any software upgrades and/or patches are required, it shall be governed by the software support agreement.

The Tenderer shall submit minimum SLA conditions with his tender, for which his tendered price is valid, considering all requirements as specified in points 1 to 4 above.

### 2. PRICING SCHEDULE

CITY OF POLOK	WANE CONTRACT PM	180-24/25										
PROVISION OF T	HE PUBLIC TRANSPO	ORT MANAGEMENT SYSTEM (PTMS)FOR THE POLOKWANE IRPTS FOR PERIOD OF THREE	(03) YEARS									
NAME OF TEND	ERER:											
SUPPLY MATERIALS SUPPLY LABOUR												
ITEM	REFEERENCE	DESCRIPTION OF ITEM	UNIT	QUANTITY	RATE	AMOUNT	RATE	AMOUNT				
rate to be filled in I	hereunder must make p	rovision for all specified equipment and miscellaneous auxiliary materials and labour in order to pro	vide maintenance as	specified.				•				
Section 15: Ma	intenance											
1	Section 15.1.2	Responsive Maintenance										
	Contine 45-2	Maintenance fee priced per station per	Month	20								
а	Section 15.3	month	Month	30								
	Section 15.3	Maintenance fee priced for all bus, midi- bus & mtb (x136)	Month	36								
b	0001011 10.0	per month	Monut	50								
	Section 15 3	Maintenance fee priced per depot/layover	Month	36								
с		area per month	Monar									
	Section 15.3	Maintenance fee priced for the TMC	Month	36								
d												
2	Section 15.1.3	Preventive maintenance										
	Section 15.3	Maintenance fee priced per station per	Month	36								
а	Section 13.5	month	Monar	30								
	Section 15.3	Maintenance fee nriced for all hus midi- hus & mth (v136)	Month	36								
b	00000110.0		WORLD	50								
	Section 15.3	Maintenance fee priced per depot/layover	Month	36								
c		area per month										
	Section 15.3	Maintenance fee priced for the TMC	Month	36								

d								
		Maintenance spares, (recommended						
	Section 15.2.h	minimum spares list to be provided with tender)						
3			v sum					
					Total material	R -		
	Total labour							R -
	Maintenance: Total carried forward to summary							-

CITY OF POLOKWANE CONTRACT PM80-24/25 PROVISION OF THE PUBLIC TRANSPORT MANAGEMENT SYSTEM (PTMS)FOR THE POLOKWANE IRPTS FOR PERIOD OF THREE (03) YEARS NAME OF TENDERER: SUPPLY MATERIALS SUPPLY LABOUR ITEM REFERENCE QUANTITY RATE AMOUNT RATE AMOUNT DESCRIPTION OF ITEM UNIT The rates to be filled in hereunder must make provision for all items to cover general obligations specified below. All other general obligations as specified in Part C2, Section C2.2 paragraph 1.6.1 shall be included in material and labour rates of all pay items. General obligations and dayworks C1, Section C1.2.2, Clause 18 1 Insurance month 36 2 C3, Section 6.1, 6.2 Project Management month 36 3 C3, Section 6.3 Health and Safety obligations 36 month C3. Section 6.4 36 4 Office & Workshop Accommodation month Provision of Full Performance 5 C1, Section C1.2.2, Clause 4.2 Lump sum Security 6 C3, Section 6.2 Quality assurance plan Lump sum 7 Dayworks These amounts will only be expended on specific instruction by the Engineer to the Contractor for additional tasks that may be required by Personnel during normal working hours (Dayworks). C3, Section 6.5 Unskilled labour 100 а hour C3. Section 6.5 b Electrician hour 100 C3, Section 6.5 Fibre Optics Technician 100 с hour C3, Section 6.5 Electronics Technician 100 d hour C3, Section 6.5 Communications Network Engineer 100 е hour f C3, Section 6.5 Systems Engineer hour 100 C3, Section 6.5 100 g Systems Integrator hour

h	C3, Section 6.5 / Section 17	Scheduling Specialist	hour	100			
i	C3, Section 6.5	Dayworks Material		Lump sum			
Total material							
Total labour							
	General obligations and da	yworks: Total carried forward to sumr					

CITY OF POLOKWANE CONTRACT PM80-24/25 PROVISION OF THE PUBLIC TRANSPORT MANAGEMENT SYSTEM (PTMS)FOR THE POLOKWANE IRPTS FOR PERIOD OF THREE (03) YEARS NAME OF TENDERER: SUPPLY MATERIALS SUPPLY LABOUR ITEM REFERENCE DESCRIPTION OF ITEM QUANTITY RATE AMOUNT RATE AMOUNT UNIT The rate to be filled in hereunder must make provision for all design work, including documentation, reports, figures, drawings, diagrams or any other relevant material to be submitted to the PLM for approval. The materials rate shall be for design documentation materials only. Software licences are measured under Section 8. Section 5: Design Requirements 1 C3, Section 5.1 High level conceptual design. Lump sum C3, Section 5.2 2 Detail Design C3, Section 5.2.1/6 & Section 8 Transport Management Centre Lump sum а C3, Section 5.2.2/6 & Section 9 **On-Board Equipment** b Lump sum C3, Section 5.2.3/6 & Section 10 Station Lump sum С C3, Section 5.2.4/6 & Section 11 d Depot / Layover Areas Lump sum е C3, Section 5.2.5/6 & Section 12 GSM APN Communications network Lump sum Total material R -Total labour Design: Total carried forward to summary R

CITY OF POLOKWANE CONTRACT PM80-24/25

PROVISION OF THE PUBLIC TRANSPORT MANAGEMENT SYSTEM (PTMS)FOR THE POLOKWANE IRPTS FOR PERIOD OF THREE (03) YEARS

NAME OF TENDERER:

					SUPPLY	MATERIALS	SUPF LABOUR	PLY
ITEM	REFERENCE	DESCRIPTION OF ITEM	UNIT	QUANTITY	RATE	AMOUNT	RATE	AMOUNT
The rate specifie	e to be filled in hereunder must make provision d. Refer to Section 7 for detailled specification	on for all specified equipment and miscellaneous auxiliary materials in order to handover a complete fully functional installat	tion as					
Sectio	on 8: Detailed Specifications: Transp	oort Management Centre (TMC)						
1		Operator workstations						
а	C3. Section 8.6.1.	Supply, installation, setup and configuration of operator workstations and monitors incl, software	No	4				
2		Servers						
		Supply, installation, setup and configuration of servers including requiredsoftware						
а		PTMS Database server						
i	C3, Section 8.6.2.1.	PTMS Database server hardware incl.operating system	No	1				
ii	C3, Section 8.6.2.1.	Setup and configuration of PTMS Database server		Lump sum				R -
b		PTMS Applications server						
i	C3. Section 8.6.2.1.	PTMS Applications server hardware incl. operating system	No	1				
ii	C3. Section 8.6.2.1.	Setup and configuration of PTMS Applications server		Lump sum				R -
с		Device Communications server						
i	C3, Section 8.6.2.1.	Device Communications server hardwareincl. operating system	No	1				
ii	C3, Section 8.6.2.1.	Setup and configuration of Device Communications server		Lump sum				R -
d		Vehicle Configuration Manager (VCM)						
i	C3, Section 8.6.2.1.	Vehicle Configuration Manager (VCM) server hardware inc. operating system	No	1				
ii	C3, Section 8.6.2.1.	Setup and configuration of Vehicle Configuration Manager (VCM) server		Lump sum				R -
е		Backup Server						
i	C3, Section 8.6.2.1. & Section 8.6.3	Backup server hardware incl. operating system	No	1				
ii	C3, Section 8.6.2.1. & Section 8.6.3	Setup and configuration of Backup server		Lump sum				R -

