Department of Water and Sanitation (DWS)
Infrastructure Branch Training Centre (IBTC, DWS)
South African Local Government Association (SALGA)

PROJECT FOR STRENGTHENING THE TRAINING CAPACITY OF IBTC ON NON-REVENUE WATER IN REPUBLIC OF SOUTH AFRICA

PROJECT FINAL REPORT (SUPPORTING REPORT, VOL.2/2)

June 2021

Japan International Cooperation Agency
Yachiyo Engineering Co., Ltd.
Yokohama Water Co., Ltd.

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APPENDICIES

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Appendix 1:	Minutes of Meeting of the JCC Meetings *including Project Monitoring Sheets
Appendix 2:	Baseline Survey Report
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Appendix 9:	Documents and Teaching/Learning Materials of the National NRW Training
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Appendix 6:

Standard Operation Procedures (SOP)

STANDARD OPERATION PROCEDURES (SOP)

1ST DRAFT (VERSION)

water & sanitation

Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

STANDARD OPERATING PROCEDURES (SOP) TO DEVELOP AND IMPLEMENT

NATIONAL NON-REVENUE WATER (NRW) TRAINING

1ST DRAFT

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NON-REVENUE WATER STANDARD OPERATING PROCEDURES INDEX

REVISION NUMBER	V001.004: REVISION 1	STANDARD OPERATING PROCEDURES (SOPS) TO DEVELOP AND IMPLEMTENT NATIONAL NON-REVENUE WATER (NRW) TRAINING
REFERENCE CLASSIFICATION	23/2/5	
PROCEDURE NUMBER	TITLE	PAGE NUMBER
DOC-QMS-01.1.1	Overview: Vision, Mission Statement and Values	
DOC-QMS-01.1.2	Strategic Objectives	
DOC-QMS-01.1.3	Quality Policy Statement	
DOC-QMS-01.1.4	Organisational Structure	
DOC-QMS-01.1.5	Purpose and Scope	
DOC-QMS-01.1.6	Acronyms, Terms and Definitions	
DOC-IP-01	International partnership SOP	
DOC-BS-01	Baseline survey SOP	
DOC-CD-01	Curriculum development SOP	
DOC-LMD-01	Learning/teaching material development SOP	
DOC-TYC-01	Training yard construction (design/procurement/supervision) SOP	
DOC-TYOM-01	Training yard O&M SOP	
DOC-SFM-01	Selection of facilitators/ municipalities (engagement/ mobilization) SOP	
DOC-FTM-01	Facilitator technical meeting (workshop) SOP	
DOC-PF-01	Project Funding SOP	
DOC-TI-01	National NRW Training implementation SOP	
DOC-A-01	Assessment SOP	
DOC-ME-01	Monitoring and evaluation SOP	
DOC-TJ-01	Training in Japan SOP	

APPROVAL FOR QUALITY MANAGEMENT SYSTEM MANUAL: INFRASTRUCTURE BRANCH TRAINING CENTRE.

DOCUMENT APPROVAL

RECOMMENDATION: SUPPORTED/ NOT SUPPORTED

DIRECTOR: TECHNICAL ENGINEERING CERVICES

DATE:

RECOMMENDATION: SUPPORTED/ NOT SUPPORTED

CHIEF DIRECTOR: ENGINEERING SERVICES
DATE:

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DOCUMENT VERSION CONTROL

VERSION	DATE	SUMMARY OF CHANGES
V001.001	22/02/2019	1st Draft
V001.004		VERSION 1

OVERVIEW

VISION STATEMENT

- To be a world class education and training centre for Water Sector qualifications.
- To be an admired occupational driven training provider and assessment centre for DWS and water sector beneficiaries.

MISSION STATEMENT

- Is to continue to grow as a training centre in providing high quality education, training, and capacity building programmes and assessment at both departmental and sector level.

VALUES

The training centre believes that its major role and significant contribution is to "**EMPOWER**" workforce and enhance human capital through the following values:

E: Equal access
People should be given equal opportunity in accessing training and development programmes despite their status in process and manner which is fair and non-discriminatory.

M: Mentorship
Mentoring of new entrants into water sector and other technical field has become a major challenge due to shortage of experienced personnel in the public sector. Continuous identification and development of mentors becomes a strategic key enabler for capacity and skills development.

P: Partnership
The centre is consciously aware that to fully cater and make meaningful impact is has to create partnership with national and international entities so that large scope can be reached and covered.

O: Occupationally oriented
Occupational learning is an alternative pathway, especially those without formal school leaving certification; it is a route which is highly valued to the centre.

W: Willingness
Where there is a will there is a way. The centre strives to inculcate the culture of willingness.

E: Excellence
The centre subscribes to belief that individuals are inherently excellent.

R: Redress
There are still large numbers of unskilled and semi-skilled workforce in the workplace from designated and previously disadvantaged group.

STRATEGIC OBJECTIVES

1. Conduct training needs analysis in order to coordinate, provide and develop core technical competency skills development and internal capacity both at the departmental level and at the sector level.

2. To facilitate access to, mobility and progression within education, training and career pathing.

3. Provide and implement Recognition of Prior Learning (RPL) system.

4. Centrally coordinate and provide water sector skills development.

5. Enhance the quality of education and training by providing accredited learning programmes (occupational qualifications) and non-credit bearing learning programmes to address customised skills gap.

6. Conduct regular monitoring and impact assessment of learning programmes to ascertain actual impact of the delivery of various programmes.

7. Create public and private partnerships for education, training, development and skills capacity development.

8. Be accredited training and assessment centre for occupational skills development programmes.

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Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

INFRASTRUCTURE BRANCH TRAINING CENTRE

QUALITY POLICY STATEMENT

The Infrastructure Branch Training Centre is committed to support the Department and the water sector in building capacity of its people to enable the water supply, with acceptable risk, to meet sustainable national, regional, social, economic and environmental objectives for all South African citizens.

Management shall ensure that staff is aware, trained and committed to the implementation and maintenance of a quality management system that complies with South African Qualifications Authority and with ISO 9001: 2015 requirements, to enhance customer satisfaction, enable competency, capture institutional memory and for continuous improvement.

Infrastructure Branch Training Centre Quality Policy is directed towards achieving the following objectives:

Objectives:

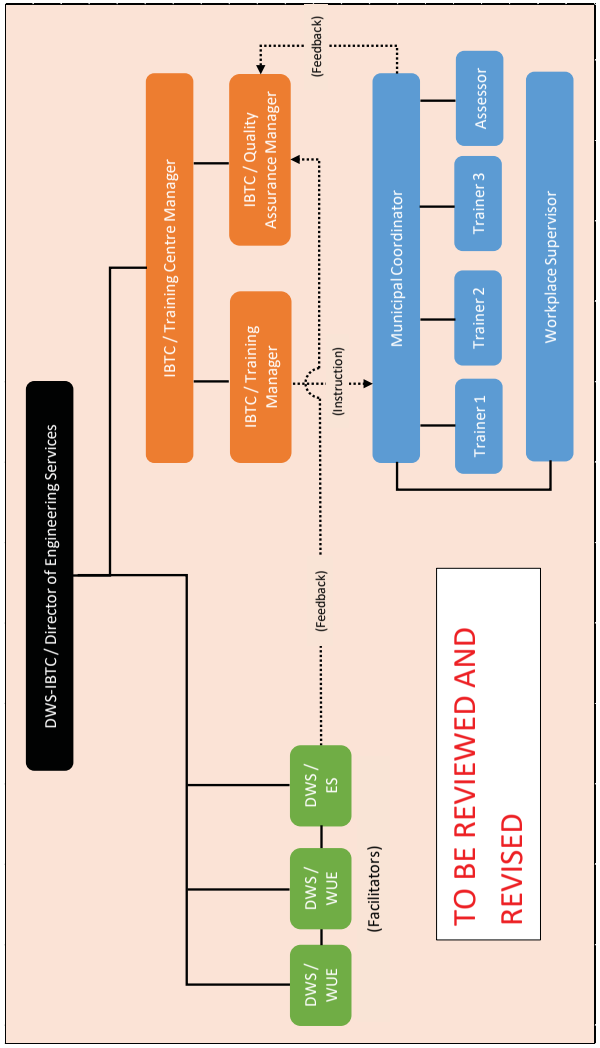
- To promote quality in achieving our Key Result Areas.
- Regulate occupational qualifications to set standards for all critical, scarce and customized training interventions and other functionaries in the water sector.
- Plan, organize, co-ordinate and manage all training activities in preparation for the Water sector.
- Liaise and co-operate with national and international training institutions to benchmark best practices.

Signed by: Date:

Chief Director: Engineering Services

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PROPOSED IBTC STRUCTURE



water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

PURPOSE

The purpose of this manual is to document standard operating procedures followed for the design, development, implementation and monitoring and evaluation of National Non Revenue Water training within DWS: Infrastructure Branch Training Centre. The same process should be followed for future development of partnership programmes.

Implementation will enhance the quality of education training and development initiatives identify non-conformances and ensure continuous improvement of processes and procedures in and through IBTC.

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SCOPE

The manual includes standard operation procedures for effective and efficient management of the following processes:

1. Approval of International Partnerships.
2. Funding model process
3. Baseline survey process
4. Curriculum and learning material development process
5. Selection and training of facilitators
6. Building of the training yard process
7. Pilot training Implementation process
8. Monitoring , evaluation of the project
9. Review process

Other supporting procedures and processes are addressed in IBTC Quality Manual.

ACRONYMS ,TERMS & DEFINITIONS

The words, acronyms or phrases below, when applied within this procedure shall assume the following meanings:

ACRONYMS	
ISO	International Organization for Standardization
QMS	Quality Management System
IBTC	Infrastructure Branch Training Centre
DWS	Department of Water and Sanitation
DMP	Demand Management Plan.
ETQA	Education and Training Quality Assurer
NWRIB	National Water Resource Infrastructure Branch.
WSP	Workplace Skills Plans
PDP	Personal Development Plan
OHS	Occupational Health and Safety.
SOP	Standard Operating Procedure
QCTO	Quality Council for Trade and Occupations
PoE	Portfolio of Evidence
RPL	Recognition of Prior Learning.

TERMS & DEFINTIONS	
Conformance	Activities of the organization performing to output to meet specifications.
Record	Document stating results achieved or providing evidence of activities performed.
Document	Information and its supporting medium, e.g. paper, magnetic or electronic.
Resource	A source of supply, support or aid especially one that can be readily drawn upon when needed.
Accreditation	A process of validation in which skills development providers and other institutions of learning are evaluated.
Training Needs Analysis	A systematic process in which strategic intent and plans of the organisation are translated into training needs. The gap between individual and organisational skills present and skills desired
Core skill	Skill that is key to learning and working.
Critical skills	Particular capabilities needed in an occupation.
Scarce Skills	Absolute or relative demand skills in the current or future.
Measurement	An action of measuring something.
Impact	A marked effect or influence
Orientation and Induction	Refers to the process of introducing a new learner or employee to his or her employer or leaning programme and work environment or learning process.
Entry	An act or going or coming in
Mentor	A person qualified in the same listed trade/occupation applied both skills and knowledge in an integrated manner to produce, maintain or deliver a service, maintain or deliver service or product for an organisation.
Workplace	A movable/temporary location where artisan applies both skill and knowledge to produce, maintain or deliver service or product.
Facilitator	Facilitator in the learning process is a person(s) who helps a group of people to understand objectives of the programme and assist them to plan how to achieve these objectives.
Monitoring	Observe or check the quality or progress over a period of time.
Evaluation	The value of something, assessment.
Code of conduct	A set of rules outlining the social norms, religious rules and responsibilities of and proper practices for individuals.

Subject Matter Experts	A person who has special skills or knowledge on a particular job or topic.
Assessment criteria	Evaluation that attempts to uncover the strengths and weaknesses of a trainee or learner in terms of what they know or don't know what they can or cannot do, measured against a standard.
Moderation	A process of monitoring assessment practice to ensure that assessment decisions are constantly accurate.
Internal Moderation	Moderation of assessment occurring at the level of skills development service provider.
Sampling	A process used in statistical analysis in which predetermined number of observations is taken from a larger quantity.
Guidance	Advice or information aimed at resolving a problem or difficulty by someone of authority.
Learning Support Staff	Includes all responsible and authorised personnel with regards to this procedure. Any other personnel formally representing and delegated by the IBTC's Training Manager.
Appeal	A serious, urgent request
Meeting	An assembly of people for a particular purpose, especially in a formal discussion.
Chairperson	Person who has been appointed as the highest ranking officer at the event. The person presides over the event to ensure that participants are following the conversations of the meeting.
Secretary	Person who makes the arrangements for the meetings, and keeps formal records of the groups processes and decisions: the minutes of the meeting including keeping records of correspondence.
Filing System	A collective storage system for example files, boxes, shelves, applications and storage system which records are stored in a systematic manner according to a file plan. Records in custody of an archive.
Retention Period	A standard, legally approved retention periods and disposition instructions for official records regardless of storage media.
Electronic record system	Any records system in which information is generated electronically and stored by means computer technology.
Archive	Records in custody of an archive.
Electronic record system	Any records system in which information is generated electronically and stored by means computer technology.
Strong room	A central location in which data is stored and managed.

Work Environment	Set conditions under which work is performed.
Emergency Rescue Personnel	Person(s) who has been trained in providing emergency services. First aiders, fire fighters etc
Audit	An official inspection of an organisation/ system.
Audit finding	Results of the evaluation of the collected audit evidence against audit criteria.
Audit conclusion	Outcome of an audit provided by the audit team after consideration of the audit objectives and all audit findings

DOCUMENT TITLE	International Partnership SOP	**DOCUMENT REF**	**DOC-QMS-01.1.1**
REVISION NO	**V001.004**	**UNIT/SECTION RESPONSIBLE**	**IBTC**

PURPOSE:

The purpose of this process is to describe the approval of DWS/SALGA/JICA project for strengthening the training capacity of IBTC on Non-Revenue Water.

SCOPE

This process is applicable to all DWS /SALGA/Water Boards/ Municipalities and other entities in Water Sector.

PERFORMANCE OUTPUT

To ensure effective national and international partnership.

REFERENCES

- Policy
- DWS approved submission
- JICA application form
- Technical Assistance (TA) project with an endorsement from National Treasury.
- JICA approval letter
- Signed agreement between Water Sector and JICA

RESPONSIBILITY AND AUTHORITY

- Director General: DWS
- Chief Representative of JICA South Africa Office
- Deputy Director General: INTERNATIONAL
- Deputy Director General: IBOM

ROLE PLAYERS

- Chief Director: International Water Support
- Director: Official Development Assistance
- Chief Director: Engineering Services
- Director: Technical Engineering Services
- Director: SALGA
- IBTC
- Municipalities

DOCUMENTS, FORMS AND RECORDS

The following documentation is required for implementation of this Procedure:

- Application forms
- Approval letters

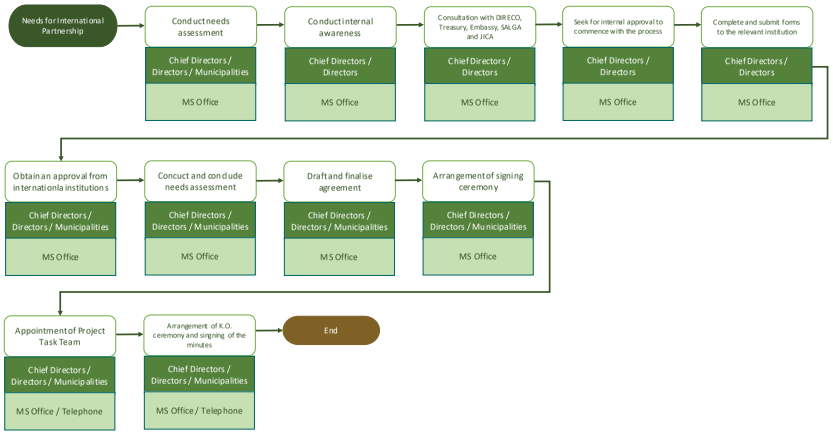
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PROCESS

APPROVAL OF INTERNATIONAL PARTNERSHIP PROCESS

1. Conduct needs assessment.
2. Conduct internal awareness in DWS
3. Conduct consultation with other national departments, Department of International Relations and Cooperation (DIRCO), Treasury, Embassy, SALGA etc.) and international institutions (JICA).
4. Seek for internal approval to commence with the process.
5. Upon approval, completed and submit forms to the relevant Institution (JICA).
6. Obtain approval from International Institution (JICA/DIRCO/Embassy/Treasury.
7. Conduct and conclude needs assessment (DWS/SALGA/Water Boards/Municipalities/Water Sector Training Providers and JICA).
8. Draft and finalise Agreement in consultation with DWS/SALGA/Water Boards/Municipalities/Water Sector Training Providers and JICA).
9. Arrangement of signing ceremony.
10. Appointment of Project task team.
11. Arrangement of Kick off ceremony and signing of the minutes by JCC members.

FLOW CHART: APPROVAL OF INTERNATIONAL PARTNERSHIP PROCESS



DOCUMENT TITLE	Baseline Survey	DOCUMENT REF	DOC-BS-01
REVISION NO	V001.004	UNIT/SECTION RESPONSIBLE	IBTC

PURPOSE:

The purpose of this process is to describe how to carry out the baseline survey in order to understand the current situation and demand of municipalities.

SCOPE

This process is applicable to all DWS /SALGA/Water Boards/ Municipalities and other entities in Water Sector.

PERFORMANCE OUTPUT

Baseline survey report which contains the required data for implementing the NRW training programme.

REFERENCES

- Baseline survey report
- MOU with the targeted municipalities
- Questionnaire

RESPONSIBILITY AND AUTHORITY

- Director General :DWS
- Chief Representative of JICA South Africa Office
- Deputy Director General: INTERNATIONAL
- Deputy Director General: IBOM

ROLE PLAYERS

- Director: Technical Engineering Services, WUE
- Director: SALGA
- IBTC
- Municipalities

DOCUMENTS, FORMS AND RECORDS

The following documentation is required for implementation of this Procedure:

- Questionnaire to be submitted to the targeted municipalities

PROCESS

BASELINE SURVEY PROCESS

1. Conduct needs assessment.

2. Select of the targeted municipalities.
3. Preparation or review of the questionnaire. (WUE)
4. Approval of the questionnaire.
5. Upon approval, the questionnaire shall be delivered or sent to the targeted municipalities.
6. Visit the targeted municipalities for the further explanation of the questionnaire. (WUE/SALGA)
7. Collection of a response to the questionnaire. (WUE/SALGA)
8. Analysis of a response to the questionnaire. (WUE/SALGA/IBTC)
9. Completion of the baseline survey report

FLOW CHART: BASELINE SURVEY REPORT

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DOCUMENT TITLE	Curriculum Development	**DOCUMENT REF**	**DOC-CD-01**
REVISION NO	**V001.004**	**UNIT/SECTION RESPONSIBLE**	**IBTC**

PURPOSE:

The purpose of this process is to develop the curriculum of the NRW training programme.

SCOPE

This process is applicable to all DWS /SALGA/ Municipalities and other entities in Water Sector.

PERFORMANCE OUTPUT

Curriculum Documents

REFERENCES

- Baseline survey report
- Technical documents/materials
- Textbooks of other water training programmes

RESPONSIBILITY AND AUTHORITY

- Director: DWS-WUE and Construction
- IBTC

ROLE PLAYERS

- Director: Technical Engineering Services
- IBTC

DOCUMENTS, FORMS AND RECORDS

The following documentation is required for implementation of this Procedure:

- Teaching materials
- Learning materials

PROCESS

CURRICULUM DEVELOPMENT PROCESS
***Waiting for the PIC's reply**

FLOW CHART: CURRICULUM DEVELOPMENT PROCESS

DOCUMENT TITLE	Learning/Teaching Material Development	DOCUMENT REF	DOC-LMD-01
REVISION NO	V001.004	UNIT/SECTION RESPONSIBLE	IBTC

PURPOSE:

The purpose of this process is to develop the learning/teaching materials which used at the NRW training programme.

SCOPE

This process is applicable to all DWS / IBTC / Municipalities and other entities in Water Sector.

PERFORMANCE OUTPUT

Learning/Teaching materials to be used at the NRW training programme.

REFERENCES

- Baseline survey report
- Results of periodical survey of water supply situation of all the water authorities
- Textbooks of other water training programmes

RESPONSIBILITY AND AUTHORITY

- Director: DWS – WUE and Construction
- IBTC
- Municipalities

ROLE PLAYERS

- Director: Technical Engineering Services
- IBTC
- Municipalities: facilitators

DOCUMENTS, FORMS AND RECORDS

The following documentation is required for implementation of this Procedure:

- Draft of the two materials submitted from the JICA expert team.

PROCESS

LEARNING/TEACHING MATERIAL DEVELOPMENT PROCESS

(Preparation)

1. Determination of format and writing style rules (for classroom and for practical timing)
2. The appearance of the material, (Separate volume, copy right management, Paper design, cover design, etc.); for classroom and for practical training
3. Creating a table of contents (for classroom and for practical training)
4. Determination of sharing of writing (for classroom and for practical training)
5. Determination of writing rules (Consistency of description, unification of expression, method of checking content, and responsible person)
6. Making schedule of material writing (first Draft, commenting, first revision draft, commenting, second revision draft)

(Creating a facilitator manual - How to demonstrate to the trainees)

7. Writing (1st Draft) for classroom / for practical training
8. Comment (first draft) (JET internally) For classroom / for practical training
9. Writing (2nd draft) For classroom / for practical training
10. Comment (2nd draft) For classroom / for practical training
11. Writing (3rd draft) for classroom / for practical training
12. Comment (Third draft) for classroom / for practical training
13. Revising (for Presentation to SA side) For classroom / for practical use
14. Comment (from SA side) for classroom / for practical use
15. Writing (Presentation to the overall task meeting) For classroom / for practical training
16. Comment for classroom / for practical use
17. Revising (To introduce to the 1st and 2nd Facilitator Technical Meeting)
18. Comment (from the Facilitators) for classroom / for practical use
19. Writing (for pre-training) For classroom / for practical training
20. Comment for classroom / for practical use
21. Revising and Completion (Draft Final) * For minor comment for classroom / for practical training

(Printing and binding)

22. Organizing Printing Documents (for classroom / for practical training)
23. Printing (the number is as the number of facilitators+10print) For classroom / for practical training

(Preparation for other teaching tools [display boards, A0-size map, Photo frames using for the time of practical training.])

24. Explanation board for Practical training in the Yard
25. Preparation of practical instruction machine tools
26. Printing / binding of supplement teaching materials for Practical Training
27. Creating a Manual/framework/Systems for improvement of the content of the Teaching Materials Conduct needs assessment.

FLOW CHART: LEARNING/TEACHING MATERIAL DEVELOPMENT PROCESS

DOCUMENT TITLE	Training Yard Construction	DOCUMENT REF	DOC-TYC-01
REVISION NO	V001.004	UNIT/SECTION RESPONSIBLE	IBTC

PURPOSE:

The purpose of this process is to manage construction procedures and processes to complete the training yard for the NRW training programme.

SCOPE

This process is applicable to all DWS /IBTC/ Municipalities and other entities in Water Sector.

PERFORMANCE OUTPUT

A training yard for the NRW Training programme.

REFERENCES

- Design documents of the other training yards
- Baseline survey report
- Technical documents DWS published in the past

RESPONSIBILITY AND AUTHORITY

- Director: DWS – Construction and WUE

ROLE PLAYERS

- Director: Technical Engineering Services
- Director: SALGA
- IBTC
- Municipalities

DOCUMENTS, FORMS AND RECORDS

The following documentation is required for implementation of this Procedure:

- Design documents such as drawing and other technical materials

PROCESS

TRAINING YARD CONSTRUCTION PROCESS

(Clarify the purpose and the requirement of the Training Yard)
1. Analyze the curriculum
2. listing items of training, checking require function
3. Considering the number of equipment, facilities

4. Considering the place to store the equipment

(Design)
5. Considering required condition for training (light, rain fall, stormwater management, sunlight management)
6. Considering specifications
7. Considering security
8. Considering maintenance for the facility and equipment
9. Considering maintenance cycle
10. Calculate cost required initial stage
11. Calculate cost required maintenance stage
12. Calculate cost total
13. Determination of drawing and specification

(Ordering business)
14. Considering style of procurement
15. Making specification material
16. listing candidate applicants
17. Tender notice
18. Bidding
19. Bidding / Making contract
20. Negotiation
21. Construction / Supervision
22. Reflection to the Learning material and O&M Manuals
23. Completion examination
24. Receiving the Yard

(Preparation for maintenance)
25. Organizing and storing as-built drawings
26. Organizing and storing tools and parts
27. Making and starting operation of the Maintenance, Procurement, and Improvement Manual
28. To record all the history of new training facility establishmentConduct needs assessment.

FLOW CHART: TRAINING YARD CONSTRUCTION PROCESS

DOCUMENT TITLE	Training Yard O&M	DOCUMENT REF	DOC-TYOM-01
REVISION NO	V001.004	UNIT/SECTION RESPONSIBLE	IBTC

PURPOSE:

The purpose of this process is to describe how to operate and maintain the training yard efficiently and effectively.

SCOPE

This process is applicable to all DWS / IBTC / Water Boards/ Municipalities and other entities in Water Sector.

PERFORMANCE OUTPUT

Training Operation and Maintenance (O&M) manual shall be completed during the process.

REFERENCES

- Design documents of the training yard
- Learning/Teaching materials
- Other technical documents related to the NRW
- Manufactures' manual

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RESPONSIBILITY AND AUTHORITY

- Director: DWS – Construction and WUE

ROLE PLAYERS

- Director: Technical Engineering Services
- Director: SALGA
- IBTC
- Municipalities

DOCUMENTS, FORMS AND RECORDS

The following documentation is required for implementation of this Procedure:

- Draft of the O&M shall be submitted to all the stakeholders for the final approval.

PROCESS

TRAINING YARD O&M PROCESS

(Equipment: IBTC Technical Task members should be responsible for)

1. Inspection and Procurement of equipment and materials (Daily inspection, In-service inspection, Periodic inspection, procurement based on annual and urgent maintenance plan)
2. Management of equipment and materials such as valves and air valves, PRV, drain valves, water pressure gauges, water temperature gauges, electric

conductivity meter, pH meters , chloride testing kit, turbidity meter, batteries, acoustic bar, electronic leak detector, correlation type leak detector, metal detector, tapping machine, generator, firehose etc.

3. Consumable management for practical training: white board, marker, eraser, electric extension cord, pipes, battery, cleaning equipment, fuel for the generator, adhesive etc.
4. Tool management: driver, spanner, pliers, seal tape, machine cutter, fusing machine, etc.
5. Safety equipment management: Blower, Gas detector, Despres mask, Submersible pump, Safety fence, Working signboard, keys, Sandbags
6. Establishment of Improvement plan for equipment and material management, and its plan's improvement: Systematization

(Yard: IBTC Technical Task members should be responsible for)

7. Inspection and procurement for the Training Yard (Daily inspection, In-service inspection, Periodic inspection, repair-construction based on annual and urgent maintenance plan)
8. Inspection and Management of the Training Yard such as valves and air valves (already set ones), PRV, drain valves, pipes, asphalt pavement, manholes, roofs, retaining walls, leakage points, etc.
9. Establishment of Improvement plan of the Training Yard (including the timing of discussion for issue arising, timing of contact other department members, procedure of prioritization of the point for improvement, procedure for applying/receiving funding, etc.)

(Classroom: IBTC Administrative Task members should be responsible for)

10. Inspection and procurement of the training class: daily inspection, in-service inspection, periodic inspection, procurement based on annual and urgent maintenance plan
11. Classroom consumables management: Paper, writing instruments, notebooks, whiteboards, markers, erasers, light bulbs, extension cord, projector, projector lightbulbs, remote controller, personal computers, software and licenses, USBs, CDRs, printer, landline, Wi-Fi
12. Establishment of improvement plan for classroom condition: systematization of the procedure (including the timing of discussion for issues arising, timing of contact other department members, procedure of prioritization of the point for improvement, procedure for applying/receiving funding, etc.)

(Others: IBTC Technical Task members should be responsible for)

13. Establishment of Construction management Manual/SOP: to apply for Classroom building, Accommodation Facility, Training Yard, and the Premises
14. Acrylic pipe to be shipped with Morita
15. Identify material required in training
16. Filing Manufacturers' manuals such as
17. Pump, Electrical panel, PRV, Water meter, Valves
18. Material procurement through contractor
19. Design cover for acrylic pipe
20. Procurement of tools
21. O&M manuals
22. OHS (Occupational Health and Safety) document
23. Do training for facilitators to use equipment
24. Equipment manuals to be compiled by facilitators

FLOW CHART: TRAINIG O&M PROCESS

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DOCUMENT TITLE	Selection of Facilitators/Municipalities (Engagement/Mobilization)	**DOCUMENT REF**	**DOC-SFM-01**
REVISION NO	**V001.004**	**UNIT/SECTION RESPONSIBLE**	**IBTC**

PURPOSE:

The purpose of this process is to select of the targeted Facilitators/Municipalities for the NRW training programme.

SCOPE

This process is applicable to all DWS / IBTC / Municipalities and other entities in Water Sector.

PERFORMANCE OUTPUT

List of the targeted facilitators/municipalities.

REFERENCES

- Baseline survey report
- MOU with the targeted municipalities

RESPONSIBILITY AND AUTHORITY

- Director: DWS - WUE

ROLE PLAYERS

- Director: Technical Engineering Services
- Director: SALGA
- IBTC
- Municipalities

DOCUMENTS, FORMS AND RECORDS

The following documentation is required for implementation of this Procedure:

- Official letters to municipalities from the DWS
- MoU with the targeted municipalities and facilitators

PROCESS

SELECTION OF FACILITATORS/MUNICIPALITIES PROCESS

1. Sending an official letter to Municipality
2. Sending an official letter to Facilitator's organizations
3. Appointment to Municipalities

4. Appointment to Facilitators
5. Engagement/Mobilisation to Municipalities
6. Engagement/Mobilisation to Facilitators
7. MoU with Municipalities (service level agreement)
8. MoU with Facilitators & Facilitator's organizations (service level agreement)

FLOW CHART: SELECTION OF FACILITATORS/MUNICIPALITIES PROCESS

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DOCUMENT TITLE	Facilitator Technical Meeting (Workshop)	**DOCUMENT REF**	**DOC-FTM-01**
REVISION NO	**V001.004**	**UNIT/SECTION RESPONSIBLE**	**IBTC**

PURPOSE:

The purpose of this process is to implement the facilitator technical meeting smoothly.

SCOPE

This process is applicable to all DWS / IBTC / Municipalities and other entities in Water Sector.

PERFORMANCE OUTPUT

Assessment reports on the facilitator technical meeting.

REFERENCES

- Baseline survey report
- MOU with the targeted municipalities/facilitators

RESPONSIBILITY AND AUTHORITY

- Director: DWS – WUE and Construction

ROLE PLAYERS

- Director: Technical Engineering Services
- Director: SALGA
- IBTC
- Municipalities

DOCUMENTS, FORMS AND RECORDS

The following documentation is required for implementation of this Procedure:

- Invitation letter to the targeted municipalities/facilitators.
- Learning/Teaching materials
- Facilitator List with contact details

PROCESS

FACILITATOR TECHNICAL MEETING PROCESS

1. Define the purpose of taking place the Facilitator Meeting
2. Setting the date, contents, and agenda
3. Secure the venue, catering, accommodation, and transportation
4. Making appointment to the participants

5. Determining FACILITATOR of the Facilitator meeting
6. Sharing tasks and roles (reception, catering, facilitator, leader, manager, and so on)
7. Preparation of discussion room, training yard and equipment
8. Preparation of materials (learning materials and Teaching materials, facilitator list, contact details, and Attendance register, etc.)
9. Conduct facilitator meeting
10. Organize feedbacks in the meeting from the participants
11. Share the assessment reports

FLOW CHART: FACILITATOR TECHNICAL MEETING PROCESS

DOCUMENT TITLE	Project Funding	DOCUMENT REF	DOC-PF-01
REVISION NO	V001.004	UNIT/SECTION RESPONSIBLE	IBTC

PURPOSE:

The purpose of this process is to secure the fund for the NRW training programme.

SCOPE

This process is applicable to all DWS /SALGA/SETAs/IBTC.

PERFORMANCE OUTPUT

Fund to implement the NRW training programme.

REFERENCES

- MOU with the SETAs in the precious projects
- Contractual documents

RESPONSIBILITY AND AUTHORITY

- Director General: DWS
- Deputy Director General: INTERNATIONAL
- Deputy Director General: IBOM

ROLE PLAYERS

- Director: DWS-Support Services
- Director: SALGA
- Director: SETAs
- IBTC

DOCUMENTS, FORMS AND RECORDS

The following documentation is required for implementation of this Procedure:

- Application form including the proposal to the fund sources.
- Contract form with the SETAs.

PROCESS

PROJECT FUNDING PROCESS

(Funding proposal)

1. Refer from the available concept note of the project.
2. Refer to the Sector Skills Plan/research available on the skills need.
3. Outline the project plan/budget including the methodology.
4. Submit to the funder and request a meeting to present proposal.

5. If approved an allocation letter will be issued/ or a disapproval.
6. If approved start to complete the service level agreement and other contractual documents.
7. Implement the project and start with the training.
8. Report to funder in line with the contractual documents.

(Discretionary funding window of SETAs)

9. Wait for the funding window to open.
10. Complete application with required information online and also submit the hardcopy to the SETA.
11. Wait for the response from the SETA.
12. If approved start to complete the service level agreement and other contractual documents.
13. Implement the project and start with the training.
14. Report to funder in line with the contractual documents.

FLOW CHART: PROJECT FUNDING PROCESS

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DOCUMENT TITLE	National NRW Training Implementation	**DOCUMENT REF**	**DOC-TI-01**
REVISION NO	**V001.004**	**UNIT/SECTION RESPONSIBLE**	**IBTC**

PURPOSE:

The purpose of this process is to describe how to prepare and implement the NRW training programme.

SCOPE

This process is applicable to all DWS /SALGA/IBTC/Water Boards/ Municipalities and other entities in Water Sector.

PERFORMANCE OUTPUT

The preparation of all the hard and soft components on the NRW training programme.

REFERENCES

- Code of conduct issued by the IBTC
- Project profile

RESPONSIBILITY AND AUTHORITY

- Director: DWS-WUE and Construction

ROLE PLAYERS

- Director: Technical Engineering Services
- Director: SALGA
- IBTC

DOCUMENTS, FORMS, RECORDS AND OTHERS

The following documentations and other necessary equipment and goods are required for implementation of this Procedure:

- Facilitators manual: at classroom
- Facilitators manual: at training yard
- Explanatory board for practical training (using in the Yard)
- Leaning Material, Procedure for revising
- Leaning Material for Practical and Work Place sessions, Procedure for revising
- Preparation of Brochure/Agenda for IBTC Training session/Living
- Assessment sheet: filling up by trainees
- Assessment sheet: filling up by assessor

- Assessment sheet: filling up by facilitator
- Annual training calendar
- Cap and badge or uniform of National trainer/trainee
- Working clothes
- Certificate of Completion
- Project Webpage
- Database of trainee/facilitator management
- Signs of facility (toilet, auditorium, classrooms, fire extinguisher, fire hose, … names of all spaces)

PROCESS

NATIONAL NRW TRAINIG IMPLEMENTATION PROCESS

(Preparation (with in the training period): IBTC Administrative Task members should be responsible for;)

1. To prepare and maintenance the Training calendar (for secure the classroom, Facilitator, accommodation, and grasping leeway) and also establishing how to make this calendar
2. Procedure for preparation of supplement printing material
3. Procedure for preparation of participant List and its format (to collaborate with the Database)
4. Procedure for preparation of the material and equipment using training session in the Classroom and the Yard
5. Procedure for putting it back the materials/equipment and their daily inspection (mainly to confirm the number of equipment used in the training session of the day)

(Facilitators: IBTC Administrative Task members should be responsible for;)

6. How to lead facilitators (waiting room, material printing, Tea and catering, shower room, transport, to explain the schedule of the day, to re-confirm the purpose of the training of the day)
7. to support the assessors (waiting room, material printing, Tea and catering, shower room, transport, to explain the schedule of the day, to re-confirm the purpose of the training of the day)

(For trainees: IBTC Administrative Task members should be responsible for;)

8. Reception procedure
9. Introducing the Information on accommodation (room assignment, handing key, collection money, instruction terms and conditions, giving instruction of session starting time and place, password of Wi-Fi, security issues, meals, transport to the city or shops, and so on)
10. Printing Materials (When and How to)
11. How to share the materials (paper and electronical way)
12. How to treat Absence, completion certificate regulation and the policy
13. Procedure for an emergency (illness, injury, family issues, trouble among trainees, snake-bite, lightning, load shedding, theft, fire, sexual harassment, traffic accident, food poisoning, heat stroke, and so on)
14. Uniform/cap/badge design and arrangement
15. Safety goods: Helmet, gloves, safety shoes, reflective vest, dust mask (procurement and management)

16. Wi-Fi (procurement and management)
17. What's-Up Group(management), if necessary

(Assessment and monitoring: IBTC Administrative Task members should be responsible for;)

18. Setting Monitoring content and course completion criteria
19. Preparation of procedure for Grasping satisfaction from the trainee: regarding achievements, content of training, training logistics, facilities, and so on.
20. External assessment arrangement * if it is needed
21. Establishment of the SOP of organizing assessment results and its publication procedure
22. Establishment of SOP for linking assessment results to improvement of the Training Management/Curriculum

(Certificate: IBTC Administrative Task members should be responsible for;)

23. Preparation of Completion Certificate: name of the authority, design, assessment and management of achievement of the trainees

(Others: IBTC Administrative Task members should be responsible for;)

24. Budget control (Clarify the whole procedure and set the timing of each action, responsible person, and also how to report)
25. Management of Trainee's training history, and Facilitator cooperation history and assessment result
26. Public relations (confirmation of the purpose, way of publicity and concrete procedure, start operation)
27. Information sharing to SALGA (Why and How to)
28. Reporting to DWS (Why and How to)
29. Preparation of annual report (Why and How to)

FLOW CHART: NATIONAL NRW TRAINIG IMPLEMENTATION

DOCUMENT TITLE	Assessment	DOCUMENT REF	DOC-A-01
REVISION NO	V001.004	UNIT/SECTION RESPONSIBLE	IBTC

PURPOSE:

The purpose of this process is to conduct the impact assessment in order to measure effectiveness of the NRW training programme towards participants, and to draw a lesson for the next programmes.

SCOPE

This process is applicable to all DWS / SALGA/ IBTC/ Water Boards/ Municipalities and other entities in Water Sector.

PERFORMANCE OUTPUT

Impact assessment report shall be published and then shared with stakeholders.

