Terms of Reference

A call for hydrological expertise and modelling to contribute to the development of a pilot catchment management plan for the City of Johannesburg

BACKGROUND

Context

The City of Johannesburg's Catchment Management Policy promotes integrated catchment planning and integrated catchment management practices within a holistic frame that links various catchment aspects in a systemic manner. The aim is to understand and manage the various and diverse aspects such as water balance, water flows, flood risk and land use, to sustain healthy aquatic ecosystems and riparian areas that are essential in supporting social and economic benefits to all stakeholders, including the environment. This Terms of Reference is a call for an expert team to develop the hydrological component of a catchment pilot study for a sub-catchment of the Jukskei catchment within the City of Johannesburg.

The metropolis of Johannesburg covers an area of 1 645 km^2 (municipal area). In the 2011 census, the population of Johannesburg was estimated to be 4 434 827 million (STASSA, 2011), resulting in a population density of 2 696 people/km^2. The current average annual growth rate of the City is 3.11% (2019) and the City population is projected to grow to 6.5 million by 2040 according to the World Population Review (http://worldpopulationreview.com/). Johannesburg is one of very few cities in the world that lies on a continental watershed, and is not affected by significant catchment areas beyond the metropolitan boundaries. The City catchments and rivers form part of two main primary catchment areas, the Vaal/Orange and the Limpopo Catchments. This study will focus on a portion of the Jukskei River in the northern part of Johannesburg which flows into the Crocodile West (Marico) Water Management Area and eventually into the Limpopo River. Within the City boundary, 27 'Major Catchment' areas have been identified as part of flood line and flood risk management studies (2015).

Cities in general, and the City of Johannesburg (CoJ) in particular, present special, urban-related, catchment management problems and opportunities. The 2017 Johannesburg State of Rivers report showed that most of the rivers surveyed have been extensively modified with the loss of natural habitat, biota and loss of basic ecosystem functions (State of River Report, 2017). This follows on the 2005 State of Rivers Report for the Crocodile West (Marico) Water

Management Area which declared the state of the Jukskei to be 'Poor' (River Health Programme, 2005). Urban development has a major impact on the hydrological and riparian systems within the City of Johannesburg. The city's rapid population growth, together with no immediate plans for water supply augmentation, is placing extreme pressure on housing, requiring more green-field land development and increased densification. Drainage networks are under capacity and urban river systems continue to degrade at an alarming rate. The effects of poorly controlled urban development include increased hard surfacing, increased flood risk, canalisation of water courses, soil compaction, reduction in the surface area of vegetation cover, encroachment into floodways and water courses, disruption of hydrological pathways and loss of natural drainage areas, all of which hasten runoff and reduce opportunities for storage and infiltration of rainwater into the soil.

Urbanisation is also responsible for an increase of pollutants in natural water bodies, with runoff carrying a range of organic wastes, nutrients, bacteria, suspended solids, heavy metals, oils, animal waste, vehicle exhaust residues, street litter, fertilisers and pesticides applied to lawns, and sediments from construction sites and bare/gravel surfaces. Increased point and diffuse pollution sources, failure of wastewater drainage systems, poor or non-existent sanitary facilities, poor sanitation practices, littering and poor garbage disposal practices all contribute to the deterioration of water quality in Johannesburg's streams. In addition mine waste disposal and old sanitary and other landfills in wetlands and floodplains reduce flood storage and discharge leachate into the water. Opportunities for the regeneration of water quality are reduced by the reclamation of wetlands and the canalisation of streams, and by the nature of the pollution itself.

Failure to manage urban development in such a way as to minimise the negative impact on catchments, or to implement appropriate mitigation measures, can have disastrous consequences for the environment, for water resources, and for people's quality of life, security and safety. This can result in economic costs – directly and indirectly - either to the City itself or to the residents. Climate change is further exacerbating the risks, with increased intensity of storms and a consequent increase in flash floods. Water supply constraints, and issues such as food security, are of increasing concern and also require consideration within catchment management plans.

Given the growing pressure on the City of Johannesburg's aquatic resources, the need to balance urban development with the provision of aquatic ecosystem services, while simultaneously anticipating increasing flooding and the need for associated emergency response, it is critical to adopt an integrated catchment management approach. Within this approach it will be important to understand the hydrological potential of a catchment to support scenario-based planning and to identify feasible leverage points and opportunities. To this effect, the City of Johannesburg has identified a portion of the Jukskei catchment as a pilot study to advance an understanding of the intersection or 'nexus' of stormwater, land

use and aquatic health considerations. The CoJ has appointed ICLEI Africa to develop the pilot Catchment Management Plan.