			I				
f		Virtual Servers					 
i	C3. Section 8.6.2.2	Virtual server hardware only. Operating system and virtualisation software priced separately below.	No	2			
ii	C3, Section 8.6.2.2	Virtualisation software with high availability	No	2			
iii	C3, Section 8.6.2.2	Windows Server 2012 (1 instance required per virtual server)	No	2			
iv	C3. Section 8.6.2 2	Setup and configuration of virtual servers		Lump sum			R -
3		Network Switches					
а	C3. Section 8.6.4	Supply, installation, setup and configuration of Network Switches.	No	2			
4		Firewall					
а	C3, Section 8.6.5	Supply, installation, setup and configuration of Firewall	No	1			
5		Equipment Racks					
а	C3. Section 8.6.6	Supply, installation and configuration of Equipment Racks	No	2			
6		UPS					
а	C3, Section 8.6.7	Supply, installation, setup and configuration of UPS	No	2			
7	C3. Section 8.6.7	Software and licences					
1. All lic 2. All ve 3. All lic	ences below shall be valid indefinitely. arsion upgrades and support for 3 years shall ences below, unless specified otherwise, sha	be included in the initial license price. Il allow at least 10 clients to connect with the possibility to upgrade to an unlimited amount of clients					
а	C3. Section 8.7-8.11	Vehicle Configuration Manager (VCM)	No	1			
b	C3, Section 8.7-8.11	Schedule Planning Publication (optional)	No	1			
с	C3. Section 8.7-8.11	Compliance Monitoring System (CMS)	No	1			
d	C3. Section 8.7-8 11	IP Phone Communications	No	1			
е	C3. Section 8.7-8.11	Backup	No	1			
f	C3. Section 8.7-8.11	Anti-virus (for all servers and desktops)	No	1			
g	C3, Section 8.7-8.11	Passenger Information System	No	1			
h	C3. Section 8.7-8.11	Reporting System	No	1			
i	C3, Section 8.7-8.11	Any other Software and Licences required for PTMS functionality (List)	No	1			
i							
k							
I							
8	C3, Section 8.6.8-8,11	Video Wall					
а	C3. Section 8.10.5	Procurement, setup, installation and configuration of a complete video wall system	Prov sum				
h	C3. Section 8 10 5	Contractors markup on management and administration of nominated sub-contractor. (As a percentage of provisional sum)	%	25			
~		owny	<i>,</i> ,,	2.0	Total Matorial	R	
					i Jiai material	-	

	-		_
		1	R
Total Labour		l l	-
		R	
Detailed specification: Transport Management Centre (TMC): Total carried forward to summary		-	

CITY OF POLOKWANE CONTRACT PM80-24/25								
PROVISION OF THE PUBLIC TRANSPORT MANAGEMEN	T SYSTEM (PTMS	FOR THE POLOKWANE IRPTS FOR PERIOD OF THREE (03) YEARS						
	1	1	1					
					SUPPLY MATER	RIALS	SUPPLY L	ABOUR
ITEM	REFERENCE	DESCRIPTION OF ITEM	UNIT	QUANTITY	RATE	AMOUNT	RATE	AMOUNT
rate to be filled in bereunder must make provision for all spec	ified equipment an	d miscellaneous auviliany materials in order to handover a complete fully functional installati	ion as			•		•
	anou equipment dif	a mooshahoodo adallary materialo in order to nandover a complete fully functional installati	011 00					
specified. Refer to Section 7 for detailed specification: Generation	al.							
Section 40: Detailed enceification Trunk Statio								
Section 10: Detailed specification: Trunk Statio	ns		1	1	F	1	•	1
1		Communications						
		Communications						
	C3, Section	Supply, install and setup of an IP Phone						
	10.8	at Station manager office	No	1				
	10.9	Backup communication via Cellular APN	No	1				
2		Passenger Information Display						
		Supply, install and configuration of an						
	C3 Section	Outdoor LCD TFT (with LED backlight)						
	10.6	Resolution)	No	0				
3			-					
	C3 Section	Supply Install and Configuration of an						
	10.7	fixed IP dome CCTV camera	No	0				
	C3, Section	Oursely, Jackett and One Environmental of an NW/D	N					
	10.7.2		NO	0				
4		PA System						
	C3, Section	Supply, Install and Configuration of a	N					
	10.6	Public Address (PA) System	NO	1			-	-
		CCTV along the Route (optional - rate						
5		only)						
	C3, Section	Supply install and configure of Fixed IP CCTV compress	No	0				
<u></u>	C3. Section	ouppry, morall and configure of the of the calleras	INU	0				
	10.8	Supply, install and configure of PTZ IP dome CCTV cameras	No	0				
	C3, Section	Notwork Switch include and appling from switch to CCTV	No	_				
	C3 Section		INU	0				
	10.8	Poletop Enclosure	No	0				
	C3, Section		Ne					
	10.8 C3 Section		INO	0				
	10.8	Lightning Protection	No	0				1

C	C3, Section 10.8	Power Supply (Municipal Connection fees)	No	0			
C 1	C3, Section 10.8	Automated Bus docking sensors	1	1			
C 1	C3, Section 10.8	Backup Power Supply	No	0			
Total material							
					Total labour		
Detailed specification: On-bo	oard systems: <sup>-</sup>	Total carried forward to summary				R -	

CIY OF POLOKW	ANE CONTRACT P	M80-24/25											
		PORT MANAGEMENT SYSTEM (PTMS)FOR THE POL OKWANE IRPTS FOR PERIOD OF THREE (03) YEA	25										
PROVISION OF I	THE FUBLIC TRANS		10										
NAME OF TEN	DERER:												
	SUPPLY MATERIALS SUPPLY LABOUR												
ITEM	REFERENCE	DESCRIPTION OF ITEM	UNIT	QUANTITY	RATE	AMOUNT	RATE	AMOUNT					
rate to be filled in I	hereunder must mak	e provision for all specified equipment and miscellaneous auxiliary materials in order to handover a complete full	y functional installation	on as		•	•						
specified. Refer to	pecified. Refer to Section 7 for detailed specification: General.												
Section 11: De	ection 11: Detailed specification: Depots and layover areas												
					[								
1		Workstation PC											
		Supply, installation, setup and configuration											
а	Section 11.2	of Workstation PC including required software		2									
2		IP phone											
		Supply, installation, setup and											
а	Section 11.3	configuration of IP phone per Depot / Layover area		2									
3		Communications											
а	Section 11.4	Backup communication via Cellular APN		2									
					Total material	R -							
					Total labour								
	Detailed specification: Depots & layover areas: Total carried forward to summary							-					