REFERENCES

- Database of trainees and facilitators
- Programme agenda and curriculum

RESPONSIBILITY AND AUTHORITY

- Director: DWS – WUE and Construction

ROLE PLAYERS

- Director: Technical Engineering Services
- Director: SALGA
- IBTC
- Municipalities

DOCUMENTS, FORMS AND RECORDS

The following documentation is required for implementation of this Procedure:

- Assessment sheet and/or questionnaire to be submitted to the targeted municipalities

PROCESS

ASSESSMENT PROCESS

1) Impact Assessment on Trainees and its O&M

(Clarification of purpose for the assessment)

1. Clarification of purpose
2. Collecting and analysing good practices from other training centres

(Method development)

3. To set the criteria for the assessment
4. Making database of Trainees and Facilitators (list on the same Database table is preferable, the personal information handling policy should be also developed)
5. Setting criteria for evaluation
6. Setting criteria for completion of the course
7. Making format for the evaluation
8. Announcement of criteria for completion and evaluation,
9. Systematization for feedback to the trainees
10. Systematization for feedback to the Facilitators
11. Systematization for feedback to the Curriculum
12. Systematization for feedback to the management of training session, administrative procedures, accommodation, and so on.
13. Setting up the System/Procedure for Improvement all training aspects

(Measurement work)

14. Preparation/Printing evaluation form
15. Conduct evaluation
16. To confirm fulfilling the completion criteria or not to each trainee
17. Updating the Database, (input and analyze)
18. Feedback to Trainees
19. Feedback to Facilitators
20. Feedback to training session and Curriculum
21. Feedback to administrative issues of IBTC

(Systematization for Measurement Procedure Improvement)

22. Establishing a Mechanism of Assessment & Feedbacks, create assessing rules, and making System Improvement Manuals. And to start operation
23. Leave the progress history, know-hows, and points to be noted of the Assessment System establishment procedure.

2) Impact Assessment on the targeted municipalities and its O&M

(Clarification of purpose for the assessment)

1. Clarification of purpose and its usage

(Method development)

2. Setting up the Criteria of Impact evaluation for the Trainee Municipalities
3. Creation of Trainee(attendant) Municipality database
4. Formulation of evaluation method
5. Create evaluation format
6. Publication of evaluation method
7. Make a framework of feedback to the Municipality
8. Make a framework of feedback to the training
9. Make a framework of feedback to the IBTC (Training Centre) management
10. Setting up a Mechanism/Manual of Reviewing the Measurement Method

(Measurement work)

11. Preparation/Printing of evaluation format
12. To Perform evaluation On Site/Municipalities/Questionnaire etc.
13. Updating Database (Input and analysis)

14. Send feedbacks to the Municipalities
15. Send feedbacks to the Training Curriculum
16. Send a feedback to the IBTC (Training Centre) Management

(Systematization for Measurement Procedure Improvement)

17. Establishing a Mechanism of Assessment & Feedbacks, create assessing rules, and making System Improvement Manuals. And to start operation
18. Leave the progress history, know-hows, and points to be noted of the Impact Measurement System establishment.

FLOW CHART: ASSESSMENT PROCESS

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DOCUMENT TITLE	Monitoring and Evaluation	**DOCUMENT REF**	**DOC-ME-01**
REVISION NO	**V001.004**	**UNIT/SECTION RESPONSIBLE**	**IBTC**

PURPOSE:

The purpose of this process is to describe how to execute the monitoring and evaluation on the NRW training programme in order to improve the contents of the programme continuously.

SCOPE

This process is applicable to all DWS / IBTC/ Municipalities and other entities in Water Sector.

PERFORMANCE OUTPUT

Monitoring and Evaluation system shall be established.

REFERENCES

- Feedback from participants of the programme
- Assessment Reports
- Curriculum agenda

RESPONSIBILITY AND AUTHORITY

- Director: DWS – WUE and Construction

ROLE PLAYERS

- Director: Technical Engineering Services
- IBTC
- Municipalities

DOCUMENTS, FORMS AND RECORDS

The following documentation is required for implementation of this Procedure:

- Training Improvement database shall be established.

PROCESS

MONITORING AND EVALUATION PROCESS

(Clarification of the purpose to make this system)

1. To Confirm the Purpose of Training Improvement
2. To Collect and Analyse Cases of other Training Institutions

(Designing)

3. Setting the evaluation resources (Trainees, facilitators, staffs)
4. Setting up the means for collecting information (Reporting, Questionnaire, Reflecting Sessions, Observing, etc.)
5. To Develop Training Improvement Database (for substantial issues): to monitor the items to be improvement and its responding status
6. To Develop Training Centre Management Improvement Database (for the logistical issues): to monitor the items to be improved and its responding status
7. Setting priority of the criteria
8. Developing reflecting procedure to Facilitator Meeting, Learning Material contents, Yard and Equipment improvement, and O&M improvement.

(Preparation for evaluation)

9. Create evaluation format

(Evaluation)

10. To Collect information and Conduct the Evaluation
11. Feedback to the training
12. Feedback to the administrative issues and management of IBTC (training centre)
13. Publication of status and efforts to improve the IBTC NRW Training

(Establishment of system and procedures)

14. Realization of procedures for system improvement, manual creation. and starting operation
15. Making report of Training Effect Measurement/Feedback system Establishment

FLOW CHART: MONITORING AND EVALUATION PROCESS

DOCUMENT TITLE	Training in Japan	DOCUMENT REF	DOC-TJ-01
REVISION NO	V001.004	UNIT/SECTION RESPONSIBLE	IBTC

PURPOSE:

The purpose of this process is to implement the training course in Japan as a part of the DWS/SALGA/JICA project for strengthening the training capacity of IBTC on Non-Revenue Water.

SCOPE

This process is applicable to all DWS / SALGA / IBTC / Water Boards / Municipalities and other entities in Water Sector.

PERFORMANCE OUTPUT

Bench marking reports shall be completed and submitted by each participant.

REFERENCES

- Schedule and contents of the training programme in Japan
- Learning/Teaching materials
-

RESPONSIBILITY AND AUTHORITY

- Director General: DWS
- Chief Representative of JICA South Africa Office
- Deputy Director General: INTERNATIONAL
- Deputy Director General: IBOM

ROLE PLAYERS

- Director: Technical Engineering Services
- Director: SALGA
- IBTC
- Municipalities
- LGSETA

DOCUMENTS, FORMS AND RECORDS

The following documentation is required for implementation of this Procedure:

- Questionnaire to be submitted to the targeted municipalities

PROCESS

TRAINING IN JAPAN PROCESS

1. Finalize list of the participants

(Clarification of the purpose of this year's session in Japan)

2. Reconfirmation of purpose, Confirmation of target to achieve
3. Review of the training theme
4. Discussion of the training theme
5. Determination of training theme
6. Create candidate list
7. Training overview draft 1

(Preparation and logistics)

8. Listing of target recipients
9. Training overview draft 2
10. Acceptance request to JICA Yokohama
11. Draft of request documents to target recipients
12. Inquiries to target recipients
13. Temporary determination of detail schedule
14. Sending request documents to target recipients
15. Learning material request
16. To Conduct Participant training (as part of the Facilitator Meeting)
17. Confirming the Detail Training Schedule Final
18. Confirmation of Training Plan Final
19. Draft creation of benchmark report (SA side)
20. Pre-departure Orientation (from DWS & JICA)
21. Pre-Briefing session (from JICA office)

(Training in Japan)

(Report, Organize results and feedback)

22. Creating and Organizing the Benchmarking Report
23. Publishing the Benchmark Report, Holding a Seminar
24. Seminar holding report preparation (along with benchmark report to final report)

FLOW CHART: TRAINING IN JAPAN PROCESS

STANDARD OPERATION PROCEDURES (SOPs)

2ND DRAFT (VERSION)

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Water and Sanitation
REPUBLIC OF SOUTH AFRICA

STANDARD OPERATING PROCEDURES (SOPs) TO DEVELOP AND IMPLEMENT

THE NATIONAL NON-REVENUE WATER (NRW) TRAINING

2ND DRAFT

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THE NATIONAL NON-REVENUE WATER (NRW) TRAINING

STANDARD OPERATING PROCEDURES INDEX

REVISION NUMBER	NATIONAL NON-REVENUE WATER TRAINING: STANDARD OPERATING PROCEDURES	REVISION DRAFT 1.1.2
REFERENCE CLASSIFICATION	23/2/5	
PROCEDURE NUMBER	TITLE	PAGE NUMBER
DOC-SOP-01.1	Document Approval	
DOC-QMS-01.1.3	Overview: Vision, Mission Statement and Values	
DOC-QMS-01.1.4	Strategic Objectives	
DOC-QMS-01.1.5	Quality Policy Statement	
D-NRW-SOP-01.2	Organisational Structure	
D-NRW-QMS-01.1.7	Purpose and Scope	
D-NRW-SOP-01.3	Acronyms, Terms and Definitions	

STANDARD OPERATING PROCEDURES (SOPs)	
SOP Category	
1. ANNUAL PROGRAMME	
SOP: 1-1	Budget request and grant/funding application
SOP: 1-2	Budget and expenditure management
SOP: 1-3	Steering committee preparation/convening
SOP: 1-4	Annual programming and each group scheduling
2. MOBILIZATION AND ALLOCATION	
SOP: 2-1	DWS Coordinator allocation
SOP: 2-2	Facilitator engagement, selection and allocation
SOP: 2-3	Municipality selection and criteria
SOP: 2-4	Municipality mobilization
3. VENUE & LOGISTICS	
SOP: 3-1	Lecture/room preparation
SOP: 3-2	Logistics (Training facility and accommodation)
SOP: 3-3	IBTC accommodation and facility
4. MATERIALS	

SOP: 4-1	Teaching/learning materials development and revision
SOP: 4-2	Teaching/learning materials preparation/printing/copying
5. YARD & EQUIPMENT	
SOP: 5-1 SOP: 5-2	Yard and Equipment routine, inspection, repair, control and management
SOP: 5-3	Yard/practices preparation
6. TRAINING	
SOP: 6-1	IBTC training implementation (admin)
SOP: 6-2	Workplace training implementation / Technical
SOP: 6-3	Workplace training implementation / Logistics & Admin
SOP: 6-4	Certification
SOP: 6-5	Monitoring and evaluation for improvement plan
7. INFO SHARING	
SOP: 7-1	Storage and information/data sharing （NRWI）
SOP: 7-2	Database (and web) development

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REQUEST FOR APPROVAL OF QUALITY MANAGEMENT SYSTEM MANUAL: FOR THE PURPOSE OF DOCUMENTING STANDARD OPERATING PROCEDURES FOR THE NATIONAL NON REVENUE TRAING PROGRAMME AT INFRASTRUCTURE BRANCH TRAINING CENTRE.

DOCUMENT APPROVAL

RECOMMENDATION: SUPPORTED/ NOT SUPPORTED

DEPUTY DIRECTOR: TRAINING CENTRE MANAGER

DATE:

RECOMMENDATION: SUPPORTED/ NOT SUPPORTED

DIRECTOR: TECHNICAL ENGINEERING CERVICES

DATE:

RECOMMENDATION: SUPPORTED/ NOT SUPPORTED

CHIEF DIRECTOR: ENGINEERING SERVICES
DATE:

DOCUMENT VERSION CONTROL

REVISION DRAFT VERSION	DATE	SUMMARY OF CHANGES
V001	22/02/2019	1st Draft
V001.1	19/03/2020	2nd Draft
V001.2	19/10/2020	3rd Draft
V2	17/12/2020	4th Draft

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OVERVIEW

VISION STATEMENT

- To be a world class education and training centre for Water Sector Qualifications.
- To be an admired occupational driven training provider and assessment centre for DWS and water sector beneficiaries.

MISSION STATEMENT

- Is to continue to grow as a training centre in providing high quality education, training, and capacity building programmes and assessment at both departmental and water sector level.

VALUES

The training centre believes that its major role and significant contribution is to "**EMPOWER**" workforce and enhance human capital through the following values:

E: Equal access
People should be given equal opportunity in accessing training and development programmes despite their status in a process and manner which is fair and non-discriminatory.

M: Mentorship
Mentoring of new entrants into water sector and other technical field has become a major challenge due to shortage of experienced personnel in the public sector. Continuous identification and development of mentors becomes a strategic key enabler for capacity and skills development.

P: Partnership
The centre is consciously aware that to fully cater and make meaningful impact is has to create partnership with national and international entities so that large scope can be reached and covered.

O: Occupationally oriented
Occupational learning is an alternative pathway, especially those without formal school leaving certification; it is a route which is highly valued to the centre.

W: Willingness
Where there is a will there is a way. The centre strives to inculcate the culture of willingness.

E: Excellence
The centre subscribes to belief that individuals are inherently excellent.

R: Redress
Education, training and Development of unskilled and semi-skilled workforce in the workplace from designated and previously disadvantaged group.

STRATEGIC OBJECTIVES

1. Conduct training needs analysis in order to coordinate, provide and develop core technical competency skills development and internal capacity both at the departmental level and at the sector level.

2. To facilitate access to, mobility and progression within education, training and career pathing.

3. Provide and implement Recognition of Prior Learning (RPL) system.

4. Centrally coordinate and provide water sector skills development.

5. Enhance the quality of education and training by providing accredited learning programmes (occupational qualifications) and non-credit bearing learning programmes to address customised skills gap.

6. Conduct regular monitoring and impact assessment of learning programmes to ascertain actual impact of the delivery of various programmes.

7. Create public and private partnerships for education, training, development and skills capacity development.

8. Be accredited training and assessment centre for occupational skills development programmes.

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INFRASTRUCTURE BRANCH TRAINING CENTRE (IBTC)

QUALITY POLICY STATEMENT

The Infrastructure Branch Training Centre (IBTC) is committed to support the Department and the water sector in building capacity of its people to enable the water supply, with acceptable risk, to meet sustainable national, regional, social, economic and environmental objectives for all South African citizens.

Management shall ensure that staff is aware, trained and committed to the implementation and maintenance of a quality management system that complies with South African Qualifications Authority and with International Standard Organisation (ISO) 9001: 2015 requirements, to enhance customer satisfaction, enable competency, capture institutional memory and for continuous improvement.

IBTC Quality Policy is directed towards achieving the following objectives:

Objectives:

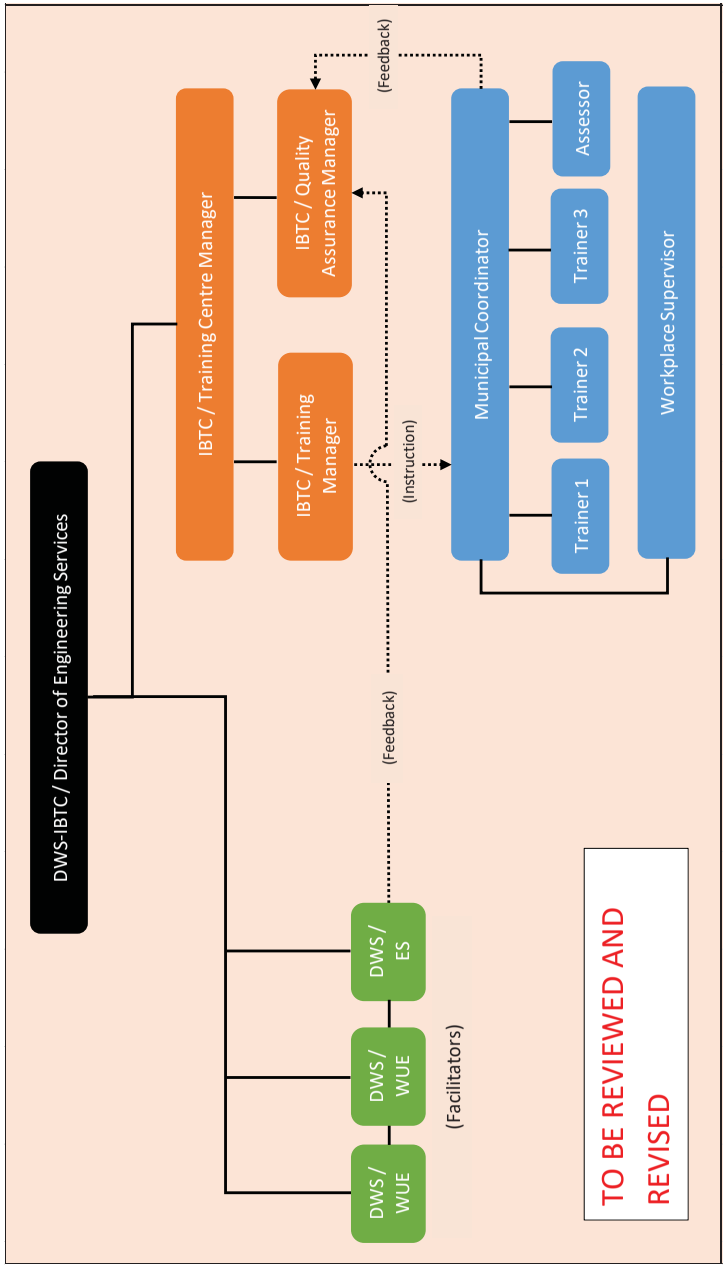
- To promote quality in achieving our Key Result Areas.
- Regulate occupational qualifications to set standards for all critical, scarce and customized training interventions and other functionaries in the water sector.
- Plan, organize, co-ordinate and manage all training activities in preparation for the Water sector.
- Liaise and co-operate with national and international training institutions to benchmark best practices.

Signed by: _____ Date: _____

Chief Director: Engineering Services

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TRAINING COORDINATING STRUCTURE



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PURPOSE

The purpose of this manual is to document standard operating procedures followed for the design, development, implementation and monitoring and evaluation of National Non-Revenue Water (NRW) training within Department of Water Supply and Sanitation (DWS): IBTC. The same process should be followed for future development of partnership programmes.

Implementation will enhance the quality of education training and development initiatives identify non-conformances and ensure continuous improvement of processes and procedures in and through IBTC.

SCOPE

The manual includes standard operation procedures for effective and efficient management of the following processes:

1. ANNUAL PROGRAMME

SOP: 1-1 Budget request and grant/funding application
SOP: 1-2 Budget and expenditure management
SOP: 1-3 Steering committee preparation/convening
SOP: 1-4 Annual programming and each group scheduling

2. MOBILIZATION AND ALLOCATION

SOP: 2-1 DWS Coordinator allocation
SOP: 2-2 Facilitator engagement, selection and allocation
SOP: 2-3 Municipality selection and criteria
SOP: 2-4 Municipality mobilization

3. VENUE & LOGISTICS

SOP: 3-1 Lecture/room preparation
SOP: 3-2 Logistics (accommodation, transport, catering)

SOP: 3-3 Training facility operation and improvement

4. MATERIALS

SOP: 4-1 Teaching/learning materials development and revision
SOP: 4-2 Teaching/learning materials preparation/printing/copying

5. YARD & EQUIPMENT

SOP: 5-1 Yard routine inspection and repair
SOP: 5-2 Equipment routine inspection, repair and control & management
SOP: 5-3 Yard/practices preparation

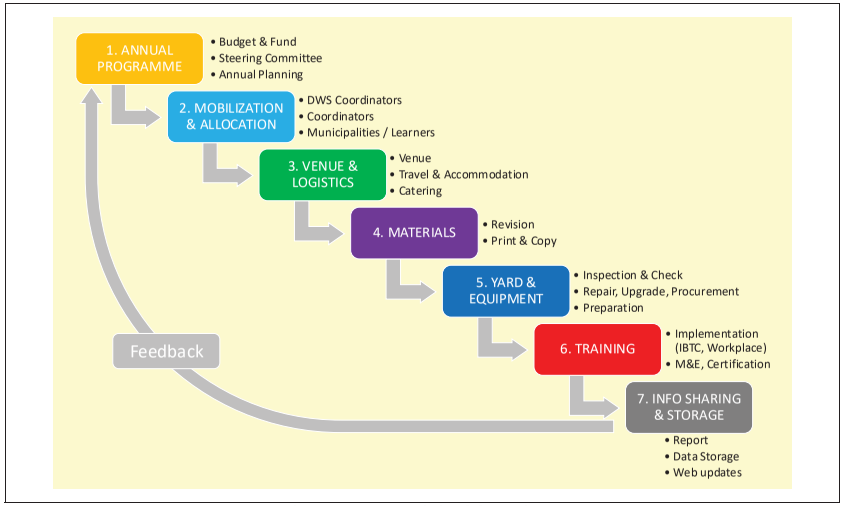
6. TRAINING

SOP: 6-1 IBTC training implementation (admin)
SOP: 6-2 Workplace training implementation / Technical
SOP: 6-3 Workplace training implementation / Logistics & Admin
SOP: 6-4 Monitoring and evaluation for improvement plan
SOP: 6-5 Certification

7. INFO SHARING

SOP: 7-1 Storage and information/data sharing
SOP: 7-2 Database (and web) development

Other supporting procedures and processes are addressed in IBTC Quality Manual.



OVERALL PROCESS FLOW

ACRONYMS ,TERMS AND DEFINITIONS

The words, acronyms or phrases below, when applied within this procedure shall assume the following meanings:	
ACRONYMS	
DDG	Deputy Director General
DMA	District Metred Area
DWS	Department of Water and Sanitation
EWSETA	Energy and Water Sector Education and Training Authority
IBTC	Infrastructure Branch Training Centre
IBOM	Infrastructure Built, Operate and Maintenance
ISO	International Organization for Standardization
JICA	Japan International Cooperation Agency
LGSETA	Local Government Sector Education and Training Authority
MISA	Municipal Infrastructure Support Agent
NRW	Non-Revenue Water
NWRI	National Water Resource Infrastructure
PFMA	Public Finance Management Act
PSC	Project Steering Committee
QMS	Quality Management System
RPL	Recognition of Prior Learning
RTC	Roodeplaat Training Centre
SALGA	South African Local Government Association
SETA	Sector Education and Training Authority
SOP	Standard Operating Procedures
TES	Technical Engineering Services
TOR	Terms of Reference
WUE	Water Use Efficiency

TERMS & DEFINTIONS	
Conformance	Activities of the organization performing to output to meet specifications.
Record	Document stating results achieved or providing evidence of Activities performed.
Document	Information and its supporting medium, e.g. paper, magnetic or electronic.
Resource	A source of supply, support or aid especially one that can be readily drawn upon when needed.
Measurement	An action of measuring something.

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Department of Water and Sanitation
INFRASTUCTURE BRANCH TRAINING CENTRE

ANNUAL PROGRAMME AND BUDGET



WATER IS LIFE - SANITATION IS DIGNITY

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NDP

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DOCUMENT TITLE	BUDGET REQUEST AND GRANT/FUNDING, EXPENDITURE MANAGEMENT	SOP CATEGORY	SOP1-1&2
REVISION NO		UNIT/SECTION RESPONSIBLE	TES IBTC

PURPOSE:

The purpose of this process is to describe the approval of external, internal funding and Budget and expenditure management project for strengthening the training capacity of IBTC on NRW.

SCOPE

This process is applicable to all DWS / South African Local Government Association (SALGA) / Water Boards / Municipalities and other entities in Water Sector.

PERFORMANCE OUTPUT

To ensure that funds are secured and managed effectively according to the Departmental Policies and Public Finance Management Act (PFMA).

REFERENCES

- DWS approved submission
- Approved Application Forms
- Approved Budget.
- Award Letter
- Signed Service Level Agreement

RESPONSIBILITY AND AUTHORITY

- Director General :DWS
- Deputy Director General: National Water Resource Infrastructure (NWRI)
- Chief Director: Engineering Services
- Director: Technical Engineering Services
- IBTC: Training Centre Manager
- SALGA

ROLE PLAYERS

- Chief Director: Engineering Services
- Director: Official Development Assistance
- Chief Director: Engineering Services
- Director: Technical Engineering Services
- Director: SALGA
- IBTC
- Municipalities

The following documentation is required for implementation of this Procedure:

- Application forms
- Approval letter

PROCESS

GRANT/FUNDING APPLICATION PROCESS

1. Conduct needs assessment.
2. Opening of funding window period by the Sector Education and Training Authority (SETA)'s.
3. Draft proposal based on the needs according to Workplace Skills Plan.
4. Finalised the proposal in consultation with the relevant internal stakeholders.
5. Submit to Chief Director (who is the member of SETA boards) for approval.
6. Follow-up with the SETA after every two weeks.
7. Update and submit any relevant information that might be required by the SETA.
8. Upon approval SETA will issue award letter.
9. Return acceptance letter signed by the Chief Director/Deputy Director General (DDG).
10. Draft and submit signed Service Level Agreement.
11. Enrolment of learners.
12. Implementation of the programme.
13. Reporting to SETA on the progress and expenditure according to SETA requirements.

DWS INTERNAL BUDGET REQUEST

1. Conduct needs assessment.
2. Cost estimates and demand plan prior to the start of the new financial year.
3. Hold meetings to finalise the list of items required.
4. Draft submission to DDG for approval.
5. Uploading the funds.
6. Draft and submit specifications or needs according to the list items and services required.
7. Request monthly expenditure report.
8. Report to the managers quarterly and annually.
9. Revise the budget during mid-term review.

DOCUMENT TITLE	**STEERING COMMITTEE PREPARATION AND CONVENING**	**SOP CATEGORY**	**SOP1-3**
REVISION NO		**UNIT/SECTION RESPONSIBLE**	**DIRECTOR TES**

PURPOSE:

The purpose of this process is to describe the approval of DWS/SALGA/Japan International Cooperation Agency (JICA) project for strengthening the training capacity of IBTC on NRW.

SCOPE

This process is applicable to all DWS /SALGA/Water Boards/ Municipalities and other entities in Water Sector.

PERFORMANCE OUTPUT

Ensure effective preparations and convening of NRW Steering Committee.

REFERENCES

- DWS approved Terms of Reference (TOR)s
- Letter of appointment of internal members of DWS.

RESPONSIBILITY AND AUTHORITY

- Director: Technical Engineering Services (TES) (DWS)
- Director: Water Use Efficiency (WUE) (DWS)
- Representative of JICA South Africa Office
- SALGA

ROLE PLAYERS

- Director: TES (DWS)
- Director: WUE (DWS)
- Director: Official Development Assistance
- Director: Water Sector Support
- Chief Director: Engineering Services
- Director: Technical Engineering Services
- Director: SALGA
- Cogta Representative
- Municipal Infrastructure Support Agent (MISA) Representative
- IBTC
- Energy and Water Sector Education and Training Authority (EWSETA)
- Local Government Sector Education and Training Authority (LGSETA)
- Municipalities

ANNEXURES AND DOCUMENTS

The following documentation is required for implementation of this Procedure:

- Terms of Reference
- Sustainability Master Plan

PROCESS

APPROVAL OF PREPARATION AND CONVENING PROCESS OF THE NATIONAL NRW TRAINING STEERING COMMITTEE

1. Finalise the draft terms of reference.
2. Seeking internal approval of terms of reference and establishment of the NRW Steering Committee
3. Identify all the role players of the Steering Committee.
4. Identify the dates for meeting for the whole year
5. Conduct consultation with other core role players both in the DWS and organisations like SALGA in the finalisation of the draft agenda.
6. Agree on rotation of the meeting venue between IBTC and SALGA.
7. Issue invites with agenda to all members of Steering Committee.
8. Agree on the secretariat for the NRW Steering Committee.
9. Minutes of the Steering Committee to be finalised within 7 working days after the steering committee meeting and sent to all role players together with action list.
10. Secretariat to follow up with role players on action list distributed to ensure that the resolutions and actions are implemented and an update on the action list is finalised and distributed to role players before the next sitting of the Steering Committee meeting.
11. Invitations, Agenda of the next Steering Committee meeting and minutes of the previous meeting are sent to role players one months before the date of the steering committee meeting.

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DOCUMENT TITLE	ANNUAL PROGRAMMING AND GROUP SCHEDULING	SOP CATEGORY	SOP1-4
REVISION NO		UNIT/SECTION RESPONSIBLE	TES IBTC

PURPOSE:

The purpose of this process is to describe the procedures to follow when scheduling various groups for NRW Training.

SCOPE

This process shall be applicable to procedures to be followed and fulfil requirements of NRW standard operating procedures.

PERFORMANCE OUTPUT

To ensure that NRW training groups are adequately planned, coordinated and implemented within a particular financial year.

REFERENCES

- DWS approved submission
- Approved Application Forms
- Approved Budget.
- Award Letter
- Allocation plans
- Signed Service Level Agreement

RESPONSIBILITY AND AUTHORITY

- Chief Director: Engineering Services
- Director: TES
- WUE
- Project Coordinator(s)
- IBTC
- SALGA

ROLE PLAYERS

- Chief Director: Engineering Services
- Director: TES
- Director: WUE
- Director: SALGA
- IBTC
- Municipalities

ANNEXURES AND DOCUMENTS

- Annual programme *Annexure SOP1-4 attached.

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Department of Water and Sanitation
INFRASTUCTURE BRANCH TRAINING CENTRE

MOBILIZATION AND ALLOCATION



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DOCUMENT TITLE	DWS COORDINATOR ALLOCATION	SOP CATEGORY	SOP2-1
REVISION NO		UNIT/SECTION RESPONSIBLE	IBTC

PURPOSE:

The purpose of this process is to describe the process of allocation and appointment of DWS coordinators for NRW training.

SCOPE

This process is applicable for each training intake.

PERFORMANCE OUTPUT

To appoint and allocate a coordinator to ensure effective communication and coordination between the participants, facilitators and other stakeholders prior to and during NRW training.

REFERENCES

N/A

RESPONSIBILITY AND AUTHORITY

- Director: WUE
- Director: TES

ROLE PLAYERS

- NRW Training Coordinator
- IBTC: Training Centre Manager
- Director: WUE

ANNEXURES AND DOCUMENTS

The following documentation is required for implementation of this Procedure:

- HR Allocation Matrix

PROCESS

1. NRW Training Coordinator to communicate the need for DWS coordinators to the Director: WUE and Director: TES including the following information:
   - Training schedule
   - Mobilization schedule
   - Details of participating municipalities
2. Role-players to identify DWS coordinators based on the information above
3. NRW Training Coordinator to communicate and confirm availability of DWS coordinators identified in 2 above.
4. 2 and 3 above should be repeated until the availability of all coordinators have been confirmed.
5. NRW Training Coordinator to update the HR Allocation Matrix once availability of DWS coordinators has been confirmed.
6. NRW Training Coordinator to distribute the updated HR Allocation Matrix to project stakeholders.

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DOCUMENT TITLE	**FACILITATOR ENGAGEMENT, SELECTION AND ALLOCATION**	**SOP CATEGORY**	**SOP2-2**
REVISION NO		**UNIT/SECTION RESPONSIBLE**	**WATER USE EFFICIENCY**

PURPOSE:

The purpose of this process is f to describe procedures for engagement of Facilitators or the facilitator engagement selection and allocation to participate in DWS/SALGA/JICA NRW training programme.

SCOPE

This process is applicable to procedures to be followed in the facilitator engagement selection and allocation to participate on NRW training programme.

PERFORMANCE OUTPUT

To ensure facilitator engagement, selection and allocation is attended before the NRW training programme commence.

REFERENCES

- Criteria of the Facilitators
- Confirmation list of Facilitators
- Nomination Letters of Facilitators
- Approval letters of Facilitator from their institution
- NRW Training Materials
- Facilitators Allocation Matrix

RESPONSIBILITY AND AUTHORITY

- Director: Water Use Efficiency
- IBTC
- SALGA

ROLE PLAYERS

- Municipalities
- DWS
- SALGA

ANNEXURES AND DOCUMENTS

- List of Facilitators
- Criteria of the Facilitators
- Nomination Letters
- Approvals
- Allocation matrix
- Training Materials

PROCESS

1. Communicate and share the NRW annual training programme and schedule with Facilitators. This annual programme will be approved by Project Steering Committee (PSC)
2. Check and confirm the availability of facilitators, 6 weeks before the training date. Written confirmation by the facilitators
3. Develop a draft facilitator allocation matrix.
4. A two-hour workshop to confirm and finalise the Facilitators allocation matrix, a month before the training.
5. Send the updated training materials (presentations) to the facilitators.
6. Send the final Facilitators allocation matrix to IBTC, four weeks before the training.
7. IBTC prepare travel and accommodation for Facilitators.
8. IBTC confirm with facilitators regarding the booking arrangements.

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DOCUMENT TITLE	**MUNICIPALITY SELECTION CRITERIA**	**SOP CATEGORY**	**SOP2-3**
REVISION NO		**UNIT/SECTION RESPONSIBLE**	**WATER USE EFFICIENCY**

PURPOSE:

The purpose of this process is to describe the procedures for the selection of municipalities to participate in DWS/SALGA/JICA NRW training programme**.**

SCOPE

This process is applicable to procedures to be followed in the municipality selection and criteria to participate in the NRW training programme.

PERFORMANCE OUTPUT

To strengthen the technical capacity within municipalities to tackle challenges of water losses, NRW and water use efficiency.

REFERENCES (legislative/policy and document referrals applicable to your procedure)

- Status Report on Water Losses within the 8 Large water supply systems
- Status of NRW in South Africa
- Baseline Status and Selection criteria report
- Nomination Letters.
- NRW Training Programme Outline
- NRW Training Programme Materials/Modules

RESPONSIBILITY AND AUTHORITY

- Director: Water Use Efficiency
- DWS Provincial offices
- SALGA Coordinators
- IBTC

ROLE PLAYERS (stakeholders/role players to the process/procedure)

- Municipalities
- Director: SALGA
- IBTC

ANNEXURES AND DOCUMENTS

The following documentation is required for implementation of this Procedure:

- Nomination Letters
- Project document and training programme outline *Annexure SOP2-3 attached.
- Email municipal Invites

PROCESS

1. Literature review of NRW documents and reports to enable development of Selection Criteria, 3 months before start of training schedule.
2. Select the municipality as per the selection Criteria developed, 2 months before start of training schedule.
3. Draw up the selected municipalities' spreadsheet and distribute to project members for inputs.
4. Sent emails to introduce the NRW training to selected municipalities for buy in, 2 months before start of training schedule.
5. Schedule meeting/workshops to selected municipalities to outline and orientate them on the scheduled NRW training.

DOCUMENT TITLE	MUNICIPALITY MOBILIZATION	SOP CATEGORY	SOP2-4
REVISION NO		UNIT/SECTION RESPONSIBLE	WATER USE EFFICIENCY

PURPOSE:

The purpose of this process is to mobilize the municipalities to participate in the NRW training programme.

SCOPE

This process is applicable to procedures to be followed in the mobilization of municipalities to participate in the NRW training programme.

PERFORMANCE OUTPUT

To ensure adequate technical capacity for municipal officials to tackle challenges of water losses, NRW and water use efficiency.

REFERENCES

- NRW Training materials
- DMA selection criteria
- Municipality maps
- Municipalities drawings
- Municipal photos.
- Billing Data

RESPONSIBILITY AND AUTHORITY

- Director: Water Use Efficiency
- IBTC
- DWS Provincial
- SALGA Coordinators

ROLE PLAYERS

- Municipalities
- IBTC
- WUE
- SALGA

ANNEXURES AND DOCUMENTS

- Nomination letters *Annexure SOP2-4-1 attached.
- Agenda, project document, training programme outline *Annexure SOP2-4-2 attached.
- Approval letter for municipality to participate in NRW training
- Candidate list of official to attend training
- Drawings, maps and billing data of municipality
- Email municipal invites

PROCESS

1. Nomination letters signed by the Designated official (Chief Directorate Infrastructure or D: WUE) and send to selected municipalities introducing the NRW training, three months before the training.
2. Arrange meetings/workshops with the selected municipalities to further outline the aspects and requirements of NRW training, two months before the training.
3. Confirmation of participating officials in the NRW training by the selected municipalities, a month before the training: this entails the following:
   - Municipalities to select the training site-based on DMA selection criteria.
   - List of candidates nominated to attend the training and the Team Leader.
4. The list of Candidates forwarded to IBTC a month before training for logistics.
5. IBTC confirm all the necessary logistics with candidates two weeks before the training.

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Department of Water and Sanitation
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VENUE AND LOGISTICS



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DOCUMENT TITLE	LECTURE ROOM PREPARATION	SOP CATEGORY	SOP3-1
REVISION NO		UNIT/SECTION RESPONSIBLE	IBTC QMS

PURPOSE:

The purpose of this process is to give guidance to IBTC officials and to describe the process or procedure to be followed for preparation of lecture rooms for National NRW training, workshops, meeting or any other related sessions that are to be held at IBTC.

SCOPE

This process is applicable to NRW Training.

PERFORMANCE OUTPUT

To ensure efficient coordination and a conducive environment for National NRW Training.

REFERENCES

- IBTC approved Quality Management System (QMS) document
- IBTC venue maintenance process

RESPONSIBILITY AND AUTHORITY

- Deputy Director: Training Centre Manager
- Deputy Director: Training Manager(s)
- Assistant Director: Quality Assurer
- Assistant Director: Chief Training Coordinator
- Principal Administration Clerk (Administrator)

ROLE PLAYERS

- Deputy Director: Training Centre Manager
- Deputy Director: Training Manager(s)
- Assistant Director: Quality Assurer
- Assistant Director: Chief Training Coordinator
- Principal Administration Clerk (Administrator)

ANNEXURES AND DOCUMENTS

The following documentation is required for implementation of this procedure:

- Venue booking form *Annexure SOP3-1 attached.
- Venue checklist (room equipment) form *Annexure SOP3-2 attached.
- Request for electrical support/ assistance form *Annexure SOP3-3 attached.

PROCESS

LECTURE ROOM PREPARATION

1. Receives the request for venue booking via e-mail / telephonically.
2. Sends the venue booking form to the coordinator to complete.
3. The coordinator completes the venue booking form for securing of the venue.
4. Administrator receives the completed venue booking form, signed and approved by the Training Centre Manager.
5. Confirmation of venue booking is sent via e-mail to the coordinator.
6. Administrator checks the venue and equipment's in the asset register if they are all in good working condition before the commencement of the training.
7. Any damaged equipment(s) are reported to the relevant Head of Section (carpentry, electrical) at Construction East in writing via e-mail/ telephonically.
8. Administrator completes the electrical support / assistance form for all electrical requests.
9. The Head of Section confirm the date as to when the matter will be attended to or repairs will be done.
10. Once the repairs have been done, the administrator checks again to verify.
11. The administrator and the coordinator complete the venue checklist (room equipment) form on the first day and on the last day of the training.

DOCUMENT TITLE	LOGISTICS (ACCOMMODATION, TRANSPORT, CATERING)	SOP CATEGORY	SOP3-2
REVISION NO		UNIT/SECTION RESPONSIBLE	IBTC

PURPOSE:

The purpose of this process is to describe logistical arrangement prior the training on NRW Training programme.

SCOPE

This process is applicable to all DWS /SALGA/Water Boards/ Municipalities and other persons participating on the NRW Training programme as a learner or facilitator.