The need for catchment management plans

There is a need to develop Catchment Management Plans (CMPs) for the City's catchments, which can guide their holistic management and rehabilitation in order to restore rivers, reduce flooding, enhance environmental resilience and sustainability and restore the social amenity value of watercourses and riparian zones. Catchment Management Plans should take cognizance of inter alia, the nature of soils, topography, rainfall and climate, water quality, land use, vegetation, infrastructure, economic and social issues within the respective catchments.

While it is unrealistic to attempt to return rivers to their original state, it is possible to prevent ongoing deterioration and to restore rivers as assets, through collective action between stakeholders, and the implementation of appropriate planning, restoration, engineering and land use practices, and improved management of water resources and the water balance within catchments. Plans should also consider opportunities for retrofitting and strategies to support the recovery of catchments, to restore hydrological systems to an improved state, and/or facilitate adaptive management responses. To be successful, CMPs will in addition to the hydrological performance of a catchment, need to consider ecological and societal factors and conditions.

The need for a pilot catchment management plan is in part driven by the City of Johannesburg's draft Stormwater Design Manual. The final draft of the Stormwater Design Manual was developed in terms of the City's Stormwater By-Laws and it specifically highlights the need for Catchment 'Master' Plans to provide the context for the development of stormwater management targets to achieve desirable conveyance of stormwater and to promote flow to support healthy rivers and the services that rivers provide to society. The draft Manual notes that strategies may include 'catchment recovery' or 'runoff harvesting' targets, and should include stormwater control targets for new development, retrofitting source control and Sustainable Urban Drainage Solutions (SUDS) facilities in established catchments, and the development of Green and Blue Infrastructure. The draft Manual also identifies the need for Catchment Master Plans to contextualize requirements for attenuation/retention and water quality requirements for specific sub catchments, taking cognisance of downstream risks and requirements; and to set stormwater targets for a catchment as a whole. Stormwater management criteria may vary across and between catchments and site drainage requirements should be designed to support the overall objectives of the Catchment Plan.

The purpose of the City of Johannesburg's Catchment Management Plan pilot study, is to serve as a model for future CMPs. Such CMPs should provide guidance for planning and land use decisions, service delivery and infrastructural interventions, rehabilitation and greening initiatives, ensuring the health of hydrological systems in support of economic, social and environmental goals. The pilot plan will focus on the intersection ('nexus') between (1) land use, (2) stormwater and (3) aquatic health against an understanding of the catchment's hydrological cycle. The objective of this Terms of Reference is to provide the context of the CMP study and to stipulate the requirements for the hydrological inputs into and related expert participation in, the development of a pilot catchment management plan for the City of Johannesburg.

Study area

The pilot catchment comprises a sub-section of the eastern portion of the Jukskei catchment. A map showing this selection is provided in the Annexure to this document. Sub-catchments 3, 9 and 11 were selected for the purpose of this study. These sub-catchment boundaries (3, 9 & 11) are based on the City of Johannesburg's recent (2015) flood line catchment delineation. These sub-catchments were chosen to provide sufficient complexity to model the current state and to expose trade-offs and difficult decisions, but simple enough to identify future options and to distill the key elements of a catchment management strategy. The total study area is 209.11 km^2 and the hydrological model must include analysis of the tributaries up to 10 km^2.

- Sub-catchment 11 (Jukskei: Bez Valley) is the southern-most sub-catchment of the study area. The Jukskei River flows from section 11 out of the City of Johannesburg, into Ekurhuleni and back into the City of Johannesburg into sub-catchment 9.

- Sub-catchment 9 (Jukskei River) falls entirely within the administrative boundary of the City of Johannesburg.

- In Sub-catchment 3 (Rietspruit/Randjiesfontein), the river flows into the Hennops River, with some influence again from Ekurhuleni and eventually flows into the Jukskei River via the Centurion area of Tshwane, forming part of the Upper Crocodile Management Area and which flow into the Hartbeespoort and Roodekopjes Dams.

