

NUMBERS AND NEEDS IN LOCAL GOVERNMENT – UPDATE 2015

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c/o SAICE Professional Development and Projects

Research carried out in 2005 for the publication 'Numbers and Needs' 1 highlighted the fact that municipalities were short of civil engineering practitioners with some 30% of municipalities having no inhouse civil engineering capacity at all. The key recommendations at the time were to rebuild structures, rather than embark on further restructuring; and to professionalise rather than politicise the appointment of technical staff.

Ten years later, the latest census of civil engineering capacity has shown that the number of civil engineering practitioners has increased, however, few experienced staff remain, the majority being under 35 years of age; and few engineers remain, having been replaced by technicians, and in some instances technologists. In municipalities which previously had no civil engineering staff, or which did not have technical leadership, systems and processes are not in place in terms of planning, budgeting for, developing, operating and maintaining infrastructure, and there are no experienced engineering personnel to guide the way.

There is an urgent need to implement a system to develop young municipal engineering practitioners which includes training courses and workshops associated with activities in the municipal calendar, combined with assignments associated with the actual work to be done. It is suggested that a programme of work integrated training, assignments and system implementation should be rolled out to allow junior civil engineering staff to develop as professionals at the same time as developing the systems and procedures which need to be put in place.

A massive campaign needs to be mounted to find experienced, willing engineers to return to local government for a period to assist with rebuilding such systems and supporting younger employees in their growth as professionals. Furthermore, it is time to once again campaign for the introduction of qualification and experience requirements to be linked to each technical post to ensure that engineering structures are populated with suitably skilled staff.

KINGFISHER: A SOUTH AFRICAN/DUTCH INITIATIVE IMPROVING IWRM THROUGH STRENGTHENING MUNICIPAL WATER AND SANITATION SERVICES

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c/o Emanti Management

South Africa's water resource governance framework is being reorganized, including transfer of responsibilities from Department of Water and Sanitation (DWS) to Catchment Management Agencies (CMAs). CMAs will play a critical role in managing the country's water resources. Key water resource management stakeholders within a CMA include municipalities, whom both utilize water resources and potentially impact on water quality by discharging treated effluent to catchment thereby having substantial impact on Integrated Water Resource Management (IWRM) aspects.

Well acknowledged for their leading international experience within the water arena, with many centuries of experiences of cooperation between municipalities and Regional Water Authorities (Waterschappen) to improve the effectiveness and to reduce costs in the Dutch water services sector. The Dutch are supporting the establishment of the CMAs through a government to government support initiative known as the Kingfisher Programme, in which DWS, CMAs and Dutch Water Utilities work together towards the successful establishment and operation of CMAs.

A key focus of the Kingfisher Programme is the addressing of critical

municipal water management business vulnerabilities, that left unresolved, could otherwise result in severe and deleterious impacts on water resource quantity and quality. The approach used is one of a multi-stakeholder approach, where key municipal officials (Heads of Finance, Technical Services and Human Resources), the CMA and other regional and national stakeholders participate in a facilitated planning process that both identifies key municipal business vulnerabilities and "co-creates" a Municipal Priority Action Plan committing all parties to alleviate these critical business vulnerabilities that are detrimentally affecting local municipal IWRM.

This paper presents the progress of the Kingfisher Programme regarding the pioneering Inkomati Usuthu CMA (IUCMA), which has trans-boundary responsibilities with South Africa, Mozambique and Swaziland, with an emphasis on the sharing of lessons learned in this Netherlands-South Africa collaborative colleague-to-colleague partnering approach as regards to municipal water and sanitation services. Of additional interest, is the innovative co-operative governance process utilised to support effective monitoring and evaluation of progress. The initiative is being extended across all CMAs, and the paper ought to be of strong interest to all parties seeking to improve management of municipal performance for the benefit of IWRM.