PERFORMANCE OUTPUT

To ensure effective and efficient logistical arrangement on NRW Training programme attendance.

REFERENCES

- Signed agreement between DWS and JICA

RESPONSIBILITY AND AUTHORITY

- Deputy Director General: Infrastructure Built, Operate and Maintenance (IBOM)
- Chief Director: Engineering Services
- IBTC
- SALGA
- Municipalities

ROLE PLAYERS

- Deputy Director General: IBOM
- Chief Director: Engineering Services
- Director: Technical Engineering Services
- SALGA
- IBTC
- Municipalities

ANNEXURES AND DOCUMENTS

The following documentation is required for implementation of this Procedure:

- Application forms
- Approval letter

PROCESS

1. Project Coordinator send the invitation to the Facilitator to partake on training programme by indicating their availability according to the schedule.
2. Follow up the available facilitator to complete the travel form and send back
3. Submit the travel form to the Director: TES for approval
4. Send the approved travel forms, VA 2, approved submission to the Supply Chain Management office in Standerton for processing.
5. Make follow up and update the travellers regularly.
6. Ensure by checking with Supply Chain Management office if the traveller receives the confirmations.
7. Parallel to travelling arrangement, book the catering at Roodeplaat Training Centre (RTC) according to the number of the attendees.
8. If catering service not available at RTC:
   a. Request three quotations.
   b. Complete the VA 2, send it to SCM office in Standerton together with three quotations and SBD forms for processing.
   c. Receive the Purchase Order for catering and liaise with the provider on serving times.
   d. Monitor the provider.

DOCUMENT TITLE	IBTC ACCOMMODATION FACILITY	SOP CATEGORY	SOP3-3
REVISION NO		UNIT/SECTION RESPONSIBLE	IBTC FACILITIES MANAGEMENT

PURPOSE:

The purpose of this process is to describe the process to be used when making use of IBTC accommodation from reservations to check-out.

SCOPE

This process is applicable to all DWS /SALGA/Water Boards/ Municipalities and other entities in Water Sector.

PERFORMANCE OUTPUT

To create an efficient and simple process from reservations to check-out to ensure client satisfaction.

REFERENCES

- None

RESPONSIBILITY AND AUTHORITY

- Training Centre Manager

ROLE PLAYERS

- Training Centre Manager
- Training Manager
- Reception Clerk
- Caretaker
- Security personnel
- Construction East Contract Manager
- Construction East Maintenance team
- Occupants

ANNEXURES AND DOCUMENTS

The following documentation is required for implementation of this Procedure:

- Email request or Booking form.
- Check-in register
- Check-out register
- Disclaimer form for damages/theft to property.
- Maintenance request form.
- Incidence register.
- Incidence reporting form.
- Asset register.
- Information booklet.

PROCESS

APPROVAL OF IBTC ACCOMMODATION FACILITY USAGE

1. Email request/booking form is received by reservation clerk.
2. Booking form to include comprehensive learner information and emergency contact details.
3. The reservation clerk checks availability of accommodation in the Accommodation Calendar based on the dates requested, the period of stay and the number of people.
4. Confirmation of booking is made via email. If emails are not working telephonic confirmation is made.
5. The rooms are checked and prepared before check-in. Preparation of rooms entails:
   - Vacuuming/dusting/polishing of room and furnishings.
   - Washing and sanitising of bathroom facilities and furnishings.
   - Dusting of beds and changing of linen.
   - Checking of equipment/electrical/plumbing in the room.
   - Checking of items against asset register.
6. On arrival for check-in the check-in register is signed.
7. The Check-in clerk is to explain the rules/important information of the facility to the occupant and to inform the occupant of the asset register which is found in each room.
8. The Asset list/disclaimer is signed by the occupant and the room key is allocated and the occupant is escorted to their allocated room.
9. An information booklet should be available in each room detailing:
   - Map of the facility and contact details.
   - An asset registers of all items in the room with a disclaimer that missing/damaged items will be billed to the occupant/Organisation.
   - Emergency/incidents procedures with contact details.
   - Reporting of Maintenance issues with contact details.
   - Evacuation procedures.
10. Should there be any maintenance issues they are reported to the caretaker immediately as detailed in the information booklet.
11. The maintenance issues are then reported by the caretaker to IBTC office/Management immediately.
12. IBTC office reports the maintenance issue to Construction East telephonically or via email.
13. IBTC administrator completes the relevant documentation for maintenance to be conducted.
14. Emergencies/Incidents are reported to the caretaker as detailed in the information booklet.
15. The incident is then reported to IBTC office/Management and security personnel immediately.
16. The matter is reported to SAPS and docket number is obtained if necessary.
17. The docket number is submitted to the DWS security section for dealing with the matter further.
18. On the day of check-out the room is checked against the asset register by the caretaker.
19. Once rooms have been checked and all is in order the check-out register is signed and dated and the room key is returned to check-out clerk.
20. The IBTC Check-out clerk returns the key to the key safe.
21. Should theft/damages be found by the occupant the process as outlined in the disclaimer will apply.
22. Rooms are prepared for next intake as outlined under No 4.

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Department of Water and Sanitation
INFRASTUCTURE BRANCH TRAINING CENTRE

MATERIALS





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DOCUMENT TITLE	TEACHING/LEARNING MATERIALS DEVELOPMENT /REVISION	SOP CATEGORY	SOP 4-1
REVISION NO		UNIT/SECTION RESPONSIBLE	IBTC

PURPOSE:

The purpose of this process is to describe the procedure for preparation of teaching/learning materials development/revision for NRW training.

SCOPE:

This process is applicable to National NRW Training.

PERFORMANCE OUTPUT:

To ensure efficient and effective training session for National NRW Training.

REFERENCES:

RESPONSIBILITY AND AUTHORITY

- Director WUE
- DWS Coordinator,
- Quality Assurer
- Administrator

ROLE PLAYERS

- WUE Director
- DWS Coordinator
- Quality Assurer
- Administrator

ANNEXURES AND DOCUMENTS

The following documentation is required for implementation of this procedure:

- Programme outline
- Presentations
- Textbook

PROCESS

1. NRW Training Coordinator upload the updated training materials, such as programme outline, presentations, and textbook to a cloud server 30 days before the training and inform of it to project stakeholders by email.
2. Facilitators, who are in HR allocation matrix access the cloud server, download all the training materials and read it carefully. All facilitators who are in HR allocation matrix, inform if all training materials are appropriate in the viewpoint of your facilitation by email.
3. If a facilitator has some ideas to improve the training materials, revise the materials then, send a draft of revised training materials by email to NRW Training Coordinator and WUE director 25 days before the training.
4. NRW Training Coordinator and WUE director should review the revised training material which received from a facilitator. The revised training materials to be approved within 72 hours by WUE director. WUE director will send an email that shows the revision are approved.
5. After the approval of the WUE director, NRW Training Coordinator replace the old version to new version of the training materials and proceed to preparation of the training materials.
6. Preparation, printing, copying of teaching/learning materials is done 10 days before the training.

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DOCUMENT TITLE	**TEACHING/LEARNING MATERIALS PREPARATION/ PRINTING/COPYING**	**SOP CATEGORY**	**SOP4-2**
REVISION NO		**UNIT/SECTION RESPONSIBLE**	**IBTC**

PURPOSE:

The purpose of this process is to describe the procedure for preparation of teaching/learning materials in preparation for National NRW training.

SCOPE

This process is applicable preparation of learning material for National NRW Training.

PERFORMANCE OUTPUT

To ensure learning materials are prepared in a user friendly and logical sequence.

REFERENCES

RESPONSIBILITY AND AUTHORITY

- Assistant Director: Quality Assurer
- Administrator

ROLE PLAYERS

- Assistant Director: Quality Assurer
- Administrator

ANNEXURES AND DOCUMENTS

The following documentation is required for implementation of this procedure:

- Programme outline
- Presentations
- Textbook

PROCESS

TEACHING/LEARNING MATERIALS PREPARATION/PRINTING/COPYING

1. Preparation, printing, copying of teaching or learning materials is done 10 days before the training.
2. Prepare and confirm the availability for the mini files, toners and printing papers.
3. Receives the teaching or learning materials (programme outline, presentations and textbook.
4. Print and copy teaching or learning materials (programme outline, presentations and textbook) double sided in colour.
5. Separate presentations and staple individually.
6. Use colour paper dividers to separate each component.
7. Put the teaching or learning materials (programme outline, presentations and textbook) inside the mini files prepared for each learner.
8. Print and copy additional programme outline and presentations for the facilitator(s), DWS coordinators and other stakeholders/participants in the programme.

Standard Number of Copy in each Group (Cycle)

Component	Programme Outline	Presentations	Textbook
Learners	20	20	20
Facilitator(s), DWS Coordinators and other stakeholders/participants	15	15	-
Total	**45**	**40**	**20**

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Department of Water and Sanitation
INFRASTUCTURE BRANCH TRAINING CENTRE

YARD AND EQUIPMENT





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DOCUMENT TITLE	YARD AND EQUIPMENT ROUTINE INSPECTION, REPAIR AND CONTROL MANAGEMENT	SOP CATEGORY	SOP5-1&2
REVISION NO		UNIT/SECTION RESPONSIBLE	IBTC

PURPOSE:

The purpose of this process is to describe the process of operations and maintenance of the NRW Training Yard.

SCOPE

This process should be on-going with special attention required in preparation for, during and directly after utilisation of the facilities.

PERFORMANCE OUTPUT

To maintain and ensure the serviceability of the NRW Training Yard and associated facilities.

REFERENCES

Maintenance Manual for the Training yard in IBTC

RESPONSIBILITY AND AUTHORITY

- IBTC: Training Centre Manager
- NRW Training Coordinator

ROLE PLAYERS

- NRW Training Coordinator
- IBTC: Maintenance Manager
- Facilitators

ANNEXURES AND DOCUMENTS

The following documentation is required for implementation of this Procedure:

- Yard Maintenance Manual *Annexure SOP5-1 attached.
- Equipment Maintenance Manual *Annexure SOP5-2 attached.

PROCESS

ROUTINE MAINTENANCE

1. IBTC: Maintenance Manager should ensure that the Training Yard is clean and accessible on a daily basis.
2. IBTC: Maintenance Manager to inspect and perform tests on the infrastructure as per the Maintenance Manual for the Training yard in IBTC.
3. Any damaged or defective infrastructure must be reported to IBTC: Training Centre Manager
4. IBTC: Maintenance Manager and IBTC: Training Centre Manager to prepare repair/replacement strategy:
   a. In-house, no procurement required.
   b. In-house, procurement of parts, equipment and/or tools required.
   c. Appoint a contractor to repair/replace defect.
5. Implement the repair/replacement strategy and thoroughly test the infrastructure afterwards.
6. Facilitators and IBTC: Training Centre Manager to update the Maintenance Manual for the Training yard in IBTC once repair/replacement is accepted.

i. TRAINING AT IBTC

1. IBTC: Asset Management, NRW Training Coordinator and Facilitators to ensure an asset list is signed when equipment is removed from storage.
2. Facilitators to test and verify the condition of the equipment 2 days prior to practical training:
   a. Ensure that the equipment and accessories' batteries are fully charged 2 days prior to training.
   b. Ensure that sufficient backup batteries are available for equipment and accessories that do not have rechargeable batteries 2 days.
3. Any damaged or defective equipment, accessories or batteries must be reported to IBTC: Training Centre Manager.
4. Facilitators to remove safeguard and return equipment and accessories as required for practical training.
5. Facilitators are to assist participants when using equipment and accessories during practical training to avoid damage and incorrect use.

Facilitators to stored equipment in the correct storage containers/bags sleeves and return to the IBTC storage facility in preparation for workplace training.

ii. TRAINING AT WORKPLACE

1. Facilitators and DWS Coordinators to identify equipment requirements for workplace training.
2. IBTC: Asset Management, NRW Training Coordinator, DWS Coordinators and Facilitators to ensure an asset list is signed when equipment is removed from storage.
3. DWS Coordinators to test and verify the condition of the equipment 2 days prior to workplace training:
   a. Ensure that the equipment and accessories' batteries are fully charged 2 days prior to training.

b. Ensure that sufficient backup batteries are available for equipment and accessories that do not have rechargeable batteries 2 days.

4. Any damaged or defective equipment, accessories or batteries must be reported to IBTC: Training Centre Manager.
5. DWS Coordinators to remove, transport safeguard and return equipment and accessories as required for workplace training.
6. Facilitators are to assist participants when using equipment and accessories during practical training to avoid damage and incorrect use.
7. Facilitators to transport and return equipment to the DWS Coordinator for safekeeping.
8. DWS Coordinators to transport and return equipment to the IBTC storage facility.
9. IBTC: Asset Management to control removal and return of equipment.

DOCUMENT TITLE	**TRAINING YARD PRACTICES PREPARATION**	**SOP CATEGORY**	**SOP5-3**
REVISION NO		**UNIT/SECTION RESPONSIBLE**	**IBTC**

PURPOSE:

The purpose of this process is to describe the process of preparing Training Yard to conduct practical learning aspect for NRW training.

SCOPE

This process should be on-going with special attention required in preparation for, during and directly after utilisation of the facilities.

PERFORMANCE OUTPUT

To maintain and ensure the serviceability of the NRW Training Yard and associated facilities.

REFERENCES

Maintenance Manual for the Training yard in IBTC

RESPONSIBILITY AND AUTHORITY

- IBTC: Training Centre Manager
- NRW Training Coordinator

ROLE PLAYERS

- NRW Training Coordinator
- IBTC: Maintenance Manager
- Facilitators

ANNEXURES AND DOCUMENTS

The following documentation is required for implementation of this Procedure:

- Maintenance Manual for the Training yard in IBTC

PROCESS

i. PRE-TRAINING

1. Facilitators to test and verify the condition of the infrastructure 2 days prior to practical training following the Maintenance Manual for the Training yard in IBTC.
2. Any damaged or defective infrastructure must be reported to IBTC: Training Centre Manager
3. IBTC: Maintenance Manager and IBTC: Training Centre Manager to prepare repair/replacement strategy:
   a. In-house, no procurement required.
   b. In-house, procurement of parts, equipment and/or tools required.

c. Appoint a contractor to repair/replace defect.

4. Implement the repair/replacement strategy and thoroughly test the infrastructure afterwards.
5. Facilitators and IBTC: Training Centre Manager to update the Maintenance Manual for the Training yard in IBTC once repair/replacement is accepted.

ii. DURING TRAINING

1. Facilitator to ensure that participants are briefed on safety.
2. Facilitators to ensure that start-up procedures are followed as per the Maintenance Manual for the Training yard in IBTC.
3. Facilitators to monitor the infrastructure throughout and implement and emergency shut off in case of any failures or emergency.
4. Facilitators to soft lock the facilities once practical training is completed.

iii. AFTER TRAINING

1. Facilitators ensure that the shut sown procedure in line with the Maintenance Manual for the Training yard in IBTC is followed.

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TRAINING



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DOCUMENT TITLE	IBTC TRAINING IMPLEMENTATION (ADMIN)	SOP CATEGORY	SOP 6-1
REVISION NO		UNIT/SECTION RESPONSIBLE	IBTC

PURPOSE:

The purpose of this process is to outline the administration process on National NRW Training before, during and after the training.

SCOPE

This process is applicable to all DWS /SALGA/Water Boards/ Municipalities and other entities in Water Sector.

PERFORMANCE OUTPUT

To ensure smooth running and implementation of the National NRW Training.

REFERENCES

- Annual Implementation Schedule
- Approved List of facilitators, coordinators and learners
- Budget spread sheet
- VA2.

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RESPONSIBILITY AND AUTHORITY

- DDG: NWIR
- Chief Director : Engineering Services
- Director: SALGA

ROLE PLAYERS

- Director: Engineering Services
- Directors : Water Use Efficiency
- IBTC training Centre Manager
- IBTC training Manager
- Municipalities

ANNEXURES AND DOCUMENTS

The following documentation is required for implementation of this Procedure:

- Information Note *Annexure SOP6-1-1 attached.
- Code of Contact *Annexure SOP6-1-2 attached.
- Application forms
- Name list
- VA2

PROCESS

1. Receive annual planning schedule from the task team.
2. Receive confirmed date and schedule per training
3. Receive confirmed list of delegates 2 weeks prior training.
4. Send forms to delegates to complete required information.
5. Capture information of delegates on the spread sheet.
6. Submit delegates completed forms to Director for approval.
7. Submit delegates sign forms to SCM for arrangement of transport, flights, and accommodation.
8. Follow-up with SCM to ensure that bookings and arrangements are done.
9. Facilitate printing of learning material
10. Prepare training rooms for ensure readiness before the training.
11. Prepare readiness of the training yard.
12. Administer attendance register during the training.
13. Issuing and analysing of evaluation forms by Quality assuror.
14. Printing and issuing of certificates.
15. Ensure all external vendors are paid.
16. Preparation and submission of training report by training manager.

DOCUMENT TITLE	WORKPLACE TRAINING IMPLEMENTATION /TECHNICAL (PILOT DMA SELECTION)	SOP CATEGORY	SOP6-2
REVISION NO		UNIT/SECTION RESPONSIBLE	IBTC TECHNICAL TEAM

PURPOSE:

The purpose of this process is to describe the procedure to select pilot DMA to maximize the output of the workplace training of the program.

SCOPE

This process is applicable to all participating Municipalities undergoing NRW training.

PERFORMANCE OUTPUT

To ensure all participants experience required menu: identify the problem, explain to their managers, fix and confirm the result effectively in the WP within the time manner.

REFERENCES

- The training presentation material
- The training textbook

RESPONSIBILITY AND AUTHORITY

- DWS facilitators in charge of the participate Municipality
- Municipal facilitators in charge of the participate Municipality

ROLE PLAYERS

- DWS facilitators in charge of the participate Municipality.
- Municipal facilitators in charge of the participate Municipality.
- IBTC (Technical team)
- The participate municipality team

ANNEXURES AND DOCUMENTS

The following documentation is required for implementation of this Procedure:

- Criteria for workplace DMA and major steps *Annexure SOP6-2 attached.

PROCESS

I. Communicate with the Municipality (Before mobilization)

1. Send the Pilot DMA check list to the Municipality (DWS Coordinator)
2. Select the three candidate pilot sites and send information to DWS (Municipality)
3. Check and prioritise the candidate site (DWS Coordinator, Facilitators)
4. Re-submit the information to DWS if the requirement does not fit (Municipality)

II. Prepare for the equipment (Before mobilization)

1. Prepare and share the required equipment (DWS Coordinator, IBTC Technical Team)
2. Check the battery level, or charge the batteries (DWS Coordinator, IBTC Technical Team)
3. Prepare the tools for the equipment to measure the flow rate/pressure (DWS Coordinator, IBTC Technical Team)
4. Prepare the PPE for the premeasurement work (DWS Coordinator, IBTC Technical Team)
5. Write the name to all the equipment and tools (DWS Coordinator, IBTC Technical Team)
6. Load the equipment and tools in the car to bring Municipality (DWS Coordinator, IBTC Technical Team)

III. Check the site, start pre-logging (On the site: mobilization)

1. Drive and check the candidate site with the Municipality team (DWS Coordinator, Facilitator)
2. Select the most suitable site for training purpose (DWS Coordinator, Facilitator)
3. Close the boundary valves (Municipality)
4. Start pre-logging (at least for 24 hours) (DWS Coordinator, Facilitator)
5. Confirm the data which has retrieve properly or not (DWS Coordinator, Facilitator)
6. Collect the logger (DWS Coordinator, Facilitator)

IV. Pre-data analysis (After mobilization)

1. Check the SIV (DWS Coordinator, Facilitator)
2. Check the night-time flow rate roughly(m3/h) (DWS Coordinator, Facilitator)
3. Check the meter size (DWS Coordinator, Facilitator)
4. Check the pulse interval (DWS Coordinator, Facilitator)
5. If the meter size is not proper, try to change the pilot area size.
6. If the pulse interval is not proper, try to change the pulsar

V. Check the equipment (After the mobilization)

1. Check the battery level, or charge the batteries (DWS Coordinator, IBTC Technical Team)
2. Check the equipment and tools of its proper function (DWS Coordinator, IBTC Technical Team)
3. Store the equipment and tools to the storage (DWS Coordinator, IBTC Technical Team)

DOCUMENT TITLE	CERTIFICATION	SOP CATEGORY	SOP 6-4
REVISION NO		UNIT/SECTION RESPONSIBLE	IBTC

PURPOSE:

The purpose of this process is to describe certification for participants on NRW Training programme.

SCOPE

This process is applicable to all DWS /SALGA/Water Boards/ Municipalities and other persons participating on the NRW Training programme as a learner or facilitator.

PERFORMANCE OUTPUT

To ensure effective and efficient certification process on NRW Training programme attendance.

REFERENCES (legislative/policy and document referrals applicable to your procedure)

- N/A

RESPONSIBILITY AND AUTHORITY

- Deputy Director General: IBOM
- Chief Director: Engineering Services
- IBTC
- SALGA
- Municipalities

ROLE PLAYERS

- Deputy Director General: IBOM
- Chief Director: Engineering Services
- Director: Technical Engineering Services
- SALGA
- IBTC
- Municipalities

ANNEXURES AND DOCUMENTS

- Certificate sample *Annexure SOP6-4 attached.

PROCESS

NRW ATTENDANCE CERTIFICATE

1. Compile a certificate register of all certificates as per attendance register.
2. The training Manager/training coordinator verifies attendee's names, identity number and other relevant particulars.
3. Each certificate is allocated a certificate number by Quality Assuror/admin.
4. The training coordinator prints the record indicating certificate number against learner whom the certificate is issued.
5. Training manager checks and confirms certificate register.
6. Training coordinator prints out certificates.
7. Training coordinator submits printed certificates for signatures.
8. Certificates are then registered on control register for issuing purposes.
9. Copy of certificates and control register are submitted to Quality Assurer by training coordinator.
10. Quality assurer ensures safe keeping of all submitted documents.

DOCUMENT TITLE	MONITORING AND EVALUATION PROCESS	SOP CATEGORY	SOP 6-5
REVISION NO		UNIT/SECTION	IBTC

PURPOSE

The purpose of this procedure is to describe the process to follow to accurately report, evaluate success and challenges for all components of NRW training programme for the purpose of continuous improvement.

SCOPE

The process is applicable to monitoring and evaluation activities of NRW training programme coordinated and facilitated through IBTC.

PERFORMANCE OUTPUT

Measure the quality, effectiveness, impact and relevance of training output for continuous improvement.

REFERENCES

- ISO 9001: 2015
- Skills Development Act
- Skills Development Levies Act.

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RESPONSIBILITY AND AUTHORITY

- NRW Project Manager
- Training Managers
- Directorate: WUE

ROLE PLAYERS

- Training Manager
- Stands for Assistant Director: Quality Assurer
- Directorate: WUE

ANNEXURES AND DOCUMENTS

- Learner evaluation/ feedback forms *Annexure SOP6-5 attached.
- Monitoring and evaluation report (theory and practical).
- Daily Reports (workplace)

PROCESS

Is conducted in the follow ways:

Learner feedback forms

1 Learners are issued with a feedback form at the end of the training.
2 Analyse feedback received.
3 Capture and analyse feedback questionnaires on template.
4 Compile a monitoring report and consolidate on template for feedback of both theory and practical.
5 Circulate and share report for the purpose of discussion at PSC meeting.

Workplace Observation

1. Compile daily report.
2. Submit report. (Daily/weekly) to project manager.
3. Compile summary report on daily or weekly observation and/or findings.
4. Circulate and share report for the purpose of discussion at PSC meeting.

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DOCUMENT TITLE	STORAGE AND INFORMATION/DATA SHARING	SOP CATEGORY	SOP 7-1
REVISION NO		UNIT/SECTION	IBTC / DWS ICT SECTION

PURPOSE

The purpose of this procedure is to describe the process to compile and store the information and data used in the NRW training programme and to share them with all the stakeholders involved.

SCOPE

The process is applicable to compile and archive the information and data used in the NRW training programme and to share them by using database storage in the DWS serve or cloud computing.

PERFORMANCE OUTPUT

To ensure the certainty, safety and convenience of the storage and information/data sharing within all the participants of the NRW training programme such as DWS, IBTC and municipalities.

REFERENCES

- ISO 9001: 2015

RESPONSIBILITY AND AUTHORITY

- NRW Project Manager
- IBTC Training Centre Managers
- Directorate: WUE
- ICT Manager (DWS)

ROLE PLAYERS

- IBTC Training Manager
- Directorate: WUE
- NRW Training Coordinator
- Facilitators
- ICT Development Officer (DWS)

ANNEXURES AND DOCUMENTS

- List of archives
- Manual for the development of Database (Directorate: IT)

PROCESS

Archiving

1. All the technical materials and administration information are sent to the training Manage of IBTC.
2. All the technical materials and administration information are compiled into the categorised folders by the training manage of IBTC.
3. The categorised folders are archived into the database server of the DWS or cloud computing.
4. (*In case of the database of the DWS) The categorised folders are regularly managed and checked by the PIC in the ICT sector.

Sharing

1. ID and password for accessing the database or cloud computing are sent to the applicants by the training manager of IBTC.
2. The applicants are able to access to the database or cloud computing by inputting the ID and password.
3. The applicants are also able to download the information/data on demand.
4. The training manager regularly conduct a questionnaire survey to improve the storage and information/data sharing.

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DOCUMENT TITLE	DATABASE (AND WEB) DEVELOPMENT	SOP CATEGORY	SOP 7-2
REVISION NO		UNIT/SECTION	IBTC / DWS IT SECTION

PURPOSE

The purpose of this procedure is to develop the database in DWS server or cloud computing and website development.

SCOPE

The process is applicable to develop the database in DWS server or cloud computing and website of the national NRW training course.

PERFORMANCE OUTPUT

To ensure the user-friendliness, convenience and accessibility of database in DWS server or cloud computing and website of the national NRW training course.

REFERENCES

- ISO 9001: 2015

RESPONSIBILITY AND AUTHORITY

- NRW Project Manager
- IBTC Training Centre Managers
- Directorate: WUE
- ICT Manager (DWS)

ROLE PLAYERS

- IBTC Training Manager
- Directorate: WUE
- NRW Training Coordinator
- ICT Development Officer (DWS)
- ICT Manager (IBTC)

ANNEXURES AND DOCUMENTS

- List of archives
- Manual for the development of Database (Directorate: IT)
- Manual for the development of Website (Directorate: Communication)

PROCESS

Database

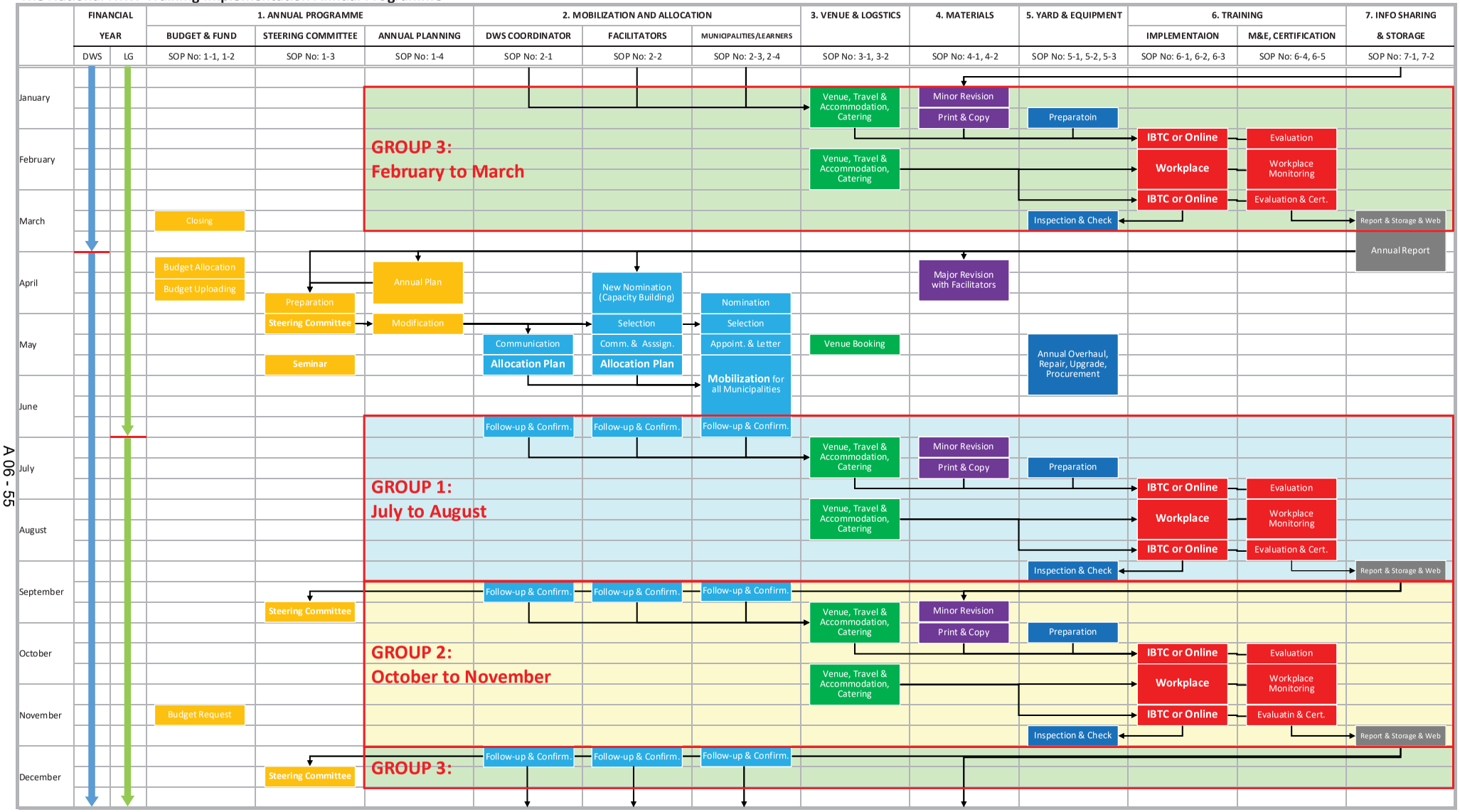
1. Information/Data to be input in the Database is sent to the ICT Development Officer of DWS from ICT manager of IBTC.
2. ICT manager of IBTC sends some requirement how to add and modify the database.
3. The new structure of the database is designed by ICT development Officer and is sent to the ICT manager of IBTC for the approval.
4. ICT Development Officer of DWS adds and modifies the Database as per the requirement from the ICT Manager of IBTC.

Website

1. (Shor-term basis) The latest news and information on the national NRW training programme are updated regularly by the IT manager of IBTC. Any additional and modified portions of the website are reviewed and approved by the ICT manager of DWS.
2. (Middle and Long-term basis) All the contents in the Website is regularly renewed and modified by the IT manager of IBTC. Any additional and modified portions of the website are reviewed and approved by the ICT manager of DWS.

The National NRW Training Implementation Annual Programme

18/02/2021



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SOUTH AFRICAN LOCAL GOVERNMENT ASSOCIATION
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THE NATIONAL NRW TRAINING

PROJECT DOCUMENT OF CAPACITATING WATER SERVICES AUTHORITIES (MUNICIPALITIES) TO IMPLEMENT NON-REVENUE WATER MANAGEMENT



DWS's Infrastructure Branch Training Centre

June 2019

Executive Summary

Water is a scarce resource in South Africa. The need to manage water equitably is espoused in the constitution of the republic and also in the National Water Act (Act 36 of 1998). Water Conservation and Water Demand Management (WC/WDM) is recognized in the Act as an instrument for managing water equitably thus aiming at reducing Non-Revenue Water (defined as water not billed or accounted for).

South Africa has very high water losses and non-revenue water with a national average of 41%. This is a major contrast compared to Japan with less than 10%. It is therefore prudent that South Africa learns from best practices in Japan to bring down the proportion of non-revenue water in the water supply system.

It is based on the above that None Revenue Water (NRW) management training should as the start; focus on developing practical skills to tackle water losses and NRW in the municipal environment. The Department of Water and Sanitation (DWS) together with municipalities, South African Local Government Association (SALGA), Local Government Sector Education and Training Authority (LGSETA) and other key players must collaborate to ensure support to the National NRW Training offered through the Infrastructure Branch Training Centre (IBTC). The future objective to ensure a national support will include collaboration with other training centres especially in the metropolitan municipalities to enhance NRW management training.

1 PROJECT DESCRIPTION

The government of the Republic of South Africa and the Government of Japan have entered into a bilateral cooperation in the field of water resources, the two governments represented by the Department of Water and Sanitation (DWS) and the Ministry of Land Infrastructure and Transport (MLIT) respectively have strong bilateral, economic and political relations.

The relationship between the DWS and MLIT of Japan date back from 2011, the relationship started through the joint resolution entered into by the then Deputy Ministers of both DWS and MLIT, with simple cooperation on common areas related to water infrastructure, its maintenance and operations.

There are two technical cooperation agreements signed by DWS and Japan International Cooperation Agency (JICA), functionary of Japan government. The first technical cooperation came to an end in 2016 focusing on water treatment plants. The Japanese government through JICA has been supporting the implementation of the first technical cooperation since 2011; however the coverage in terms of the beneficiaries of the programme has been low due to the distance and cost associated with the provision of such trainings in Japan. The various training was attended by officials, including municipal officials; are practical, easy to follow, although not accredited in South Africa.

The three year training programme supported by JICA came to an end in 2016. A new technical cooperation has been signed in April 2017 and was kick started on 17 August 2017 focusing on strengthening training capacity of DWS owned Infrastructure Branch Training Centre (IBTC). The technical cooperation is to be implemented by DWS and SALGA with JICA providing technical support.

The new technical cooperation will focus on the development of a training package on Non-Revenue Water (NRW) and will ensure that training provided by JICA are easily accessible and offered in South Africa to increase training coverage (no longer in Japan). The IBTC as the centre selected for the provision of the National NRW Training is already accredited as a training institution by MerSETA and is already offering training programmes on Carpentry, Bricklaying and Electrical.

As part of the implementation of the JICA supported programme, the South African water sector, led by the DWS, sent a benchmarking mission composed of Senior Managers from the Sector Education and Training Authority (SETA), municipalities, DWS and Tshwane University of Technology to Japan. The purpose of the mission was to benchmark Japanese trainings and ensures that a training package on NRW is developed and offered at the IBTC. The team was exposed to the Japanese NRW training model and identified areas to be incorporated into the South African training package.

The JICA Technical Assistance programme will have many benefits for the water sector. The Department in collaboration with its water partners responsible for the implementation of the project has the responsibility to develop and test the new training programme to ensure that it delivers the skills required to deal with non-revenue water in the country. The JICA support to the programme excludes the training of trainers in South Africa for the implementation of the training programme.

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2 LINKAGE WITH THE SECTOR SKILLS PLAN

One of the mandates of local government, as stipulated in Section 152 of the Constitution, is to ensure the provision of services to communities in a sustainable manner including *inter alia* the provision of water and sanitation. Significant progress has been made since 1994 in the provision of water and sanitation, whereby between 2016 and 2017, the number of consumer units receiving water services grew from 12.8 million to 13 million (Stats SA, 2018b). However the gains have being offset by the ageing and dilapidated infrastructure which results in high water losses as evidenced by the current NRW of 42% countrywide.

Although there are many issues that could affect NRW at local government level, such as: poor planning, increased infrastructure development portfolio, and poor governance; however skills has been identified as one the key drivers that exacerbate the problem.

One of the most important skills implications of the ever-increasing role of technology is that the minimum skills requirements in many occupations are increasing. The use of technology in a function increases the minimum skills required to participate in that occupation. This poses an on-going risk for the number of poorly educated unemployed, whose number of entry level occupations is decreasing. Therefore it is against this backdrop that DWS, SALGA and the JICA have proposed the above programme to up skill existing employees in local government dealing with NRW.

3 PROJECT OBJECTIVE

The main purposes of the National NRW Training course are the following:

- To increase the skills and capacity of the water sector in particular local government in tackling Non-Revenue Water (NRW)
- To empower all identified beneficiaries with relevant skills and knowledge to manage NRW
- To develop the technical skills and knowledge on NRW in order to meet the demand of the daily routine work in municipalities

4 DESIGN OF THE NATIONAL NRW TRAINING

Based on the following observation and concepts from the baseline survey and development of new qualifications, the Project designed the National NRW Training as more practical training based on “Knowledge, Practice and Work Experience” to contribute to problem solution.

Observation

- A lot of municipalities have not conducted accurate water balance analysis with reliable data and information on NRW.
- Prior to taking NRW reduction measures effectively, a lot of municipalities are still at the initial stage “measuring/metering” for proper analysis which leads to planning.

Concepts

- The National NRW Training focuses on water measurement, proper water balance

analysis and planning in principle.

- The National NRW Training is “problem-solving-oriented” with secure positive effect and impact to participating municipalities.
- The National NRW Training develops not only individuals (Trainees) but also organization (participating municipalities) in tackling NRW.
- The National NRW Training curriculum is developed in consideration of occupational qualification standard model of QCTO: Knowledge (Theory), Practice and Work Experience (Workplace).

The main targets of the National NRW Training course are employees of municipalities as Water Services Authority or water service provider as defined by Water Services Act and National Water Act, respectively; and other water supply related organisations.

5 COURSE CONTENT/OUTLINE

To support and assist municipalities with NRW management, DWS/JICA and SALGA would like to implement intensive NRW programme comprising of the following knowledge, practical and workplace training components:

Knowledge and Practical Component

- Orientation and general overview
- Bulk meter knowledge, technique (including pipe fitting)
- Customer meter knowledge, technique
- Reticulation facility planning, operation and maintenance (valves, fire hydrant, air valves, etc.)
- District-Metered Area (DMA) and Measurement planning
- Data logging and analysis
- Water balance analysis
- NRW reduction strategy planning & presentation
- Fundamental knowledge of active leakage equipment
- Fundamental knowledge of conditional assessment

* The course may be customized flexibly by these components in consideration of the participating municipalities.

Workplace Training Component

Contents and log sheet are to be set along with the curriculum with support by DWS. Workplace training will take place at the respective municipalities.