CITY OF P	OLOKWANE CONTRACT PM80-24	V25						
PROVISION	OF THE PUBLIC TRANSPORT MA	NAGEMENT SYSTEM (PTMS)FOR THE POLOKWANE IRPTS FOR I	PERIOD OF THREE (03) YEARS					
NAME OF	TENDERER:							
					SUPPLY MA	TERIALS	SUPPLYL	ABOUR
ITEM	REFERENCE	DESCRIPTION OF ITEM	UNIT	QUANTITY	RATE	AMOUNT	RATE	AMOUNT
The rate to b	e filled in hereunder must make prov	rision for all specified equipment and miscellaneous auxiliary materials i	n order to handover a complete fully functional installation as					
specified. Re	fer to Section 7 for detailed specifica	ttion: General.						
Section 1	2: Detailed specification: GS	M/UTMS APN	[					
1		GSM/UMTS APN						
		Supply installation configuration testing and commissioning of a						
а	Section 12	dedicated PTMS APN with direct connection to the TMC as specified in Section 12.2		1				
b	Section 12 N	Network up-time support contract	Month	36				
2		Cards and Data Contracts						
2	Section 12.3 / 5	Supply and provisioning of SIM cards and	Eash	156				
a	00010H 12.37 J	data contracts	Lacit	130				
b	Section 12.3 / 5	Usage Contract per card per month	Each	156				
с	Section 12.3	usage monitoring including	Each	1				
		monitoring and reporting tool						
				Т	otal material	R		

Total labour		
Detailed specification: GSM/UTMS APN: Total carried forward to summary	R -	

CITY OF POLOKWANE CONTRACT PM80-24/25

PROVISION OF THE PUBLIC TRANSPORT MANAGEMENT SYSTEM (PTMS)FOR THE POLOKWANE IRPTS FOR PERIOD OF THREE (03) YEARS

#### NAME OF TENDERER:

					SUPPLY MATE	RIALS	SUPPLY L	ABOUR			
ITEM	REFERENCE	DESCRIPTION OF ITEM	UNIT	QUANTITY	RATE	AMOUNT	RATE	AMOUNT			
The rate to be fille	The rate to be filled in hereunder must make provision for all specified tests, equipment and miscellaneous auxiliary materials and documentation in order to all testing and										
commissioning as	commissioning as specified										
Section 13: Te	Section 13: Testing & Commissioning										
1		Testing and Commissioning									
а	C3, Section 13.1	Development of test plans, per test stage	No	20							
2		Test stage 1: Functional									
2	C3, Section 13.3.1	Acceptance Testing (FAT).									
а	C3, Section 13.3.1.1	PTMS OBU (integrated MDT)	No	1							
		Test stage 2: System Integration Test									
3	C3, Section 13.3.2	(SIT).									
а		Setup of APN and TMC communications	No	1							
4	C3, Section 13.3.3	Test stage 3: Installation Inspections.									
а		Transport Management Centre (TMC)	No	1							
		Bus on-board equipment, per bus	No	21							
		Midi-bus, per Midi-bus	No	15							
		Stations, per station	No	1							
	C3, Section 13.3.4										
		Depots/layovers, per depot/layover									
		Test stage 4: System Acceptance Testing (SAT).									

5		Transport Management Centre (TMC)	No	1					
		Bus on-board equipment, per bus	No	21					
а		Midi-bus, per Midi-bus	No	15					
		Stations, per station	No	1					
	C3, Section 13.4		Lump sum						
Total material									
Total Labour								R -	
labour Testing & Commissioning: Total carried forward							R -		

CITY OF POLOKWANE CONTRACT PM80-24/25								
PROVISION OF TH	E PUBLIC TRANSPO	RT MANAGEMENT SYSTEM (PTMS)FOR THE POLOKWANE IRPTS FOR PERIOD OF THREE	(03) YEARS					
			(00) 121410					
NAME OF TENDE	RER:							
					SUPPLY MATERIA	LS	SUPPLY LABOU	R
ITEM	REFERENCE	DESCRIPTION OF ITEM	UNIT	QUANTITY	RATE	AMOUNT	RATE	AMOUNT
The rate to be filled i	in hereunder must mak	e provision for all specified equipment and miscellaneous auxiliary materials, all manuals and stu	dent guides in order to	provide	-	-	-	
professional and effe	ective training as speci	fied in the relevant sections.						
Secction 14: Tra	ining							
1		Training preparation						
		Delopment of training course curriculum, including all training manuals, tutorials and other						
		aids to be used by students during course, priced per course and paid after						
				10			1430	R 14,300.00
		approval from LLP						
а	Section 14.1							
b	Section 14.1	el costs for instructors	v sum					R 100,000.00
с	Section 14.1	Provision of DVD video per training course		10			500	R 5,000.00
2		Training courses						
2	Section 14.2	On-board operations course per class		n			600	P 1 200 00
a	Section 14.2	On-board operations course, per class		۷.			000	к 1,200.00
b	Section 14.2	Schedule planning system training course, per		2			600	R 1,200.00
1	1		1	1	1	1	1	1

		class							
c	Section 14.2	Compliance Monitoring (CMS) course, per		2				600	R 1,200.00
		class							
d	Section 14.2	Reporting System (RS) course, per class		2			750	R 1,500.00	
е	Section 14.2	System administration & IT course, per		2			750	R 1,200.00	
		class							
f	Section 14.2	System maintenance cource, per class		10			850	R 8,500.00	
g	Section 14.2	Follow-up course, per class		6			600	R 3,600.00	
Total material									
Total labour								R 137,700.00	
Training: Total carried forward to summary							R 137,700.00		

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CITY OF POLOKWANE CONTRACT PM80-24/25

PROVISION OF THE PUBLIC TRANSPORT MANAGEMENT SYSTEM (PTMS)FOR THE POLOKWANE IRPTS FOR PERIOD OF THREE (03) YEARS NAME OF TENDERER: SUPPLY MATERIALS SUPPLY LABOUR ITEM REFEERENCE DESCRIPTION OF ITEM UNIT QUANTITY RATE AMOUNT RATE AMOUNT rate to be filled in hereunder must make provision for all specified equipment and miscellaneous auxiliary materials and labour in order to provide maintenance as specified. Section 15: Maintenance 1 Section 15.1.2 **Responsive Maintenance** Maintenance fee priced per station per Section 15.3 а month Maintenance fee priced for all bus, midi- bus & mtb (x136) Section 15.3 b per month Maintenance fee priced per depot/layover Section 15.3 с area per month Section 15.3 Maintenance fee priced for the TMC d 2 Section 15.1.3 Preventive maintenance Maintenance fee priced per station per Section 15.3 month а Section 15.3 Maintenance fee priced for all bus, midi-bus & mtb (x136) b Maintenance fee priced per depot/layover Section 15.3 с area per month Section 15.3

3	Section 15.2.h	Maintenance spares, (recommended minimum spares list to be provided with tender)	v sum					
Total material					R -			
Total labor							R	-
Maintenance: Total carried forward to summary							-	

CITY OF POLOKWANE CONTRACT PM80-24/25

PROVISION OF THE PUBLIC TRANSPORT MANAGEMENT SYSTEM (PTMS)FOR THE POLOKWANE IRPTS FOR PERIOD OF THREE (03) YEARS

NAME OF TENDERER:

					SUPPLY MATERIALS			SUPPLY LABOUR		
ITEM	REFERENCE	DESCRIPTION OF ITEM	UNIT	QUANTITY	RATE	AMOUNT		RATE	AMOUNT	
The rate to be fil	The rate to be filled in hereunder must make provision for all costs to provide operation support as specified.									
Section 17: T	Section 17: Technical Operational Support									
1		Operational Support								
а	C3, Section 17	Technical Operations Specialist	hours	240						
b	C3, Section 17	Off-site Technical Support Specialist	hours	120						
Total material										
Total labour										R -
	Technical operational support: Total carried forward to summary							R -		

#### PREFERENCE POINTS CLAIM FORM IN TERMS OF THE PREFERENTIAL PROCUREMENT REGULATIONS 2022

This preference form must form part of all tenders invited. It contains general information and serves as a claim form for preference points for specific goals.