SOLVING OUR MUNICIPAL SERVICE DELIVERY CRISIS THROUGH PPPs – NOT-SO-NEW SOLUTIONS TO OLD PROBLEMS

Stephan Jooste

c/o Aurecon

South African local government continues to face significant challenges in responding to the service delivery needs of their constituents. Underperforming municipalities have led to widespread service delivery protests by both poor and wealthy people, both violently and peacefully. The poor performance has been linked to a lack of skills, corruption, political interference, intergovernmental relations challenges and weak basic administrative systems. The involvement of the private sector through Public Private Partnerships (PPPs) have long been touted as the possible solution. Proponents of this approach point to private sector efficiencies, access to private capital, and the superior technologies and skills the private sector bring to the table.

There are various reasons the private sector should be more efficient than the public sector in delivering a project, but there are also detractions from private delivery as shown. In a time of rising fiscal pressure, PPPs can help government avoid increasing general taxation. In fact, the South African government has illustrated their intent to this end through the publication of a range of supportive legislative, policy, and guidance documents to enable Municipal PPPs. Among others, this includes the original Municipal Systems Act (2000), Municipal Finance Management Act (2006), and Municipal PPP Guidelines. Yet, despite these efforts, the number of successful Municipal PPPs remains insignificant. Clearly PPPs have not (yet) served as a solution that local government face in South Africa.

This paper lays out our assessment of the main challenges facing Municipal PPP development and delivery in South Africa, and suggests a possible solution to overcome these challenges. We believe there is much to learn from the very successful Renewable Energy Independent Power Producer Procurement Programme (REIPPP) which has been rolled out over the last three years by the Department of Energy (DoE). This IPP Procurement Programme was designed as a programmatic approach for soliciting (and awarding) private sector interest into the generation of power from renewable sources. We recognise that the

Renewable Energy Generation market differs quite substantially from municipal service delivery, including the limited demand risk, the mass standardisation of proposals, and the political differences between national and local government level roll-out. Regardless, we believe that the REIPPPP offers invaluable guidance to a solution for the municipal PPP space. We lay out an initial idea for such a solution in the paper.

MOVING ON: SUSTAINABLE GROWTH VIA INCREASED RURAL CONNECTIVITY

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Bridges aren't just steel. They connect communities, provide children with safe access to education and facilitate direct access to social health-care and amenities. They also link communities to the main transportation network, enabling enhanced market access for the sale of locally grown produce, yet at the same time minimising the community's dependency on local crop production by facilitating improved access to a broader range of employment opportunities.

Bridging also plays a vital role in modernisation. Rural development projects attract investment from both the private and public sectors to encourage the move towards cleaner, greener sources of energy production. In turn, collaboration with industry creates jobs and secures rural growth and poverty alleviation.

A leading provider of permanent bridging and infrastructure solutions, Mabey recognises that innovations in rural connectivity are not however solely limited to the tangible benefits offered by our bridging products or by the infrastructure that they enable. Although technological innovations, for example in the development of steel over concrete, undoubtedly play an important role in rural development, and have a direct impact on the speed and cost-efficiency of project implementation, in Mabey's experience, it is the sustainable relationships that are established throughout the life of a project, and beyond, which have a significant long-term social, economic and environmental impact on the local community and enable it to innovate.

In this paper, Mabey will illustrate, through the use of real case study examples, how working effectively with local communities has helped secure finance for rural development programmes. We will explore how local partnerships can deliver immediate cost-savings in materials and manpower, how training can have a positive impact on long-term maintenance costs and sustainability, and how skills-transfer can help improve future opportunities for local labour. We will draw on our experience of a wide range of both small and large bridging programmes to demonstrate that it is the direct engagement, local partnerships and collaboration on the ground – the people factor – that will deliver real innovations in rural connectivity in Africa in the years to come.

In doing so, we hope to demonstrate our commitment to the region and to illustrate how our comprehensive modular bridging expertise, vast engineering skills, and our experience in rapid installation and project finance make us unique, and have earned us the worldwide reputation of being a reliable bridging supplier of choice.