Training Period and Stages

The National NRW Training is a crash course of net 30 weekdays (not consecutively) in 8 weeks period through the following stages (tentative) as a training group:

Stage 1: Theory & Practice: 5 weekdays solid at IBTC (20 trainees each group)
Stage 2: Workplace: 10 weekdays in participating municipalities with Mentor(s) with support from Facilitator(s)
Stage 3: Theory & Practice: 5 weekdays solid at IBTC (20 trainees each group)

Stage 4: Workplace: 10 weekdays in participating municipalities with Mentor(s) with support from Facilitator(s)

6 ROLES AND RESPONSIBILITIES OF FACILITATORS

Roles and responsibilities of the facilitators are:

- To undertake training for specific course modules during the training at IBTC as well as in the workplaces.
- To be punctual for the training.
- To facilitate course modules and trainees’ participation.
- To participate and provide his/her knowledge and experiences to develop leaning/teaching materials.
- To attend the facilitator technical meetings (workshops) at IBTC, Roodeplaat, Pretoria for the facilitator’s training and also familiarize themselves with learning/teaching materials and training yard at IBTC.
- To make sure that the attendance register is signed during all the training.
- To provide technical advises in the training at IBTC and workplace
- To visit workplaces for trainings.
- To record, monitor and retain details of trainings.
- To provide the full record of progress of assessments.
- To participate in capacity assessment as a training resource of the National NRW Training.
- To cooperate for quality assurance, monitoring and evaluation of the National NRW Training.

7 ROLES AND RESPONSIBILITIES OF PARTICIPATING MUNICIPALITIES (TRAINEES)

Roles and responsibilities of the participating municipalities (trainees) are:

Municipalities

- To release 3 to 5 officials as trainees to participate in the training at IBTC for 10 weekdays (5 weekdays solid x two).
- To release 3 to 5 officials as trainees to participate in the workplace training in their municipality for 20 weekdays (10 weekdays x two).
- To ensure that the trainees attends the training
- To assign a leader or coordinator from the officials during the training
- To provide water supply and NRW-related information (drawings, billed water consumption data, customer classification, etc.) and efforts for the training.
- To create District-Metered Area (DMA) or equivalent as an isolated area for measurement and analysis in the workplace training
- To provide consumables such as piping materials, fittings, flowmeter(s), valve(s) and workforce, which will be used for the benefit of the municipality during the workplace training
- To provide tentative office spaces for facilitators during the workplace training.
- To provide understanding, assistance and necessary information to trainees for the training purpose.

- To provide and share NRW-related information with IBTC before/after the training continuously.
- To provide normal occupational health and safety (OHS) in the workplace training (Night-time works may arise.)
- Political/traditional coordination if necessary
-

  * All provided information will be utilized only for the training purposes.

Trainees

- To attend surely the training at IBTC and workplaces.
- To be punctual for the training.
- To coordinate with other section in his/her municipality during the workplace training
- To cooperate for evaluation of the training by quality assurer.
- To follow instruction of IBTC and facilitators.
- To share own knowledge and experiences with other trainees.
- To evaluate the training course.

The NRW National Training expects ideally trainees from the municipality to be organized hierarchically and cross-sectorally "as a team" consisting of 3 to 5 officials from relevant sections such as:

- Water conservation and water demand management (WCWDM)
- Operation and maintenance (O&M), and
- Billing and finance if necessary
- Equivalent

Also, the NRW National Training targets the following officials of municipalities, who have accumulated a certain amount of education, knowledge, experience and expertise, for example:

- Technician (or Junior, Technician-to-be)
- Superintendent/Supervisor/Foreperson/Site-Manager (or Superintendent/Supervisor/Foreperson/Site-Manager-to-be)
- Artisan Plumber (or Artisan Plumber-to-be)
- General Worker if applicable, and
- Equivalent

8 FINANCIAL IMPLICATION

The costs to be covered by the Project are as below:

Facilitators

- Transport (return) between their municipalities and IBTC (own driving)
- Transport (return) between OR Tambo Airport and IBTC if flying
- Daily transport between accommodation and IBTC
- Accommodation and catering during training at IBTC
- Transport for workplace training (own driving)
- Accommodation and food allowance during workplace training (if away overnight)

Participating Municipalities (Trainees)

- Any kind of training tuition/fee and learning materials
- Accommodation and catering during training at IBTC
- Accommodation and food allowance during workplace training (if away overnight)

* The participating municipalities are in principle required to cover costs for transport for their respective municipal officials (trainees).

9 MONITORING AND EVALUATION PROCESS

For monitoring and evaluation, discussion on issues, challenges, solutions and way forward of the Project for Strengthening the Training Capacity of IBTC on Non-Revenue Water, JICA, DWS and SALGA have established a Joint Coordination Committee (JCC) consisting of the following individuals listed in Table 1 (South African side) and Table 2 (Japanese side).

Table 1: South African Project Team

Position in the Project	Organization and Name
Project Management Committee (PMC) Chairperson	Chief Director, Engineering Services, NWRI, DWS Mr. Aloious Chaminuka
Project Director PMC Task Manager	Director, Technical Engineering Services, NWRI, DWS Mr. Vincent Monene
Co-Project Director	Director, Water Sustainability & Innovation, SALGA Mr William Moraka
Project Manager (Operational) PMC Task Manager	Centre Manager, IBTC, DWS Ms. Rosa Mfomadi Rahube
Co-Project Manager (Technical) PMC Task Manager	Director, Water Use Efficiency, P&I, DWS Mr. Hadebe Xolani
Member PMC Secretary/Task Manager	Director, ODA, IWS, DWS Mr. Albert Mmbidi
Member KZN Facilitator	Director, Planning and Information, DWS-KZN Mr. Michael Singh
Member	Training Manager, IBTC, DWS Ms. Kgoputso Sekgoilane
Member	Quality Assurer, IBTC, DWS Ms. Makola Lerato
Member	Water Use Efficiency, P&I, DWS Mr. Thabo Masike / Mr. Padi Andries
Member	Director, Strategic Water Sector Support, P&I, DWS Ms. Iris Mathye
Member	Water Sector Institutional Development, P&I, DWS Ms. Margaret Matlala / Mr. Mtsweni Dennis
Member PMC Task Manager	Director, Operational Support, PMU, DWS Ms. Kentse Mathiba
Member	Water Sector Skill Development & Special Project, PMU, DWS Mr. Maputha
Member	Director, HRD, DWS Ms. Merriam Moagi
Member	HRD, DWS Mr. Matome Makwaeba
Member	Construction, NWRI, DWS Mr. Armand Basson / Mr. Riaan Stassen
Secretary	Official Development Assistance, IWS, DWS Ms. Mtsweni Zanu

Table 2: Japanese Project Team

Position in the Project	Organization and Name
Chief Advisor / NRW Management	Mr. Akinori MIYOSHI
Deputy Chief Advisor / NRW Management	Mr. Taketoshi FUJIYAMA
Skills Programme Planning/Organization Coordination	Mr. Kenichiro SUGIYA
Water Leakage Detection	Mr. Hiroki NIIMURA
Water Distribution Control / Commercial Loss	Mr. Hiroyuki MORITA
Training Yard Design and Supervision	Mr. Masuji IDE
Procurement / Administrative Coordination	Mr. Toshinobu KASUYA
Training Management/Human Resource Development	Mr. Nobutaka MARUYAMA

9 SUSTAINABILITY

The proposed programme has a potential to be built onto a full occupational qualification by progressively developing beneficiaries from short term learning programmes that will eventually lead to achievement of Water Reticulation Practitioner (WRP) occupational qualification. The completion of the NRW programme will allow trainees to articulate to much higher level of National Qualification Framework (NQF) in future, as envision by the National Qualification Framework Act, 2008 (No 67 of 2008).In future, the trainees will qualify to enroll for the already-registered WRP occupational qualification in some parts.

10 PROJECT TIMELINE

The overall goal of the Project is to continuously develop NRW management skills for municipalities under the direction of IBTC in collaboration with SALGA based on municipal NRW ratios. The National NRW Training is implemented in two groups in FY2019/2020.

Training Groups

The three groups in FY2019/2020 and early FY2020/2021 are as follows:

Group 1: 7th September 2019 - 29th November 2019

Group 2: **27th January 2019 - 6th March 2020**

Group 3: **11th May 2019 - 19th June 2020**

11 IMPORTANT SCHEDULE FOR FACILITATORS ONLY

As a role and responsibility, the nominated facilitators are requested to be in the facilitator technical meetings (workshops) at IBTC, Roodeplaat, Pretoria for the facilitator's training and also familiarize themselves with learning/teaching materials and training yard.

The schedule are as below and details will be informed later:

- **2 - 3 days in the first week of June 2019 (3rd to 5th July 2019)**
- **2 - 3 days in the first week of July 2019 (19th and 20th September 2019)**

12 CONCLUSION

In conclusion Skills development is one vehicle that supports the optimum management of NRW in the municipalities which requires integrated collaboration of stakeholders at National office, Local government and SETAs to ensure access of water to support the socio-economic activities in the sector. One of the strategic action of the NWRS2 Chapter 15 is to increase Intergovernmental relations, sector collaboration and partnerships through effective utilisation of existing structures and instruments to facilitate intergovernmental relations, sector collaboration and partnerships in addressing key education, training and skills development issues. This proposal seek to implement the above objective of the NWRS2 Chapter 15 and also monitor the agreement between DWS and other Global and African countries in terms of KPI's set for training and skills transfer, and advances in research and technology.

This project will assist with skilling and building capacity of municipalities to tackle water losses and related non-revenue water challenges. This will ensure a better provision of reliable water services and improve water security for the municipalities and the country.

11/March/2020

Programme Outline of the National NRW Training

Aims:

- Understand NRW using District-Metered Area (DMA).
- Be able to show the NRW status using proper data.
- Learn basic skills for O&M through DMA management
- Select and illustrate effective countermeasures by each status quo and social situation.
- Make persuasive presentation and get project fund.
- Show clearly the project output.

Learner:

- Municipal water services officials (3-5 officials as a team consisting WCWDM, O&M, Billing, etc)

Facilitators:

- Skilled and experienced municipal water services officials
- DWS officials

Venue:

- Infrastructure Branch Training Centre (IBTC) of DWS, Roodeplaat, Pretoria
- Workplaces, Pilot DMA of each participating Municipality

Training Period (Revised):

- 1st week: IBTC training (theory & practice), Net 5 weekdays (incl. traveling days)
- 2nd week: Preparatory activities in municipalities
- 3rd week: Workplace training in municipalities, Net 5 weekdays (incl. traveling days)
- 4th week: Buffer week
- 5th week: Workplace training in municipalities, Net 5 weekdays (incl. traveling days)
- 6th week: IBTC training (Results, findings and actions & Way forward) , Net 3 weekdays (incl. traveling days)

Training net period is 18 weekdays incl. travelling days in 6 weeks duration

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---- Criteria of Pilot DMA (in Municipality) -----

1. Number of connections:
   Around 100 connections, can isolate on the map by existing valves.
2. Availability of operational reticulation map (e.g. IMQS):
   Pipelines, valves, fire hydrants, air valves, PRVs, altitudes, etc.
3. SIV meter (D80mm, D100mm preferable):
   Be able to measure by only one input line.
4. Data availability:
   Available financial/consumption/billing data of the DMA and of each household (Population, number of supply households, number of connection, each supply volume, billed or non billed status, payed or non payed status, using community stand or not, FBW status, interruption of water, etc. Monthly data preferable)

Programme Conceptual Flow

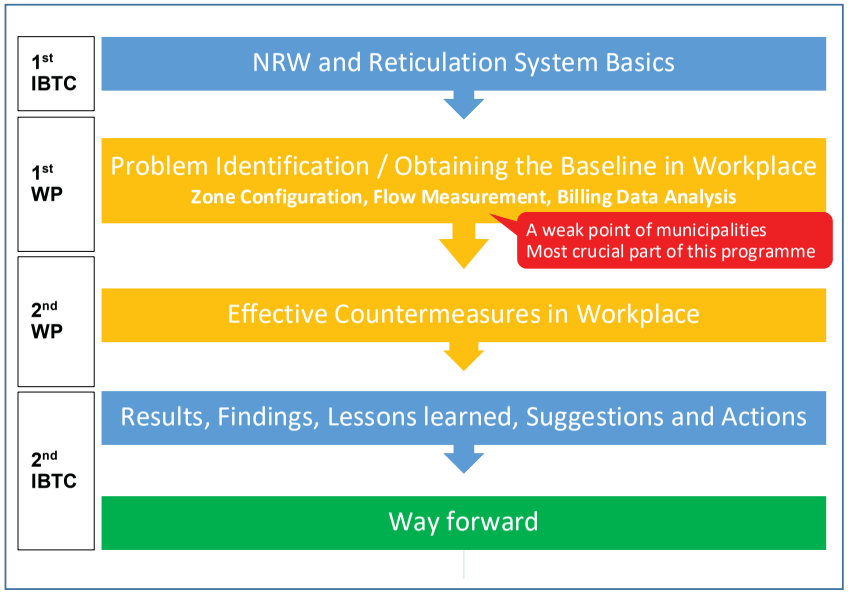


Table 1: Training in IBTC (1st week)

Day	Time	Contents	Venue
1st week (IBTC)			
11 May (Mon)	am	* Travelling (facilitators and learners)	-
	13:30-14:00	Course orientation [Orientation]	Room
	14:00-14:30	Introduction of participating municipalities [Presentation]	Room
	14:45-16:00	The previous training activities and results [Presentation]	Room
12 May (Tue)	8:30-10:00	NRW in reticulation network [Theory]	Room
	10:15-11:50	NRW calculation [Practices]	Room
	Lunch		
	13:00-14:00	Water reticulation infrastructure and appurtenance [Theory]	Room
	14:10-16:00	Water reticulation infrastructure and appurtenance [Practices]	Yard
13 May (Wed)	8:30-10:00	Problem identification by using DMA [Theory]	Room
	10:15-11:50	Zoning practice, meter selection [Practices]	Room
	Lunch		
	13:00-14:20	Data logging, retrieval, analysis, billing data analysis [Practices]	Room
	14:40-16:00	Problem identification by using DMA [Practices]	Yard
14 May (Thu)	8:30-9:30	NRW Countermeasures, the most common [Theory] (methodology, techniques and technology)	Room
	9:45-11:50	NRW Countermeasures, the most common [Practices] (methodology, techniques and technology)	Yard
	Lunch		
	13:00-13:30	Funding application (DWS: WSIG) [Theory]	Room
	13:30-14:00	Strategy and Implementation Plans [Theory]	Room
	14:15-16:00	Planning for workplace training [Practices]	Room
15 May (Fri)	8:30-10:00	Planning for workplace training and their modification [Practices]	Room
	10:15-11:00	Summarize of the 1st week programme [Theory] Evaluation and assessment of the training [Orientation]	Room
	11:15-11:50	Workplace training [Orientation]	Room
	Lunch		
	pm	* Travelling (facilitators and learners)	-

Table 2: Workplace Training (2nd to 5th weeks)

Day	Time	Contents	Remarks
2nd week (Preparatory)			
18-22 May	-	- Preparation by learners in workplaces (DWS Coordinators support learners if necessary) - Confirmation of pilot DMA at the site - Starting data logging - Collect billing data in the DMA by learners	-
3rd week (1st Workplace)			
25 May (Mon)	am	* Travelling (DWS Coordinators and Facilitators)	-
	pm	Participant assembly, meeting about training plan and courtesy call	Office
26 May (Tue)	am	DMA configuration	Site
	pm	DMA configuration	Site
27 May (Wed)	am	DMA configuration	Site
	pm	DMA configuration, MNF (by step measurement) at night	Site
28 May (Thu)	am	Data retrieval and Data analysis	Site and office
	pm	Reporting (Baseline & problem identification)	Office
29 May (Fri)	am	Presentation to managers of each Municipality Wrap up workplace training results	Office
	pm	* Travelling (DWS Coordinators and Facilitators)	-
4th week (Buffer)			
1-5 Jun.	-	(DWS Coordinators support learners if necessary) (MNF and SIV measurement if necessary)	-
5th week (2nd Workplace)			
8 Jun. (Mon)	am	Travelling (DWS Coordinators and Facilitators)	-
	pm	Participant assembly and meeting about training plan	Office
9 Jun. (Tue)	am	NRW Countermeasures	Site
	pm	NRW Countermeasures	Site
10 Jun. (Wed)	am	NRW Countermeasures	Site
	pm	NRW Countermeasures, MNF (by step measurement) at night	Site
11 Jun. (Thu)	am	Data retrieval/analysis	Office
	pm	Preparation for presentation (Findings, results, remaining issues, strategic implementation planning with considering funding application)	Office
12 Jun. (Fri)	am	Presentation to relevant managers Wrap up workplace training results	Office
	pm	* Travelling (DWS Coordinators and Facilitators)	-

Remarks: Learners should be firstly capable to identify problems. If the team identifies the problems properly, selecting/taking effective countermeasures are a piece of cake.

Table 3: Training in IBTC (6th week)

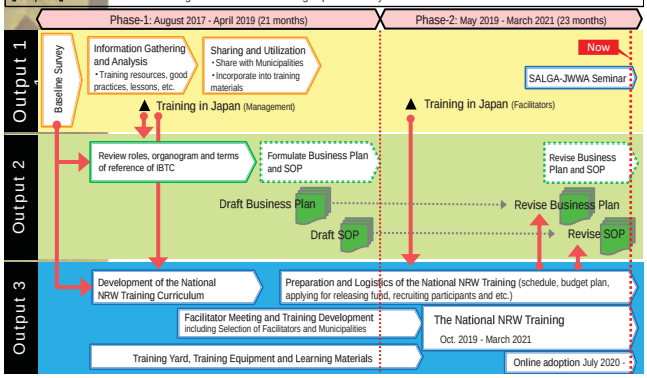
Day	Time	Contents	Venue
6th week (2nd IBTC)			
15 Jun. (Mon)	-	-	-
16 Jun. (Tue)	-	-	-
17 Jun. (Wed)	-	* Traveling (facilitators and learners)	-
18 Jun. (Thu)	8:30-9:45	Workplace Training Results (Presentation) drafting	Room
	10:00-12:00	Workplace Training Results (Presentation) and Q&A [Presentation, 30 minutes each]	Room
		Lunch	
	13:00-13:50	Technical Review and Recapping [Interactive Session]	Room
	14:00-15:15	Follow-up Lectures with Supplemental Notes [Theory & Practices]	
	15:30-16:30	Revision of Workplace Training Results (Presentation)	Room / Yard
19 Jun. (Fri)	8:30-9:00	**Output Sharing Seminar** * **Invite various stakeholders** Introduction of Participants [Orientation]	Room
	9:00-11:00	**Output Sharing Seminar** * **Invite various stakeholders** Presentation and Q&A [Presentation, 30 minutes each]	Room
	11:15-11:45	Overall Evaluation	Room
	11:45-12:30	Certification, Closing Remarks, Group Photos	Room
		Lunch	
	pm	* Travelling (facilitators and learners)	-

Remarks:

END

1. Project Outline (Timeframe and Activities)

【Overall Goal】Non-Revenue Water (NRW) management skills are utilized in participating municipalities under the established National NRW Training system.
【Project Purpose】NRW management skills are developed for participating municipalities through the National NRW Training.
【Output 1】Skill development, status-quo and challenges of NRW, and needs in municipalities are analyzed and shared with stakeholders.
【Output 2】IBTC's National NRW Training capacity is improved.
【Output 3】The National NRW Training is conducted with training improvement cycle.



2. Observation in Baseline Survey

- The **NRW is still high** in municipalities for the past decade.
- A lot of municipalities have **not calculated/evaluated NRW properly.** This may not lead to effective interventions.
- The municipalities **need proper analysis** based on adequate **"measuring and metering"**.
- Have municipalities conducted **adequate reticulation management** and O&M ? (**Inadequacy of essential information and analysis ability**)
- Have municipalities taken actions with **strategic planning and budgeting** for tackling with NRW?
- Have **real issues and problems** been informed properly **from working-level staff** to decision makers?
- Does South Africa need to have **a function/opportunity to cooperate at the working level among municipalities** for tacking with NRW?

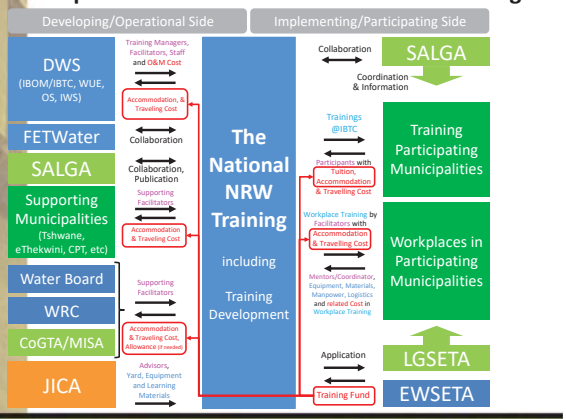
3. Basic Concepts of the National NRW Training

- **Problem-solving** oriented and flexible training programme with **practicality** for participating municipalities
- Targeting **cross-sectoral/departmental/hierarchical learners as a team**
- Training programme - participating municipalities to approach **root causes of the problems** in reticulation and NRW management
- Training programme - establishing the municipal **working-level network** and encouraging participants to take **proactive** actions.
- Training programme - leading to **strategic/effective use of limited resources** through **prioritization**
- Stakeholders' **participatory/interactive** Training programme organized by DWS/SALGA
- **Sustainable** training programme contrbuting to nationwide water services and capacity development by **accumulating knowledge/information**

4. Modules programmed in the Training



5. Development Model of the National NRW Training



Key Concept:

"By Municipalities for Municipalities"

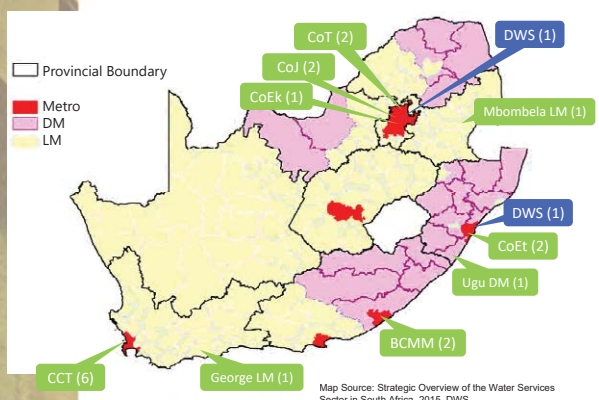
Partnering Municipalities for the Training Programme

CITY OF CAPE TOWN ISIXEKO SASEKAPA STAD KAAPSTAD
CITY OF TSHWANE
City of Ekurhuleni
ETHEKWINI MUNICIPALITY
Joburg
BUFFALO CITY
MBOMBELA
GEORGE

Supported by

water & sanitation Department: Water and Sanitation REPUBLIC OF SOUTH AFRICA
SALGA Inspiring service delivery
JICA

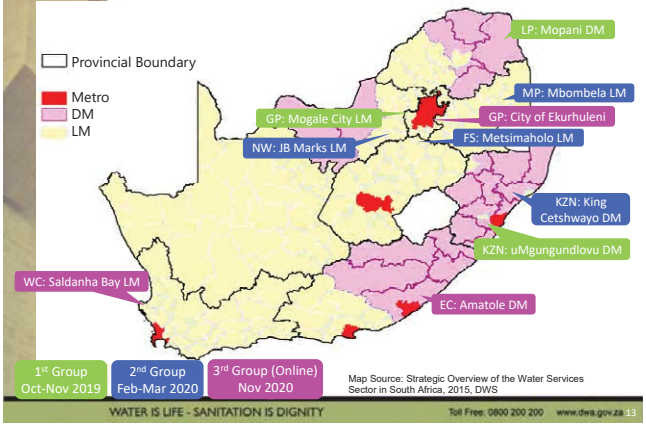
6. National Facilitators from Municipalities (Start-up)



Map Source: Strategic Overview of the Water Services Sector in South Africa, 2015, DWS



7. Participating Municipalities (Learners) in the Training



Map Source: Strategic Overview of the Water Services Sector in South Africa, 2015, DWS



THEORY & PRACTICAL TRAINING AT IBTC



WORKPLACE TRAINING



WORKPLACE TRAINING



OUTPUT SEMINAR AT IBTC



ONLINE TRAINING (THEORY)

Thank you very much for your attention.

ANNEXURE SOP2-4-1

water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

Enquiries: X Hadebe **Tel:** 012 336 7886 **Reference: 25/5/6/2/NRW2-1**

By Email:

Mr.
Municipal Manager
City of

Dear Mr.

NOMINATION OF LOCAL MUNICIPALITY TO ALLOW WATER SERVICES OFFICIALS RESPONSIBLE FOR WATER LOSSES AND NON-REVENUE WATER MANAGEMENT TO ATTEND NON REVENUE WATER MANAGEMENT TRAINING PROVIDED BY THE DEPARTMENT AND JICA AT ROODEPLAAT DEPARTMENT'S TRAINING CENTRE IN PRETORIA

The Department of Water and Sanitation (DWS) is receiving technical support from the Japanese government through the Japan International Cooperation Agency (JICA) for building National Non-Revenue Water (NRW) Training Facility and roll out of actual NRW management training at Department's Infrastructure Branch Training Centre (IBTC) located at Roodeplaat in Pretoria.

This is a direct response to the national challenge of rising NRW in the municipalities. Currently NRW national average is 41 % (1 659 Mm^3/a) resulting in loss of revenue (R 9 billion) and inadequate water to supply in the municipal areas.

Therefore the aim of NRW training project is to capacitate municipal officials responsible for water services to develop NRW management skills. This project is done in collaboration with various key stakeholders such as municipalities, South African Local Government Association (SALGA) and Local Government Sector Education and Training Authority (LGSETA) to ensure success of the National NRW Training.

Key municipalities with high levels of NRW and Water Losses have been identified and nominated to send officials responsible for water losses management, operation and maintenance of water services infrastructure .i.e. reservoirs, water conveyance pipelines, pump stations, control and pressure valves, water metering for both customer and bulk supply systems and develop regular water balance to attend training. Thus DWS requests the municipality to at least avail three (3) to four (4) officials as a team to attend training. The spread as per designation can range from technician, supervisor, foreman and general workers working as municipal plumbers.

This training programme is structured as on the job hands training with particular emphasis on physical doing of the work ,i.e. to identify and fix the leaks, install meters and valves, conduct step test of water supply zones, system operating pressure and generate monthly water balance to account for water supplied, billed consumption, water losses and NRW. Training is structured into two critical parts as follows:

a. Theoretical and practical training at Roodeplaat Training Centre

Various water losses management modules will be presented based on the course outline manuals and guidelines. This will be supported by practical training at the training yard that physical simulate water supply system in the municipal environment. Trainees will get opportunity to test their understanding of concepts and principles behind certain practices of water losses management such as conducting minimum night flows to identify influence of surge in system pressure during night time, install meters and valves, identify and fix water leaks to ensure a reliable water supply system. Total duration for Roodeplaat training is two weeks (10 weekdays solid) split by a week per training session.

b. Workplace Training

Municipality will be required to identify an area such as a ward/district metered area or water supply zone for the municipal officials to conduct workplace training. The essence of workplace training is to afford trainees opportunity to apply the knowledge and skills acquired to solve real water losses challenges experienced in the municipality. DWS, JICA team and training facilitators will be on ground with municipal trainees to assist with situation assessment first order studies, trouble shooting and fixing water losses. Total duration for workplace training is four weeks (20 weekdays) split by two weeks per workplace training session.

At the end of training all successful trainees will be awarded with competency certificate that shows all modules passed and skills acquired.

Looking forward to your cooperation.

Yours sincerely

Mr Alouious Chaminuka
Chief Director: Engineering Services (Project Leader)
Date: 2019-11-12

ANNEXURE SOP2-4-2

AGENDA

THE NATIONAL NRW TRAINING

Date: ** **** 202X
Time: 10h00 to 12h00
Venue: *** LM Boardroom

Facilitator: DWS/WUE

Meeting Objectives:

- To inform about the National Non Revenue Water Training
- To request for municipality to accept request for participation in the training programme and avail municipal officials to participate in the training programme for both theoretical, practical and workplace training
- To explore further areas for cooperation and working together to capacitate other Municipalities in the Province and Nationally, and
- To visit candidate pilot DMA site or equivalent for preparation of workplace training

1. Opening and welcome	Municipality
2. Introduction and Apologies	All
3. Purpose of the meeting	DWS
a. Background of the training	DWS
b. Concept and design of training proramme	DWS
c. Roles and responsivities of participating municipalities	DWS
d. Requirements to participate in the training	DWS
4. Discussions and/or Questions	All
5. Request for information about water losses and Non-Revenue Water of municipality as well as candidate pilot DMA site for workplace training	
6. Recap, way forward and closure of the meeting	Municipality

THE NATIONAL NRW TRAINING

PROJECT DOCUMENT OF CAPACITATING WATER SERVICES AUTHORITIES (MUNICIPALITIES) TO IMPLEMENT NON-REVENUE WATER MANAGEMENT



DWS's Infrastructure Branch Training Centre

June 2019

Executive Summary

Water is a scarce resource in South Africa. The need to manage water equitably is espoused in the constitution of the republic and also in the National Water Act (Act 36 of 1998). Water Conservation and Water Demand Management (WC/WDM) is recognized in the Act as an instrument for managing water equitably thus aiming at reducing Non-Revenue Water (defined as water not billed or accounted for).

South Africa has very high water losses and non-revenue water with a national average of 41%. This is a major contrast compared to Japan with less than 10%. It is therefore prudent that South Africa learns from best practices in Japan to bring down the proportion of non-revenue water in the water supply system.

It is based on the above that None Revenue Water (NRW) management training should as the start; focus on developing practical skills to tackle water losses and NRW in the municipal environment. The Department of Water and Sanitation (DWS) together with municipalities, South African Local Government Association (SALGA), Local Government Sector Education and Training Authority (LGSETA) and other key players must collaborate to ensure support to the National NRW Training offered through the Infrastructure Branch Training Centre (IBTC). The future objective to ensure a national support will include collaboration with other training centres especially in the metropolitan municipalities to enhance NRW management training.

1 PROJECT DESCRIPTION

The government of the Republic of South Africa and the Government of Japan have entered into a bilateral cooperation in the field of water resources, the two governments represented by the Department of Water and Sanitation (DWS) and the Ministry of Land Infrastructure and Transport (MLIT) respectively have strong bilateral, economic and political relations.

The relationship between the DWS and MLIT of Japan date back from 2011, the relationship started through the joint resolution entered into by the then Deputy Ministers of both DWS and MLIT, with simple cooperation on common areas related to water infrastructure, its maintenance and operations.

There are two technical cooperation agreements signed by DWS and Japan International Cooperation Agency (JICA), functionary of Japan government. The first technical cooperation came to an end in 2016 focusing on water treatment plants. The Japanese government through JICA has been supporting the implementation of the first technical cooperation since 2011; however the coverage in terms of the beneficiaries of the programme has been low due to the distance and cost associated with the provision of such trainings in Japan. The various training was attended by officials, including municipal officials; are practical, easy to follow, although not accredited in South Africa.

The three year training programme supported by JICA came to an end in 2016. A new technical cooperation has been signed in April 2017 and was kick started on 17 August 2017 focusing on strengthening training capacity of DWS owned Infrastructure Branch Training Centre (IBTC). The technical cooperation is to be implemented by DWS and SALGA with JICA providing technical support.

The new technical cooperation will focus on the development of a training package on Non-Revenue Water (NRW) and will ensure that training provided by JICA are easily accessible and offered in South Africa to increase training coverage (no longer in Japan). The IBTC as the centre selected for the provision of the National NRW Training is already accredited as a training institution by MerSETA and is already offering training programmes on Carpentry, Bricklaying and Electrical.

As part of the implementation of the JICA supported programme, the South African water sector, led by the DWS, sent a benchmarking mission composed of Senior Managers from the Sector Education and Training Authority (SETA), municipalities, DWS and Tshwane University of Technology to Japan. The purpose of the mission was to benchmark Japanese trainings and ensures that a training package on NRW is developed and offered at the IBTC. The team was exposed to the Japanese NRW training model and identified areas to be incorporated into the South African training package.

The JICA Technical Assistance programme will have many benefits for the water sector. The Department in collaboration with its water partners responsible for the implementation of the project has the responsibility to develop and test the new training programme to ensure that it delivers the skills required to deal with non-revenue water in the country. The JICA support to the programme excludes the training of trainers in South Africa for the implementation of the training programme.

2 LINKAGE WITH THE SECTOR SKILLS PLAN

One of the mandates of local government, as stipulated in Section 152 of the Constitution, is to ensure the provision of services to communities in a sustainable manner including *inter alia* the provision of water and sanitation. Significant progress has been made since 1994 in the provision of water and sanitation, whereby between 2016 and 2017, the number of consumer units receiving water services grew from 12.8 million to 13 million (Stats SA, 2018b). However the gains have being offset by the ageing and dilapidated infrastructure which results in high water losses as evidenced by the current NRW of 42% countrywide.

Although there are many issues that could affect NRW at local government level, such as: poor planning, increased infrastructure development portfolio, and poor governance; however skills has been identified as one the key drivers that exacerbate the problem.

One of the most important skills implications of the ever-increasing role of technology is that the minimum skills requirements in many occupations are increasing. The use of technology in a function increases the minimum skills required to participate in that occupation. This poses an on-going risk for the number of poorly educated unemployed, whose number of entry level occupations is decreasing. Therefore it is against this backdrop that DWS, SALGA and the JICA have proposed the above programme to up skill existing employees in local government dealing with NRW.

3 PROJECT OBJECTIVE

The main purposes of the National NRW Training course are the following:

- To increase the skills and capacity of the water sector in particular local government in tackling Non-Revenue Water (NRW)
- To empower all identified beneficiaries with relevant skills and knowledge to manage NRW
- To develop the technical skills and knowledge on NRW in order to meet the demand of the daily routine work in municipalities

4 DESIGN OF THE NATIONAL NRW TRAINING

Based on the following observation and concepts from the baseline survey and development of new qualifications, the Project designed the National NRW Training as more practical training based on “Knowledge, Practice and Work Experience” to contribute to problem solution.

Observation

- A lot of municipalities have not conducted accurate water balance analysis with reliable data and information on NRW.
- Prior to taking NRW reduction measures effectively, a lot of municipalities are still at the initial stage “measuring/metering” for proper analysis which leads to planning.

Concepts

- The National NRW Training focuses on water measurement, proper water balance analysis and planning in principle.
- The National NRW Training is “problem-solving-oriented” with secure positive effect and impact to participating municipalities.
- The National NRW Training develops not only individuals (Trainees) but also organization (participating municipalities) in tackling NRW.
- The National NRW Training curriculum is developed in consideration of occupational qualification standard model of QCTO: Knowledge (Theory), Practice and Work Experience (Workplace).

The main targets of the National NRW Training course are employees of municipalities as Water Services Authority or water service provider as defined by Water Services Act and National Water Act, respectively; and other water supply related organisations.

5 COURSE CONTENT/OUTLINE

To support and assist municipalities with NRW management, DWS/JICA and SALGA would like to implement intensive NRW programme comprising of the following knowledge, practical and workplace training components:

Knowledge and Practical Component

- Orientation and general overview
- Bulk meter knowledge, technique (including pipe fitting)
- Customer meter knowledge, technique
- Reticulation facility planning, operation and maintenance (valves, fire hydrant, air valves, etc.)
- District-Metered Area (DMA) and Measurement planning
- Data logging and analysis
- Water balance analysis
- NRW reduction strategy planning & presentation
- Fundamental knowledge of active leakage equipment
- Fundamental knowledge of conditional assessment

* The course may be customized flexibly by these components in consideration of the participating municipalities.

Workplace Training Component

Contents and log sheet are to be set along with the curriculum with support by DWS. Workplace training will take place at the respective municipalities.

Training Period and Stages

The National NRW Training is a crash course of net 30 weekdays (not consecutively) in 8 weeks period through the following stages (tentative) as a training group:

Stage 1: Theory & Practice: 5 weekdays solid at IBTC (20 trainees each group)
Stage 2: Workplace: 10 weekdays in participating municipalities with Mentor(s) with support from Facilitator(s)
Stage 3: Theory & Practice: 5 weekdays solid at IBTC (20 trainees each group)

Stage 4: Workplace: 10 weekdays in participating municipalities with Mentor(s) with support from Facilitator(s)

6 ROLES AND RESPONSIBILITIES OF FACILITATORS

Roles and responsibilities of the facilitators are:

- To undertake training for specific course modules during the training at IBTC as well as in the workplaces.
- To be punctual for the training.
- To facilitate course modules and trainees' participation.
- To participate and provide his/her knowledge and experiences to develop leaning/teaching materials.
- To attend the facilitator technical meetings (workshops) at IBTC, Roodeplaat, Pretoria for the facilitator's training and also familiarize themselves with learning/teaching materials and training yard at IBTC.
- To make sure that the attendance register is signed during all the training.
- To provide technical advises in the training at IBTC and workplace
- To visit workplaces for trainings.
- To record, monitor and retain details of trainings.
- To provide the full record of progress of assessments.
- To participate in capacity assessment as a training resource of the National NRW Training.
- To cooperate for quality assurance, monitoring and evaluation of the National NRW Training.

7 ROLES AND RESPONSIBILITIES OF PARTICIPATING MUNICIPALITIES (TRAINEES)

Roles and responsibilities of the participating municipalities (trainees) are:

Municipalities

- To release 3 to 5 officials as trainees to participate in the training at IBTC for 10 weekdays (5 weekdays solid x two).
- To release 3 to 5 officials as trainees to participate in the workplace training in their municipality for 20 weekdays (10 weekdays x two).
- To ensure that the trainees attends the training
- To assign a leader or coordinator from the officials during the training
- To provide water supply and NRW-related information (drawings, billed water consumption data, customer classification, etc.) and efforts for the training.
- To create District-Metered Area (DMA) or equivalent as an isolated area for measurement and analysis in the workplace training
- To provide consumables such as piping materials, fittings, flowmeter(s), valve(s) and workforce, which will be used for the benefit of the municipality during the workplace training
- To provide tentative office spaces for facilitators during the workplace training.
- To provide understanding, assistance and necessary information to trainees for the training purpose.

- To provide and share NRW-related information with IBTC before/after the training continuously.
- To provide normal occupational health and safety (OHS) in the workplace training (Night-time works may arise.)
- Political/traditional coordination if necessary
-

* All provided information will be utilized only for the training purposes.

Trainees

- To attend surely the training at IBTC and workplaces.
- To be punctual for the training.
- To coordinate with other section in his/her municipality during the workplace training
- To cooperate for evaluation of the training by quality assurer.
- To follow instruction of IBTC and facilitators.
- To share own knowledge and experiences with other trainees.
- To evaluate the training course.