#### NB: BEFORE COMPLETING THIS FORM, TENDERERS MUST STUDY THE GENERAL CONDITIONS, DEFINITIONS AND DIRECTIVES APPLICABLE IN RESPECT OF THE TENDER AND PREFERENTIAL PROCUREMENT REGULATIONS, 2022

#### 1. GENERAL CONDITIONS

- 1.1 The following preference point systems are applicable to invitations to tender:
  - the 80/20 system for requirements with a Rand value of up to R50 000 000 (all applicable taxes included); and

#### 1.2 To be completed by the organ of state

- a) The applicable preference point system for this tender is the 80/20 preference point system.
- b) 80/20 preference point system will be applicable in this tender. The lowest/ highest acceptable tender will be used to determine the accurate system once tenders are received.
- 1.3 Points for this tender (even in the case of a tender for income-generating contracts) shall be awarded for:
  - (a) Price; and
  - (b) Specific Goals.

#### 1.4 To be completed by the organ of state:

The maximum points for this tender are allocated as follows:

	POINTS
PRICE	80
SPECIFIC GOALS	20
Total points for Price and SPECIFIC GOALS	100

- 1.5 Failure on the part of a tenderer to submit proof or documentation required in terms of this tender to claim points for specific goals with the tender, will be interpreted to mean that preference points for specific goals are not claimed.
- 1.6 The organ of state reserves the right to require of a tenderer, either before a tender is adjudicated or at any time subsequently, to substantiate any claim in regard to preferences, in any manner required by the organ of state.
#### 2. DEFINITIONS

- (a) "tender" means a written offer in the form determined by an organ of state in response to an invitation to provide goods or services through price quotations, competitive tendering process or any other method envisaged in legislation;
- (b) "price" means an amount of money tendered for goods or services, and includes all applicable taxes less all unconditional discounts;
- (c) "rand value" means the total estimated value of a contract in Rand, calculated at the time of bid invitation, and includes all applicable taxes;
- (d) "tender for income-generating contracts" means a written offer in the form determined by an organ of state in response to an invitation for the origination of income-generating contracts through any method envisaged in legislation that will result in a legal agreement between the organ of state and a third party that produces revenue for the organ of state, and includes, but is not limited to, leasing and disposal of assets and concession contracts, excluding direct sales and disposal of assets through public auctions: and
- (e) "the Act" means the Preferential Procurement Policy Framework Act, 2000 (Act No. 5 of 2000).

#### 3. FORMULAE FOR PROCUREMENT OF GOODS AND SERVICES

#### POINTS AWARDED FOR PRICE 3.1.

#### 3.1.1 THE 80/20 OR 90/10 PREFERENCE POINT SYSTEMS

A maximum of 80 or 90 points is allocated for price on the following basis:

80/20 90/10 or

 $Ps = 80\left(1 - \frac{Pt - P\min}{P\min}\right)$  or  $Ps = 90\left(1 - \frac{Pt - P\min}{P\min}\right)$ 

Where

Ps Points scored for price of tender under consideration =

Pt = Price of tender under consideration

Pmin = Price of lowest acceptable tender

#### 3.2. FORMULAE FOR DISPOSAL OR LEASING OF STATE ASSETS AND INCOME GENERATING PROCUREMENT

#### 3.2.1. POINTS AWARDED FOR PRICE

A maximum of 80 or 90 points is allocated for price on the following basis:

80/20 90/10 or

$$Ps = 80\left(1 + \frac{Pt - Pmax}{Pmax}\right)$$
 or  $Ps = 90\left(1 + \frac{Pt - Pmax}{Pmax}\right)$ 

Where

- Ps = Points scored for price of tender under consideration
- Pt = Price of tender under consideration
- Pmax = Price of highest acceptable tender

## 4. POINTS AWARDED FOR SPECIFIC GOALS

- 4.1. In terms of Regulation 4(2); 5(2); 6(2) and 7(2) of the Preferential Procurement Regulations, preference points must be awarded for specific goals stated in the tender. For the purposes of this tender the tenderer will be allocated points based on the goals stated in table 1 below as may be supported by proof/ documentation stated in the conditions of this tender:
- 4.2. In cases where organs of state intend to use Regulation 3(2) of the Regulations, which states that, if it is unclear whether the 80/20 or 90/10 preference point system applies, an organ of state must, in the tender documents, stipulate in the case of—
  - (a) an invitation for tender for income-generating contracts, that either the 80/20 or 90/10 preference point system will apply and that the highest acceptable tender will be used to determine the applicable preference point system; or
  - (b) any other invitation for tender, that either the 80/20 or 90/10 preference point system will apply and that the lowest acceptable tender will be used to determine the applicable preference point system,

then the organ of state must indicate the points allocated for specific goals for both the 90/10 and 80/20 preference point system.

Table 1: Specific goals for the tender and points claimed are indicated per the table below.

(Note to organs of state: Where either the 90/10 or 80/20 preference point system is applicable, corresponding points must also be indicated as such.

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The specific goals allocated points in terms of this tender	MEANS OF VERIFICATION DOCUMENTS REQUIRED	Number of points allocated (80/20 system) (To be completed by the organ of state)	Number of points claimed (80/20 system) (To be completed by the tenderer)
Ownership of 51% or more by persons who are black	CSD/Company registration copy and ID Copies of directors	5	
Ownership of 51% or more by persons who are woman	CSD/Company registration copy and ID Copies of directors	5	

Note to tenderers: The tenderer must indicate how they claim points for each preference point system.)

Ownership of 51% or more by persons who are disable	Medical report indicating disability	4	
Ownership of 51% or more by persons who are youth	CSD/Company registration copy and ID Copies of directors	4	
Ownership by persons who are residing within jurisdiction of Polokwane Municipality	municipal rates and taxes statement of account/ signed valid leasing agreement/Letter from tribal authority	2	
Total points claimed		20	

## Table 2: Business entity ownership disclosure

Bidders must list all shareholders and provide ownership information in terms of the

### business entity registration certificate

Full Names	ldentity Number	% of ownership	South African (Yes/No)	Race	Gender	Disable (Yes/No)	Youth (Yes/No)	Local enterprise (Yes/No)

### DECLARATION WITH REGARD TO COMPANY/FIRM

- 4.3. Name of company/firm.....
- 4.4. Company registration number: .....
- 4.5. TYPE OF COMPANY/ FIRM
  - Partnership/Joint Venture / Consortium
  - □ One-person business/sole propriety

- □ Close corporation
- Public Company
- Personal Liability Company
- □ (Pty) Limited
- □ Non-Profit Company
- State Owned Company
- [TICK APPLICABLE BOX]
- 4.6. I, the undersigned, who is duly authorised to do so on behalf of the company/firm, certify that the points claimed, based on the specific goals as advised in the tender, qualifies the company/ firm for the preference(s) shown and I acknowledge that:
  - i) The information furnished is true and correct;
  - ii) The preference points claimed are in accordance with the General Conditions as indicated in paragraph 1 of this form;
  - iii) In the event of a contract being awarded as a result of points claimed as shown in paragraphs 1.4 and 4.2, the contractor may be required to furnish documentary proof to the satisfaction of the organ of state that the claims are correct;
  - iv) If the specific goals have been claimed or obtained on a fraudulent basis or any of the conditions of contract have not been fulfilled, the organ of state may, in addition to any other remedy it may have –
    - (a) disqualify the person from the tendering process;
    - (b) recover costs, losses or damages it has incurred or suffered as a result of that person's conduct;
    - (c) cancel the contract and claim any damages which it has suffered as a result of having to make less favourable arrangements due to such cancellation;
    - (d) recommend that the tenderer or contractor, its shareholders and directors, or only the shareholders and directors who acted on a fraudulent basis, be restricted from obtaining business from any organ of state for a period not exceeding 10 years, after the *audi alteram partem* (hear the other side) rule has been applied; and
    - (e) forward the matter for criminal prosecution, if deemed necessary.