The choice of these sub-catchments therefore make provision for modeling and exploring the implications for managing rivers and catchments that traverse administrative boundaries. Prospective service providers should e-mail Ernita van Wyk at ernita.van.wyk@iclei.org to obtain a higher resolution map of the study area as shown in the Annexure of this document.

RATIONALE FOR APPOINTING A SERVICE PROVIDER

Within the context of this study, it is critical to understand the catchment's hydrology, the character of the hydrological cycle in the study catchment and how it interacts with human uses and impacts. The aim is for the study to develop a strong technical hydrological basis for exploring solutions for water management challenges. Hydrological models are vital in understanding the hydrological processes within a specified context and the insights from the model/s outputs must support decision-makers and help inform the work of operational managers. Within the context of this Terms of Reference, the purpose of the hydrological modelling will be to inform and support the development of a catchment management plan for the study area through:

(1) Gaining hydrological ***process understanding***, as well as;

(2) ***Exploring different scenarios*** at different scales. Models can help the City understand the consequences of policy changes for example, a growing population and demand on the resource, a change in land use, or, at a relatively smaller scale, the impact of a proposed intervention such as removing woody invasive alien vegetation from a section of a river. These insights will help the City investigate options for the future.

Central to this study will be understanding the hydrological potential of an urban catchment and how this may be enhanced through sound good catchment planning and management. The hydrological potential of the catchment will form the basis for interpreting the relationship between catchment hydrology, societal requirements of the city environment, in particular housing, recreation and wellbeing, and how these can be managed in a mutually beneficial manner.

MAIN REQUIREMENTS AND SCOPE OF WORK

This is a call for a service provider to work closely with the ICLEI team and relevant staff of the City of Johannesburg to:

- Develop a ***hydrological model*** (or combination of models) that shows the 'current state' hydrological performance and water balance of the pilot catchment (including tributaries up to 10 km^2). In addition:
    - The model must take into account the various components of the hydrological cycle, and including the effects of catchment surface hardening and the resultant stormwater flows, combined with more natural aspects of the hydrological system such as ground water, rivers, wetlands and areas of natural vegetation that allow infiltration.
    - Model analysis must include water volume and water quality;

- The model must be able to incorporate field-sourced stream flow data;
- The rationale for selecting an appropriate hydrological model must be presented by the service provider and the choice of model/s will be subject to approval by the CoJ in order to ensure compatibility with existing systems;
- The model must address the full study area and must account for the cross-boundary issues where the river in the study area leaves and re-enters the City of Johannesburg;
- The hydrological model must be useful in the application to/as inputs into dynamic system scenarios;

- Use the hydrological model/s to conduct a ***flood risk analysis*** for areas that have not yet been covered by previous but recent SRK risk mapping. The maps produced must show already completed (by SRK) and new flood risk analysis results (Prospective service providers must e-mail Ernita van Wyk at ernita.van.wyk@iclei.org for access to the SRK flood risk maps). Note that prospective service providers are advised that they may only use the information for projects and project proposals which they are undertaking for COJ (or via ICLEI/COJ programme) and the source of the data must be acknowledged.

- Participate in the technical process of ***integrating the results*** of the hydrological model and the new understanding it produces, ***into scenarios*** of geohydrology, hydrological performance (and managing water balance), land use, aquatic health, stormwater flows and impact on flood risk related to vulnerability and exposure. The model must be able to show for example the implications of the catchment's hydrological potential for achieving resource quality objectives, for promoting river health, for harvesting stormwater, show the impact on flood risk on specific communities and also contribute to the debate around the impact of land use and land use scenarios on the hydrological performance of the pilot catchment. These discussions will take place within the context of a technical working group as set up by the City of Johannesburg and ICLEI.

- Provide ***inputs***, from a hydrological perspective, ***into the development of the pilot Catchment Management Plan***. This will involve participating in an exercise to set Objectives for stormwater management, for example, as well as other catchment aspects. The service provider will also be required to provide written inputs into an implementation plan associated with the Catchment Management Plan.

DELIVERABLES

The overarching deliverable is a hydrological model, developed and calibrated to provide baseline information on the current state of the hydrological cycle in the study area and

which would contribute as an input into scenarios that integrate issues of catchment stormwater, aquatic health and land use. The aim is to understand catchment hydrological functioning, constraints and opportunities for improved catchment management with particular emphasis on stormwater management, land use and aquatic health.