BRT AND PUBLIC TRANSPORT NETWORKS – PAVEMENT DESIGN CONSIDERATIONS FOR BUS LANES

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The number of Bus Rapid Transit (BRT) systems worldwide has grown exponentially since 2000. Also in South Africa, BRT systems or Integrated Rapid Public Transport Networks (IRPTN), are being rolled out in at least 13 metropolises and larger municipalities across the country. Pure BRT systems are characterized by 1) exclusive bus lanes, 2) median aligned infrastructure, 3) priority at intersections, 4) level boarding at station platforms and 5) off-board fare collection. The BRT systems currently being implemented in South Africa are not necessarily pure BRT systems, but a hybrid of a high level bus service with quality bus systems that provide reliable and fast public transport, comfortable buses and good facilities at bus stops and stations.

From a pavement design perspective, the design of BRT or IRPTN lanes requires specific attention due to the high number of load repetitions being applied to the pavement in a channelized manner. The wheel loads are very high due to bus axle loads of up to 13t, much in excess of the legal axle limit for normal traffic. A fully loaded articulated bus has an axle equivalency factor of between 8 and 10 E80's. The required structural capacity of bus lanes is in the order of 30 – 50 million E80's or even more. The bus lanes therefore classify as very heavily loaded pavements. The paper provides guidance to municipal engineers and pavement designers to arrive at appropriate pavement design solution for these bus lanes.

This paper evaluates a number of pavement design options that were developed for inter alia the Johannesburg Rey Vaya, the Rustenburg Yarona, the eThekweni Go!Durban and the Ekurhuleni Harambee. These include both flexible pavements (asphalt with and without binder modification) and rigid pavements (continuously reinforced concrete pavements). Each of these options have their own unique advantages, but also come with challenges. The paper provides insight into these advantages and challenges. It also includes an economic evaluation of the various pavement options, based on actual implementation costs within the various metropolises and municipalities.

One of the conclusions of the paper is that concrete pavements have a higher initial construction costs, but are better suited to withstand the long term heavy pavement loading. However, at critical areas, such as intersections and confined CBD areas, asphalt pavements have certain advantages over concrete and may be preferred.

SOUTH AFRICA'S FUTURE SERVICE NEEDS: DEVELOPMENTS IN TRENCHLESS TECHNOLOGY CAN MEET THE CHALLENGES

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South Africa's Civil engineering focus has shifted from economic infrastructure to social infrastructure and in particular providing basic services to those previously without. Urban populations, due to the migration of employment seekers, are growing at almost double the national rate, compounding the problem of meeting the service delivery backlog. Minimizing the social and environmental impact of construction in densely populated urban areas has to be met within economic and political constraints. Buried service installation, in particular water services is especially disruptive to the movement of people and vehicles. Many existing services designed for smaller urban populations have reached the end of their planned service life. Local Authorities are now faced with quandary of whether to replace

or rehabilitate these services whilst still providing technically sound and sustainable solutions within the constraints posed by future densified urban environments.

Globally, big cities have faced similar situations but not at the rapid urbanization rates challenging South Africa's municipal authorities. Internationally, this led to the phenomenal development and growth in trenchless techniques for installing new and rehabilitating existing buried services. This was initially driven by the specialist contractor who could do the work at a lower cost than conventional open trench installation. However this is not the only benefit. The true costs of replacing buried services must include those associated with social, environmental and commercial disruption, worker and public safety and maintaining quality standards. When included, the trenchless options are usually far more cost effective. By the very nature of the products and processes used, the rehabilitated services will probably serve their function for considerably longer than the original period during which they operated.

Trenchless techniques are used for the installation of new services and the rehabilitation of existing water, sanitation, stormwater and cabled services. Some techniques, such as directional drilling and microtunnelling work where open trench methods are impossible and others, such as pipe bursting can replace and upsize pipelines using the same labour compliment as open cut methods, but at lower costs. Developments include multi sensor inspections which give a complete picture of an operating pipeline's internal conditions, providing essential data needed to assess its condition before deciding about whether remedial measures are needed and if so what techniques to use. These cutting edge techniques can make a significant contribution towards reducing South Africa's service delivery backlog and simultaneously provide sustainable employment leading to the development of skilled and semiskilled workers.