The NRW National Training expects ideally trainees from the municipality to be organized hierarchically and cross-sectorally "as a team" consisting of 3 to 5 officials from relevant sections such as:

- Water conservation and water demand management (WCWDM)
- Operation and maintenance (O&M), and
- Billing and finance if necessary
- Equivalent

Also, the NRW National Training targets the following officials of municipalities, who have accumulated a certain amount of education, knowledge, experience and expertise, for example:

- Technician (or Junior, Technician-to-be)
- Superintendent/Supervisor/Foreperson/Site-Manager (or Superintendent/Supervisor/Foreperson/Site-Manager-to-be)
- Artisan Plumber (or Artisan Plumber-to-be)
- General Worker if applicable, and
- Equivalent

8 FINANCIAL IMPLICATION

The costs to be covered by the Project are as below:

Facilitators

- Transport (return) between their municipalities and IBTC (own driving)
- Transport (return) between OR Tambo Airport and IBTC if flying
- Daily transport between accommodation and IBTC
- Accommodation and catering during training at IBTC
- Transport for workplace training (own driving)
- Accommodation and food allowance during workplace training (if away overnight)

Participating Municipalities (Trainees)

- Any kind of training tuition/fee and learning materials

- Accommodation and catering during training at IBTC
- Accommodation and food allowance during workplace training (if away overnight)

* The participating municipalities are in principle required to cover costs for transport for their respective municipal officials (trainees).

9 MONITORING AND EVALUATION PROCESS

For monitoring and evaluation, discussion on issues, challenges, solutions and way forward of the Project for Strengthening the Training Capacity of IBTC on Non-Revenue Water, JICA, DWS and SALGA have established a Joint Coordination Committee (JCC) consisting of the following individuals listed in Table 1 (South African side) and Table 2 (Japanese side).

Table 1: South African Project Team

Position in the Project	Organization and Name
Project Management Committee (PMC) Chairperson	Chief Director, Engineering Services, NWRI, DWS Mr. Aloious Chaminuka
Project Director PMC Task Manager	Director, Technical Engineering Services, NWRI, DWS Mr. Vincent Monene
Co-Project Director	Director, Water Sustainability & Innovation, SALGA Mr William Moraka
Project Manager (Operational) PMC Task Manager	Centre Manager, IBTC, DWS Ms. Rosa Mfomadi Rahube
Co-Project Manager (Technical) PMC Task Manager	Director, Water Use Efficiency, P&I, DWS Mr. Hadebe Xolani
Member PMC Secretary/Task Manager	Director, ODA, IWS, DWS Mr. Albert Mmbidi
Member KZN Facilitator	Director, Planning and Information, DWS-KZN Mr. Michael Singh
Member	Training Manager, IBTC, DWS Ms. Kgoputso Sekgoilane
Member	Quality Assurer, IBTC, DWS Ms. Makola Lerato
Member	Water Use Efficiency, P&I, DWS Mr. Thabo Masike / Mr. Padi Andries
Member	Director, Strategic Water Sector Support, P&I, DWS Ms. Iris Mathye
Member	Water Sector Institutional Development, P&I, DWS Ms. Margaret Matlala / Mr. Mtsweni Dennis
Member PMC Task Manager	Director, Operational Support, PMU, DWS Ms. Kentse Mathiba
Member	Water Sector Skill Development & Special Project, PMU, DWS Mr. Maputha
Member	Director, HRD, DWS Ms. Merriam Moagi
Member	HRD, DWS Mr. Matome Makwaeba
Member	Construction, NWRI, DWS Mr. Armand Basson / Mr. Riaan Stassen
Secretary	Official Development Assistance, IWS, DWS Ms. Mtsweni Zanu

Table 2: Japanese Project Team

Position in the Project	Organization and Name
Chief Advisor / NRW Management	Mr. Akinori MIYOSHI
Deputy Chief Advisor / NRW Management	Mr. Taketoshi FUJIYAMA
Skills Programme Planning/Organization Coordination	Mr. Kenichiro SUGIYA
Water Leakage Detection	Mr. Hiroki NIIMURA
Water Distribution Control / Commercial Loss	Mr. Hiroyuki MORITA
Training Yard Design and Supervision	Mr. Masuji IDE
Procurement / Administrative Coordination	Mr. Toshinobu KASUYA
Training Management/Human Resource Development	Mr. Nobutaka MARUYAMA

9 SUSTAINABILITY

The proposed programme has a potential to be built onto a full occupational qualification by progressively developing beneficiaries from short term learning programmes that will eventually lead to achievement of Water Reticulation Practitioner (WRP) occupational qualification. The completion of the NRW programme will allow trainees to articulate to much higher level of National Qualification Framework (NQF) in future, as envision by the National Qualification Framework Act, 2008 (No 67 of 2008).In future, the trainees will qualify to enroll for the already-registered WRP occupational qualification in some parts.

10 PROJECT TIMELINE

The overall goal of the Project is to continuously develop NRW management skills for municipalities under the direction of IBTC in collaboration with SALGA based on municipal NRW ratios. The National NRW Training is implemented in two groups in FY2019/2020.

Training Groups

The three groups in FY2019/2020 and early FY2020/2021 are as follows:

Group 1: 7th September 2019 - 29th November 2019

Group 2: 27th January 2019 - 6th March 2020

Group 3: 11th May 2019 - 19th June 2020

11 IMPORTANT SCHEDULE FOR FACILITATORS ONLY

As a role and responsibility, the nominated facilitators are requested to be in the facilitator technical meetings (workshops) at IBTC, Roodeplaat, Pretoria for the facilitator's training and also familiarize themselves with learning/teaching materials and training yard.

The schedule are as below and details will be informed later:

- **2 - 3 days in the first week of June 2019 (3rd to 5th July 2019)**
- **2 - 3 days in the first week of July 2019 (19th and 20th September 2019)**

12 CONCLUSION

In conclusion Skills development is one vehicle that supports the optimum management of NRW in the municipalities which requires integrated collaboration of stakeholders at National office, Local government and SETAs to ensure access of water to support the socio-economic activities in the sector. One of the strategic action of the NWRS2 Chapter 15 is to increase Intergovernmental relations, sector collaboration and partnerships through effective utilisation of existing structures and instruments to facilitate intergovernmental relations, sector collaboration and partnerships in addressing key education, training and skills development issues. This proposal seek to implement the above objective of the NWRS2 Chapter 15 and also monitor the agreement between DWS and other Global and African countries in terms of KPI's set for training and skills transfer, and advances in research and technology.

This project will assist with skilling and building capacity of municipalities to tackle water losses and related non-revenue water challenges. This will ensure a better provision of reliable water services and improve water security for the municipalities and the country.

11/March/2020

Programme Outline of the National NRW Training

Aims:

- Understand NRW using District-Metered Area (DMA).
- Be able to show the NRW status using proper data.
- Learn basic skills for O&M through DMA management
- Select and illustrate effective countermeasures by each status quo and social situation.
- Make persuasive presentation and get project fund.
- Show clearly the project output.

Learner:

- Municipal water services officials (3-5 officials as a team consisting WCWDM, O&M, Billing, etc)

Facilitators:

- Skilled and experienced municipal water services officials
- DWS officials

Venue:

- Infrastructure Branch Training Centre (IBTC) of DWS, Roodeplaat, Pretoria
- Workplaces, Pilot DMA of each participating Municipality

Training Period (Revised):

- 1st week: IBTC training (theory & practice), Net 5 weekdays (incl. traveling days)
- 2nd week: Preparatory activities in municipalities
- 3rd week: Workplace training in municipalities, Net 5 weekdays (incl. traveling days)
- 4th week: Buffer week
- 5th week: Workplace training in municipalities, Net 5 weekdays (incl. traveling days)
- 6th week: IBTC training (Results, findings and actions & Way forward) , Net 3 weekdays (incl. traveling days)

Training net period is 18 weekdays incl. travelling days in 6 weeks duration

---- Criteria of Pilot DMA (in Municipality) -----

1. Number of connections:
   Around 100 connections, can isolate on the map by existing valves.
2. Availability of operational reticulation map (e.g. IMQS):
   Pipelines, valves, fire hydrants, air valves, PRVs, altitudes, etc.
3. SIV meter (D80mm, D100mm preferable):
   Be able to measure by only one input line.
4. Data availability:
   Available financial/consumption/billing data of the DMA and of each household (Population, number of supply households, number of connection, each supply volume, billed or non billed status, payed or non payed status, using community stand or not, FBW status, interruption of water, etc. Monthly data preferable)

Programme Conceptual Flow

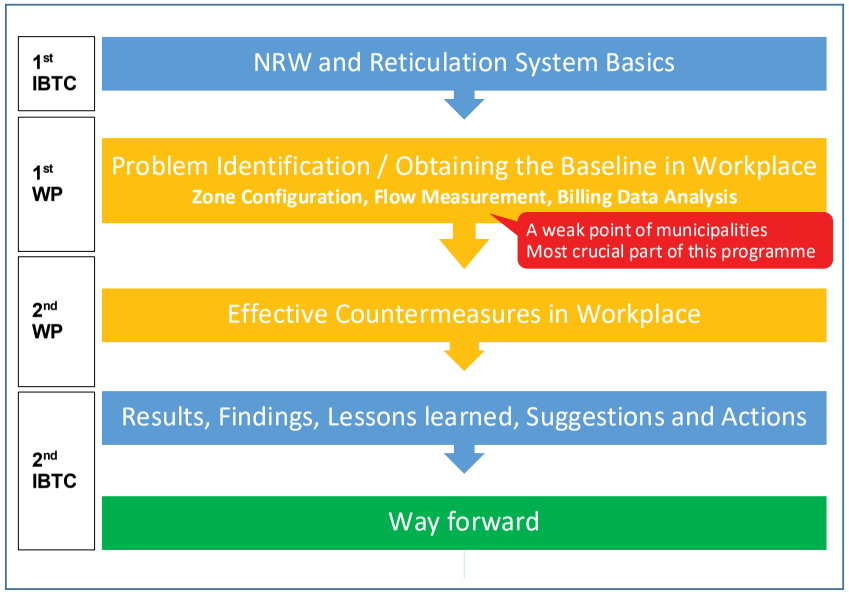


Table 1: Training in IBTC (1st week)

Day	Time	Contents	Venue
1st week (IBTC)			
11 May (Mon)	am	* Travelling (facilitators and learners)	-
	13:30-14:00	Course orientation [Orientation]	Room
	14:00-14:30	Introduction of participating municipalities [Presentation]	Room
	14:45-16:00	The previous training activities and results [Presentation]	Room
12 May (Tue)	8:30-10:00	NRW in reticulation network [Theory]	Room
	10:15-11:50	NRW calculation [Practices]	Room
	Lunch		
	13:00-14:00	Water reticulation infrastructure and appurtenance [Theory]	Room
	14:10-16:00	Water reticulation infrastructure and appurtenance [Practices]	Yard
13 May (Wed)	8:30-10:00	Problem identification by using DMA [Theory]	Room
	10:15-11:50	Zoning practice, meter selection [Practices]	Room
	Lunch		
	13:00-14:20	Data logging, retrieval, analysis, billing data analysis [Practices]	Room
	14:40-16:00	Problem identification by using DMA [Practices]	Yard
14 May (Thu)	8:30-9:30	NRW Countermeasures, the most common [Theory] (methodology, techniques and technology)	Room
	9:45-11:50	NRW Countermeasures, the most common [Practices] (methodology, techniques and technology)	Yard
	Lunch		
	13:00-13:30	Funding application (DWS: WSIG) [Theory]	Room
	13:30-14:00	Strategy and Implementation Plans [Theory]	Room
	14:15-16:00	Planning for workplace training [Practices]	Room
15 May (Fri)	8:30-10:00	Planning for workplace training and their modification [Practices]	Room
	10:15-11:00	Summarize of the 1st week programme [Theory] Evaluation and assessment of the training [Orientation]	Room
	11:15-11:50	Workplace training [Orientation]	Room
	Lunch		
	pm	* Travelling (facilitators and learners)	-

Table 2: Workplace Training (2nd to 5th weeks)

Day	Time	Contents	Remarks
2nd week (Preparatory)			
18-22 May	-	- Preparation by learners in workplaces (DWS Coordinators support learners if necessary) - Confirmation of pilot DMA at the site - Starting data logging - Collect billing data in the DMA by learners	-
3rd week (1st Workplace)			
25 May (Mon)	am	* Travelling (DWS Coordinators and Facilitators)	-
	pm	Participant assembly, meeting about training plan and courtesy call	Office
26 May (Tue)	am	DMA configuration	Site
	pm	DMA configuration	Site
27 May (Wed)	am	DMA configuration	Site
	pm	DMA configuration, MNF (by step measurement) at night	Site
28 May (Thu)	am	Data retrieval and Data analysis	Site and office
	pm	Reporting (Baseline & problem identification)	Office
29 May (Fri)	am	Presentation to managers of each Municipality Wrap up workplace training results	Office
	pm	* Travelling (DWS Coordinators and Facilitators)	-
4th week (Buffer)			
1-5 Jun.	-	(DWS Coordinators support learners if necessary) (MNF and SIV measurement if necessary)	-
5th week (2nd Workplace)			
8 Jun. (Mon)	am	Travelling (DWS Coordinators and Facilitators)	-
	pm	Participant assembly and meeting about training plan	Office
9 Jun. (Tue)	am	NRW Countermeasures	Site
	pm	NRW Countermeasures	Site
10 Jun. (Wed)	am	NRW Countermeasures	Site
	pm	NRW Countermeasures, MNF (by step measurement) at night	Site
11 Jun. (Thu)	am	Data retrieval/analysis	Office
	pm	Preparation for presentation (Findings, results, remaining issues, strategic implementation planning with considering funding application)	Office
12 Jun. (Fri)	am	Presentation to relevant managers Wrap up workplace training results	Office
	pm	* Travelling (DWS Coordinators and Facilitators)	-

Remarks: Learners should be firstly capable to identify problems. If the team identifies the problems properly, selecting/taking effective countermeasures are a piece of cake.

Table 3: Training in IBTC (6th week)

Day	Time	Contents	Venue
6th week (2nd IBTC)			
15 Jun. (Mon)	-	-	-
16 Jun. (Tue)	-	-	-
17 Jun. (Wed)	-	* Traveling (facilitators and learners)	-
18 Jun. (Thu)	8:30-9:45	Workplace Training Results (Presentation) drafting	Room
	10:00-12:00	Workplace Training Results (Presentation) and Q&A [Presentation, 30 minutes each]	Room
	Lunch		
	13:00-13:50	Technical Review and Recapping [Interactive Session]	Room
	14:00-15:15	Follow-up Lectures with Supplemental Notes [Theory & Practices]	
	15:30-16:30	Revision of Workplace Training Results (Presentation)	Room / Yard
19 Jun. (Fri)	8:30-9:00	**Output Sharing Seminar * Invite various stakeholders** Introduction of Participants [Orientation]	Room
	9:00-11:00	**Output Sharing Seminar * Invite various stakeholders** Presentation and Q&A [Presentation, 30 minutes each]	Room
	11:15-11:45	Overall Evaluation	Room
	11:45-12:30	Certification, Closing Remarks, Group Photos	Room
	Lunch		
	pm	* Travelling (facilitators and learners)	-

Remarks:

END

ANNEXURE SOP3-1

water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

VENUE RESERVATION FORM

IBTC FACILITIES

(Please note: venue bookings must be done 14 working days before the event)

RESERVATION DETAILS				
Department/Client:				
Directorate:				
Branch:				
Name of Event:				
No. of People:				
Type of Facility Required (√) appropriate block/s	Auditorium 60 max	Classroom 16-18 max p/class x 3	Boardroom 25 max	Comp Lab 18 max
Date/s of Event:	From		To	
NB: Take note that IBTC Venues are only available between 07:15 in the morning until 15:45 in the afternoons on weekdays. Any afterhours activities must be arranged and approved by IBTC management in advance.				
Name of Event Coordinator:				
Cost Centre:				
Functional Area:				
G/L Account:				
Tel no:				
Fax no:				
Cell no:				
Email Address:				
Director's Signature:				
Date:				
FOR OFFICE USE ONLY				
Booking official name:				
Persal Number:				
Reservation Date:				
Booking status (Reservation/Confirmed):				
Venue and Room Number Allocated:				
Administrator Signature:		Date:		
IBTC Manager Signature:		Date:		

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ANNEXURE SOP3-2

water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

Infrastructure Branch Training Centre (IBTC)

Client Name: ..... **Date:** .....

Facility: Auditorium

Checklist of Room Equipment and Cleanliness

ITEMS	IN			OUT			COMMENTS
	Yes	No	N/A	Yes	No	N/A	
EQUIPMENT							
Computer screen							
Computer hard drive							
Key board							
Mouse							
13 Tables							
71 Chairs							
2 Microphones							
Overhead projector							
Projection screen							
Projector Remote control							
Extension cords							
Wire (to connect laptop)							
Plugs							
Lights							
Air conditioner							
White board							
White board markers							
Flip chart							
Flip chart stand							
Podium							
CLEANLINESS							
Floor							
Desks							
chairs							
Walls							

Comments

- The responsible event coordinator hereby acknowledges that he/she received the venue and equipment (as per attached check list) in good working condition.
- The responsible coordinator also accepts responsibility of any loss or damage to equipment.
- Any loss or damage must be reported immediately to the Chief Administrator followed by a comprehensive report about the incident. If it is found that the said loss or damage can be contributed as negligence, the person who has cost the loss or damage will be held responsible for cost of such loss or damage.

Client Signature: ..... **Date:** .....

IBTC Management Signature: ..... **Date:** .....

ANNEXURE SOP3-3

water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

Request for Electrical Support / Assistance

Directorate Construction East
Electrical Support Workshop

1. Request must be completed by the requestor and be authorized.
2. Request must be send to: (Telephonic request will not be accepted or acted upon)
   e-Mail: [redacted]
   Fax:
3. Emergencies must be declared and communicated to Willem Strydom on 083 229 4925.
   EVEN IF AN EMERGENCY WAS DECLARED, A REQUEST MUST STILL BE SEND TO THE ELECTRICAL WORKSHOP.

Information of Requestor

Name:
Contact number(s): ☐☐☐ - ☐☐☐ - ☐☐☐☐ or ☐☐☐ - ☐☐☐ - ☐☐☐☐
e-Mail: @
Work Site / Project:

Details of Request

Full Description:
Other forms Attached: ☐ Yes ☐ No
Description of form: 1. 2.

Declaration of an Emergency

Emergency Declared: ☐ Yes ☐ No
Date of Communication: 2 0 - - -
Communicated with: see point 3
Reason for Emergency:

Financial Details / Costing Information

Cost Centre Code:
WBS Code: C
Full Description:

Authorization

I, the undersigned, hereby:

1. authorize the electrical workshop to complete the work requested.
2. declare that all work requested are needed due to SLA / OHS / ICA / SANS or another valid reason and not in contradiction to any DWS rules, policies, regulation communications and/or applicable law(s).
3. declare that the cost centre and/or WBS code are to be used in all transactions relating to this request.

Name / Surname _____ Signature _____ 2 0 / / Date

Electrical Office Use

Date Received: 2 0 - - -
Sequence Number: ☐ - ☐ - ☐ - ☐ - ☐
Request Issued To: Date: 2 0 - - -
Request Closed By: Date: 2 0 - - -

ANNEXURE SOP5-1

water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

Japan International
Cooperation Agency

SOUTH AFRICAN LOCAL GOVERNMENT ASSOCIATION
SALGA
Inspiring service delivery

Project for Strengthening the Training Capacity of IBTC on Non-Revenue Water

THE NATIONAL NRW TRAINING

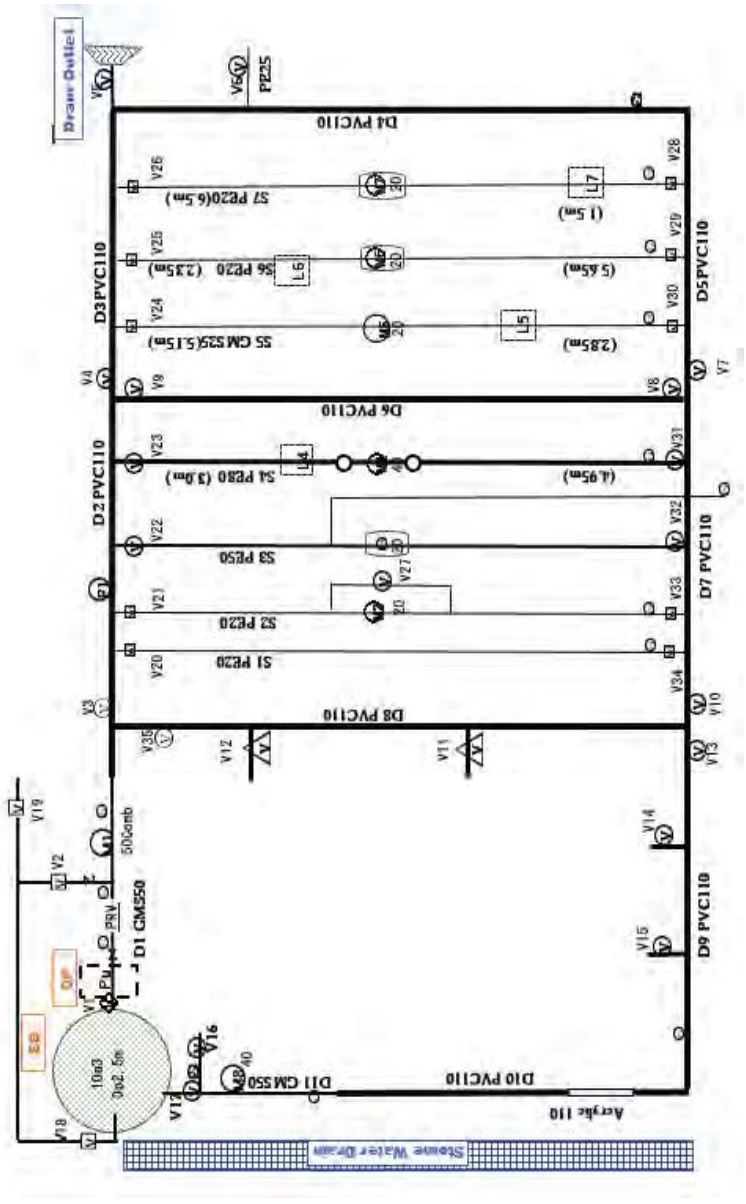


TRAINING YARD MAINTENANCE MANUAL

VERSION 1.0

OCTOBER 2019

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Training Yard

I. Facility

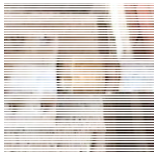
1. Basic Condition

1.1. Water pressure

- Public Water Supply (PWS): About 3.8 bar-4.2 bar
- Pump Pressure (PP): Use maximum 4 bar for normal operation, (Except for high pressure test)

Repeating of high and 0 pressure is not recommended for pipelines especially plastic pipes to avoid early deterioration of the pipes.

1.2. Valves



- Two (2) no-return valves (symbol: Z on the drawing) are installed at the out flow pipe from the pump and inflow pipe from V2. If these valves do not work well, water from the pump flows into the public service line, or water from the public service line flows into the tank. Be careful when operating with the pump or the public service line.
- Two type of valves with different rotation directions
  - Open Clockwise: V1, V3, V4, V7, V8, V9, V10, V17
  - Open untie-clockwise: V5, V6, V11, V12, V14, V15, V16





2. When Not in Use

2.1. Control Panel (CP)



- Off the Main switch

2.2. Valves

- Close V19, V2

3. Use after long period not in use

3.1. Filling water

- Check inside of the water tank, if there are foreign substances such as leaves, pebbles or trash in JoJo tank. Those foreign substances should be removed before the pump start.
- Open V16 or F3 to wash out pipelines for the first several minutes. Do not open V17 to return the water into the tank when you wash out the water.

4. Preparation

4.1. Fill Water into the Facility and Cleaning Pipelines

4.1.1. Fill Water into the Water Tank

I. Close V1, Open V19, V18. Check close V2
II. Filling water volume: around 50% (5m3)
III. Pay attention to overflow (There isn't an overflow pipe)
IV. Close V18

4.1.2. Fill Water into the Pipelines

(1) From the water tank

I. Open valves: V3, V4, V7, V8, V9, V10, V13, V17, V35
II. Open V1 slightly
III. Confirm air is discharged at A1, A2
IV. Open F1, F2, F3 and check if still air is in the pipelines.

- Note: In this case water does not flow into the tank because of the water revel

(2) From public service line

I. Open valves: V3, V4, V7, V8, V9, V10, V13, V17, V35
II. Open V2
III. Check if air is discharged at A1, A2
IV. Open F1, F2, F3 and check if still air is in the pipelines.
V. Open taps and discharge remaining air inside of service pipe completely.

- Note: In this case water flows into the tank. Therefore, close V17 before opening V2 to prevent over flow of the tank.

4.1.3. Cleaning Pipelines

I. Starting pump or open V2
II. Cleaning for D2 and D3 line: Open V3, V4, V5 Close V17
III. Cleaning for D8, D7, D5, D4 line: Open V35, V34, V7 Close V3, V13
IV. Cleaning for D2, D6, D5, D4 line: Open V9 Close V35V, 13
V. Cleaning for D8, D9, D10 line: Close V5, V17 Open V16 and F3
VI. Cleaning for service pipes: Open V3, V4, V20, V21, V22, V23, V24, V25, V26
Open T1, T2, T3, T4, T5, T6, T7

- Don't return the cleaning water in to the tank. Open V5, V16 or F3 for several minutes to drain out water used for pipe cleaning.

II. Operation of the Facility

1. Operation

1.1. Pump Operation

1.1.1. Operator

- Pump operation should be done by IBTC staff.
- Facilitators who have learned pump operation may do this if there is no person responsible for the operation in the IBTC.

1.1.2. Preparation

- Confirm V1, V17, V35 is opened (at least a circulation piping should be formed, except high water pressure test)
- A pumping is needed to check M1and M8.
- Switch on and adjust required pressure by pump rotation speed and V17.

Table 1-1 Pump rotation speed and obtained water pressure (when V17 closed)

Pump speed	P1 pressure	
1,000		
1,500		
2,000		
2,500		
3,000		
3,500		

2. Valve Operation

2.1. Valve Operation

2.1.1. No leak pipe condition

◆ Close both sides of valve S4(V23, V31), S5(V24, V30), S6(V25, V29), S7(V26, V28) or V4, V7 and S4(V23, V31).

3. PRV setting

① Usual position of PRV, when inflow pressure is 4 bar and out flow pressure is same as 4 bar

② For operation training of PRV, use a spanner to turn the control volt to adjust the required water pressure which is shown at P3 gauge.

4. After Training Program

4.1. Usually Keep Water in the Pipeline

① Turn off pump switch,

② Close both side valve of S4, S6, S6, S7

4.2. When Discharge Water from the Pipelines.

① Turn off pump switch,

② Open: V1, V3, V4, V5, V7, V8, V9, V10, V13

③ Close all valves

4.3. When Discharge Water from the Water Tank and Pipelines.

① Open: V1, V3, V4, V5, V7, V8, V9, V10, V13

② Pumping to empty the water in the tank

③ Turn off pump switch

④ Close all valves

5. Notice

◆ Don't step on the PVC pipes directly

◆ Don't lean on the handrails

II. MAINTENANCE

【Training Yard Facility】

1. Not in Use for Long Period (More than One Month)

1.1. Electric power supply

◆ Shat down main switch in the EB (Except If lights are needed in the night)

◆ Main switch off in the Control Panel.

1.2. Water tank

◆ Drain out all water by pump and closed the lid of the tank to avoid the growth of algae and other creatures.

1.3. Water in the pipes

◆ Keep the pipeline filled with water with the valve operation to stop water leak from the water leak points, so that the joint material of the ground piping part is not dried up.

◆ Open V5 and drain all water to avoid the growth of algae and other creatures, every one month.

1.4. Valves

◆ Close V19, V18, V2 to avoid water flow in the Tank and pipeline

2. Periodical Maintenance

Check the condition of TY facility periodically. Equipment which requires manufacturer's observation ask them about the maintenance period recommended by them.

◆ See [Reference -3: Facility Check sheet]

Every one (1) year

【Pump】

Check the electricity condition by electric staff of the DWS or suitable expert.

◆ Earth connection, electric resistance, etc.

Every one (1) month

【Water tank】

◆ Inspect leak of three connection points between pipes and tank. (One outlet, Two inlet)

◆ Inspect function of floating water-tap condition.



Inlet



Floating valve

【Pump facility】

- Functioning test of pump and control panel.
- Check if there are no strange sound, smell and vibration from control panel and pump.


Control Panel


Pump and Motor

【Pressure Reducing Valve】

- Functioning test of PRV and pressure gauge


PRV(Pressure Reducing Valve)


Pressure Gauge

【Pipes & Appurtenance】

- Visual inspection of leak from, joints and accessories
- Visual inspection of scratches on the pipelines surface
- Check if any loose bolts of the accessories and pipe end caps
- To avoid the growth of algae and other creatures in the Transparent Pipe, flow water several minutes once a month. If algae is observed in the Transparent Pipe, remove it from the pipe line and clean inside of the pipe with sponge.


Facility


Transparent Pipe


Pipe End Flange


Air Valve

【Valves】

- Operation check by opening and closing.
- Visual inspection of leak from valve, body and connections.
- Check for loose bolts of the body and connections.
- Inspection of valve boxes.


Gate (Sluice) valve


Butterfly valve


Stop cock

【Water Meter & Box】

- Confirm counter function by running water
- Clean water meter


Water meter


Water meter


Combination meter

【Leak point】

- Investigate leak sound from the leak points.
  - S4(hole size 6mm), S5(6mm), S6(4mm), S7(4mm) have leak holes
  - S5 is Galvanized Metal Steel, pay attention to be rusted.


Leakage hole


Leakage pit

【Storm water drain and outlet】

◆ Clean fallen leaves and periodically.



Storm water drain



Storm water drain

【Hand rails】

◆ Retighten bolts and nuts periodically



Hand rails

【Asphalt & Interlocking blocks】

◆ Check visually of the flatness bulging, holes, dents, and block displacement.



Asphalt pavement



Interlocking block

【Equipment】

1. Stored equipment

Check the condition and number of equipment stored every month, and calibrate the function according to the period recommended by the manufacturer.

◆ See [Reference -4: Equipment List]

Reference

Reference-1

Specification of the facility

Water storage

Item	Specifications
Water tank	Manufacturer: JoJo, Capacity: 10m3, Installed a floating water-tap

Pump facility

Item	Specifications
Booster Pump	Manufacturer: LOWARA Dia.: 50mm Motor Power Kw: Head m:
Control panel	Manufacture: ZEST WEG ELECTRIC (PTY) LTD Description: 5.5KW, 380V, VSD Panel

Water pressure facility

Item	Specifications
Pressure Reduce Valve	Manufacturer:, Dia.: 50mm
Pressure gauge	Manufacture:, Dia.: mm

Pipes *Plastic pipe size Dia. is outside Dia., GMS pipe is inside Dia.

Item	Manufacturer	Specifications
PVC (D2)		Dia.: 110mm, Class: 12
PVC (D3)		Dia.: 110mm, Class: 12
PVC (D4)		Dia.: 110mm, Class: 12
PVC (D5)		Dia.: 110mm, Class: 12
PVC (D6)		Dia.: 110mm, Class: 12
PVC (D7)		Dia.: 110mm, Class: 12
PVC (D8)		Dia.: 110mm, Class: 12
PVC (D9)		Dia.: 110mm, Class: 12
PVC (D10)		Dia.: 110mm, Class: 12
GMS (D1)		Dia.: 50mm
GMS (D11)		Dia.: 50mm
GMS (S5)		Dia.: 25mm
PE (S1)		Dia.: 20mm
PE (S2)		Dia.: 20mm
PE (S3)		Dia.: 50mm
PE (S4)		Dia.: 80mm
PE (S6)		Dia.: 20mm
PE (S7)		Dia.: 20mm
Acrylic pipe (D10)		Dia.: 110mm, thickness: 15mm, length: 1 m

Valves & accessories

Item	Manufacturer	Specifications
Valve (V1)		Dia.: 50mm, outlet valve from tank, Clockwise: open
Valve (V2)		Dia.: 50mm, at bypass pipe, Counterclockwise: open
Valve (V3)		Dia.: 100mm, Clockwise: open
Valve (V4)		Dia.: 100mm, Clockwise: open
Valve (V5)		Dia.: 100mm, Drain, Clockwise: open
Valve (V6)		Dia.: 25mm, Counterclockwise: open
Valve (V7)		Dia.: 100mm, Clockwise: open
Valve (V8)		Dia.: 100mm, Clockwise: open
Valve (V9)		Dia.: 100mm, Clockwise: open

Valve (V10)		Dia.: 100mm, Clockwise: open
Valve (V11)		Dia.: 100mm, Butterfly, Counterclockwise: open
Valve (V12)		Dia.: 100mm, Butterfly, Counterclockwise: open
Valve (V13)		Dia.: 100mm, Clockwise: open
Valve (V14)		Dia.: 100mm, Clockwise: open
Valve (V15)		Dia.: 100mm, Clockwise: open
Valve (V16)		Dia.: 50mm, Clockwise: open
Valve (V17)		Dia.: 50mm, Clockwise: open
Valve (V18)		Dia.: 50mm, Counterclockwise: open
Valve (V19)		Dia.: 50mm, Counterclockwise: open
Valve (V20)		Dia.: 20mm, Counterclockwise: open
Valve (V21)		Dia.: 20mm, Counterclockwise: open
Valve (V22)		Dia.: 50mm, Counterclockwise: open
Valve (V23)		Dia.: 80mm, Counterclockwise: open
Valve (V24)		Dia.: 25mm, Counterclockwise: open
Valve (V25)		Dia.: 20mm, Counterclockwise: open
Valve (V26)		Dia.: 20mm, Counterclockwise: open
Valve (V27)		Dia.: 20mm, Counterclockwise: open
Valve (V28)		Dia.: 20mm, Counterclockwise: open
Valve (V29)		Dia.: 20mm, Counterclockwise: open
Valve (V30)		Dia.: 25mm, Counterclockwise: open
Valve (V31)		Dia.: 80mm, Counterclockwise: open
Valve (V32)		Dia.: 50mm, Counterclockwise: open
Valve (V34)		Dia.: 50mm, Counterclockwise: open
Valve (V35)		Dia.: 100mm, Butterfly, Counterclockwise: open
Air valve (A1)		Dia.: 50mm,
Air valve (A2)		Dia.: 50mm,
Fire hydrant (F1)		Dia.: 75mm,
Fire hydrant (F2)		Dia.: 75mm,
Fire hydrant (F3)		Dia.: 75mm,
Water tap (T1 – T7)		Dia.: 20mm,

Water meter

Item	Manufacturer	Specifications
Water meter (M1)		Dia.: 50mm, Combination Type
Water meter (M2)		Dia.: 20mm
Water meter (M3)		Dia.: 20mm
Water meter (M4)		Dia.: 40mm
Water meter (M5)		Dia.: 20mm
Water meter (M6)		Dia.: 20mm
Water meter (M7)		Dia.: 20mm
Water meter (M8)		Dia.: 40mm

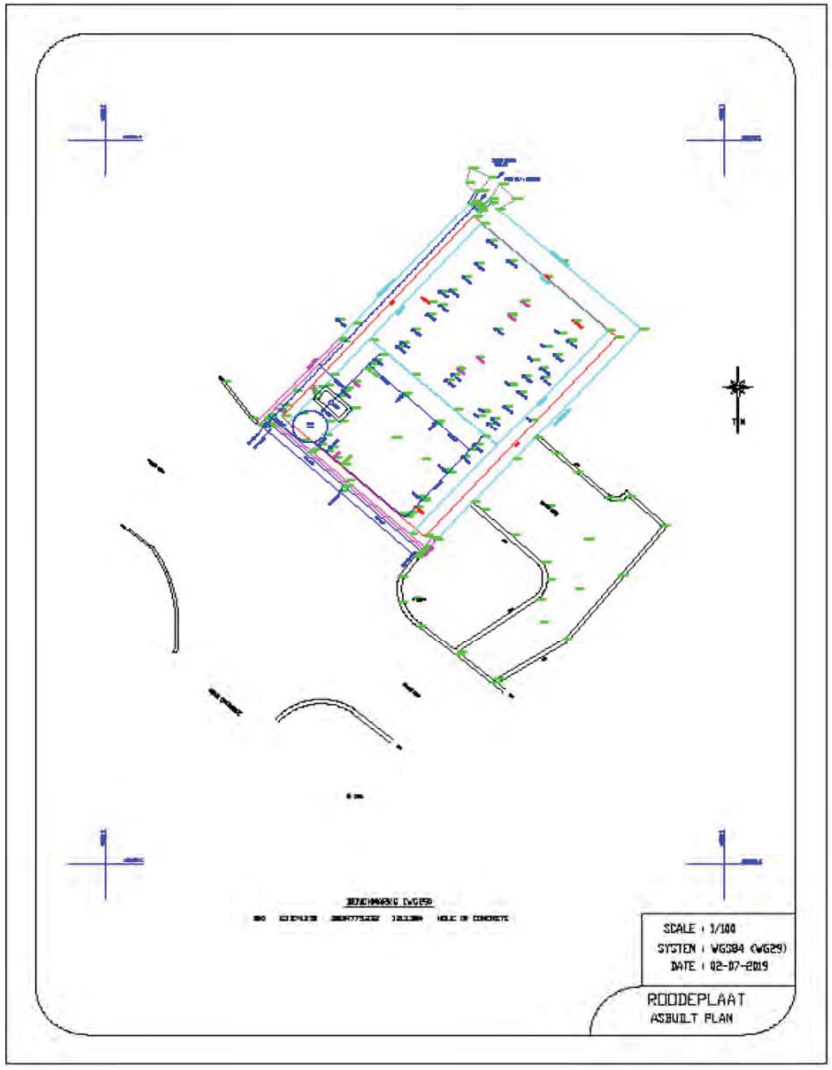
Others

Item	Specifications
Roof structure	Baking Steel
Lighting	Overhead light: 12, Security light: 3
Pavement	Asphalt:5cm, Interlocking:8cm
Handrail	Hight:1.2m
Concrete block	
Concrete apron	Thickness:10cm
Brick wall	
Gutter	Precast concrete with steel grating: 600x450x8000
Brick Wingwall	
Drainage canal	
Storm water pipe	PVC Dia.: 300mm

Reference-2

As-built Drawings

Plan Figure-1



Reference-3

Facility Inspection Sheet

| Category | Check point | Item | Detail | | |

Reference-4

Procured Equipment List

No	Item	Model	Unit	Manufacturer	Supplier
1	Ultrasonic Flow-meter	PrimeflowT(RXG845) with thickness gauge SA40	2	Primayer	NLD
2-1	Pressure logger	Primelog 2i +XAP Display	2	Primayer	NLD
2-2	Pressure logger	Cello 4S (2xFlow & 1xPressure) with accessories	1	Technolog	WRP
3	Leak noise correlator	Aqua scan 610	1	Gutermann	NLD
4-1	Ground microphone	Aqua scope 3-C	1	Gutermann	NLD
4-2	Ground microphone	KMT HL5000 Pro	1	Seba	WRP
4^3	Ground microphone	DNR-18	1	Fujitecom	H2O
5	PVC locator	NPL-100	1	Fujitecom	NLD
6	Metal Pipe Locator	Aqua tracer 200	1	Gutermann	NLD
7	Buried Valve Locator	Magscan 100	1	Gutermann	NLD
8	Electric Listening Stick	Aquascope 2	1	Gutermann	NLD
9	Listening Stick	LSP-1.5m	5	Fujitecom	NLD
10	Walking Measure	GT9050	1	Grip	NLD
11	Hammer Drill with bit (500mm)	RYOBI RH1440 With 3 bits of 19ϕ500mm SDS-Max bit	1	Ryobi	NLD
12	Boring Bar	Boring bar	2	Fujitecom	NLD
13	Sensus iPERL water meter 25mm	iPERL 25mm	1	Sensus	NLD

Supplier List

No.	Item	Address	Contact Details
1	National Leak Detection (NLD)	Unit 8, George Palmer Business park, Boksburg	
2	WRP Consulting Engineers (PTY) LTD (WRP)	27 George Storrar Drive 5 Greenpark Estate Groenkloof, Pretoria	
3	H2O Leak Technologies (H2O)	P.O. Box 1871, Bedfordview, 2008./ 134 Second Avenue, Edenvale, 1609.	