Specific deliverables include:

- A conceptual model to represent the relationship between the hydrological cycle, stormwater considerations, land use and aquatic health, to be shared and debated with the CoJ and ICLEI team;
- Review of the flood risk analysis completed by SRK and a report indicating how this information will be used to develop flood risk results for the remaining sections of the study area (i.e. clarify methodology).
- Presentation of options for hydrological models and an indication of the preferred model and motivation as to why one model will be more appropriate than others within the context of the requirement as set out;
- Summary that clarifies the assumptions that have to be made when using the chosen model (i.e. clearly state model limitations); and includes clarification of where proxies need to be used to represent variables. Implications for model confidence must also be stated;
- Field installation of a maximum of ten streamflow rate measurement units to provide streamflow input data into the hydrological model to test the usefulness of field-based streamflow data. Maintenance of the equipment, associated data collection, calibration and incorporation of data into the model will be the responsibility of the service provider for the duration of the contract. However, beyond the contract, the CoJ will assume responsibility for the maintenance and data collection from the same equipment.
- Analysis results: Undertake and present the necessary and relevant statistical and mathematical analysis to determine the relationships between the hydrological cycle (inter alia, precipitation, evapotranspiration, streamflow and groundwater recharge in the study catchment) and land use, aquatic health and the implications for stormwater hydrology;
- A mathematical hydrological model; The model should address detention and retention strategies at a catchment scale (e.g. "Regional detention/retention"), evaluate the potential for "catchment recovery" in term of hydrological and ecological function (this will include aspects as identifying ecological and water resource potential, water quality, etc.), and assess water stormwater harvest potential and set targets;
- Assessment of the current water balance for the study area;
- A map and model outputs of flood risk showing areas of vulnerability and risk (low, medium, high)

- Model inputs and outputs: Following the development of the hydrological model, the service provider must submit all model input data set and model outputs: i.e. data, narrative results, presentations, model and maps, shape files. All maps and shape files should be provided in PDF (Acrobat) and DXF format;
- Written, descriptive information (drawing on the outputs of the model), about the current state of the study catchment's water balance and overall hydrological performance and preliminary notes on key risks and opportunities. This information will form part of the current state description in the Catchment Management Plan and the catchment scenarios;
- Written comment on the draft Catchment Management Plan from a hydrological perspective;
- Written inputs, from a hydrological perspective, into a Terms of Reference and desired scope and format for future Catchment Management Plans for all Catchments within the City of Johannesburg.

SERVICE PROVIDER REQUIREMENTS

The service provider is required to have experience and competencies in some or all of the following:

- A central skill set comprises a post-graduate degree at or above MSc level in hydrological engineering, hydrology and hydraulics - with particular focus on best practice in the area of river management, Sustainable Urban Drainage Systems (SUDS) and Water Sensitive Urban Design (WSUD), water sensitive cities and flood management.
- Project team with at least: a hydrologist, geohydrologist, aquatic health specialist, planner & GIS and model operators (CAD or PCSWIM), and supporting staff.
- Access to and experience in the installation and calibration, data collection, storage and data interpretation from in-field streamflow measurement devices.
- A track record of experience in hydrogeological modelling using multiple data sources and relevant softwares;
- Demonstrated ability & experience in simulation to support scenarios analysis
- Access to simulation models/software
- Familiarity with the Jukskei catchment will be advantageous.
- Familiarity with the City of Johannesburg Stormwater Design Manual will be advantageous as one of the aims will be to set catchment specific guidelines for land development projects in the catchment, typically centered on SUDs methods.
- The service provider must have the access to the appropriate data and ability to develop the model to incorporate and reflect both water quantity (volume) and water quality aspects.

- Demonstrated ability to interpret outputs and results of a hydrological model within the context of catchment management challenges and the need to design management interventions at various scales;
- Scenario experience specifically with regards catchment futures. Experience with modelling with regards *urban* catchments will be greatly advantageous.
- Demonstrated ability to integrate model outputs in the context of requirements such as the Department of Water Affairs' Resource Quality Objectives (or Internal Strategic Perspectives), Stormwater requirements and inform the setting of stormwater targets;
- Service Provider must be able to source data, access the model software, use the model and must be adaptable and flexible with the possible addition of new information;
- Excellent written and spoken English.