ENERGY-EFFICIENT PLANT DESIGN: COST-BENEFIT ANALYSES OF TREATMENT PROCESS OPTIONS AT DIFFERENT WESTERN CAPE WASTEWATER TREATMENT WORKS

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c/o Aurecon

Constraints around security and affordability of energy are increasingly driving planning decisions in municipal water and sanitation service provision. This study reviewed the technical and economic potential of different design configurations for a number of wastewater treatment works within the Western Cape, both at the small regional scale (1ML/d), right up to the major metropolitan scale (150ML/d).

For each case study treatment plant, projections were made of future flows and organic loads. These estimates then fed into steady state biological treatment process models to determine key treatment plant design parameters (optimal sequencing of phased upgrades, sizing of equipment, energy demands, sludge volumes).

A broad spectrum of treatment technologies were considered from a simple base-case scenario (biological treatment, surface aerators and sludge disposal) to an optimal scenario (biological treatment, fine bubble diffused aeration, advanced digestion and direct application of digested sludge).

The study presents a useful array of results that indicate how wastewater treatment plants of different scales may be appropriately designed to practically and affordably reduce energy demands over a plant's lifetime.

A DECISION-SUPPORT PROCESS FOR THE UPGRADING OF GRAVEL ROADS IN THE WESTERN CAPE PROVINCE

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A Decision-Support Process for the Upgrading of Roads in the Western Cape has become essential given the strong emphasis placed on joint-planning, the scarcity of suitable gravel materials for re-gravelling programs, the backlogs on road infrastructure conditions, rising traffic volumes and the financial burdens due to budgetary constraints.

The Western Cape Department of Transport is the custodian of nearly 10 500 km of Class 2 to 4 gravel roads within its borders. These roads are located over 5 districts and have disparate traffic, geological, network condition and topographic challenges. Guided by its mission "to develop and maintain appropriate infrastructure and related services for sustainable economic development, which generates growth in jobs and facilitates empowerment and opportunity", the Department is compelled to provide sound infrastructure management business processes in the management of its asset life-cycle, which ranges from project-identification, prioritization, planning, design, implementation and maintenance-all within a sound reporting and monitoring framework.

This paper provides an overview of the strategic objectives of the road asset within the provisions of the Western Cape Spatial Development and Provincial Land Transport Frameworks. It looks at the issue of limited resources and the need for its optimisation within asset-management and lifecycle costing. Furthermore, it provides a description of the provincial road network and its traffic conditions within a context of economic growth. This leads to a description of the Deighton Total Infrastructure Management System, which is used to develop the Road Network Preservation Model for determining the sustainability of the roads asset. It summarises the impacts of the preservation model across all road programmes and highlights the current trends specific to gravel road maintenance and gravel upgrade programs.

It then develops a range of funding and program scenarios in a quest to optimise asset life within constrained resources such as funding. The paper seeks furthermore to highlight the complexities of road planning within the context of the transport environment, as a changing landscape, with its associated constraints, and thus the need for a multi-criteria analyses and the development of the Road Upgrade Business Process to assist in more transparent project identification.

OPPORTUNITIES IN THE CITY OF CAPE TOWN TO SUPPORT A SECONDARY MATERIALS ECONOMY IN BUILDERS' RUBBLE THROUGH UPTAKE IN ROAD REHABILITATION AND CONSTRUCTION

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Builders' rubble is usually landfilled in South Africa, in spite of its re-use potential. Based on international experience, the biggest opportunities in the application of recycled builders' rubble lie in road building. For example in Japan and the Netherlands with 90-95% diversion rates of construction and demolition waste from landfill, about 80% of the diverted material is used in the construction of roads. There are therefore opportunities both on the supply side for the crushing industry, as well as on the demand side in road construction.