	SIGNATURE(S) OF TENDERER(S)
SURNAME AND NAME:	
DATE:	
ADDRESS:	

### **EVALUATION PROCESS AND CRITERIA**

#### BID NO: PM80-24/25

The following evaluation process and criteria will be used to evaluate all bids submitted:

#### 1. Administrative Compliance – Phase One

1.1 All bids duly lodged will be examined to determine compliance with bidding requirements and conditions. Bids with obvious deviations from the requirements/conditions, will be eliminated from further evaluation.

# 2.ADMINISTRATIVE COMPLIANCE

2.1. All bids duly lodged will be examined to determine compliance with bidding requirements and conditions. Bids with obvious deviations from the requirements/conditions, will be eliminated from further evaluation.

#### 2.2. Critical Criteria:

The following critical criteria have been identified for this bid and any non-compliance thereto will lead to the bid being regarded as non-responsive and disqualified from further evaluation:

- Authority to sign filled in full
- All Pages initialed
- Certified ID Copies of All Directors/Members/Shareholders of The Company/Business (If JV, For Both)
- Valid original tax compliance status certificate (If JV, For Both)
- Joint venture agreement (Where applicable)
- Pricing Schedule in black ink
- Signed for all alteration and in the Pricing Schedule
- Central Supplier Database (CSD) report (If JV, For Both)
- Company certificate
- Municipal rates and taxes/Lease agreement/Local tribal authority letter (For company and all the directors) not older than three months
- Completed and signed Invitation to bid (MBD1)
- Completed and signed declaration of interest (MBD4)
- Completed and signed declaration for procurement above R10 million (Including tax) (MBD5)
- Completed and signed preference points claim form (MBD6.1)
- Completed and signed declaration on past SCM practices form (MBD8)
- Completed and signed certificate of independent bid determination (MBD9)

# NB: THE BIDDERS THAT MEET THE ABOVE ADMINISTRATIVE COMPLIANCE WILL FUTHER BE EVALUATED ON PRICE AND FUNCTIONALI

# 3. EVALUATION ON QUALITY/ FUNCTIONALITY= 100

# Scoring Criteria for Quality and Functionality

						PTMS
						Maximum Number of
	1				Scores	points
	Relevant Project Experience on	Relevant experience of key public transport management system ,automatic fare collection, EMV	0	The tenderer has no experience in field of PTMS related projects. (Very Poor)	0	20
	similar contractstransit card or similar projects as described .and Currentdescribed .Users of the system.	40	The tenderer has poor and limited (1-2 projects) experience in the field of PTMS. (Integrating with AFC knowledge will be an additional advantage)	8		
1			80	The tenderer has satisfactory and relevant (3- 4 projects) experience in the field of PTMS related projects. (Integrating with AFC knowledge will be an additional advantage)	16	
			90	The tenderer has good and extensive (5-6 projects) experience in the field of PTMS related projects. (Integrating with AFC knowledge will be an additional advantage)	18	
			100	The tenderer has very good and outstanding (+6 projects) experience in the field of PTMS related projects. (Integrating with AFC will be an additional advantage)	20	
	Methodology and	Approach paper which responds to the scope of work and outlines	0	Very poor response received which does not	0	15

	1				
	Technical	the proposed approach		comply with this evaluation schedule.	
	Approach, Project	methodology, project			
	Management and	management and programme	e e e e e e e e e e e e e e e e e e e		
2	Programme	including that relating to health and safety.	40	The technical approach and / or methodology are poor / are unlikely to satisfy project objectives or requirements. The tenderer has misunderstood certain aspects of the scope of work and does not deal with the critical aspects of the project.	6
			80	The approach addresses the specific project objectives and methodology. The approach identifies the critical characteristics of the project and offers solutions that show an adequate understanding of the systems and services required. The quality plan, manner in which risk is to be managed etc. is adequate/Satisfactory.	12
			90	The approach is specifically tailored to address the specific project objectives and methodology and is sufficiently flexible to accommodate changes that may occur during execution. The quality plan and approach to managing risk etc. is specifically tailored to the critical characteristics of the project (Good)	13.5
			100	Besides meeting the "good" rating, the important issues are approached in an innovative and efficient way, indicating that the tenderer has outstanding knowledge of state-of-the- art approaches. The approach paper details ways to improve the project outcomes and the quality of the outputs (Very Good)	15

3	PTMS - Equipment, design and	Ability for equipment and contractor to fully comply with the specification and requirements criteria as set out .	0	None compliance with any of the below criteria		20
	contractor requirements		20	AI Analytics & AFC Integration		
				<ul> <li>Al-powered analytics to merge AFC revenue data with PTMS ridership numbers for monthly reports.</li> <li>Predictive maintenance alerts based on vehicle/driver performance trends.</li> <li>Automated anomaly detection (e.g., fare evasion patterns, route deviations).</li> </ul>	2 1 2	
			40	Data Integration & Interoperability		
				<ul> <li>Seamless real-time data sync between PTMS and AFC (e.g., ridership ↔ revenue reconciliation).</li> <li>Compatibility with third-party tools (e.g.</li> </ul>	2	
				<ul> <li>Compatibility with third-party tools (e.g., traffic APIs, fuel management systems).</li> <li>Support for GTFS (General Transit Feed Specification) or equivalent standards.</li> </ul>	2	
			60	Warranties & Lifecycle Support	2	

		<ul> <li>Minimum 5-year warranty from the OEM, covering parts, labor, and software updates.</li> <li>Clear documentation of equipment lifespan (e.g., 10+ years).</li> <li>Commitments for local technical support, spare parts availability, and response time guarantees (e.g., &lt;24 hours for critical failures).</li> </ul>		
	80	<ul> <li>Passenger Information Systems</li> <li>Real-time updates on displays/announcements for delays, route changes, or disruptions.</li> <li>Accessibility compliance (e.g., voice announcements for visually impaired passengers).</li> <li>Mobile app/API integration for live passenger notifications</li> </ul>	2 1 2	
	90	Driver Terminal Automation & Features		

			100	<ul> <li>Automated driver logging with secure credential verification (e.g., biometrics or RFID).</li> <li>Scheduling system for real-time route adjustments and duty allocation.</li> <li>Mileage counting with GPS integration for accurate distance tracking.</li> <li>Incident reporting (e.g., accidents, breakdowns) directly from the terminal</li> </ul>	3	
4	Operations and Maintenance plan (AFC)	Ability to provide suitable operations and maintenance plan to meet the specified requirements.	0	Very poor response received which does not comply with this evaluation schedule.	0	15
	Maintenance plan and Technical Operational Support (PTMS)	Ability to provide a suitable maintenance plan and Technical Operational Support (PTMS) to meet the specified requirements.	40	The proposed operations and maintenance plan may likely not meet the stated employer's requirements (Poor)	6	
			80	The proposed operations and maintenance plan may possibly be able to meet the stated employer's requirements (Satisfactory)	12	