Reference-5

Donated Equipment/Materials List

- Tydan Control Valve
  Contact:
  Tel:
  Email:
  Provided: 1 off 50mm SINGER #106-PR pressure reducing valve PN16 rated)

- Dynamic Fluid Control
  Contact:
  Tel:
  Email:
  Provided: 1 x DN050 Cla Val (demo valve), 1 x DN080 RSV valve (demo valve), 1 x See thru Vent O Mat RBX Air valve (demo valve)
  (the following valves are also ready and can be delivered to the training centre: 1 x DN050 VOSA swing check valve, 1x DN025 RBX Air release and vacuum break valve)

- Xylem / Zest
  Contact:
  Tel:
  Email:
  Provided: Electrical panel, pump motor, pump, water meters

- Davis and Deale
  Contact:
  Tel:
  Email:
  Provided: Water meters and meter boxes

- AVENG DFC
  Contact:
  Email:
  Tel:
  Provided: 80mm RS Valve, 50mm Swing check valve, 25mm Air valve

End

ANNEXURE SOP5-2

water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

Japan International Cooperation Agency

SOUTH AFRICAN LOCAL GOVERNMENT ASSOCIATION
SALGA
Inspiring service delivery

Project for Strengthening the Training Capacity of IBTC on Non-Revenue Water

THE NATIONAL NRW TRAINING

TRAINING EQUIPMENT MAINTENANCE MANUAL

VERSION 1.0

OCTOBER 2019

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PROCURED EQUIPMENT LIST

PROCURED EQUIPMENT LIST

No	Item	Model	Unit	Manufacturer	Supplier
1	Ultrasonic Flow-meter	PrimeflowT(RXG845) with thickness gauge SA40	**2**	Primayer	NLD
2-1	Pressure logger	Primelog 2i +XAP Display	**2**	Primayer	NLD
2-2	Pressure logger	Cello 4S (2xFlow & 1xPressure) with accessories	**1**	Technolog	WRP
3	Leak noise correlator	Aqua scan 610	**1**	Gutermann	NLD
4-1	Ground microphone	Aqua scope 3-C	**1**	Gutermann	NLD
4-2	Ground microphone	KMT HL5000 Pro	**1**	Seba	WRP
4-3	Ground microphone	DNR-18	**1**	Fujitecom	H2O
5	PVC locator	NPL-100	**1**	Fujitecom	NLD
6	Metal Pipe Locator	Aqua tracer 200	**1**	Gutermann	NLD
7	Buried Valve Locator	Magscan 100	**1**	Gutermann	NLD
8	Electric Listening Stick	Aquascope 2	**1**	Gutermann	NLD
9	Listening Stick	LSP-1.5m	**5**	Fujitecom	NLD
10	Walking Measure	GT9050	**1**	Grip	NLD
11	Hammer Drill with bit (500mm)	RYOBI RH1440 With 3 bits of 19 ϕ 500mm SDS-Max bit	**1**	Ryobi	NLD
12	Boring Bar	Boring bar	**2**	Fujitecom	NLD
13	Sensus iPERL water meter 25mm	iPERL 25mm	**1**	Sensus	NLD

If you have any problems of the equipment, please contact the address below.

SUPPLIER LIST/CONTACT ADDRESS

No.	Item	Address	Contact Details
1	National Leak Detection (NLD)	Unit 8, George Palmer Business park, Boksburg	
2	WRP Consulting Engineers (PTY) LTD (WRP)	27 George Storrar Drive 5 Greenpark Estate Groenkloof, Pretoria	
3	H2O Leak Technologies (H2O)	P.O. Box 1871, Bedfordview, 2008./ 134 Second Avenue, Edenvale, 1609.	

1. MAINTENANCE POLICY

Recording of the maintenance is important to understand the condition of the equipment. All the equipment should be checked monthly and the record should be kept as a monthly maintenance record.

- All equipment should be maintained by the through check list monthly.
- List of all components should be in the check list to avoid loss of any component.
- The inventory record must include “who” and “when” use them.

2. RENTAL POLICY TO MUNICIPALITIES

Before rental of the equipment to municipalities for a work place training or a survey, rental note should be signed by a responsible person of the borrowing municipalities.

A sample of Rental Note

SAMPLE

EQUIPMENT LEASE AGREEMENT

Date: DD/MM/YYYY

Project for Strengthening the Training Capacity of IBTC on Non-Revenue Water

RENTAL TERMS AND CONDITIONS

1. The renter shall keep and maintain the rented equipment during the terms of rental at his own cost and expenses.
2. The renter shall pay the owner full compensation for replacement for and replacement and/or repair of it.

RENTAL PERIOD

From Date of DD/MM/YYYY, To Date of DD/MM/YYYY

Renter: Mr.
***** Municipality,

Owner Mr.
Manager, IBTC
Department of Water and Sanitation

Record of Inspection Dated DD/MM/YY

Equipment 3.10 Walking Measure: GT-9050

(1)	Main unit	1	Pc
(2)	Stand	1	Pc
(3)	Soft carry case	1	Pc

(1) Please make sure there is no malfunction of any components.

End

Operation manual must include list of the equipment, and the Renter/user must read thoroughly before the use.

- All equipment should be rented out with a rental note
- The rental note should be signed by a responsible person of the renter municipalities.
- The rental note must include “the check list” of the equipment.

3. Equipment and components

3.1. Ultrasonic Flow Meter: Prime Flow T (2 units)

(1)	Prime flow T Hand-held flowmeter	1	pc
(2)	Clamp-on sensors	1	pc
(3)	Sensor mounting accessories	2	pcs
(4)	Coupling component	1	pc
(5)	Measuring tape	1	pc
(6)	Battery Charger	1	pc
(7)	USB-RS232C connection cable	1	pc
(8)	Prime data software (USB)	1	pc
(8)	Operating instructions	1	pc

(1) Please make sure there is no malfunction of any components.

(2) Check the accuracy of flowmeter, at low, middle, and high rate using a test course compared to a mechanical flow meter.

3.2.1 Data logger: Prime log (2 units)

(1)	Prime log	2	pc
(2)	USB cable	1	pc
(3)	Helical pressure cable	2	pcs
(4)	Digital input cable	1	pc
(5)	XAP display	2	pcs

(1) Please make sure there is no malfunction of any components.

(2) Please make sure the flow data (output pulse) is properly logged by the data logger.

3.2.2 Data logger: Cello 4

(1)	Cello 4	1	pc
(2)	USB cable	1	pc
(3)	Helical pressure cable	1	pc
(4)	Digital input cable	1	pc

(1) Please make sure there is no malfunction of any components.

(2) Please make sure the flow data (output pulse) is properly logged by the data logger.

3.2.3 Pulsers:

(1)	Sensus Domestic Reed Switch	1	pc
(2)	Sensus HRI-Mei (D=10)	1	pc
(3)	Sensus HRI-Mei(D=100)	1	pc
(4)	Sensus HRI-Mei (D=10 to D=100)	1	pc
(5)	Kent PR-7 Inductive Pulser	1	pc
(6)	Kent PR-7 Inductive Pulser	1	pc
(7)	Kent Domestic Reed Switch	1	pc

(1) Please make sure there is no malfunction of any components.

(2) Please make sure the flow data (output pulse) is properly logged by the data logger.

3.3 Leak Noise Correlator: Aquascan 610

(1)	Cordless Correlator	1	pc
(2)	Two radio-operated sensors	1	pc
(3)	Battery chargers AC mains and DC	1	pc
(4)	Antenna & extension cable	1	pc
(5)	Headset	1	pc

(1) Please make sure there is no malfunction of any components.

(2) Please make sure a correlation peak is shown in the center of the display when the both sensor A & B is attached.

3.4.1 Ground Microphones: Aquascope 3C

(1)	Amplifier control unit with waist belt	1	pc
(2)	Stereo headphones	1	pc
(3)	Connection Cable	2	pcs
(4)	Hand probe microphone	1	pc
(5)	3 x Probe rods including 1 2with a tip	1	pc
(6)	1 x Tripod and magnet	1	Pc
(7)	Geophone	1	
(8)	T bar handle and rod	1	

(1) Please make sure there is no malfunction of any components.

(2) Please make sure the sound of the sensor is properly heard by the stereo headphone.

3.4.2 Ground Microphones: KMT-H5000 Pro

(1)	H5000 control	1	pc
(2)	Headphones	1	pc
(3)	Geophone	1	pc
(4)	T bar handle and rod	1	pc
(5)	Hand probe microphone	1	pc
(6)	3 X Probe rods including 1with a tip	1	pc
(7)	1 X magnet for hand probe	1	pc

(1) Please make sure there is no malfunction of any components.

(2) Please make sure the sound of the sensor is properly heard by the stereo headphone.

3.4.3 Ground Microphones: DNR-18

(1)	DNR-18 Control	1	pc
(2)	Pick up sensor with a hand switch	1	pc
(3)	Headphones (ST-3)	1	pc
(4)	USB connection cable	1	pc
(5)	Software	1	pc
(6)	3 X Probe rods including 1with a tip	1	pc
(7)	1 X magnet for hand probe	1	pc

(1) Please make sure there is no malfunction of any components.

(2) Please make sure the sound of the sensor is properly heard by the stereo headphone.

3.5 PVC locator NPL-100

(1)	Transmitter Oscillator	1	pc
(2)	Vibrator	1	pc
(3)	Antenna	1	pc
(4)	Connecting Cable	2	pc
(5)	Meter adaptor	1	pc
(6)	Receiver Amplifier	1	pc
(7)	Pick up sensor with hand switch	1	pc
(8)	Headphones	1	pc
(9)	Carrying case	1	pc

(1) Please make sure there is no malfunction of any components.

(2) Please make sure the sound of the sensor is properly heard by the stereo headphone.

(3) Please make sure the vibrator starts vibration.

3.6 Metal Pipe Locator: Aquatracer 200

(1)	Receiver RF	1	pc
(2)	Transmitterr	1	pc
(3)	User's manual	1	pc
(4)	Red/Black Cord (Large Clamp)	2	pc
(5)	Ground Rod	1	pc
(6)	Dry cell batteries		

(1) Please make sure there is no malfunction of any components.

(2) Please make sure there is a signal from transmitter to receiver.

3.7 Buried Valve Locator: Magscan 100

(1)	Main unit	1	pc
(2)	Soft Carrying Case	1	pc
(3)	User's manual	1	pc
(4)	Dry cell batteries AAA	1	pc

(1) Please make sure there is no malfunction of any components.

(2) Please make sure there is a sound when put the power button on.

3.8 Electric Listening Stick: Aquascope 2

(1)	Amplifier unit	1	pc
(2)	Accelerometer sensor	1	pc
(3)	Connection cable	1	pc
(4)	Pair of stereo headphones	1	pc
(5)	Operation manual	1	pc
(6)	Extension & 1 pointed rod	1	pc
(7)	Robust hard carry case	1	pc
(8)	Dry Cell Batteries AAA	4	pcs

(1) Please make sure there is no malfunction of any components.

(2) Please make sure the sound of the sensor is properly heard by the stereo headphone.

3.9 Listening Stick: LSP-1.5 * 5

(1)	Listening Stick	1	pc

(1) Please make sure there is no malfunction of any components.

3.10 Walking Measure: GT-9050

(1)	Main unit	1	pc
(2)	Stand	1	pc
(3)	Soft carry case	1	pc

(1) Please make sure there is no malfunction of any components.

3.11 Hammer Drill with bits: Ryobi RH1440

(1)	Main unit	1	pc
(2)	Drill bit	3	pcs
(3)	Lubricant	1	pc
(4)	Hard carry case	1	Pc
(5)	Operation Manual		

(1) Please make sure there is no malfunction of any components.

3.12 Boring Bar : 2

(1)	Boring bar	2	Pcs

(1) Please make sure there is no malfunction of any components.

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4. Tips for Maintenance

(1) Operation

- Please read the respective operation manuals if you encounter a problem on operation. Most of troubles will be solved.

(2) Storage

- Most of equipment use dry cell batteries. Please detach the batteries when the equipment is not used for a long time. Batteries may have leak and it causes a damage to the equipment.
- The equipment and its accessories should be stored in a fixed place in the own soft/hard case to prevent a malfunction due to dust and sun.
- The equipment should be checked once in a month to keep it in good condition.

End.

water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA



INFORMATION NOTE

THE NATIONAL NON-REVENUE WATER TRAINING PROGRAMME

By Municipalities for Municipalities



1. OVERVIEW

The Infrastructure Branch Training Centre (IBTC) is committed to support the Department of Water and Sanitation (DWS) and other stakeholders in building capacity of its people to effectively manage the water supply, with acceptable risks, to meet sustainable national, regional, social, economic and environmental objectives for all South African.

IBTC believes that its major role and significant contribution is to "**EMPOWER**" workforce and enhance human capital through the following values:

- ✓ Equal access
- ✓ Mentorship
- ✓ Partnership
- ✓ Occupationally oriented
- ✓ Willingness
- ✓ Excellence
- ✓ Redress

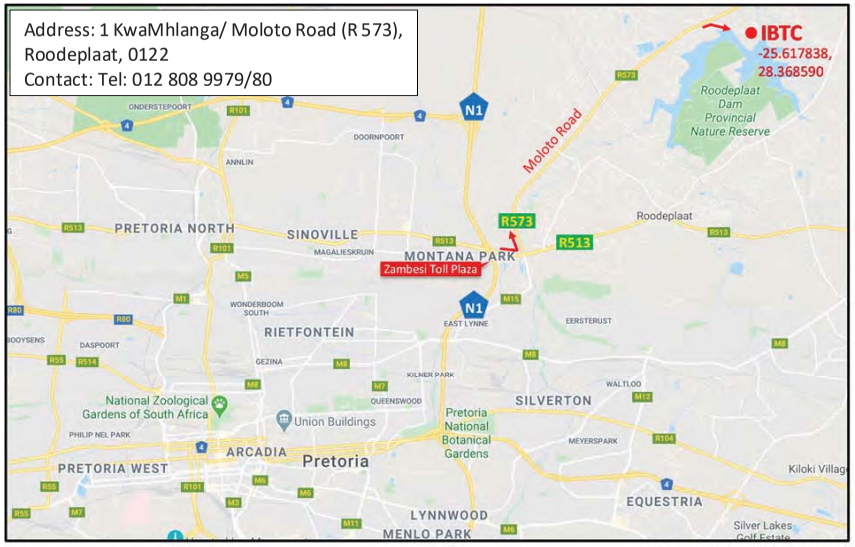
This note provides you with the overview of the programme and IBTC location for easy access.

IBTC is located at northern side of Tshwane (Pretoria), Roodeplaat, near Roodeplaat dam, approximately about 30 kilometres from CBD. The centre has an accommodation with 23 twin-bed rooms and 7 single rooms.

The training venue is where the theoretical and practical part of training shall take place.

All visitors (participants) should complete the register at the reception desk upon their arrival.

Address: 1 KwaMhlanga/ Moloto Road (R 573),
Roodeplaat, 0122
Contact: Tel: 012 808 9979/80



Source: Map from Google Map

2. BOOKINGS

Any person who wish to enrol on this programme should contact IBTC to check the next scheduled trainings. A course booking form should be completed and send for processing to enrol in the programme.

3. TRAINING INFORMATION

3.1 The Aim of the National NRW Training

Learners



- To understand NRW using District-Metered Area (DMA).
- To be able to show the NRW status using proper data.
- To learn basic skills for O&M through DMA management
- To select and illustrate effective countermeasures by each status quo and social situation.
- To make persuasive presentation and get project fund.
- To show clearly the project output.

3.2 Modules of Curriculum



1) Bulk Meter Knowledge and Technique
2) Customer Meter Knowledge and Technique
3) Reticulation Facility Planning and O&M (Valves, Fire Hydrant, Air Valves, etc.)
4) Messurement Planning
5) Data Logging and Analysis
6) Water Balance Analysis
7) NRW Reduction Strategic Planning and Presentation
8) Fundamental Knowledge of Active Leakage Detection

3.3 Training Period



- 1st week: 1st IBTC training (theory & practice), net **5 weekdays** (incl. traveling days)
- 2nd week: Preparatory activities in municipalities
- 3rd week: 1st Workplace training in municipalities, net **5 weekdays** (incl. traveling days)
- 4th week: Buffer week
- 5th week: 2nd Workplace training in municipalities, net **5 weekdays** (incl. traveling days)
- 6th week: 2nd IBTC training (Results, findings and actions & Way forward) , net **3 weekdays** (incl. traveling days)

Total net training period is **18 weekdays** including travelling days in 6 weeks duration.

3.4 Assessment

Assessment is divided into three phases pre-evaluation, evaluation and post-evaluation, and is conducted to measure the effect and impact of the programmes towards participants. Participants are, thus, required to answer the assessment sheet (quesionnaire) periodically.

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4. OTHER LOGISTCS

4.1 Accommodation and Travelling

Each participant is required to make direct booking at the nearest hotel or IBTC guest house. List of proposed accommodation is available at the general section in the IBTC. A means of transportation to either IBTC or workplace should be provided by self (participants).

4.2 Meals

Tea and lunch are served during the programmes. Any special diet should be made known on the booking form.

4.3 Attire

All participants should wear their uniform or equivalent throughout the duration of the sessions including at the workplace.

5. LANGUAGE AND SECURITY

English is the main language, though other languages are spoken as a communication tool.

6. SECURITY

IBTC is a venue for major conferences and presents a low risk to users. However, as when travelling to any major city, it is important to take responsibility for your personal safety and exercise common sense security precautions at all times. Delegates should observe common sense security precautions and not venture into unknown or unfamiliar areas without trusted local guide.

7. SAFETY, MEDICAL AND HEALTH

Induction will be held on the first day of the training which shall include the completion of the Indemnity form and Code of Conduct. In a case of emergency and urgency medical assistance first aid services will be provided for free within the premises where the training will take place, however the further assistance will be done according the information provided on the indemnity form.

8. GENERAL INFORMATION OF THE IBTC

8.1 Weather

The weather condition in Roodeplaat, Gauteng is generally fair throughout year.

8.2 Internet Facility

Free internet access is available at the training venue via free Wi-Fi connectivity.

9. CONTACT INFORMATION

For any further clarification needed, the following people can be contacted:

Training Coordinator:	**Training Manager:**
Tel: 012 808 9979/80 Mobile: Email:	Tel: 012 808 9979/80 Mobile: Email:

End

water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

TITLE	**LEARNER/FACILITATOR CODE OF CONDUCT**
REVISION 1	**INFRASTRUCTURE BRANCH TRAINING CENTRE**

Document title	LEARNER/FACILITATOR CODE OF CONDUCT
Document number	
Revision number	
Status	

LEARNER&FACILITATOR CODE OF CONDUCT

The Infrastructure Branch Training Centre (IBTC) of Department of Water and Sanitation (DWS) aims to provide an inclusive approach to learning and development. IBTC believes that learners/facilitators should be treated with respect by their facilitators/learners, assessors, staff and those we our host at the venue. In return, we also expect and anticipate that learners/facilitators will behave respectfully towards both other people and their training programme.

"Learner/Facilitator Code of Conduct" is to set out expectations for learner's behaviour and the procedures that the IBTC uses to resolves matters when learners'/facilitators' behaviour is unacceptable.

INTRODUCTION

Our code of conduct applies to:

- Both classroom/face-to-face courses and assessments.
- Internal and external learners enrolled on IBTC offered and coordinated learning programme.
- Internal and external facilitators for IBTC enrolled or coordinated training programmes and assessments

A learner is any individual enrolled on IBTC offered and coordinated programmes. This includes:

- Classroom course and/or assessment.
- Workplace course and/or assessment
- Delegates enrolled, from point of registration, that are undertaking a programme that includes a series of classroom/practical and theoretical assessments.

LEARNERS

All learners are expected to adhere to the code of conduct.

- A breach of the code of conduct may lead to a learner being excluded from the programme(s) of learning they are undertaking.
- Learners are individuals enrolled/booked on a training or assessment programme or registered on IBTC database.
- Learners are representing their employer's business whilst attending a course. Employers will be considered responsible for their employees' behaviour and may be liable for any damage because of misconduct.

We ask that you:

- Respect others, without any discrimination, regardless of culture, ability, race, gender, age or sexual orientation.
- Are courteous and respectful of host venues and training centres.
- Show a positive commitment to your own development and learning.
- Show respect for another learners' development.
- That you attend and arrive punctually to training/assessment events that you have been scheduled to take.

Document title	LEARNER/FACILITATOR CODE OF CONDUCT
Document number	
Revision number	
Status	

- That you cooperate with other learners, facilitators and IBTC staff.
- Understand that learner's progress at different paces.
- Understand that there is a certain amount of necessary paperwork which must be completed by each learner.
- Take care of equipment, facilities and buildings and show respect to others.
- Take due notice of health and safety related regulations applicable at IBTC (refer to IBTC facility induction).
- Put on the necessary protective equipment such as work suit and safety boots in the training yard.

FACILITATORS

- Acknowledge the noble calling of their profession to educate and develop internal employees / external clients.
- Acknowledge that their attitude, dedication, self-discipline, learning and facilitation methods determine the quality of education in the classroom.
- Commit themselves therefore, to do all within their power, in the executing of their professional duties, to act in accordance with the standards and norms of the profession.
- Ensure that their behaviour does not bring the IBTC or DWS into disrepute.
- Accept that they have a professional obligation towards learners, course induction, lessons, programme preparation, assessment of critical cross filed outcomes, learner feedback and certification.
- Will demonstrate understanding of new educational trends and apply on-going development in the education and learning field.
- Recognise their employer as a partner in education and learning; acknowledge that learning and development responsibilities are vested in them by their employer through legislation which they will serve to the best of their ability.
- Will refrain from discussing confidential and official matters with unauthorised people and will not disclose personal or any information about learners regarding the learning and development information as per conditions stipulated under Protection of Personal Information (POPI) Act.
- Will respect the dignity, beliefs and constitutional rights of all learners and will NOT tolerate any harassment in the IBTC and workplace venue.
- Will not discriminate on the basis of race, gender, national origin, political or religious beliefs, family, social or cultural background, sexual orientation, unfairly exclude any learner from participation in any learning programme, deny grant benefits to any learner.
- Will always maintain a professional relationship with all learners both in and outside the classroom and will refrain from improper behaviours.
- Will under no circumstances leave learners unattended in a practical assessment area.
- Accept and comply with the policies and procedures of DWS: IBTC.

MISCONDUCT

The following are forms of behaviour which are considered as **misconduct** and may result in a learner's suspension or exclusion from a programme of study.

- Failure to follow Health & Safety Regulations.
- Conduct which prevents, obstructs, or disrupts teaching, learning or administration of training/assessment.
- Disruption to a training course or assessment, either directly or by lack of cooperation, that affects other learners on the programme.

Document title	LEARNER/FACILITATOR CODE OF CONDUCT
Document number	
Revision number	
Status	

- Failure to follow the reasonable instructions and requests of the facilitator or a representative of the IBTC.
- Disorderly behaviour or the use of bad or abusive language.
- Causing damage to the premises, equipment or property of another learner, facilitator.
- Behaviour or language which is racially or sexually offensive, or which is offensive to those with disabilities and LGBT people.
- Violence or a threat of violence.
- Drunkenness or illegal use of drugs whilst on the IBTC premises while attending a training course/assessment.
- Activity that is classified as illegal whilst attending a training or assessment event.
- Failure to follow health and safety instructions that may cause or have caused serious injury.

Document title	LEARNER/FACILITATOR CODE OF CONDUCT
Document number	
Revision number	
Status	

Selection Criteria of Workplace Pilot DMA for National NRW Training

*You need to confirm RED PART before the pre-survey with DWS.

Selection Criteria

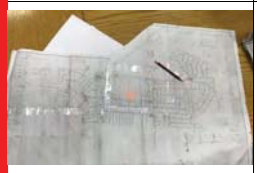
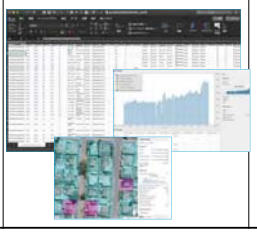
Regarding Project Document page5. article7.

Pilot DMA area:

1. Is not so complicated land use (It is like normal residential area. If it includes a school or some shops is fine.)
2. Seems to easy to isolate by using existing valves
3. Has preferably only one input
4. Has area-bulk-water meter on the input line(size & manufacturer)
5. Has No. of connection- under 150
6. Has safe working environment
7. Operation team are cooperative
8. Sites near its Area-Water-Depo Office and easy to access.

Please select and inform us **3-candidate** area (4&6 is critical)

Required information(if possible)

1. O&M Maps (Pipeline) -The one you are currently using distribution reticulation map -Diameter, Material, Age	**2. Position of Valves**	**3. Position of Fire hydrants**	**4. Contours** -If you have IMQS or the same, height interval by 1m
			
5. Flow rata & Pressure range -If you have IMQS or the same, height interval by 1m	**6. Photos** -Google map photo with name and address	**7. Billing data** -The one you are currently using table	**8. Councilor and Municipal Police in charge**
			

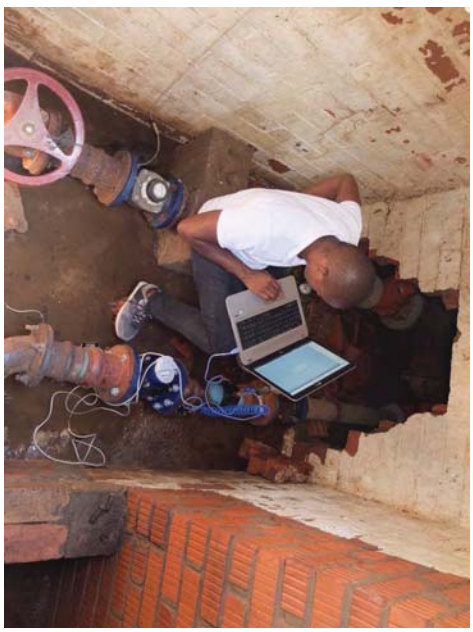
Take the meters' photos and share DWS by email

Ver. 04-20200317

Equipment for starting Pre-Logging



Final setting will be like this: line from the pulser, line from the pressure gauge, pulser, logger, pressure coil and the fittings



USB cable and PC



Pulser: 10L/pulse, cable & connector to the logger





Different type of pulser: for Kent meter (You should bring this as well)



Pressure gauge, coil and its fittings



Logger(Prime log)



Tools: Plumber wrench, Nipper, Cable connecting Pins, Instruction file

O2 & Gas meter

PPE

end

A 06 - 95

Checking points of the site survey and How to start Pre-Log

Site survey:

1. Control the pilot-site size: residential area, 100-150 house hold.
2. Confirm positions of the boundary valves
3. Confirm positions of the fire hydrants
4. Remember the highs and lows of pilot area
5. Feel safety situation of the site
6. See how the people are using water
7. Remember the landmarks
8. Talk about gathering point
9. Check the O2 level and harmful gas concentration in the meter chamber
10. See the bulk meter is working or not (Record the reading, the time stamp)
11. Write down the size and manufacturer
12. Take photos of bulk meter
13. See the pressure gauge is working or not and its output (Record the reading, the time stamp)

Setting pulser and a logger, start logging (For example; SENSUS meter, Prime log logger)

1. Connect PC and the logger(prime log) by USB cable (automatically start communication)
2. Program the setting(use 2 channels: Flow/Pressure, **Pulse setting: 10L**, **Logging interval: 1min**, Unit: m3/h)
3. Install the program to the logger
4. Set the Pulser to the meter's face and connect the line to the logger
5. Check the data is coming up or not
6. If it is no problem disconnect the PC, and place the logger in the chamber, and lock the lid of the chamber
7. Wait 24 hours

Data downloading procedure:

1. Bring PC into the Chamber and open the Software(Prime works)
2. Connect Prime Log & Your PC (gently!)
3. (Automatically synchronizing starts)
4. Press "readback" button on right top to Download , select date and time
5. Press "No" in popup small window(Don't stop the logging)

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6. (message coming up "Readback was successful" or something)=> you can disconnect the cable if you need
7. Select the data name from the list on the left
8. Right click on the name => select "Graph"
9. you can see the graph (To enlarge => area drag)
10. Please take photo of the graph by your cellphone and share by what's up to the member



Use 10L/pulse, confirm applicable mete size , set logging interval: 1min(through the App)



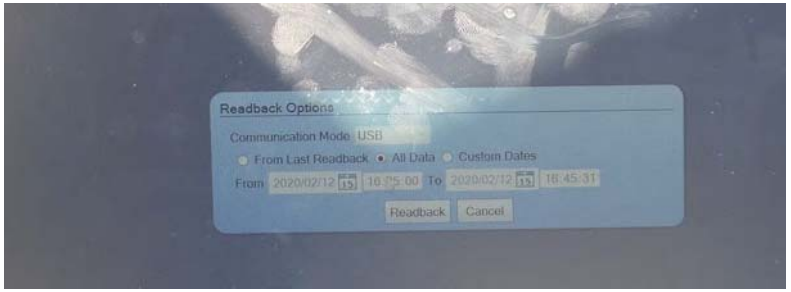
Set like this: line from logger & line from pressure gauge



Down load using USB cable. just connect => auto start communication(Prime Works)

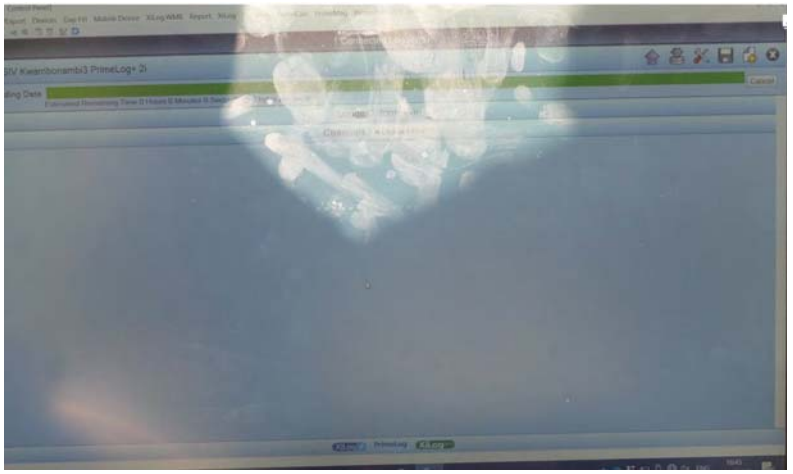


Press "Readback"

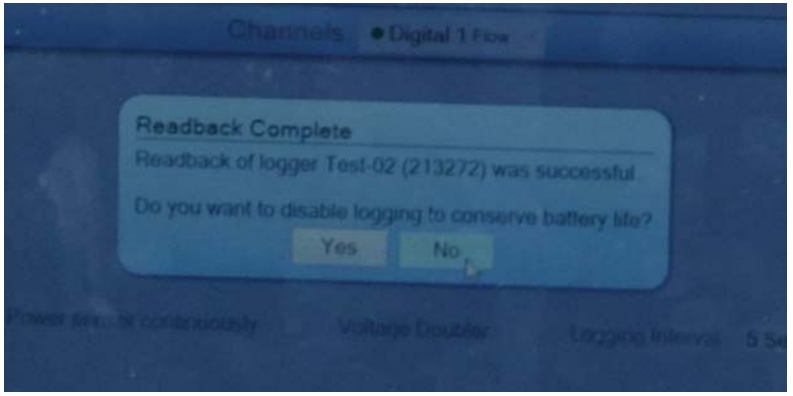


Just "Readback"

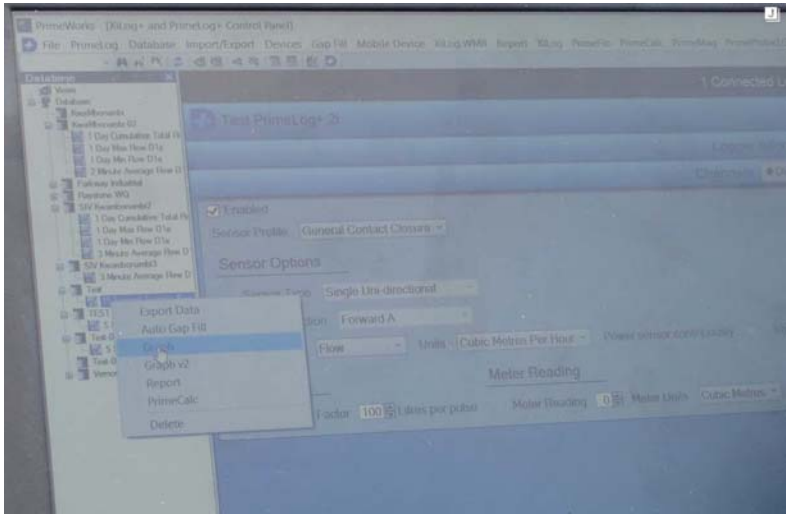
A 06 - 97



Automatically down load will start



Press "No"



After download, select the data"1min average flow" then "Graph"



You can see the graph.

end

A 06 - 98

Pre-data analysis

Checking points:

1. SIV (→ Check by actual meter reading: from Yesterday - Today; 24 hours)
2. MNF (Compare with meter performance chart): For checking meter size
3. MNF occurring time (from-until): For the night time work planning

* Pre-data logging should be conducted among week days (Monday-Friday): Weekend's flow rate will fluctuate in most cases.
* Check the unit setting again: We can see the most mistake here.
* Check the ball-park figure of MNF for each zones: For checking the meter size again.

end

Check the equipment

1. Check the number and serial number of all the equipment
2. Check functions of all the equipment,
3. Stop logging for save battery (connect to PC, and confirm)
4. Check defects at the connecting parts
5. Check peculiar bends of the cables
6. Check all fitting parts
7. Check battery level
8. Check defects at the waterproof caps
9. Check dirt or water => be clean
10. Check consumables(such as: seal tape, cable connecting pins, spray paint, chalks, pens, batteries)

end

A 06 - 99

ANNEXURE SOP6-4

IBTC TRAINING CENTRE

training towards the future

CERTIFICATE OF ATTENDANCE

This is to certify that

****** ******

ID No: **********

has attended

National Non-Revenue Water Training

Date: 27 January 2020 to 06 March 2020

TRAINING MANAGER

PROJECT COORDINATOR

Certificate No. IBTC 1–A/0001

water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

2030 NDP

JICA Japan International Cooperation Agency

SOUTH AFRICAN LOCAL GOVERNMENT ASSOCIATION
SALGA
Inspiring service delivery

ANNEXURE SOP6-5

water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

SOUTH AFRICAN LOCAL GOVERNMENT ASSOCIATION
SALGA
Inspiring service delivery

JICA

INFRASTRUCTURE BRANCH TRAINING CENTRE
EVALUATION SHEET/FORM

Please complete the evaluation form for training provided. Your feedback is valuable to us and is appreciated .The department is committed to continual improvement and suggestions will be considered for future training needs.

Course Name	The National Non-Revenue Water Training											
Date of Training												
Service Provider	DWS: IBTC											
Name of Presenter(s)												
Name & Surname:												
Organization:												
Attendance Dates (☑)	Date		27/Jan		28/Jan		29/Jan		30/Jan		31/Jan	
	am	pm	-	☐	☐	☐	☐	☐	☐	☐	☐	-

A 06 - 100

ITEMS

- NRW in Reticulation, Water supply infrastructure
- Problem identification
- NRW countermeasures, Strategy and implementation plans
- Planning for workplace training

1. PROGRAMME OUTPUTS AND GENERAL

1.1 Did you achieve the above aims? ☑
☐ 4 ☐ 3 ☐ 2 ☐ 1 * 4= Excellent, 3= Good; 2= Average; 1= Poor
Reasons, comments (particularly if poor)
_____
_____

1.2 To what extend did you like the course, how did you feel about it? How relevant was the course to your work?
_____
_____

1.3 Which part of the course content did you like the most or were useful for you?
_____
_____

1.4 Which part of the course content did you like the least?
_____
_____

1.5 Which the course content was supposed to be included? (with reasons if any)
_____
_____

1.6 How did you feel about the length of the course? ☑
☐ 4 ☐ 3 ☐ 2 ☐ 1 * 4= Very long, 3= Long; 2= Average; 1= Short

1.7 How was the number of leaners? ☑
☐ 4 ☐ 3 ☐ 2 ☐ 1 * 4= Too many, 3= Many, 2= Average; 1= Little

1.8 Could you learn from experience of participants (facilitators and learners)? ☑
☐ 4 ☐ 3 ☐ 2 ☐ 1 * 4= Enough, 3= Good; 2= Average; 1= Poor

1.9 Could you communicate with participants (facilitators and learners)? ☑
☐ 4 ☐ 3 ☐ 2 ☐ 1 * 4= Enough, 3= Good; 2= Average; 1= Poor

1.10 Could you participate in discussions and exercises actively? ☑?
☐ 4 ☐ 3 ☐ 2 ☐ 1 * 4= Enough, 3= Good; 2= Average; 1= Poor

Comments on Programme Outcome and General

2. FACILITIES

Criteria *(4= Excellent, 3= Good; 2= Average; 1= Poor)*	**4**	**3**	**2**	**1**
2.1 Venue and seating comfort ☑	☐	☐	☐	☐
2.2 Ventilation ☑	☐	☐	☐	☐
2.3 Security/emergency procedures ☑	☐	☐	☐	☐
2.4 Replenishment (water) ☑	☐	☐	☐	☐
2.5 Catering ☑	☐	☐	☐	☐
2.6 Personnel assistance ☑	☐	☐	☐	☐
2.7 Accommodation ☑	☐	☐	☐	☐

Comments on Facilities

3. CONTENTS AND PROGRAMME DESIGN

Criteria *(4= Excellent, 3= Good; 2= Average; 1= Poor)*	**4**	**3**	**2**	**1**
3.1 The content met my expectations. This training programme design (composition and balance) was suitable and useful for your own works and your municipality.	☐	☐	☐	☐
3.2 The content was at an appropriate depth and allowed for intellectual engagement.	☐	☐	☐	☐
3.3 The content of the course was logically sequenced.	☐	☐	☐	☐
3.4 The course delivery methodology created the opportunity to address relevant and current issues.	☐	☐	☐	☐
3.5 The course materials (presentation and textbook) was customised user-friendly and easy to follow	☐	☐	☐	☐
3.6 The time allocation was sufficient for practical exercises	☐	☐	☐	☐
3.7 The Training Yard was user-friendly	☐	☐	☐	☐

Comments on Contents and Programme Design

SAMPLE

4. FACILITATORS AND FACILITATION				
Criteria *(4= Excellent, 3= Good; 2= Average; 1= Poor)*	**4**	**3**	**2**	**1**
4.1 The facilitator introduced the main theme of the topic and objectives in a logical manner.	☐	☐	☐	☐
4.2 There was enough time allocated for questions	☐	☐	☐	☐
4.3 The facilitator has extensive knowledge about the subject matter.	☐	☐	☐	☐
4.4 The facilitator style and delivery (encouraged participation, voice projection, responsiveness to the group, organised)	☐	☐	☐	☐
4.5 The facilitator was well prepared.	☐	☐	☐	☐
Comments on Facilitators and Facilitation				

5. COORDINATION				
Criteria *(4= Excellent, 3= Good; 2= Average; 1= Poor)*	**4**	**3**	**2**	**1**
5.1 The communication between DWS and your organization before attendance was appropriate.	☐	☐	☐	☐
5.2 The administrative arrangement/preparation was appropriate.	☐	☐	☐	☐
Comments/Suggestions on Coordination				

OTHER REMARKS/SUGGESTIONS: *Please make any comments that will improve the programme, you may write on the separate page if the space provided is not enough*

Thank you for taking the time to help us improve our training

SAMPLE

The National NRW Training Daily Evaluation Form (Day-2)

This is to reconfirm your attendance register.