The builders' rubble market in the City of Cape Town (CCT) is showing robust growth. There is scope for market expansion as a result of drivers such as rising virgin material costs, increasing transport costs, regulation of waste flows and limited landfill airspace available.

Large volumes (518 000 m³) of builders' rubble are landfilled annually in the city. At least 25% of this material is suitable for sub-base in roads. Therefore, an extra 11 400 m³ of high quality material with a value of R1.1 – R1.5 million is available to the market per month in the CCT.

Recovery, processing and reuse of secondary materials from builders' rubble has the potential to create at least 500 new jobs, and divert ~2.3 million tons from landfill over the next four years within the Western Cape. The current crushing capacity in the City is in excess of 52 000 m³ per month. Based on market analysis it is expected that a further 40 000 m³ per month will be available in the next three years.

Material of sufficient quality for road construction in the private sector is already available, with construction companies citing lack of specifications and reluctance on the part of municipal and provincial government to include secondary materials, as the main stumbling blocks for the industry. Strict quality control for verified quality products is needed to capitalise on these opportunities, so that end users may be confident in the material specifications, especially for inclusion in roads.

Work by GreenCape to develop the builders' rubble economy, with the assistance of industry stakeholders, is focussing on best practice guidelines for the crushing industry to produce high quality products that will meet the requirements of end users. In the longer term, the goal is to stimulate the development of material specifications for road building aggregates that include processed builders' rubble, through a partnership of academia and road industry bodies.

DEBRIS WALLS – LEARNINGS AND SUCCESSES OF eTHEKWINI MUNICIPALITY

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Historically river culverts were generally sized using purely hydraulic calculations with little or no thought given to the debris being carried by these rivers during storm events.

The combination of multicellular culverts and an increase in alien vegetation and litter being carried by flood waters, has meant an increase in the occurrence of blockages of these culverts with the associated damage to infrastructure and hardship for the adjacent community.

This paper will present the failures and successes of eThekweni Municipality in dealing with this problem. This paper will highlight the innovative approach in dealing with this issue and some of the science behind why this approach is working.

It will provide a guide to other municipalities facing the same issues as well as the key risks which need to be checked and taken into account when adopting this approach.

This approach has proved that the risk to infrastructure and communities caused by debris blockages can be significantly reduced with relatively small expenditure.

THE COLLECTION OF NETWORK LEVEL ROAD CONDITION DATA USING AN INTEGRATED TRAFFIC SPEED DEFLECTOMETER – A PARADIGM SHIFT IN ROAD ASSET MANAGEMENT PRACTICE

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The collection of Network Level road pavement condition/performance data in South Africa has traditionally been undertaken by means of driven visual assessments. Whilst these surveys are carried out by trained "inspectors", and have been an essential component of Road Asset Management in this country for around 30 years, the issue of subjectivity and the time consuming nature of this exercise have long been acknowledged as a "stumbling block" in the data acquisition process.

A further, more important constraint is that visual inspections only report on the "perceived" road condition and cannot give actual measurement/quantification of structural condition – this usually being undertaken at a later Project Level investigation stage by a Falling Weight Deflectometer (FWD) survey in conjunction with intrusive pavement materials investigations.

In recent years, a small number of specialist consulting firms in South Africa have acquired automated data collection vehicles. These vehicles record visual condition data (via several cameras) together with a measurement of rut depth, macro texture and riding quality. Whilst it is generally considered in the industry that this method of collecting road condition data is a significant improvement, the visual data still needs to be assessed and condition rated – this from automated photographs as opposed to being physically on the road, and the quantification of actual pavement structural condition is still not addressed.

A Traffic Speed Deflectometer (TSD), as the name suggests, undertakes the measurement of pavement deflection but, unlike the FWD, which must come to a halt for around 60 seconds to measure pavement deflections, the TSD takes continuous measurements using ten (10) Doppler lasers sensors at a driving speed of 40 km/h up to 80 km/h. The benefits in both speed of data collection and, more importantly, safety, are obvious. The first TSD began undertaking data collection on Danish State Road Network in 2005.