			90 100	The proposed operations and maintenance plan is likely to meet the stated employer's requirements (Good) The proposed operations and maintenance plan is most likely to meet the stated employer's requirements. (Very Good)	13.5 15	
5	Organization and staffing	Qualifications and general experience of key staff (Project Manager, Technical and Operational Staff) and Adequacy for the assignment (assigned personnel) in relation to the Scope of Works	0	Very poor/No response received which does not comply with this evaluation schedule. A score of 0 will also be awarded for any misrepresentation made in the schedule of experience of key personnel.	0	10
			40	The organization chart is sketchy, the staffing plan is weak/poor in important areas. There is no clarity in allocation of tasks and responsibilities. Key staff have limited levels of project specific education, skills, training and experience (Project Manager is < NQF8 (or Equivalent Qualification), Technical Staff is < NQF6 (or Equivalent Qualification) and Operational Staff (Relevant Qualifications)).	4	
			80	The organizational chart is complete and detailed, the technical level and composition of the staffing arrangements are adequate/Satisfactory. Key staff have reasonable levels of project specific education (Project Manager is NQF8 (or Equivalent Qualification), Technical Staff is NQF6 (or Equivalent Qualification) and Operational Staff (Relevant	8	

		Qualifications)), skills, training and experience (5 years)		
		Besides meeting the "satisfactory" rating, staff are well balanced i.e. they		
	90	show good co-ordination, complimentary skills, clear and defined duties and	٩	
		responsibilities, and the approach to satisfying local consultants. Some	5	
		members of the project team have worked together before on limited		
		occasions. Key staff have extensive levels of project specific education		
		(Project Manager is NQF8 (or Equivalent Qualification), Technical		
		Staff is NQF6 (or Equivalent Qualification) and Operational Staff		
		(Relevant Qualifications)), skills, training and experience (6-10 years).		
		Besides meeting the "good" rating, the proposed team is well integrated and		
	100	several members have worked together extensively in the past.	10	
		Key staff have outstanding/Very Good levels of project specific education		
		(Project Manager is NQF8 (or Equivalent Qualification), Technical		
		Staff is NQF6 (or Equivalent Qualification) and Operational Staff		
		(Relevant Qualifications), skills, training and experience (+11 years)		

6	Quality Control Procedures	Demonstrate the tenderers Quality Control practices and procedures.	0	Very poor response received which does not comply with this evaluation schedule.	0	5
			40	The described Quality control procedures are unlikely to ensure compliance with stated employer's requirements	2	
			80	The described Quality control procedures are likely to ensure compliance with stated employer's requirements	4	
			90	The described Quality control procedures are very likely to ensure compliance with stated employer's requirements, add to a well- managed project environment and ensure quality deliverables	4.5	
			100	Quality control procedures are very likely to ensure compliance with stated employer's requirements, add to a well management environment and are highly likely to add value to the project deliverables	5	
7	Training Plan	Detail the tenderers proposed Training programme.	0	Very poor response received which does not comply with this evaluation schedule.	0	5
			40	The training plan proposed may likely not meet the stated employer's requirements	2	
			80	The training plan is likely to meet the stated employer's requirements	4	

			90	The training plan is very likely to ensure compliance with stated employer's requirements	4.5	
			100	The training plan is very likely to ensure compliance with stated employer's requirements and add value to the capability of the operations team.	5	
8	System compatibility	Demonstrate the ability of the system to integrate with similar 3 <sup>rd</sup> party systems.	0	Very poor response received which does not comply with this evaluation schedule	0	5
			40	System compatibility is unlikely to ensure compliance with stated employer's requirements	2	
			80	System compatibility is possibly able to ensure compliance with stated employer's requirements	4	
			90	System compatibility is likely to ensure compliance with stated employer's requirements	4.5	
			100	System compatibility is most likely to ensure compliance with stated employer's requirements	5	

		<u> </u>	<u> </u>			
9	Financial	Attach Audited Financial	l			
	Capability	Statements for the past three	0	The tenderer has a very poor financial ability.	0	5
		years.	40	The tenderer has poor financial ability with unsatisfactory liquidity and gearing ratio.	2	
		(Liquidity ratio and gearing ratio in terms of industry)	80	The tenderer has a satisfactory liquidity and gearing ratio.	4	
			90	The tenderer has a good and extensive financial ability with good liquidity and gearing ratios.	4.5	
			100	The tenderer has a very good and outstanding liquidity and gearing ratio and the financial statements prove that tenderer is financial strong to deliver high quality project.	5	
Maximum possible score for Quality and Functionality						
						100
The Tenderer must score the following Minimum score to Pass Quality and Functionality:						
• Min • Min • Min	<ul> <li>Minimum of 80% of overall average Functionality/Quality</li> <li>Minimum of 40% on relevant project experience for PTMS individually</li> <li>Minimum of 80% compliance with key requirements on PTMS - Equipment, design and contractor requirements</li> </ul>					

#### 3. Price and Specific goals– Phase Three

The evaluation will be done by using **80/20**-point system as indicated below:

Preference point system	Points
Price	80
Specific Goals	20
Total Maximum Score	100

# THE EVALUATION WILL BE DONE USING 80/20-POINT SYSTEM, 80 FOR PRICE AND 20 FOR SPECIFIC GOALS

Notes: Bidders must note that points for specific goals must be claimed in terms with the percentage of ownership within their business entity. The tenderer must indicate how they claim points.)

SPECIFIC GOALS	POINTS ALLOCATED	POINTS SCORED
Ownership of 51% or more by persons who are black	5	
Ownership of 51% or more by persons who are woman	5	
Ownership of 51% or more by persons who are disable	4	
Ownership of 51% or more by persons who are youth	4	
Ownership by persons who are residing within jurisdiction of Polokwane Municipality	2	

Incase ownership of specific goals is below 51% points will be *claimed in terms with the percentage of ownership within their business entity. For example:* 

An Entity that has 35% shareholding of able black man who is above age of 35 and residing outside the jurisdiction of Polokwane Municipality. Points will be claimed as follows:

*Calculation* = <u>*Black Ownership*</u> X Total number of allocated points

100 <u>35</u> X 5 100

1.75

Points to be score for ownership of black person will be 1.75

=

=

OR			
Calculation	=	<u>Black Ownership</u>	X Total number of allocated points
		100	
	=	<u>35</u> X 3	
		100	
	=	1.05	

Points to be score for ownership of black person will be 1.05

#### MBD 4

# **DECLARATION OF INTEREST**

#### 1. PURPOSE OF THE FORM

Any person (natural or juristic) may make an offer or offers in terms of this invitation to bid. In line with the principles of transparency, accountability, impartiality, and ethics as enshrined in the Constitution of the Republic of South Africa and further expressed in various pieces of legislation, it is required for the bidder to make this declaration in respect of the details required hereunder.

Where a person/s are listed in the Register for Tender Defaulters and / or the List of Restricted Suppliers, that person will automatically be disqualified from the bid process.