* Required

* This form will record your name, please fill your name.

1. You name in full *

2. Name of your organization *

3. Select modules that you attended today *

- ☐ d. Technical Aspects: Water Reticulation
- ☐ e. Institutional Aspects: Metering and Billing
- ☐ f. Data Collection (Logging)

4. Comments and suggestions to today's modules in terms of contents, facilitation and so on. *

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Microsoft Forms

6/7/2021

The National NRW Training Daily Evaluation Form (Day-1)

This is to reconfirm your attendance register.

* Required

* This form will record your name, please fill your name.

1. Your name in full *

2. Name of your organization *

3. Select modules that you attended today *

- ☐ a. Orientation and Introduction
- ☐ b. WCWDM and NRW in Municipal Water Services of South Africa
- ☐ c. NRW-related Problem Awareness Workshop

4. Comments and suggestions to today's modules in terms of contents, facilitation and so on. *

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Microsoft Forms

6/7/2021

The National NRW Training Daily Evaluation Form (Day-3)

This is to reconfirm your attendance register.

* Required

* This form will record your name, please fill your name.

1. You name in full *

2. Name of your organization *

3. Select modules that you attended today *

- [ ] g. Zone Configuration and Drop Test
- [ ] h. MNF and Step Test
- [ ] j. Practices by using a simulated DMA

4. Comments and suggestions to today's modules in terms of contents, facilitation and so on. *

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Microsoft Forms

The National NRW Training Daily Evaluation Form (Day-4)

This is to reconfirm your attendance register.

* Required

* This form will record your name, please fill your name.

1. You name in full *

2. Name of your organization *

3. Select modules that you attended today *

- [ ] k. Case Studies (from the previous trainings)
- [ ] l. Data Utilization/Arrangement and Presentation
- [ ] m. Actions and Way Forward

4. Comments and suggestions to today's modules in terms of contents, facilitation and so on. *

This content is neither created nor endorsed by Microsoft. The data you submit will be sent to the form owner.

Microsoft Forms

The National NRW Training Overall Evaluation Form

Improve training programme, curriculum and facilitation/teaching methods by hearing directly from learners.

* Required

Name and Organization

1. Your name in full *

2. Name of your organization *

A. PROGRAMME OUTPUTS AND GENERAL

3. How satisfied are you with the knowledge you gained throughout the course? *

- ◯ Very satisfied
- ◯ Satisfied
- ◯ Neither satisfied nor dissatisfied
- ◯ Dissatisfied

4. The reason why you chose "Dissatisfied" in the above

5. Do you feel you achieved your desired learning outcome? *

- ◯ Yes a lot
- ◯ Yes
- ◯ Maybe
- ◯ No

6. The reason why you chose "No" in the above

7. How likely are you to recommend this course to your colleagues? *

- ◯ Very likely
- ◯ Likely
- ◯ Neither likely nor unlikely
- ◯ Unlikely

8. The reason why you chose "Unlikely" in the above

9. How was the length of the course? *

- ◯ Very long
- ◯ Long
- ◯ Average
- ◯ Short

10. How was the number of leaners? *

- ◯ Too many
- ◯ many
- ◯ Average
- ◯ Little

11. How did you learn from experiences of participants (facilitators and/or learners)? *

- ◯ Very well
- ◯ Well
- ◯ Somewhat well
- ◯ Not well

12. How did you communicate with participants (facilitators and/or learners)? *

- ◯ Very well
- ◯ Well
- ◯ Somewhat well
- ◯ Not well

13. How did you participate in discussions and exercises actively? *

- ◯ Very well
- ◯ Well
- ◯ Somewhat well
- ◯ Not well

B. ONLINE TRAINING SYSTEM

14. Web-conference platform *

- ◯ Excellent
- ◯ Good
- ◯ Average
- ◯ Poor

15. Which devices did you use throughout the training? *

- ☐ Desktop
- ☐ Laptop
- ☐ Phone
- ☐ Tablet
- ☐ Shared the device with other participant(s)
- ☐ Other device

16. Audio visual conditions during the online training *

- ◯ Excellent
- ◯ Good
- ◯ Average
- ◯ Poor

17. Your own IT environment and connectivity during online training *

- ◯ Excellent
- ◯ Good
- ◯ Average
- ◯ Poor

18. Where did you attend the training from? *

- ☐ Home
- ☐ Office
- ☐ Other

19. Did you attend the training at your own expense? *

- ◯ Yes, attended whole
- ◯ Yes, attended partially
- ◯ No (at your organization's expense)

20. Technical assistance from secretariat(s)/coordinator(s) and/or facilitators *

- ◯ Excellent
- ◯ Good
- ◯ Average
- ◯ Poor

C. PROGRAMME DESIGN (CONTENTS/MODULES)

21. The contents/modules met your expectations. This training programme design (composition and balance) was suitable and useful for your own works and your municipality. *

- ◯ Excellent
- ◯ Good
- ◯ Average
- ◯ Poor

22. The contents/modules were at an appropriate depth and allowed for intellectual engagement. *

- ◯ Excellent
- ◯ Good
- ◯ Average
- ◯ Poor

23. The contents/modules were logically sequenced. *

- ◯ Excellent
- ◯ Good
- ◯ Average
- ◯ Poor

24. The course delivery methodology created the opportunity to address relevant and current issues. *

- ◯ Excellent
- ◯ Good
- ◯ Average
- ◯ Poor

25. How effective were the learning materials (presentation slides) used in the course? (customised user-friendly and easy to follow) *

- ◯ Excellent
- ◯ Good
- ◯ Average
- ◯ Poor

26. What kind of content/module(s) should be included further? If any, please specify it (them) and the reason(s) why.

D. FACILITATORS AND FACILITATION

27. The facilitators introduced the topics, objectives and key points in a logical manner. *

- ◯ Excellent
- ◯ Good
- ◯ Average
- ◯ Poor

28. There was enough time allocated for questions. *

- ◯ Excellent
- ◯ Good
- ◯ Average
- ◯ Poor

29. The facilitators have extensive knowledge about the subject matter. *

- ◯ Excellent
- ◯ Good
- ◯ Average
- ◯ Poor

30. The facilitation style and delivery (encouraged participation, voice projection, responsiveness to the group, organised) *

- ◯ Excellent
- ◯ Good
- ◯ Average
- ◯ Poor

31. The facilitators were well prepared. *

- ◯ Excellent
- ◯ Good
- ◯ Average
- ◯ Poor

E. COORDINATION

32. The communication between DWS/IBTC and your organization before attendance was appropriate. *

- ◯ Excellent
- ◯ Good
- ◯ Average
- ◯ Poor

33. The administrative arrangement/preparation was appropriate. *

- ◯ Excellent
- ◯ Good
- ◯ Average
- ◯ Poor

F. OTHER REMARKS AND SUGGESTIONS

34. Please make comments and inputs that will improve the programme.

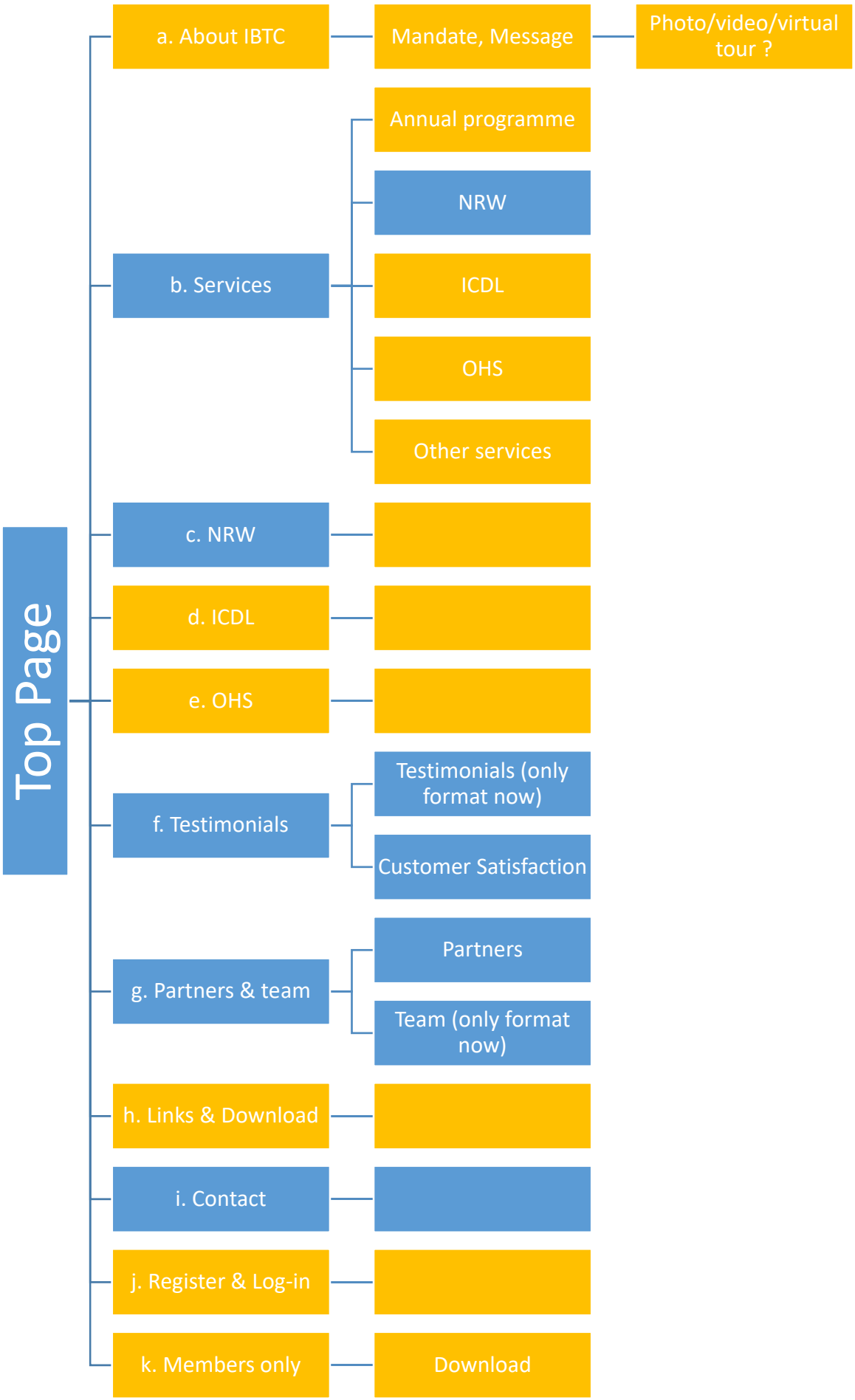
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Microsoft Forms

Appendix 7:

Suggestion on Website Contents and Cloud Server

IBTC Website Diagram (Draft Contents)



Blue: Existing and Orange: Non-existing in our test/temporary site, https://ibtc-the-national-nrw-training16.webnode.com/

IBTC: THE NATIONAL NRW TRAINING **Virtual Training is coming soon**

We will provide the excellent training in water sector of South Africa.

A 07 - 2

Solutions to your challenges

Learn more about our training courses

National Non-Revenue Water Training

To learn more about the course, read here.

International Computer Driving License (ICDL) *Accredited

To learn more about the course, read here. Coming soon.

Occupational Health and Safety (OHS) *Accredited

To learn more about the course, read here. Coming soon.

All services

Testimonials

Read what our nationwide customers from municipalities have to say

Name Surname
Learner / Municipality, Province

"It was very *interesting training due to interactive communication with experienced and skilled facilitators from municipalities. Thank you so much*"

Name Surname
Learner / Municipality, Province

"Coming soon."

More testimonials

Our nationwide and worldwide partners

We have been providing a unique training "the National NRW Training" together with municipalities as facilitators and the international partner from Japan

"For municipalities by municipalities"

We will get your capacity to the next level

Make inquiries now

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Learn more about our training courses

Annual Programme

To learn more about the annual programme, read here. Coming soon.

National Non-Revenue Water Training

To learn more about the course, read here.

International Computer Driving License (ICDL) *Accredited

To learn more about the course, read here. Coming soon.

Occupational Health and Safety (OHS) *Accredited

To learn more about the course, read here. Coming soon.

Other services

To learn more about the other services, read here. Coming soon.

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Experience our programme

Knowledge, practices and workplace components

The Infrastructure Branch Training Centre (IBTC) is committed to support **the Department of Water and Sanitation (DWS)** and other stakeholders including **municipalities** in building capacity of its people to effectively manage the water supply, with acceptable risks, to meet sustainable national, regional, social, economic and environmental objectives for all South African.

IBTC believes that its major role and significant contribution is to "**EMPOWER**" workforce and enhance human capital through the following values:

Equal access, Mentorship, Partnership, Occupationally oriented, Willingness, Excellence and Redress

South African Local Government Association (SALGA) and **Japan International Cooperation Agency (JICA)** have cooperated with DWS to develop the capacity of IBTC and the National NRW Training since 2017.





Knowledge



Practices





Workplace





Flow Data Logging



Certification

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Testimonials

Read what our nationwide customers from municipalities have to say

Name Surname
Learner / Mogale City, Gauteng
"Coming soon."

Name Surname
Learner / Mopani, Limpopo
"Coming soon."

Name Surname
Learner / uMgungundlovu, KZN
"Coming soon."

Name Surname
Learner / JB Marks, North-West
"Coming soon."

Name Surname
Learner / King Cetshwayo, KZN
"Coming soon."

Name Surname
Learner / Mbombela, Mpumalanga
"Coming soon. "

Name Surname
Leaner / Metsimaholo, Free State
"Coming soon."

Name Surname
Learner / DWS Regional, KZN
"Coming soon."

Customer Satisfaction

Our confidence



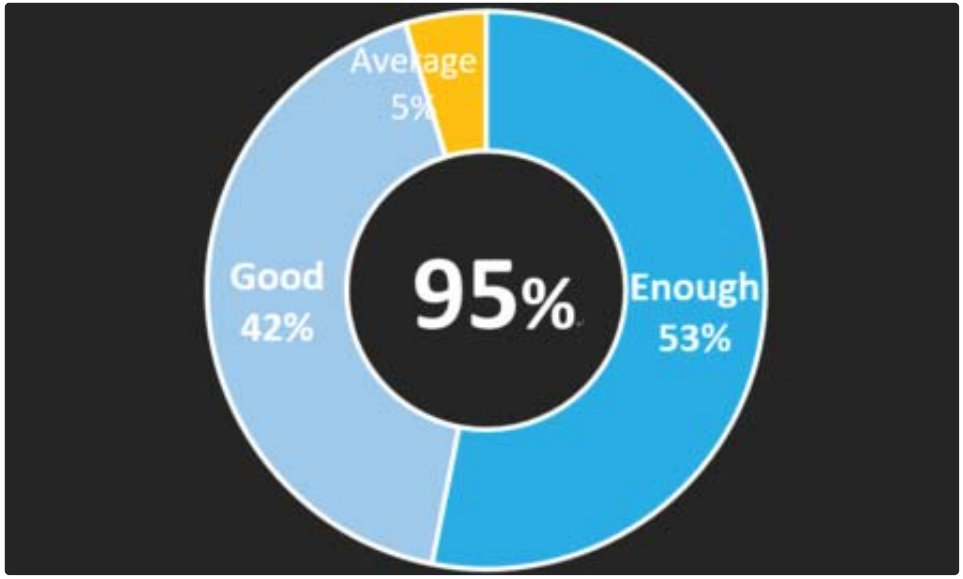
The National NRW Training

Contents & Design



The National NRW Training

Facilitators



The National NRW Training

Interactivity

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We have been providing a unique training "the National NRW Training" together with municipalities as facilitators and the international partner from Japan

"For municipalities by municipalities"

A 07 - 7

Our team

The people dedicated to assisting you

?

Mfomadi Rosa

IBTC: Centre Manager

?

Kgoputso Sekgoilane

IBTC: Training Manager

?

Lerato Makola

IBTC: Quality Assurer

?

Govender Verusha

IBTC: Coordinator

?

Armand Basson

IBTC: Yard & Equipment/Devices

?

Riaan Stassen

IBTC: Yard & Equipment/Devices

?

Hadebe Xolani

DWS: Director, Water Use Efficiency

?

Thabo Masike

DWS: Water Use Efficiency

?

Andries Padi

DWS: Water Use Efficiency

?

Musara Tapiwanashe

The National NRW Training Facilitator (DWS)

?

Trevor Westman

The National NRW Training Advisor/Facilitator (Tshwane)

?

Nico Schmulian

The National NRW Training Facilitator (Tshwane)

Jaco De Bruyn

The National NRW Training Advisor/Facilitator (Cape Town)

Ndzululwazi Joni

The National NRW Training Facilitator (Cape Town)

Mahdi Pathan

The National NRW Training Facilitator (Cape Town)

Unathi Noludwe

The National NRW Training Facilitator (Cape Town)

Brandon Stevens

The National NRW Training Facilitator (Cape Town)

Adonis Mckaylin

The National NRW Training Facilitator (Cape Town)

Ashan Nandal

The National NRW Training Advisor/Facilitator (eThekwini)

Mulalo Bvumbi

The National NRW Training Facilitator (Ekurhuleni)

Pholo Nthutang

The National NRW Training Facilitator (Johannesburg)

Faith Ramatsoele

The National NRW Training Facilitator (Johannesburg)

Siyamcela Mamane

The National NRW Training Facilitator (Buffalo City)

Sikiza Yekane

The National NRW Training Facilitator (Buffalo City)

Mr. Koena Moabelo

The National NRW Training Facilitator (Mbombela)

Thuli Mwelase

The National NRW Training Facilitator (Ugu)

Henry Jansen

The National NRW Training Facilitator (George)

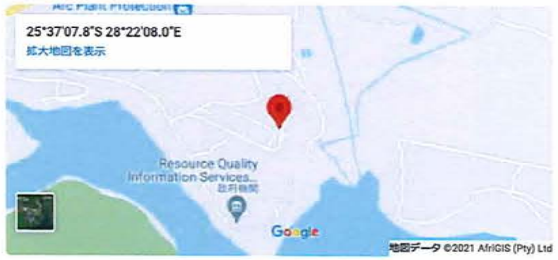
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Please feel free to inquire



Infrastructure Branch Training Centre, Department of Water and Sanitation (IBTC/DWS)

1 KwaMhlanga/ Moloto Road (R 573), Roodeplaat, Tshwane 0122

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JICA

The Project for Strengthening the Training Capacity of IBTC on NRW

The National Non-Revenue Water (NRW) Training

IT/ICT ENHANCEMENT FOR ONLINE/VIRTUAL TRAINING AS WELL AS NETWORKING AND SKILLS/KNOWLEDGE/INFO SHARING

19th March 2021

(For Directorates: IT and Communication)

Items to be discussed

1. Web-Conference Platform and Tools
2. Data Storage/Sharing Tools
3. Devices to join
4. Always-on or stable Internet Access
5. Independent account and website
6. Alternative way to join

1. Web-Conference Platform and Tools:

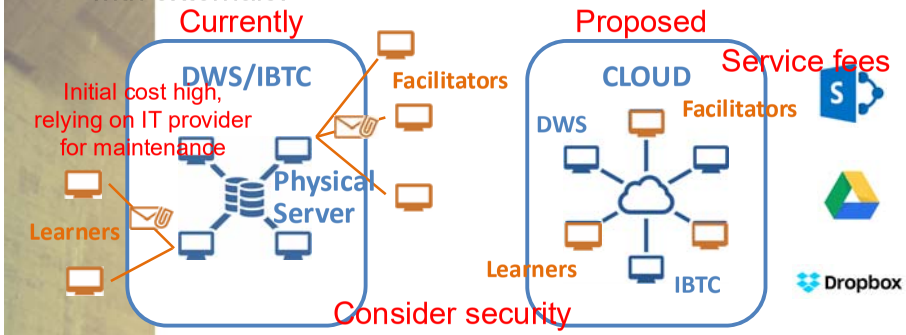
a. Smooth operation and necessary function for facilitation and lectures (sharing screen, chat, etc.).
b. Microsoft Teams, Google Meet, Zoom, etc.
c. Standard platform of DWS as a host: Microsoft Teams.
d. Backup platform: Zoom ?
e. Other tools: Microsoft Forms or Google Forms (web-based questionnaire, quiz, attendance and roll call), Slido, etc.



2. Data Storage/Sharing Tools:

a. Background: Improvement in business efficiency by useful tools is a key to sustainability of the Training.
b. Server accessible by not only DWS officials but also partners (facilitators) and learners.
c. Large-size file transmission/receipt and simultaneous works among members and partners.
d. DWS's server and/or dedicated server at IBTC, but not easy access by externals.

e. Cloud server: Microsoft 365 (SharePoint, OneDrive), Google Drive, Dropbox, etc.
f. Microsoft Teams (Microsoft 365: Business) would solve this issue while it acts as web-conference platform.
g. DWS should be an administrator and share folders/files with externals.



3. Devices to join:

a. Desktop/laptop (personal) at IBTC, learners' office or home.
b. Tablet (personal) at IBTC, learners' office or home.
c. Smartphone (personal) at IBTC, learners' office or home.



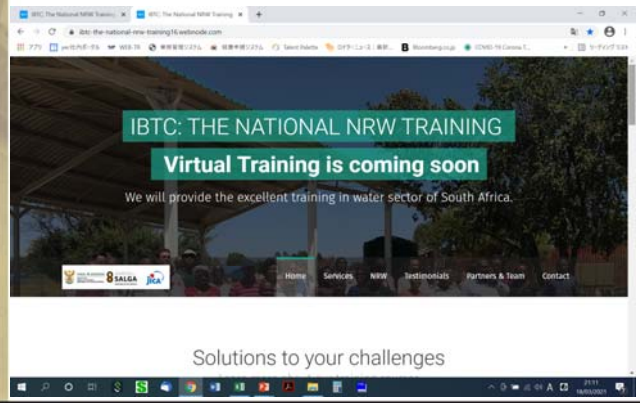
4. Always-on or stable Internet Access

a. IBTC, learners' office and home environment for secure participation and communication.
b. Unlimited or semi-unlimited or sufficient data plan/bundles at IBTC, learners' office or home
c. Online workshops/meetings: e.c. 1.5 hours x 5 times.
d. Online training: e.c. 3 half-days x 3 hours.
e. With large-size file transmission/receipt.



5. Independent (?) account and website

a. Email account easy/fast/stably-accessible
b. Temporary website for image/idea sharing (to be more graphic, advertised and commercialized?)



4. Always-on or stable Internet Access | 5. Independent account and website | 6. Alternative way to join

6. Alternative way to join

a. Sharing display/monitor with desktop/laptop at learners' office, if conditions permitted (wearing masks and social distancing).



Thank you very much.

Appendix 8:

Sustainability Plan of the National NRW Training and Steering Committee's Terms of Reference (TOR)

Department of Water and Sanitation (DWS)
Infrastructure Branch Training Centre (IBTC)
assisted by
Japan International Cooperation Agency (JICA)

PROGRAMME/AGENDA FOR THE INTERIM STEERING COMMITTEE MEETING ON THE NATIONAL NRW TRAINING PROGRAMME

Chaired by Mr. Aloious Chaminuka
Venue: Online Meeting
Date: 10:00, Tuesday, 23rd March 2021 (SAST)

10:00 - 10:10	1. Introduction of Participants and Apology
10:10 - 10:15	2. Adoption of Agenda
10:15 - 10:20	3. Purpose of the meeting: Mr. Hadebe Xolani (Director: WUE, DWS)
10:20 - 10:35	4. Background of the National NRW Training: Mr Armand Basson (DWS Project Coordinator)
10:35 - 10:50	5. Sustainability Strategic (Master) Plan and Purpose of the Steering Committee: Mr. William Moraka (Head: Technology and Innovative Projects, SALGA)
10:50 - 11:05	6. Terms of Reference: Mr. Hadebe Xolani (Director: WUE, DWS)
11:05 - 11:20	7. Q&A and Discussion
11:20 - 11:25	8. Acceptance and Way-forward
13:25 - 13:30	9. Closing Remarks by DWS: Mr. Aloious Chaminuka (Chief Director: Engineering Services

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Japan International Cooperation Agency
JICA

The Project for Strengthening the Training Capacity of IBTC on NRW

The National Non-Revenue Water (NRW) Training

23rd March 2021

KEY CONCEPT

"By Municipalities for Municipalities"

with support from DWS, SALGA and Stakeholders

Based on

Networking and Skills/Knowledge/Info Sharing

A 08 - 2

1. Project Outline

- **Project Period:**
  Phase-1: August 2017 to April 2019 (21 months)
  Phase-2: May 2019 to March 2021 (23 months)
- **Implementing Organization:**
  Department of Water and Sanitation (DWS) /
  Infrastructure Branch Training Centre (IBTC)
  South African Local Government Association (SALGA)
- **Beneficiaries:**
  Participating Municipalities (Leaners), DWS/IBTC and their personnel and Facilitators
- **End Beneficiaries:**
  Customers / Consumers of Municipalities

1. Project Outline (Project Design)

2017.8

Project

2021.3

Ex-post Project

2025

Outputs

1. Skill development, status-quo and challenges of NRW, and needs in municipalities are analyzed and shared with stakeholders.
2. IBTC's National NRW Training capacity is improved.
3. The National NRW Training is conducted with training improvement cycle.

Project Purpose

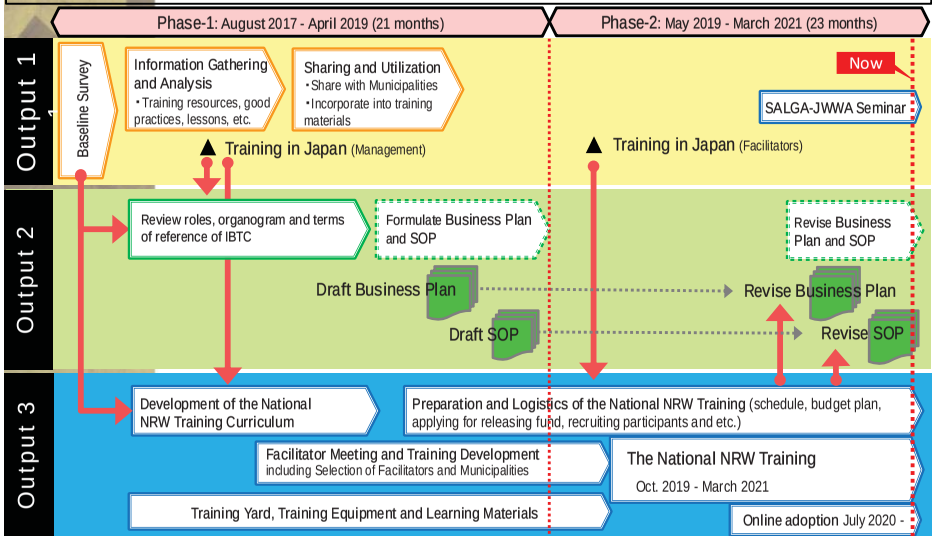
NRW management skills are developed for participating municipalities through the National NRW Training.

Overall Goal

Non-Revenue Water (NRW) management skills are utilized in participating municipalities under the established National NRW Training system.

1. Project Outline (Timeframe and Activities)

【Overall Goal】 Non-Revenue Water (NRW) management skills are utilized in participating municipalities under the established National NRW Training system.
【Project Purpose】 NRW management skills are developed for participating municipalities through the National NRW Training.
【Output 1】 Skill development, status-quo and challenges of NRW, and needs in municipalities are analyzed and shared with stakeholders.
【Output 2】 IBTC's National NRW Training capacity is improved.
【Output 3】 The National NRW Training is conducted with training improvement cycle.



2. Observation in Baseline Survey

- The **NRW is still high** in municipalities for the past decade.
- A lot of municipalities have **not calculated/evaluated NRW properly**. This may not lead to effective interventions.
- The municipalities **need proper analysis** based on adequate "**measuring and metering**".
- Have municipalities conducted **adequate reticulation management** and O&M ? (**Inadequacy of essential information and analysis ability**)
- Have municipalities taken actions with **strategic planning and budgeting** for tackling with NRW?
- Have **real issues and problems** been informed properly **from working-level staff** to decision makers?
- Does South Africa need to have **a function/opportunity to cooperate at the working level among municipalities** for tacking with NRW?

A 08 - 3

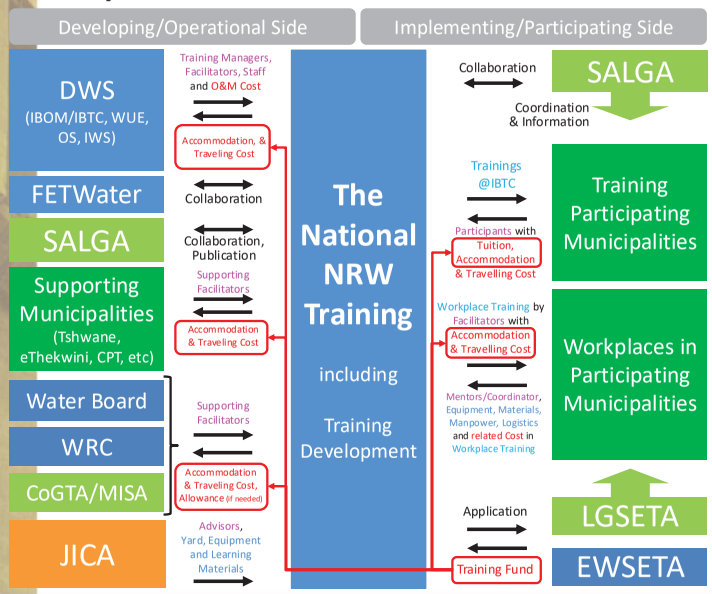
3. Basic Concepts of the National NRW Training

- **Problem-solving** oriented and flexible training programme with **practicality** for participating municipalities
- Targeting **cross-sectoral/departmental/hierarchical learners as a team**
- Training programme - participating municipalities to approach **root causes of the problems** in reticulation and NRW management
- Training programme - establishing the municipal **working-level network** and encouraging participants to take **proactive** actions.
- Training programme - leading to **strategic/effective use of limited resources** through **prioritization**
- Stakeholders' **participatory/interactive** Training programme organized by DWS/SALGA
- **Sustainable** training programme contrbuting to nationwide water services and capacity development by **accumulating knowledge/information**

4. Modules programmed in the Training



5. Development Model of the National NRW Training



Key Concept:

"By Municipalities for Municipalities"

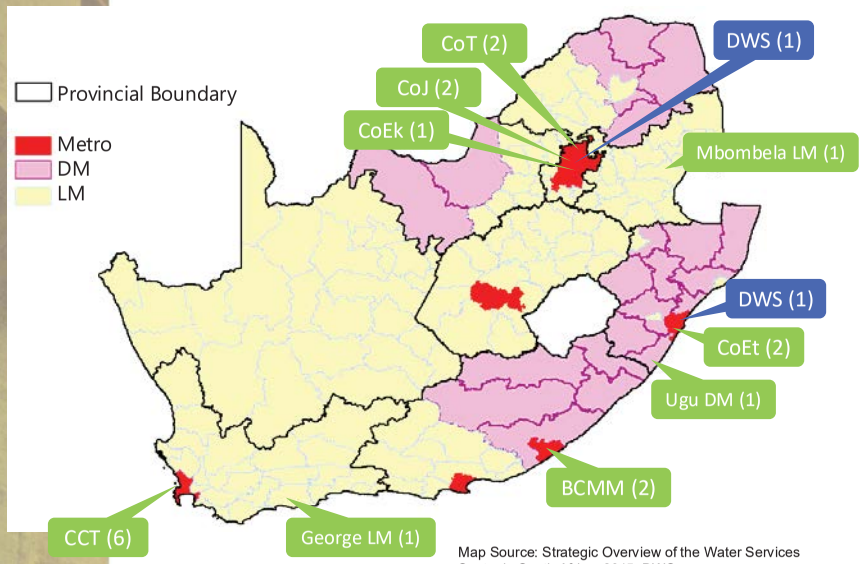
Partnering Municipalities for the Training Programme

CITY OF CAPE TOWN ISIXEKO SASEKAPA STAD KAAPSTAD
CITY OF TSHWANE
City of Ekurhuleni
ETHEKWINI MUNICIPALITY
Joburg a world class African city
BUFFALO CITY
CITY OF MBOMBELA
Ugu District Municipality
GEORGE THE CITY FOR ALL REASONS

Supported by

water & sanitation Department: Water and Sanitation REPUBLIC OF SOUTH AFRICA
SOUTH AFRICAN LOCAL GOVERNMENT ASSOCIATION SALGA Inspiring service delivery
JICA

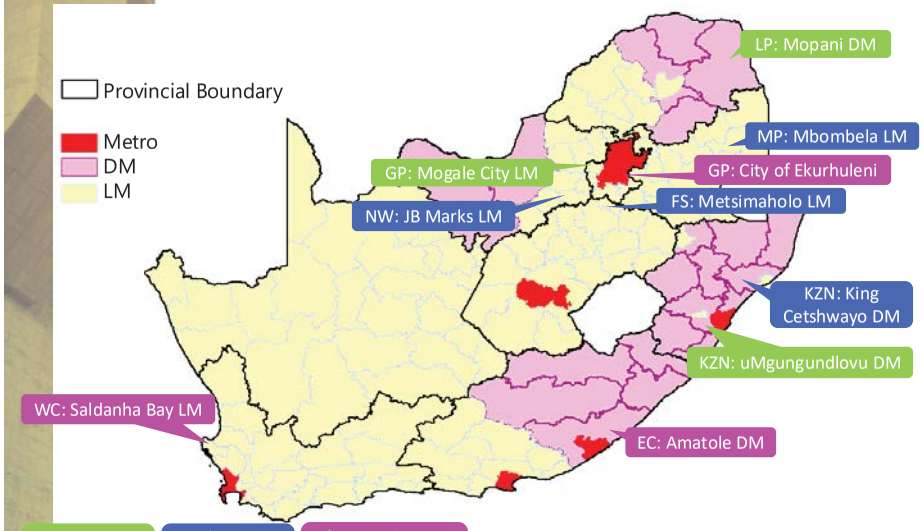
6. National Facilitators from Municipalities (Start-up)



Map Source: Strategic Overview of the Water Services Sector in South Africa, 2015, DWS



7. Participating Municipalities (Learners) in the Training



1st Group Oct-Nov 2019 | 2nd Group Feb-Mar 2020 | 3rd Group (Online) Nov 2020

Map Source: Strategic Overview of the Water Services Sector in South Africa, 2015, DWS









OUTPUT SEMINAR AT IBTC



ONLINE TRAINING (THEORY)

A 08 - 6



SUSTAINABILITY STRATEGIC (MASTER) PLAN
OF THE NATIONAL NRW TRAINING FOR 3 FINANCIAL YEARS

Update 23/03/2021

Pillars	No.	Strategic Action	Purpose and/or Outcome	Legend: Lead / Supporters	Funding	FY20/21 FY-4Q	FY21/22 FY-1Q	FY21/22 FY-2Q	FY21/22 FY-3Q	FY21/22 FY-4Q	FY22/23 FY-1Q	FY22/23 FY-2Q	FY22/23 FY-3Q	FY22/23 FY-4Q	FY23/24 FY-1Q	FY23/24 FY-2Q	FY23/24 FY-3Q	FY23/24 FY-4Q
						1 2 3	4 5 6	7 8 9	10 11 12	1 2 3	4 5 6	7 8 9	10 11 12	1 2 3	4 5 6	7 8 9	10 11 12	1 2 3
PILLAR-1 ADMINISTRATIVE	1-1	Governance structure (steering committee)	Functional governance structure (1st tier: SteerCom, 2nd tier: implementation forum)	DWS & SALGA / Partners	DWS & SALGA	* Kick off	* Annual	* Debriefing	* Debriefing		* Annual	* Debriefing	* Debriefing		* Annual	* Debriefing	* Debriefing	
	1-2	Steering committee task allocations as per the ToR	Allocation of roles and responsibilities	DWS & SALGA / Partners	-	* Initial					* Review				* Review			
	1-3	Funding instruments for post-project roll out (Business plan)	Funding proposal and/or partnership	DWS & SALGA / Partners	DWS, SETAs	* Close	* Uploading		* Request	* Close	* Uploading		* Request	* Close	* Uploading		* Request	* Close
	1-4	Engagement with Municipalities on the roll out plan	Buy in of Municipalities	SALGA & DWS / Partners	SALGA & DWS													
	1-5	Engagement of local/international development (funding) partners	Neiboring countries, generating income, training SA community members who are interested in NRW	SALGA & DWS / Partners	-													
PILLAR-2 TRAINING & DEVELOPMENT	2-1	Physical/online training	Physical/online training convened for identified municipalities with a report	DWS & SALGA / Task members	DWS & partners			G1	G2	G3		G1	G2	G3		G1	G2	G3
	2-2	Workplace training	Workplace training conducted with a report	Munics & MISA / DWS & SALGA	SALGA & partners			G1	G2	G3		G1	G2	G3		G1	G2	G3
	2-3	Master class on NRW (Knowledge sharing platform/programme)	Accredited master class convened (with CPD points)	SALGA / Partners (IMESA, etc)	SALGA & partners		* Master Class				* Master Class				* Master Class			
	2-4	Increasing the footprint of the National NRW Training	Training conducted in 5 major Provinces: GP, WC, KZN, EC and FS (anchors for network) with RW/UW	SALGA / Partners	SALGA & partners		To be discussed											
	2-5	Increasing the number of facilitators per Province	Number of accredited facilitators	SALGA & DWS / JICA	EWSETA													
	2-6	Accreditation of the National NRW Traning and related programmes	Water Reticulation Practitioner, Water Reticulation Management (additional if any)	DWS/IBTC / Partners	DWS/IBTC		Water Reticulation Practitioner											
PILLAR-3 MONITORING & EVALUATION	3-1	Undertaking formal evaluation of the projects	Impact analysis (from 2nd year), lesson learnt	Partners	Partners			*			*				*			
	3-2	Monitoring & measuring instruments and systems in place	National NRW Dashboard (for high-level decision makers) and No-Drop *Also to be shown in website	DWS & SALGA / Partners	DWS		*				*				*			
	3-3	Benchmarking indicators on NRW	Annual report on municipal benchmarking	SALGA & Munics / DWS	SALGA & Munics		*				*				*			
JICA FOLLOW-UP SUPPORTS	J-1	Training programme in Japan	For training new facilitators, as well as for committee members to gain further knowledge on	JICA Follow-up Team / DWS & SALGA	JICA										?			
	J-2	Short-term support for workplace training in South Africa	To technically support 3rd workplace training in SA	JICA Follow-up Team / DWS & SALGA	JICA													
	J-3	Monitoring (and evaluation) of the Training in South Africa	To monitor (and evaluate) the operation of the National NRW training in SA.	JICA Expert to DBSA	JICA				*		*				*			
OTHERS RELEVANT	O-1	National NRW Programme (proppsed)	Contribution to institutional interventions: Training & capacity building	SALGA-MISA-DBSA / DWS	NT & Other sources													

2021: Olynpic Games (August) in Tokyo, Local Government Election (Aug to Nov) in SA
2022: *if any

2023: National Government Election in SA
2024: *if any

THE NATIONAL NON-REVENUE WATER (NRW) TRAINING
"BY MUNICIPALITIES FOR MUNICIPALITIES"

STEERING COMMITTEE
ON
THE NATIONAL NRW TRAINING PROGRAMME

TERMS OF REFERENCE

VERSION. 1.1

DRAFT

MARCH 2021

water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

SOUTH AFRICAN LOCAL GOVERNMENT ASSOCIATION
SALGA
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VERSION HISTORY

Date	Doc. Ver.	Document Revision History	Document Author/Reviser
23/March/2021	1.1	Checking draft TOR	Interim Steering Committee attendees
23/March/2021	1.1	Formulation of TOR	

APPROVAL

Date	Doc. Ver.	Approver Name and Title	Approver Signature
23/March/2021	1.1	Mr Aloius Chaminuka	

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DRAFT

ACRONYMS

CoGTA	Department of Cooperative Governance and Traditional Affairs
DHET	Department of Higher Education and Training
DWS	Department of Water and Sanitation
IBOM	Infrastructure Build, Operate and Maintenance (Branch)
IBTC	Infrastructure Branch Training Centre (DWS)
EWSETA	Energy & Water Sector Education and Training Authority
FETWater	Framework Programme for Research, Education & Training in the Water Sector
IMESA	Institute of Municipal Engineering of Southern Africa
IWS	International Water Support (DWS)
JCC	Joint Coordination Committee
JICA	Japan International Cooperation Agency
LGSETA	Local Government Sector Education and Training Authority
MISA	Municipal Infrastructure Support Agent
NDP	National Development Plan
NGO	Non-Governmental Organisation
NSDS	National Skills Development Strategy
NRW	Non-Revenue Water
NWRS	National Water Resources Strategy
OS	Operational Support (DWS)
QCTO	Quality Council for Trades and Occupations
RBIG	Regional Bulk Infrastructure Grant
SAICE	South African Institution of Civil Engineering
SALGA	South African Local Government Association
SAQA	South African Qualifications Authority
TOR	Terms of Reference
WC/WDM	Water Conservation and Water Demand Management
WRP	Water Reticulation Practitioner
WSA	Water Services Authority
WSDP	Water Services Development Plan
WSIG	Water Services Infrastructure Grant
WSLG	Water Sector Leadership Group
WSP	Water Services Provider
WUE	Water Use Efficiency (DWS)

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CHAPTER 1: INTRODUCTION

1-1. PUPORSE

The purpose of this document is to define the Terms of Reference (TOR) for the Steering Committee on the National Non-Revenue Water (NRW) Training programme (hereinafter "the Steering Committee").