Refer to the Evaluation Criteria in the Annexure

The City of Johannesburg will ensure that the service provider has access to the following:

- Rainfall data
- Flood line data – updated for major 25 square km indicative flood lines – and risk analysis for some of the study area. Risk maps that have already been developed must be sourced by prospective service providers with an e-mail to: ernita.van.wyk@iclei.org
- A hydropedology report
- Relevant State of Rivers reports
- City of Johannesburg GIS layers including land use data
- Geoscience ground water study
- City of Johannesburg Stormwater Master Plan

WORK SCHEDULE AND TIME FRAMES

- Once the service provider is selected, but prior to signing a service level agreement, there will be an inception meeting to refine the scope of work, data requirements and the work and payment schedules. These details will be discussed and incorporated into the service level agreement.

- Work should begin as soon as possible after a service level agreement has been finalised and signed by parties. Given the time needed to make an appointment, it is envisaged that hydrological part of the study should start towards the end of September 2019. The expectation is that the development of the hydrological model will take four to five months.
- Time must be allocated for identifying, sourcing and preparing relevant input data.
- Once the technical modelling phase is concluded, the service provider will be required to participate in a workshop to test the model in relation to different scenarios (three scenarios). Also the Service Provider must attend 1 internal and 2 external stakeholder engagement sessions. The project Gantt chart will be provided on request.
- Time should also be budgeted for presentation to two internal CoJ committee meetings.
- Provision must also be made for a consultative session with the Stormwater Design Manual technical team.
- The service provider will report to the CoJ-ICLEI core team and primary liaison person will be Dr Ernita van Wyk, who will be responsible for ensuring project implementation.

REPORTING REQUIREMENTS AND MANAGEMENT

- Within three weeks of the appointment, a detailed work plan and time schedule of activities should be submitted, which should include all the work streams envisaged in the project.
- Tasks must be scheduled towards a project end-date of April 2020. Prospective service providers may e-mail Ernita van Wyk at ernita.van.wyk@iclei.org to obtain a project Gantt chart.
- Project co-ordination meetings will be held monthly or otherwise as and when required at the City of Johannesburg's offices in Braamfontein. The service provider will be required to provide monthly progress reports and also may be required to do presentations.
- The service provider must supply accurate and comprehensive financial records of project-related expenses, which contribute to a financial report that is submitted with a narrative report to ICLEI prior to receiving payments.

REQUIREMENTS FOR THE PROPOSAL

The following information must be provided in the proposal:

1. Clear description of each of the proposed activities and anticipated outputs.
2. Clear description of methods for each activity and who will be implementing each.
3. Company profile plus profiles of sub-consultants where applicable.
4. Short biosketch of the team members who will work on this project, indicating their respective roles and responsibilities.
5. Full CVs of relevant person/s who will work on this project, detailing qualifications, skills, experience and past track record, particularly in relation to the main requirements and skills and competencies requirements for service providers as outlined above.
6. Organogram of the work group showing roles and responsibilities;
7. Description of areas of expertise (in relation to the bulleted list in the "Service Provider Requirements" section)
8. State the location of your office/s. An office branch in Gauteng Province will be an added advantage.
9. The company's BBB-EE Certificate (where applicable)
10. Demonstrated experience: A table or list of relevant projects, including the name, project description and major deliverables, client, your role in the overall project and contact details of project reference(s).
11. The service provider may include a 10% contingency in the budget breakdown.
12. Detailed budget denominated in ZAR (with VAT indicated), broken down into:
    - Daily charge out rate for all members of the team for 2019 and 2020[1]
    - Expenses associated with the specified activities to be implemented in 2019 and 2020,
    - All disbursement must be allowed for in the rates, inter alia travel, accommodation and printing.
    - A Pricing Schedule structure guideline as provided in the Annexure of this document.

The service provider may sub-contract other parties to assist them. Sub-contracted parties must be identified in the proposal and the specific role/s and task/s to be performed by sub-contracted parties must be described.

BRIEFING SESSION

Prospective service providers will be expected to attend a compulsory briefing session. The briefing session will be held in the **Basement Boardroom in Traduna House at 10 am on 14 August 2019**. The closing date for the bidding will be on 23 August 2019. Prospective

[1] State whether these rates would be valid for a two year period. If not, provide rates that include increases over the two year period.

service providers who do not attend the briefing session will be disqualified from being considered for the work set out in this Terms of Reference.