# 2. Bidder's declaration

- 2.1 Is the bidder, or any of its directors / trustees / shareholders / members / partners or any person having a controlling interest1 in the enterprise, employed by the state? YES/NO
- 2.1.1 If so, furnish particulars of the names, individual identity numbers, and, if applicable, state employee numbers of sole proprietor/ directors / trustees / shareholders / members/ partners or any person having a controlling interest in the enterprise, in table below.

Full Name	Identity Number	Name institution	of	State

- 2.2 Do you, or any person connected with the bidder, have a relationship with any person who is employed by the procuring institution? **YES/NO**
- 2.2.1 If so, furnish particulars:

<sup>1</sup> the power, by one person or a group of persons holding the majority of the equity of an enterprise, alternatively, the person/s having the deciding vote or power to influence or to direct the course and decisions of the enterprise.

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.....

- 2.3 Does the bidder or any of its directors / trustees / shareholders / members / partners or any person having a controlling interest in the enterprise have any interest in any other related enterprise whether or not they are bidding for this contract? YES/NO
- 2.3.1 If so, furnish particulars:

# 3 DECLARATION

I, the undersigned, (name).....in submitting the accompanying bid, do hereby make the following statements that I certify to be true and complete in every respect:

- 3.1 I have read and I understand the contents of this disclosure;
- 3.2 I understand that the accompanying bid will be disqualified if this disclosure is found not to be true and complete in every respect;
- 3.3 The bidder has arrived at the accompanying bid independently from, and without consultation, communication, agreement or arrangement with any competitor. However, communication between partners in a joint venture or consortium2 will not be construed as collusive bidding.
- 3.4 In addition, there have been no consultations, communications, agreements or arrangements with any competitor regarding the quality, quantity, specifications, prices, including methods, factors or formulas used to calculate prices, market allocation, the intention or decision to submit or not to submit the bid, bidding with the intention not to win the bid and conditions or delivery particulars of the products or services to which this bid invitation relates.
- 3.4 The terms of the accompanying bid have not been, and will not be, disclosed by the bidder, directly or indirectly, to any competitor, prior to the date and time of the official bid opening or of the awarding of the contract.
- 3.5 There have been no consultations, communications, agreements or arrangements made by the bidder with any official of the procuring institution in relation to this procurement process prior to and during the bidding process except to provide clarification on the bid submitted where so required by the institution; and the bidder was not involved in the drafting of the specifications or terms of reference for this bid.

<sup>2</sup> Joint venture or Consortium means an association of persons for the purpose of combining their expertise, property, capital, efforts, skill and knowledge in an activity for the execution of a contract.

3.6 I am aware that, in addition and without prejudice to any other remedy provided to combat any restrictive practices related to bids and contracts, bids that are suspicious will be reported to the Competition Commission for investigation and possible imposition of administrative penalties in terms of section 59 of the Competition Act No 89 of 1998 and or may be reported to the National Prosecuting Authority (NPA) for criminal investigation and or may be restricted from conducting business with the public sector for a period not exceeding ten (10) years in terms of the Prevention and Combating of Corrupt Activities Act No 12 of 2004 or any other applicable legislation.

I CERTIFY THAT THE INFORMATION FURNISHED IN PARAGRAPHS 1, 2 and 3 ABOVE IS CORRECT.

I ACCEPT THAT THE STATE MAY REJECT THE BID OR ACT AGAINST ME IN TERMS OF PARAGRAPH 6 OF PFMA SCM INSTRUCTION 03 OF 2021/22 ON PREVENTING AND COMBATING ABUSE IN THE SUPPLY CHAIN MANAGEMENT SYSTEM SHOULD THIS DECLARATION PROVE TO BE FALSE.

Signature

Date

.....

Name of Bidder

Capacity

171

# DECLARATION FOR PROCUREMENT ABOVE R10 MILLION (ALL APPLICABLE TAXES INCLUDED)

For all procurement expected to exceed R10 million (all applicable taxes included), bidders must complete the following questionnaire

- 1 Are you by law required to prepare annual financial statements for auditing?
- 1.1 If yes, submit audited annual financial statements for the past three years or since the date of establishment if established during the past three years.

.....

.....

- 2 Do you have any outstanding undisputed commitments for municipal services towards any municipality for more than three months or any other service provider in respect of which payment is overdue for more than 30 days?
- 2.1 If no, this serves to certify that the bidder has no undisputed commitments for municipal services towards any municipality for more than three months or other service provider in respect of which payment is overdue for more than 30 days.
- 2.2 If yes, provide particulars.

\* Delete if not applicable

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3 Has any contract been awarded to you by an organ of state during the past five years, including particulars of any material non-compliance or dispute concerning the execution of such contract?

YES / NO

- 3.1 If yes, furnish particulars
- 4. Will any portion of goods or services be sourced from outside \*YES / NO the Republic, and, if so, what portion and whether any portion of payment from the municipality / municipal entity is expected to be transferred out of the Republic?
- 4.1 If yes, furnish particulars

.....

#### CERTIFICATION

I, THE UNDERSIGNED (NAME)

CERTIFY THAT THE INFORMATION FURNISHED ON THIS DECLARATION FORM IS CORRECT.

I ACCEPT THAT THE STATE MAY ACT AGAINST ME SHOULD THIS DECLARATION PROVE TO BE FALSE.

.....

Signature

Date

.....

.....

Position

Name of Bidder

### DECLARATION OF BIDDER'S PAST SUPPLY CHAIN MANAGEMENT PRACTICES

- 1 This Municipal Bidding Document must form part of all bids invited.
- 2 It serves as a declaration to be used by municipalities and municipal entities in ensuring that when goods and services are being procured, all reasonable steps are taken to combat the abuse of the supply chain management system.
- 3 The bid of any bidder may be rejected if that bidder, or any of its directors have:
  - a. abused the municipality's / municipal entity's supply chain management system or committed any improper conduct in relation to such system;
  - b. been convicted for fraud or corruption during the past five years;
  - c. willfully neglected, reneged on or failed to comply with any government, municipal or other public sector contract during the past five years; or
  - d. been listed in the Register for Tender Defaulters in terms of section 29 of the Prevention and Combating of Corrupt Activities Act (No 12 of 2004).

# 4 In order to give effect to the above, the following questionnaire must be completed and submitted with the bid

Item	Question	Yes	No
4.1	Is the bidder or any of its directors listed on the National Treasury's Database of Restricted Suppliers as companies or persons prohibited from doing business with the public sector?	Yes	No
	(Companies or persons who are listed on this Database were informed		
	in writing of this restriction by the Accounting Officer/Authority of the		
	institution that imposed the restriction after the audi alteram partem		
	rule was applied).		
	The Database of Restricted Suppliers now resides on the		
	National Treasury's website( <u>www.treasury.gov.za</u> ) and can be		
	accessed by clicking on its link at the bottom of the home page.		
4.1.1	If so, furnish particulars:	1	
4.2	Is the bidder or any of its directors listed on the Register for Tender Defaulters in terms of section 29 of the Prevention and Combating of Corrupt Activities Act (No 12 of 2004)?	Yes	No
	The Register for Tender Defaulters can be accessed on the National Treasury's website ( <u>www.treasury.gov.za</u> ) by clicking on its link at the bottom of the home page.		
4.2.1	If so, furnish particulars:		
4.3	Was the bidder or any of its directors convicted by a court of law (including a court of law outside the Republic of South Africa) for fraud or corruption during the past five years?	Yes	No
4.3.1	If so, furnish particulars:	1	
ltem	Question	Yes	No
4.4	Does the bidder or any of its directors owe any municipal rates and taxes or municipal charges to the municipality / municipal entity, or to any other municipality / municipal entity, that is in arrears for more than three months?	Yes	No
4.4.1	If so, furnish particulars:	•	
4.5	Was any contract between the bidder and the municipality / municipal entity or any other organ of state terminated during the past five years	Yes	No
	on account of failure to perform on or comply with the contract?		
4.7.1	If so, furnish particulars:		

# CERTIFICATION

I, THE UNDERSIGNED (FULL NAME) ..... CERTIFY THAT THE INFORMATION FURNISHED ON THIS DECLARATION FORM TRUE AND CORRECT.