In late 2012, the South African National Roads Agency (SOC) Ltd (SANRAL) recognising the benefits of such, took delivery of the 5th TSD worldwide and became the 1st owner of a TSD on the African continent. As of 2015, nine TSD's were in operation around the world including Australia/NZ, China, UK, USA, Denmark, Italy, Poland and, as discussed above, South Africa. The above mentioned, are all owned by State Road Authorities or Research Institutes.

In April 2016, VNA Consulting (Pty) Ltd will acquire the 10th TSD worldwide, the second in Africa, and the first such machine to be operated by a private enterprise. This is the latest generation TSD and is a fully integrated system providing not only continuous deflection measurement, but also corresponding riding quality, rut depth, macro texture, automated visual condition imaging and crack detection/quantification.

This Paper presents the TSD rationale together with detailed discussion of the capabilities and outputs of the device. In addition, the following topics are discussed:

- An analysis and comparison between the TSD and the FWD. The future of pavement assessment and analysis utilising an Integrated System.
- The benefit of an integrated TSD for network level analysis of road pavements.

TREATING UD FAECAL WASTE USING BLACK SOLDIER FLY (BSF): A MUNICIPAL, RESEARCHER AND CONTRACTOR PARTNERSHIP

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c/o Khanyisa Projects

The Bill & Melinda Gates Foundation requested proposals from Cities to test Business Partnerships such as service level contracts and incentivised contracts to deliver sustainable sanitation services.

The eThekweni Water and Sanitation Department put forward a proposal lead by Khanyisa Projects and supported by professional partners PID and UKZN Pollution Research Group. EThekweni Water Services identified the removal of faecal waste from over 50 000 Urine Diversion (UD) double vault toilets as a key sanitation service that could allow for the testing of various business partnership options. The key objective of these business partnerships would be to improve sanitation service for poor and marginalised communities, reduce service costs to the Municipality and create jobs and economic opportunities for small businesses.

The programme was divided into two elements which require some form of business partnership; (i) Removal of faecal waste from the toilets and either burial on site with tree planting or transport to a processing site; and (ii) Planning, design and development of a processing plant for the production of marketable products from the faecal waste – the selected technology was Black Soldier Fly (BSF).

During the planning phase the procurement options available to the Municipality were explored and the institutional requirements identified. Two business partnership options were selected for the project; (i) an incentivised contract using standard tender processes for the removal, disposal and transport aspect; and (ii) a Service Level Agreement (SLA) for a 5-year period for the BSF plant operation.

A number of challenges have arisen during the business partnership establishment such as obtaining all the necessary approvals and the use of an innovative technology for the processing of UD toilet waste. In addition, several delays have been encountered along the way leading to postponement of the starting date for the emptying of UD toilets and the operation of the BSF plant.

This paper aims to highlight the different procurement options available to a municipality wishing to create public-private (Business) partnerships, the reasons for the selection of the current model, the lessons learnt during this project, how the challenges were overcome and the key success factors that have resulted in the project moving forward.

A FIRST ORDER GUIDELINE TO ASSESS THE FEASIBILITY OF GRAVITATING SEWAGE VIA A TUNNEL VS SEWER RISING MAINS

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c/o HATCH

The challenge facing all designers and owners of water infrastructure is sustainability. Nowhere is this more so than in the municipal environment, where substantial investment is made in infrastructure that includes pumping facilities. The sustainability of this infrastructure is an increasing challenge as the operation and maintenance of these facilities becomes more expensive each year. This is especially true in municipal infrastructure designed and built for the conveyance of waste water.

Electrical driven systems are increasingly at risk with power supply constraints and there is the increasing need to reduce operational costs. With rising energy costs, and the resultant impact on operating costs, there can be cost advantages to gravitating sewage through tunnels between

catchments, rather than pumping over the spur to the next catchment. The use of tunnel boring machines (TBMs) makes it feasible to tunnel through many different geotechnical conditions. TBMs have been used successfully in South Africa for hard rock tunnels, as well as tunnels in sand and clay beneath sea level.