CLOSING DATE FOR SUBMISSION OF PROPOSALS

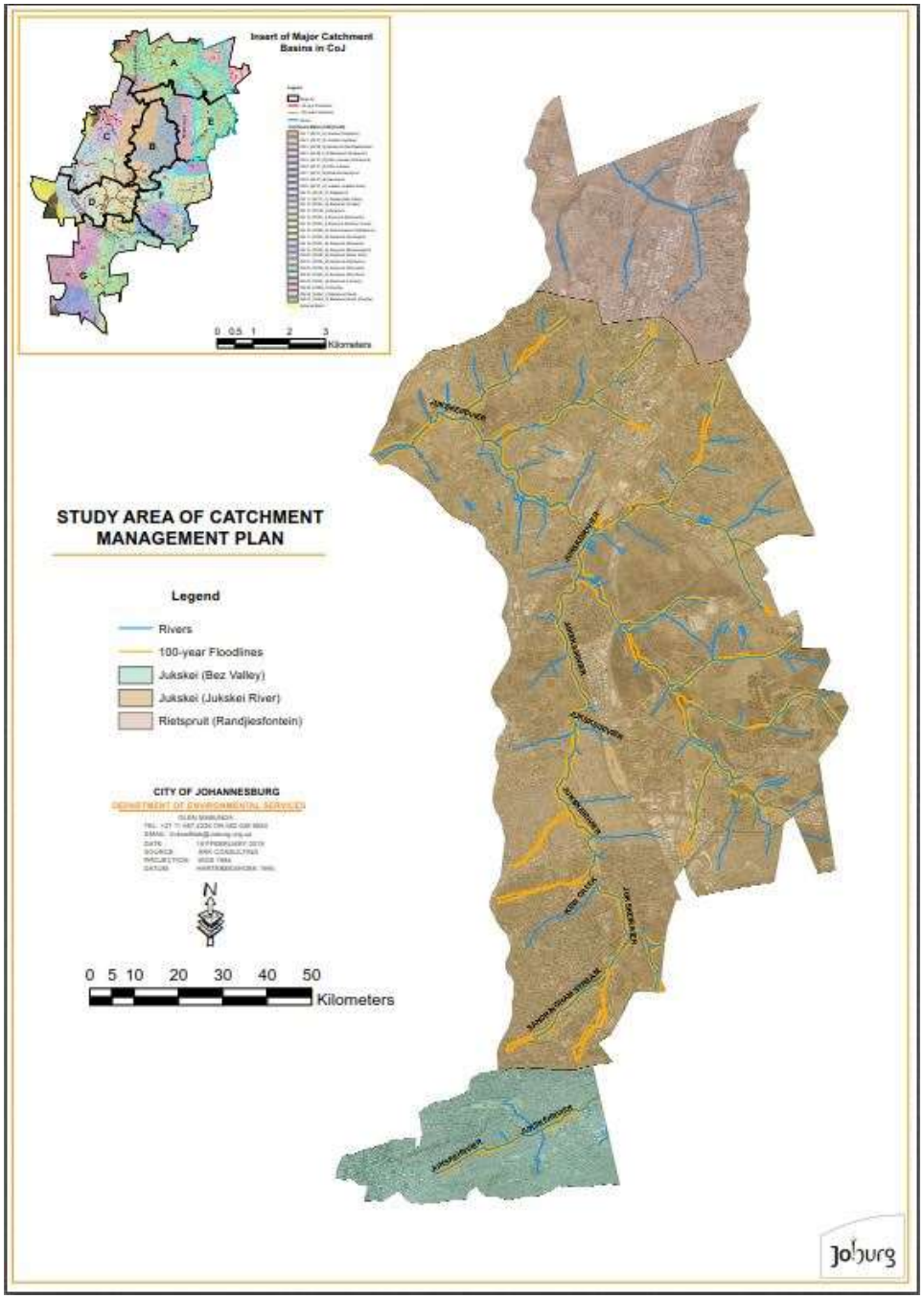
Kindly submit your proposal and supporting documents to Ernita van Wyk by e-mail and/or hard copy delivery to ICLEI at: Sable Park, no. 1 Bridgeway, Century City, Cape Town, for attention: Ernita van Wyk, or e-mail to Ernita van Wyk at ernita.van.wyk@iclei.org **by 16:00 (SAST) on 23rd of August 2019**. For any queries related to submission please contact us via the email above. Please use the subject line: "Service provider: hydrologist" when submitting your proposal. ICLEI reserves the right to short-list a maximum number of four proposals to present their proposals to the evaluation committee prior to decision on an appointment. ICLEI will aim to share the outcome of the process by mid-September 2019.