I ACCEPT THAT, IN ADDITION TO CANCELLATION OF A CONTRACT, ACTION MAY BE TAKEN AGAINST ME SHOULD THIS DECLARATION PROVE TO BE FALSE.

.....

Signature

.....

.....

Date

.....

Name of Bidder

Position

#### **CERTIFICATE OF INDEPENDENT BID DETERMINATION**

- 1 This Municipal Bidding Document (MBD) must form part of all bids<sup>1</sup> invited.
- 2 Section 4 (1) (b) (iii) of the Competition Act No. 89 of 1998, as amended, prohibits an agreement between, or concerted practice by, firms, or a decision by an association of firms, if it is between parties in a horizontal relationship and if it involves collusive bidding (or bid rigging).<sup>2</sup> Collusive bidding is a *pe se* prohibition meaning that it cannot be justified under any grounds.
- 3 Municipal Supply Regulation 38 (1) prescribes that a supply chain management policy must provide measures for the combating of abuse of the supply chain management system, and must enable the accounting officer, among others, to: a.take all reasonable steps to prevent such abuse;
  - b. reject the bid of any bidder if that bidder or any of its directors has abused the supply chain management system of the municipality or municipal entity or has committed any improper conduct in relation to such system; and
  - c cancel a contract awarded to a person if the person committed any corrupt or fraudulent act during the bidding process or the execution of the contract.
- 4 This MBD serves as a certificate of declaration that would be used by institutions to ensure that, when bids are considered, reasonable steps are taken to prevent any form of bid-rigging.
- 5 In order to give effect to the above, the attached Certificate of Bid Determination (MBD
- 6 must be completed and submitted with the bid:
  - <sup>1</sup> Includes price quotations, advertised competitive bids, limited bids and proposals.
  - <sup>2</sup> Bid rigging (or collusive bidding) occurs when businesses, that would otherwise be expected to compete, secretly conspire to raise prices or lower the quality of goods and / or services for purchasers who wish to acquire goods and / or services through a bidding process. Bid rigging is, therefore, an agreement between competitors not to compete.

### CERTIFICATE OF INDEPENDENT BID DETERMINATION

I, the undersigned, in submitting the accompanying bid:

# (Bid Number and Description)

in response to the invitation for the bid made by:

# (Name of Municipality / Municipal Entity)

do hereby make the following statements that I certify to be true and complete in every respect:

l of:	certify,	on	behalf that:		
•	(Name of Bidder)				
1. 2. not	I have read and I understand the contents of I understand that the accompanying bid wi	of this Certificate; Il be disqualified it	f this Certificate is found		
3.	to be true and complete in every respect; I am authorized by the bidder to sign this Certificate, and to submit the accompanying bid, on behalf of the bidder:				
4.	Each person whose signature appears on t	he accompanying	bid has been authorized		
5.	For the purposes of this Certificate and the word "competitor" shall include any individua whether or not affiliated with the bidder, who (a) Has been requested to submit a bid in re (b) Could potentially submit a bid in respons their qualifications, abilities or experience; a (c) Provides the same goods and services a line of business as the bidder	accompanying bid al or organization, o: esponse to this bid se to this bid invita and as the bidder and/	d invitation; tion, based on or is in the same		
6.	The bidder has arrived at the accompanying	g bid independent	y from, and without		
Howe	consultation, communication, agreement ver communication between partners in a joint v as collusive bidding	or arrangement enture or consorti	with any competitor. um <sup>3</sup> will not be construed		
7.	In particular, without limiting the generality	of paragraphs 6 a	bove, there has been no		
regard	<ul> <li>(a) Prices;</li> <li>(b) Geographical area where product or ser allocation)</li> <li>(c) Methods, factors or formulas used to cal (d) The intention or decision to submit or no (e) The submission of a bid which does not conditions of the bid; or</li> <li>(f) Bidding with the intention not to win the bid</li> </ul>	vice will be render loulate prices; of to submit, a bid; meet the specifica	red (market		
8.	In addition, there have been no consultatio arrangements with any competitor regarding	ns, communication g the quality, quar	ns, agreements or tity, specifications and		

conditions or delivery particulars of the products or services to which this bid invitation relates.

9. The terms of the accompanying bid have not been, and will not be, disclosed by the bidder, directly or indirectly, to any competitor, prior to the date and time of the official bid opening or of the awarding of the contract.

<sup>3</sup> Joint venture or Consortium means an association of persons for the purpose of combining their expertise, property, capital, efforts, skill and knowledge in an activity for the execution of a contract

10. I am aware that, in addition and without prejudice to any other remedy provided to combat any restrictive practices related to bids and contracts, bids that are suspicious will be reported to the Competition Commission for investigation and possible imposition

of administrative penalties in terms of section 59 of the Competition Act No. 89 of 1998 and or may be reported to the National Prosecuting Authority (NPA) for criminal investigation and or may be restricted from conducting business with the public sector for a period not exceeding ten (10) years in terms of the Prevention and Combating of Corrupt Activities Act No. 12 of 2004 or any other applicable legislation.

Signature Date
Position Name of Bidder

#### **ANNEXURE "C"**

# **CERTIFICATE FOR MUNICIPAL SERVICES AND PAYMENTS**

MUNICIPAL MANAGER, POLOKWANE MUNICIPALITY TO:

FROM: \_\_\_\_\_(Name of Bidder)

FURTHER DETAILS OF BIDDER(S); DIRECTORS/SHAREHOLDERS/PARTNERS, ETC.

Directors/shareholders/	Physical address of the	Municipal	Physical residential address	Municipal
Partner	Business	Account	of the	Account No.
		No.	Director/Shareholder/Partner	

# NB: Please attach certified copy (ies) of ID document(s)

Signatory		Date
Witnesses		
1		
Full Names	Signature	Date
2		
Full Names	Signature	Date

ANNEXURE "D"

# AUTHORISATION FOR DEDUCTION OF OUTSTANDING AMOUNTS OWED TO COUNCIL

TO: MUNICIPAL MANAGER, POLOK	WANE MUNICIPALITY	
FROM:	(Name of the Bide	der or Consortium)
I, Municipality to deduct the ful organisation/Director/Shareholder/Partne	the undersigned, hereb amount outstandin er, etc. from any payment	y authorise the Polokwane g by the business due by us/me.
Signed at	_ Date Month	20
Print Name:	-	
Signature:	-	
Thus done and signed for and on behalf	of the bidder/Contractor	
Signatory		Date
Witnesses		
1		
Full Names Sig	nature	Date
2		
Full Names Sig	nature	Date