Using existing tunnelling and rising main projects as costing models this paper produces a first order tool to enable service owners and/or design engineers to warrant further investigation into the benefits of gravity flow via tunnelling versus the cost of pumping.

The tunnel options investigated are for a dry tunnel, fully lined with shotcrete to ensure a minimum service life of fifty (50) years. HDPE pipes have been used for both the rising mains and the gravity lines within the tunnel due to the resilience of the material to chemical attack and the abrasive resistance of HDPE. For the pumping option the pump station is assumed to have 24 hours storage, as well as a generator capable of meeting the average annual dry weather flow.

The paper investigates the cost effectiveness of conveying effluent over a range of heights (Δh), namely 25m, 50m, 75m and 100m. The distance (Δl) that the effluent has to be conveyed is varied from 1000m through to 4000m in increments of 1000m. In addition, a variety of Peak Wet Weather Flow Rates (PWWF) (ΔQ) including 500l/s, 750l/s, 1000l/s and 2000l/s were used.

ENVIRONMENTAL AUTHORISATION OF LAND-BASED EFFLUENT DISCHARGES INTO THE COASTAL ENVIRONMENT: SYNCHRONISING ENGINEERING DESIGN, ENVIRONMENTAL IMPACT ASSESSMENT & REGULATORY APPROVAL PROCESSES TO MINIMISE THE RISK OF PROJECT DELAYS

Roy van Ballegooyen

c/o WSP | PB Ports and Coastal Engineering Africa

An overview is provided of the changing landscape with respect to the environmental policy and authorisation of effluent discharges to the marine environment.

In the recent past this has included:

- 1) Changes to the regulatory authority responsible for the issuing of environmental authorisations;
- 2) A review of the policy associated with the discharge of land-based wastewater to the marine environment and its implementation;
- 3) Changes in the Environmental Impact Assessment process, and
- 4) Recent and pending reviews of water and sediment quality guidelines.

These changes, together with a changing landscape with respect to the type and nature of wastewater discharges, have highlighted some of the existing and potential future challenges that include a need for improved technical assessment and the use of novel construction methods.

A brief summary is provided of the information needs for engineering design, environmental assessments and authorisations, and permitting/licencing. Of particular relevance is the need to synchronise information flows between these processes to minimise the risk of overall project delays – a more collaborative approach is needed. A detailed description of these processes and most probable timelines for their execution is provided, based on past experience, as well as the requirements of some of the recent regulatory changes (i.e. the Environmental Impact Assessment regulations).

Highlighted will be potential vulnerabilities that could lead to significant project delays and/or increased costs. Where relevant, reference will be made to industry and municipal case studies where some of these potential vulnerabilities have either 1) been avoided and projects executed timeously, or 2) where they have been realised and project delays have occurred.

THE DANGERS OF INTERMITTENT SUPPLY AS A MEASURE TO SAVE WATER IN SOUTH AFRICA

Ronnie Mckenzie

c/o WRP

There are many countries around the world where intermittent supply is a way of life and residents often have to deal with a water supply which is only pressurised an hour per day or even an hour per week. Such intermittent water supplies cause huge problems to the long-term viability of the water reticulation systems and pose significant health risks.

Here in South Africa, the issue of reducing water losses from municipal water supply systems is becoming a serious problem throughout the country, particularly in view of the current drought situation which is aggravating an already difficult balance between supply and demand. Municipalities throughout the country are being asked to cut their water use, many of whom have neither the expertise nor the funds to implement the appropriate interventions with the result that little progress is being made.

It has become clear that some water suppliers are resorting to the introduction of intermittent supply as a measure to reduce losses and normal water consumption. In some instances, there is clearly no alternative due to the fact that the supply reservoirs are at or near empty. In other cases, the practice of intermittent supply is being used as a quick and simple measure to reduce water losses and also to reduce demand.