NOTE: ICLEI AFRICA RESERVES THE RIGHT NOT TO APPOINT A SERVICE PROVIDER IN RELATION TO THIS TERMS OF REFERENCE. ICLEI AFRICA ALSO RETAINS THE RIGHT TO PROCEED WITH ALL OR PART OF THE WORK.

References

- City of Johannesburg (2018). Stormwater Design Manual for the City of Johannesburg. September 2018.
- STATS-SA census (2011).
- River Health Assessment: City of Johannesburg – Klip and Jukskei Water Management Units. Late Summer Survey Report. April 2017. Prepared by Sazi Environmental Consulting.
- River Health Programme (2005). State-of-Rivers Report: Monitoring and Managing the Ecological State of Rivers in the Crocodile (West) Marico Water Management Area. Department of Environmental Affairs and Tourism Pretoria STATE-OF-RIVERS REPORT NUMBER 9 ISBN NO: 0-620-34054-1. March 2005.

ANNEXURE


Insert of Major Catchment Basins in CoJ
STUDY AREA OF CATCHMENT MANAGEMENT PLAN
Legend
Rivers
100-year Floodlines
Jukskei (Bez Valley)
Jukskei (Jukskei River)
Rietspruit (Randjiesfontein)
CITY OF JOHANNESBURG
0 5 10 20 30 40 50
Kilometers
Joburg

Summary of evaluation criteria

Evaluation category	*Indicator*	*Requirements/Evidence*	*Points*
Relevant skills and expertise	Team composition	Hydrologist, geohydrologist, aquatic health specialist, planner & GIS and model operators (CAD or PCSWIM), and supporting staff. Good English.	20
Relevant experience in the appropriate fields of study	Track record / completed projects And Team/consortium experience in the required fields	Hydrological process understanding, in-field streamflow equipment and data management and interpretation, modelling catchment hydrological potential (including water quantity and quality aspects), flood risk and integration of hydrological inputs into catchment planning scenarios and other requirements such as RQOs. Links to catchment considerations e.g. stormwater, aquatic health and land use. Understanding of urban catchment hydrological dynamics and how this relates to social and environmental challenges will be greatly advantageous.	30
Service provider qualifications	CVs indicating skills and levels of qualification	Masters level and up for the majority of team members	20
Interpretation of the scope and complexity of the task	Description of approach to task and methodology	Methodology and interpretation of the scope of work matches necessary level of complexity and need for integration	20
Familiarity with the Jukskei and/or other urban catchments and with the CoJ StormWater Design Manual	Completed projects	Experience with or in the Jukskei and/or other urban catchments and previous use and/or application of the StormWater Design Manual.	10

- Functionality is of utmost importance in the evaluation. Budget considerations will include a balance between a clear understanding of the scope and complexity of the task, and affordability.
- ICLEI reserves the right to short-list a maximum number of four proposals to present their proposals to the evaluation committee prior to decision on an appointment.

Pricing Schedule

Note: This pricing schedule is a guide – please add/change as appropriate but use the table below as a basis. Prospective service providers may submit the Pricing Schedule as an Excel file.

STAFF TIME			
WP 1. Administration and management			
Activity 1: Administration & management	**No. of hours**	**Rate/hour**	**Total**
• Team member 1. e.g. Team leader			
• Team member 2			
WP 2. Inception meeting			
Activity 1: Inception meeting			
• Team member 1			
• Team member 2			
• Team member 3 etc.			
Activity 2: Revision of work plan and budget			
• Team member 1			
• Team member 2			
• Team member 3 etc.			
Activity 3: etc			
WP 3. Development of hydrological model			
Activity 1: Sourcing and preparation of data			
• Team member 1			
• Team member 2			
• Team member 3 etc.			
Activity 2: model selection & motivation			
• Team member 1			
• Team member 2			
• Team member 3 etc.			
Activity 3: etc			
WP 4. Flood Risk analysis			
Etc			
WP 5. Results integration into scenarios			
Etc			
WP 6. Inputs into the pilot Catchment Management Plan			
Etc			
BUDGET SUMMARY			
Sub-total: staff time (with disbursements collapsed into			
Overhead costs at 5%			
Contingencies at 10%			
SUB-TOTAL			
VAT (15%)			
GRAND TOTAL			