The paper will highlight the dangers of intermittent supply which include permanent and often irreparable damage to the reticulation system as well as the potential for water borne diseases such as cholera and typhoid. The paper will also highlight the fact that while some savings can initially be achieved through the introduction of intermittent water supply, in the long-term, such measures will often result in higher water use.

It is concluded that intermittent water supply should be avoided at all costs.

CHALLENGES AND THE FUTURE OF THE IMPLEMENTATION OF BULK WATER PIPELINE CONDITION ASSESSMENT

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c/o Aurecon

The condition assessment of bulk water pipelines is a challenging process as the condition of the bulk main will vary significantly along its length, of which may be measured in tens of kilometres. Furthermore, due to the stochastic nature of corrosion (the undesirable degradation of a material reacting with its environment), the extent of corrosion or degradation experienced by the bulk main can vary significantly over very short distances. This means it is particularly challenging to economically determine the condition of a bulk main with a high degree of statistical certainty and typically necessitates the use of a representative sampling approach. A phased approach to identify the locations for representative sampling is recommended in order to facilitate informed decision making throughout the entire project.

Four phases are typically included in condition assessment projects. These phases include: a desktop study and preliminary investigations, field investigations, detailed pipe integrity assessments and condition assessment post processing. Each of the phases provides direction to the next phase in terms of the selection of appropriate condition assessment tools and techniques from the various options available. There is no single tool or technique that will provide all the condition assessment information required and additionally these tools and techniques may

have limitations on operating pressures, access requirements and reach lengths. A number of different tools and techniques is typically required and the selection thereof can only be made once sufficient information on the main is available (sizes, materials, pressures, flows, access points, failure history, etc.). This data may only be available at the completion of the desktop study and preliminary investigations.

A project initiation where the desktop study and preliminary investigations can be conducted on a bulk main or water supply system independently of the further phase is recommended in order to correctly define the scope and methodology of the following phases. This also improves the budgeting accuracy of the remaining phases.

Digital technology has advanced significantly in the past decade, specifically with regard to processing power, battery capacity and storage volumes. These advances are starting to be realised in the advancement of pipeline condition assessment tools. This paper reviews the development of the available condition assessment tools and methods and their application in the phased approach to bulk water main condition assessments. Additionally the design of bulk water mains with integrated components to allow for the application of future condition assessments is discussed.

LAND OF THE RISING YOUNG ENGINEERS

David Drummond

c/o eThekweni Municipality

In September 2015, five young municipal engineers went on a scholarship to Japan to learn about Japanese technology and their approach to water and wastewater engineering solutions. The scholarship was a partnership between the South African Department of Science and Technology and Hitachi Ltd. The trainees spent 2 months in Japan and visited numerous sites across the country. The goal of the scholarship was to impart Japanese knowledge and experience onto the South African engineers, which they can bring home to help build technical capacity in South Africa.

The major gains in experience were not in learning about radical new technology, but rather in exposure to successful implementation of these technologies on a large scale. Innovative approaches to problem solving were shared by fellow engineers who are developing products to tackle the municipal engineering challenges faced throughout the world. It was also fascinating to live in a city that services 18 million people every day with little to no service interruptions and a non-revenue water percentage of 2.5%. We estimated that it would take each of us 10 years to gain the experience of large scale municipal infrastructure projects in South Africa, which we gained in 8 weeks in Japan.

The main "take home" was that South Africa is not very far behind from a technology point of view. It is the positive mind-set of the Japanese people working for municipalities to implement these technologies, as well as the mind-set of the general public towards municipal services that allows the achievement of service delivery. The Japanese people approach life in a very solution driven manner, even if something is working well, they will strive to improve it (Kaizen Principle). They view waste products as a resource that can be converted into something constructive, and utilise renewable energy and recycling to its full extent to benefit the environment.

The paper will share our experiences with IMESA, including the following:

- Wastewater reclamation and sludge re-use
- Desalination treatment processes
- The story of Fukuoka (heavily polluted to clean rivers and sky)
- Focus on community in business (training schools)
- Automation and technology to address lack of skills.