1-2. BACKGROUND

In the process of reconstruction and decentralization in South Africa from 1990's, municipalities in South Africa have taken a responsibility of Water Services Authority (WSA) and/or Provider (WSP) with human resources transfer and technical supports from the Department of Water and Sanitation (DWS) as well as Water Boards. However, most of the municipalities have faced challenges such as deterioration of services and operation & maintenance due to the loss of competent personnel, lack of adequate technology and knowledge succession, and insufficiency of systematic training opportunity. This deterioration causes a difficulty in improving NRW in South Africa struggling against frequent water scarcity. Therefore, human resources development, enhancement and dissemination of skills and knowledge such as NRW reduction are keys to success in sustainable water supply services of municipalities.

Together with job creation, capacity development and human resources development of municipalities are national priority issues emphasized under National Development Plan 2030 (NDP) and National Water Resources Strategy II (NWRS-II). Furthermore, the Department of Higher Education and Training (DHET) and Sector Educational and Training Authority (SETA) in local government and energy & water sectors are focusing on increase in skilled workers and artisans under National Skills Development Strategy III (NSDS-III).

Against this background, DWS intends to position "Infrastructure Branch Training Centre (IBTC)" of Infrastructure Build, Operate and Maintenance (IBOM) Branch as a training provider of skills development of municipal staff and also as a hub of coordination and information sharing of human resources development in water sector. DWS has established a training scheme and procedures as well as has strengthened training implementation to improve IBTC's management capacity of skills development and training in water sector through the "Project for Strengthening the Training Capacity of IBTC on Non-Revenue Water" (hereinafter "the Project") in collaboration with South African Local Government Association (SALGA) and an international development partner "Japan International Cooperation Agency (JICA)".

The Project began in August 2017 and will formally end in 31st March 2021 (44 months). The summary of the project design is shown below:

Overall Goal: NRW management skills are utilized in participating municipalities under the established National NRW Training system.

Project Purpose: NRW management skills are developed for participating municipalities through the National NRW Training.

Output 1: Skill development, status-quo and challenges of NRW, and needs in municipalities are analyzed and shared with stakeholders.

Output 2: IBTC's National NRW Training capacity is improved.

Output 3: The National NRW Training is conducted with training improvement cycle.

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During the Project, the following major activities were conducted under the leadership of Joint Coordinating Committee (JCC):

a. Baseline survey to understand the current situation of skills development and NRW in municipalities.
b. Benchmarking (comparison with) water supply services and its skills development in Japan
c. A series of SALGA and Japan Water Works Association (JWWA) Joint Seminars (webinar) with support from JICA and DWS
d. Preparation of a business plan of the National NRW Training programme.
e. Preparation of standard operating procedures (SOPs) of the National NRW Training programme.
f. Development of the National NRW Training programme.
g. Mobilization of facilitators and conducting facilitator meetings for the National NRW Training programme.
h. Procurement/construction of a training yard and equipment for the National NRW Training programme.
i. Development of the sustainability strategic/master plan
j. Development of teaching/learning materials for the National NRW Training programme.
k. Implementation of the National NRW Training programme (3 intakes for 10 participating municipalities and several DWS regional champions).

The Project was successfully completed in March 2021 after the extension for eight months due to COVID-19 pandemic in 2020.

1-3. ESTABLISHEMNT OF THE STEERING COMMITTEE

After the completion of the Project, and to ensure the sustainability of the National NRW Training programme, DWS and SALGA is establishing the Steering Committee, which will guide the National NRW Training programme and its implementation. Refer to Chapter 4 for details.

Title of Committee: Steering Committee of the National NRW Training Programme

Date of Establishment: ** ****** 2021

CHAPTER 2: GOAL AND OBJECTIVES

The goal of the National NRW Training programme (hereinafter “the training programme”) is “NRW management skills, which learners obtain in the training, are utilized in NRW reduction of participating municipalities”.

In other words, under the key concept “By Municipalities For Municipalities” with support from DWS, SALGA and stakeholders, it is to ensure developing human resources in NRW management of municipalities, and ultimately to reduce the NRW nationwide.

The following objectives for this goal are defined:

a. To increase the number of facilitators capable of NRW management skills.
b. To select and mobilize municipalities to participate in the training programme.
c. To train the leaners nominated from municipalities for acquiring NRW management skills.

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d. To increase the skilled and knowledgeable municipal staffs on NRW management.
e. To develop and enhance municipalities' collaboration in terms of knowledge, information and human resources including facilitators.
f. To review the training programme regularly including curriculum and learning/teaching materials.
g. To enhance the presence and public relations of the training programme
h. To conduct baseline survey about the current situation of skills development and NRW in municipalities at least once every five years.
i. To align with new occupational qualification: "Water Reticulation Practitioner (WRP)".
j. To collaborate with not only members but also other-than-member stakeholders such as Institute of Municipal Engineering of Southern Africa (IMESA), South African Institution of Civil Engineering (SAICE), international development partners, NGOs and private sector.

CHAPTER 3: KEY DELIVERABLES OF THE STEERING COMMITTEE

The key deliverables of the training programme include:

a. Annual plan of the training programme (schedule of 3 groups per year, facilitators, participating municipalities and etc.)
b. Annual report of the training programme
c. Annual financial report of the training programme, and
d. Report of each training group

CHAPTER 4: PURPOSE OF THE STEERING COMMITTEE

The purpose of the Steering Committee is to provide support, guidance, approval, endorsement, monitoring and oversight of the planning, implementation and review of the training programme according to the sustainability strategic/master plan and the annual plan.

The Steering Committee is also responsible for advising in budget planning and in grant application of the training programme for financial sustainability.

CHAPTER 5: GOVERNING STRUCTURE OF THE STEERING COMMITTEE

The Steering Committee shall be governed under the following structure.

Table 1: Steering Committee Governing Structure

Position	Major Duty	Organisation
Chair (1)	To represent the Steering Committee, control its affairs overall and convoke/chair it.	DWS or SALGA
Deputy Chair (1)	To assist the Chair and act for the Chair in his/her absence.	SALGA or DWS
Secretary General (1)	To take charge of administrative and accounting affairs.	DWS or SALGA
Deputy Secretary General (1)	To assist the Secretary General.	SALGA or DWS
Technical Advisors (10)	To give technical advices based on municipality's experiences.	Buffalo City, Cape Town, Ekurhuleni, eThekwini, Johannesburg, Mangaung,

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Position	Major Duty	Organisation
		Nelson Mandela Bay and Tshwane Rand Water and Umgeni Water
Sector Advisors (4)	To give advices from the institutional standpoint.	LGSETA, EWSETA, CoGTA, MISA
Secretariats	To plan, report and suggest on the training programme to the Executives as well as to practice administrative and accounting affairs of the Steering Committee	DWS (IBTC and WUE), SALGA

The position of Chair and Deputy Chair shall be rotated between DWS and SALGA annually. DWS has secretarial duties in administrative aspects in the Steering Committee, but SALGA has coordination/mobilization duties in participation of technical advisors from municipalities.

For the detailed information of members, refer to the "CHAPTER 8: MEMBERSHIP".

CHAPTER 6: RESPONSIBLITIES OF THE STEERING COMMITTEE CHAIR

The Steering Committee Chair shall be a nominated representative from DWS as well as the Deputy Chair from SALGA, or vice versa. The Deputy Chair shall take a responsibility as the Chair, should the Chair be unable to attend/chair the meeting.

The responsibilities of the Steering Committee Chair are as follows:

a. To convene meetings.
b. To set an agenda for each meeting.
c. To ensure that meeting materials including an agenda are delivered to members well in advance of the meeting.
d. To make the purpose of each meeting clear to members and explain agendas at the beginning of the meeting.
e. To conduct the meeting smoothly with time management.
f. To encourage broad participants from members in discussion by calling on different people.
g. To end each meeting with a summary of decisions, assignments and timeframe.
h. To follow up with consistently absent members to determine if they wish to discontinue membership.
i. To find replacements for members who discontinue membership.

The Chair shall be fully assisted by the Secretary General, Deputy Secretary General, and secretariats in practices of administrative and accounting affairs of the Steering Committee.

CHAPTER 7: RESPONSIBLITIES OF THE STEERING COMMITTEE MEMBERS

7-1. GENERAL

All Steering Committee members have the following responsibilities:

a. To understand the goal, objectives and key deliverables of the training programme.
b. To understand and represent the interests of all the concerned stakeholders.
c. To act on opportunities to communicate positively about the training programme.

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d. To participate actively in meetings through attendance, discussion and review of reports and other documents.
e. To support open discussion, debate and encourage fellow Steering Committee members to voice their insights.
f. To promote or advocate the training programme

Each Steering Committee member institution/organisation has also respective responsibilities as below.

7-2. DEPARTMENT OF WATER AND SANITATION (DWS)

a. With SALGA, to navigate the training programme according to sustainability strategic/master plan.
b. With SALGA, to prepare an annual plan of the training programme for each year.
c. With SALGA, to prepare a list of the candidate municipalities for each year.
d. With SALGA, to mobilize the candidate municipalities based on the approved list.
e. With SALGA, to coordinate and develop an annual allocation plan of facilitators.
f. To secure own budget and grants to implement the training programme.
g. To coordinate and develop an annual allocation plan of DWS coordinators.
h. To arrange logistics (accommodation in IBTC) for learners from the participating municipalities.
i. To arrange logistics (accommodation and transportation in IBTC and workplaces) for facilitators and DWS coordinators.
j. With SALGA, to conduct annual master class.
k. To implement the training programme in the IBTC, the participating municipalities' workplaces and online.
l. To conduct the output seminar at the end of each training intake.
m. To monitor, evaluate and review the training programme.
n. To maintain the appropriateness and sustainability of the training programme.
o. To enhance public relations of the training programme.

7-3. SOUTH AFRICAN LOCAL GOVERNMENT ASSOCIATION (SALGA)

a. With DWS, to navigate the training programme according to sustainability strategic/master plan.
b. With DWS, to prepare an annual plan of the training programme for each year.
c. With DWS, to prepare a list of the candidate municipalities for each year.
d. With DWS, to mobilize the candidate municipalities based on the approved list.
e. With DWS, to coordinate and develop an annual allocation plan of facilitators.
f. To give advices in budgeting and grants to implement the training programme.
g. With SALGA, to conduct annual master class.
h. To attend the output seminar at the end of each training intake.
i. To monitor, evaluate and review the training programme.
j. To maintain the appropriateness and sustainability of the training programme.
k. To enhance public relations of the training programme.

7-4. MUNICIPALITIES AND WATER BOARDS:

a. To input the demands and needs in municipal/bulk water services into the training programme, particularly about technical aspects such as contents, curriculum and teaching/learning materials,
b. To assist in the annual plan of the training programme.
c. To assist in the implementation of the training programme as facilitator providers.
d. To attend the output seminar at the end of each training intake.

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e. To evaluate, review and give advises on the training programme and teaching/learning materials.

7-5. LOCAL GOVERNMENT SECTOR EDUCATION AND TRAINING AUTHORITY (LGSETA)

a. To assist in grant application and securing a grant for the training programme.
b. To ensure smooth grant disbursement and procurement.
c. To assist in the annual plan of the training programme.
d. To assist in the implementation of the training programme as a sector interface for skills development.
e. To attend the output seminar at the end of each training intake.
f. To give advices in reviewing the training programme.
g. To assist in public relations of the training programme.

7-6. ENERGY & WATER SECTOR EDUCATION AND TRAINING AUTHORITY (EWSETA)

a. To assist in grant application and securing a grant for the training programme.
b. To ensure smooth grant disbursement and procurement.
c. To assist in the annual plan of the training programme.
d. To assist in the implementation of the training programme as a sector interface for skills development.
e. To attend the output seminar at the end of each training intake.
h. To give advices in reviewing the training programme.
f. To assist in public relations of the training programme

7-7. DEPARTMENT OF COOPERATIVE GOVERNANCE AND TRADITIONAL AFFAIRS (COGTA)

a. To assist in the annual plan of the training programme.
b. To attend the output seminar at the end of each training intake.
c. To give advices in reviewing the training programme.

7-8. MUNICIPAL INFRASTRUCTURE SUPPORT AGENCY (MISA)

a. To assist in the annual plan of the training programme.
b. To attend the output seminar at the end of each training intake.
c. To give advices in reviewing the training programme.
Additionally in the future,
d. To assist in the implementation of the training programme (e.g. facilitators and/or workplace mentors).

CHAPTER 8: MEMBERSHIP

The representatives from each organisation are required to be on a decision-making level, accountable for the planning, implementation and monitoring of the training programme and communications. In order to respond to the changes in the circumstances, the member composition shall be changed with other organisations or institutions as needed.

The membership to the Steering Committee is shown in the table below.

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Table 2: Steering Committee Members

No	Organisation	Directorate/Division/Section	Decision-Making Level
	DWS		
1		Engineering Services	Chief Director
		Engineering Services	Director
		IBTC	Centre Manager
2		Water Use Efficiency (WUE)	Director
		Operational Support	Director
3		Regional Offices	Director
		International Water Support (IWS)	Director
	SALGA		
4		Water Sustainability and Innovations	Director
		Municipal Capability & Governance Cluster	Director
	Municipalities		
5	Buffalo City	Water services, WCWDM or equivalent	Manager/Director or delegated official
6	Cape Town	Water services, WCWDM or equivalent	Manager/Director or delegated official
7	Ekurhuleni	Water services, WCWDM or equivalent	Manager/Director or delegated official
8	eThekwini	Water services, WCWDM or equivalent	Manager/Director or delegated official
9	Johannesburg	Water services, WCWDM or equivalent	Manager/Director or delegated official
10	Mangaung	Water services, WCWDM or equivalent	Manager/Director or delegated official
11	Nelson Mandela Bay	Water services, WCWDM or equivalent	Manager/Director or delegated official
12	Tshwane	Water services, WCWDM or equivalent	Manager/Director or delegated official
	Water Boards		
13	Rand Water	Bulk water services, WCWDM or equivalent	Manager/Director or delegated official
14	Umgeni Water	Bulk water services, WCWDM or equivalent	Manager/Director or delegated official
15	**LGSETA**	Education and Training Quality Assurer	Manager/Director or delegated official
16	**EWSETA**	Water Sector	Manager/Director or delegated official
17	**CoGTA**	Responsible for municipal water services	Manager/Director or delegated official
18	**MISA**	Responsible for municipal water services	Manager/Director or delegated official

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CHAPTER 9: GENERALS

9-1. SECRETARIAT ADDRESS AND CONTACT

DWS: Infrastructure Branch Training Centre (IBTC), 1 KwaMhlanga / Moloto Road (R 573), Roodeplaat, Pretoria
Tel: 012 808 9979/80

SALGA: Head Office, Menlyn Corporate Park Block B, 175 Corobay Avenue, Cnr Garsfontein and Corobay, Waterkloof Glen Ext.11, Pretoria
Tel: 012 369 8000

9-2. QUORUM

A minimum number of 10 Steering Committee members are required for decision-making purposes.

The quorum must include a minimum number of 2 from DWS, 1 from SALGA, 5 from Municipalities and Water Boards, 2 from other institutions/organizations.

9-3. DECISION-MAKING PROCESS

The process that the Steering Committee will use to make decisions will be based on the majority principle where a course of action requires support from more than 50% members who attend the meeting, if there is quorum.

9-4. FREQUENCY AND VENUE

The Steering Committee meeting is scheduled on three time a year basis (plenary/general and interim) in May (general), September and December of each year.

DWS/SALGA provide a schedule of dates well in advance for the year and confirmation of the next meeting will be done at the respective meetings.

In case of emergency and/or urgent necessity, DWS/SALGA will also be able to gather the Steering Committee members at their will.

Unless otherwise arranged and members notified in advance, the venue for the meeting will be held at the board room of IBTC, DWS Head Office, SALGA Head Office in Pretoria or online.

The meeting should be two hours or less in principle.

9-5. AGENDA, MINUTES AND DECISION PAPERS

A set of the meeting materials are sent electronically to the Steering Committee members at least five business days in advance of the meeting.

Meeting materials include the followings:

a. Agenda for the upcoming meeting
b. Minutes of the previous meeting
c. Copies of presentation to be done at the upcoming meeting
d. Any other documents/information to be discussed at the upcoming meeting

9-6. REPORTING STRUCTURE

The reports of training intakes, including the feedback from participants, are compiled by DWS/SALGA (training practitioners) at least within 2 weeks after the completion of each

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training intake. Afterwards, the reports are shared electronically and immediately with the Steering Committee members.

The reports shall be assembled into an annual training report to be presented in the annual/general meeting of the Steering Committee.

CHAPTER 10: THE SECOND TIER UNDER THE COMMITTEE

An implementing/operational structure or forum as the second tier under the Steering Committee is suggested to be formed for more nationwide (horizontal and vertical) collaboration, which consists of IBTC, WUE and not only existing facilitators from stakeholders but also candidate ones from other municipalities, water boards and MISA including secondary cities and capable municipalities.

This will be discussed and structured under the Steering Committee.

CHAPTER 11: CONFIDENTIALITY

The Steering Committee members must exercise reasonable care to prevent disclosure of confidential information it may have acquired as a direct or indirect result of the Steering Committee meetings and other information related to the participants of the trainings, unless written consent is obtained from the members providing such information.

The respective organisation shall each be liable for any improper disclosure of confidential information by their respective members.

END OF DOCUMENT

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Appendix 9:

Documents and Teaching/Learning Materials of the National NRW Training

PROGRAMME OUTLINE

(1ST GROUP/INTAKE)

04/10/2019

Programme Outline of the National NRW Training

Aims

- Understand NRW using District-Metered Area (DMA).
- Be able to show the NRW status using proper data.
- Learn basic skills for O&M through DMA management
- Select and illustrate effective countermeasures by each status quo and social situation.
- Make persuasive presentation and get project fund.
- Show clearly the project output.

Learner:

- Municipal water services officials (3-5 officials as a team)

Facilitators

- Skilled and experienced municipal water services officials
- DWS officials

Venue:

- Infrastructure Branch Training Centre (IBTC) of DWS, Roodeplaat, Pretoria
- Pilot DMA of each participating Municipality

Training Period:

- 1st & 4th week: in IBTC (Theory & Practice)
- 2nd -3rd and 5th-6th week: in Municipalities' workplaces excluding preparatory weeks
  Total 6 weeks (30 days)

---- Criteria of Pilot DMA (in Municipality) -----

1. Number of connections:
   300-500 connections, can isolate on the map by existing valves. (Or just add one or two.)
2. Availability of operational reticulation map (e.g. IMQS):
   Pipelines, valves, fire hydrants, air valves, PRVs, altitudes, etc.
3. SIV meter:
   Be able to measure by only one input line.
4. Data availability:
   Available financial/consumption data of DMA and of each household (Population, number of supply households, number of connection, each supply volume, billed or non billed status, payed or non payed status, using community stand or not, FBW status, interruption of water, etc. Monthly data preferable)

Table 1: Total Course Outline

Week	Venue	Contents
1st Week	IBTC	***~ NRW and reticulation basics ~*** • Orientation • NRW management • Reticulation basics • DMA and step test • Workplace preparation
2nd to 4th Week including preparation	Workplace	***~ Obtain the baseline with proper measurement~*** • Review the planned DMA • Installation of flow meter • Isolation of the DMA • SIV and MNF measurement • Sectorization to narrowing down the problem area • Review and recalculation of consumption volume data in the DMA • Make 1st Water Balance as a base line • Make a NRW reduction plan 1st draft • Make a report on results and findings of workplace training • Make a presentation and give it to site members
5th Week	IBTC	***~ The way of problem solving ~*** • Give a presentation on results of workplace training and the findings. • Study of NRW interventions • Make a plan of interventions to each Workplace site. (Update 1st draft plan)
6th to 8th Week including preparation	Workplace	***~ Making things happen with straight way ~*** • Household Leakage survey • Other interventions • Make a 2nd water balance to confirm the result • Make a presentation of the result of the intervention • Make a dissemination plan • Give a presentation to the Municipal Executives • Make a report on results and the findings of 2nd workplace training

Table 2: Training in IBTC in the 1st Half (5 days in 1st week)

Day	Time	Contents		Venue
Day 1 (Mon)	10:00-10:50	Orientation: Introduction, training programme and participants		Room
	11:00-11:50	IBTC tour: Training yard and equipment		Yard
	Lunch			
	13:00-14:20	Presentation: Introduction of municipalities		Room
	14:30-16:00	NRW, water balance and reticulation system basics		Room
Day 2 (Tue)	9:00-9:50	Bulk metering		Room
	10:00-10:50	Pipe and Appurtenance		Room
	11:00-11:50	Customer metering.		Room
	Lunch			
	13:00-13:50	Bulk metering (practices)		Yard
	14:00-14:50	Pipe and Appurtenance (practices)		Yard
	15:00-16:00	Customer metering (practices)		Yard
Day 3 (Wed)	9:00-10:20	DMA and measurement	Customer meter issues and billing data analysis	Yard C. Room
	10-30-12:00	DMA and measurement	DMA planning	Yard Room
	Lunch			
	13:00-14:20	Customer meter issues and billing data analysis	DMA and measurement	C. Room Yard
	14:30-16:00	DMA planning	DMA and measurement	Room Yard
Day 4 (Thu)	9:00-10:20	Workplace measurement planning Making a pilot DMA in each municipality on map.		Room
	10:30-12:00	Workplace measurement planning Making a pilot DMA in each municipality on map.		Room
	Lunch			
	13:00-14:20	Presentation of workplace measurement plans		Room
	14:30-16:00	Presentation of workplace measurement plans		Room
Day 5 (Fri)	9:00-10:20	Modification/finalization of workplace measurement plans		Room
	10:30-12:00	Orientation for workplace training		Room
	Lunch			
	13:00-14:30	Assessment		Room

C. Room; Computer Room

Table 3: Workplace Training in the 1st Half (10 days in 2nd to 3rd weeks)

Day	Time	Contents	Remarks
Day 6	9:00-12:00	Confirmation of pilot DMA	Room
	13:00-16:00	Confirmation of pilot DMA	Site
Day 7	9:00-12:00	Install a flow meter and pressure logger at site to measure SIV, start logging	Room
	13:00-16:00	Dry run of DMA step test	Site
Day 8	9:00-12:00	Isolate DMA and conduct a step test	Site
	13:00-16:00	Isolate DMA and conduct a step test	Site
Day 9	9:00-12:00	Isolate DMA and conduct a step test	Room
	13:00-9:00	Isolate DMA and conduct a step test	Site
Day 10	9:00-12:00	Isolate DMA and conduct a step test	Site
	13:00-9:00	Isolate DMA and conduct a step test	Site
Day 11	9:00-12:00	Review consumption data of the DMA	Room
	13:00-16:00	MNF measurement	Site
Day 12	9:00-12:00	Review consumption data of the DMA	Room
	13:00-16:00	MNF measurement	Site
Day 13	9:00-12:00	SIV Flow and pressure data retrieval	Site
	13:00-16:00	Data analysis and reporting to visual material	Room
Day 14	9:00-12:00	Make a 1st Water balance (Base Line)	Room
	13:00-16:00	Make a presentation of measurement result and NRW reduction plan 1st Draft	Room
Day 15	9:00-12:00	Give a presentation to site members	Room
	13:00-16:00	Make a report on results of workplace training and the findings	Room

Table 4: Training in IBTC in the 2nd Half (5 days in 4th week)

*Tentative

Day	Time	Contents	Remarks
Day 16 (Mon)	10:00-10:30	Orientation, introduction of 2nd Half	Room
	10:40-12:00	Presentation of results of workplace training, findings and lessons learnt (2 municipalities)	Room
	Lunch		
	13:00-14:20	Presentation of results of workplace training, findings and lessons learnt. (2 municipalities)	Room
	14:30-16:00	Review and discuss the data of pilot DMAs	Room
Day 17 (Tue)	9:00-12:00	Introduction of NRW countermeasures (for example) 1. Meter management (bulk, customer) 2. Review of piping/plumbing/repairing method 3. Awareness 4. Leakage survey and countermeasures, 5. Conditional assessment	Room
	Lunch		
	13:00-14:20	NRW countermeasures 1 Meter management	Yard
	14:30-16:00	NRW countermeasures 2 Plumbing/Repairing	Yard
Day 18 (Wed)	9:00-10:20	NRW countermeasures 3 Awareness	Yard
	10:30-12:00	NRW countermeasures 4 Active leakage survey	Yard
	Lunch		
	13:00-14:20	NRW countermeasures 5 Conditional assessment	C.Room
	14:30-16:00	Problem solving	Room
Day 19 (Thu)	9:00-10:20	Funding application	Room
	10:30-12:00	Making strategy and project implementation plan of the DMA	Room
	Lunch		
	13:00-14:20	Effective presentation	Room
	14:30-16:00	Presentation making	C.Room
Day 20 (Fri)	9:00-10:20	Presentation	Room
	10:30-12:00	Presentation	Room
	Lunch		
	13:00-14:30	Orientation for workplace training	Room

Table 5: Workplace Training in the 2nd Half (10 days in 5th to 6th weeks)

*Tentative

Day	Time	Contents	Remarks
Day 21	9:00-12:00	Review the detail NRW reduction plan and confirm the procedure	Room
	13:00-16:00	Customer Meter accuracy test in the DMA (20 meters)	Site
Day 22	9:00-12:00	Household Leakage survey (100 houses) and repair	Site
	13:00-16:00	Household Leakage survey (100 houses) and repair	Site
Day 23	9:00-12:00	Household Leakage survey (100 houses) and repair	Site
	13:00-16:00	Household Leakage survey (100 houses) and repair	Site
Day 24	9:00-12:00	Any NRW reduction activity or Leak survey (100 houses)	Site
	13:00-16:00	Any NRW reduction activity or Leak survey (100 houses)	Site
Day 25	9:00-12:00	Any NRW reduction activity or Leak survey (100 houses)	Site
	13:00-16:00	Any NRW reduction activity or Leak survey (100 houses)	Site
Day 26	9:00-12:00	Consumption data re-analysis	Room
	13:00-16:00	2nd MNF measurement after NRW countermeasures	Site
Day 27	9:00-12:00	Consumption data re-analysis	Room
	13:00-9:00	2nd MNF measurement after NRW countermeasures	Site
Day 28	9:00-12:00	Retrieve 2nd SIV data	Site
	13:00-9:00	Analyze 2nd Water balance after NRW countermeasures	Site
Day 29	9:00-12:00	Make report on NRW status of the pilot DMA	Room
	13:00-16:00	Make action plan for dissemination (including budget plan)	Room
Day 30	9:00-12:00	Make a presentation	Room
	13:00-16:00	Give a presentation to Municipal Manager and Head of W&S	Room

END

PROGRAMME OUTLINE

(2ND GROUP/INTAKE)

6/Mar/2020

Programme Outline of the National NRW Training

Aims:

- Understand NRW using District-Metered Area (DMA).
- Be able to show the NRW status using proper data.
- Learn basic skills for O&M through DMA management
- Select and illustrate effective countermeasures by each status quo and social situation.
- Make persuasive presentation and get project fund.
- Show clearly the project output.

Learner:

- Municipal water services officials (3-5 officials as a team consisting WCWDM, O&M, Billing, etc)

Facilitators:

- Skilled and experienced municipal water services officials
- DWS officials

Venue:

- Infrastructure Branch Training Centre (IBTC) of DWS, Roodeplaat, Pretoria
- Workplaces, Pilot DMA of each participating Municipality

Training Period (Revised):

- 1st week: IBTC training (theory & practice), Net 5 weekdays (incl. traveling days)
- 2nd week: Preparatory activities in municipalities
- 3rd week: Workplace training in municipalities, Net 5 weekdays (incl. traveling days)
- 4th week: Buffer week
- 5th week: Workplace training in municipalities, Net 5 weekdays (incl. traveling days)
- 6th week: IBTC training (Results, findings and actions & Way forward) , Net 3 weekdays (incl. traveling days)

Training net period is 18 weekdays incl. travelling days in 6 weeks duration

---- Criteria of Pilot DMA (in Municipality) -----

1. Number of connections:
   Around 100 connections, can isolate on the map by existing valves.
2. Availability of operational reticulation map (e.g. IMQS):
   Pipelines, valves, fire hydrants, air valves, PRVs, altitudes, etc.
3. SIV meter:
   Be able to measure by only one input line.
4. Data availability:
   Available financial/consumption/billing data of the DMA and of each household (Population, number of supply households, number of connection, each supply volume, billed or non billed status, payed or non payed status, using community stand or not, FBW status, interruption of water, etc. Monthly data preferable)

Programme Conceptual Flow

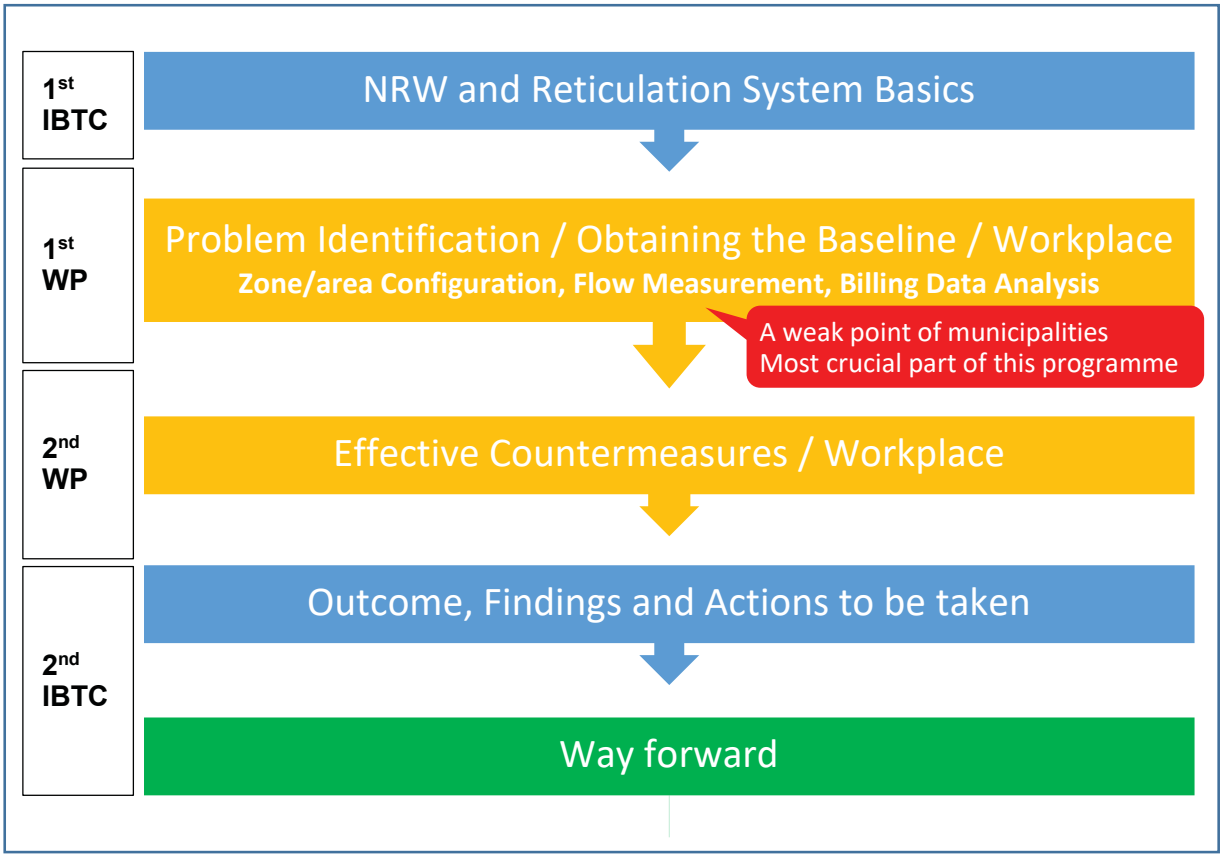


Table 1: Training in IBTC (1st week)

Day	Time	Contents	Venue
1st week (IBTC)			
27/Jan (Mon)	am	* Travelling (facilitators and learners)	-
	13:30-14:00	Course orientation [Orientation]	Room
	14:00-14:30	Introduction of participating municipalities [Presentation]	Room
	14:45-16:00	The previous training activities and results [Presentation]	Room
28/Jan (Tue)	8:30-10:00	NRW in reticulation network [Theory]	Room
	10:15-11:50	NRW calculation [Practices]	Room
	Lunch		
	13:00-14:00	Water reticulation infrastructure and appurtenance [Theory]	Room
	14:10-16:00	Water reticulation infrastructure and appurtenance [Practices]	Yard
29/Jan (Wed)	8:30-10:00	Problem identification by using DMA [Theory]	Room
	10:15-11:50	Zoning practice, meter selection [Practices]	Room
	Lunch		
	13:00-14:20	Data logging, retrieval, analysis, billing data analysis [Practices]	Room
	14:40-16:00	Problem identification by using DMA [Practices]	Yard
30/Jan (Thu)	8:30-9:30	NRW Countermeasures, the most common [Theory] (methodology, techniques and technology)	Room
	9:45-11:50	NRW Countermeasures, the most common [Practices] (methodology, techniques and technology)	Yard
	Lunch		
	13:00-13:30	Funding application (DWS: WSIG) [Theory]	Room
	13:30-14:00	Strategy and Implementation Plans [Theory]	Room
	14:15-16:00	Planning for workplace training [Practices]	Room
31/Jan (Fri)	8:30-10:00	Planning for workplace training and their modification [Practices]	Room
	10:15-11:00	Summarize of the 1st week programme [Theory] Evaluation and assessment of the training [Orientation]	Room
	11:15-11:50	Workplace training [Orientation]	Room
	Lunch		
	pm	* Travelling (facilitators and learners)	-

Table 2: Workplace Training (2nd to 5th weeks)

Day	Time	Contents	Remarks
2nd week (Preparatory)			
	-	- Preparation by learners in workplaces (DWS Coordinators support learners if necessary) - Confirmation of pilot DMA at the site - Starting data logging - Collect billing data in the DMA by learners	-
3rd week (1st Workplace)			
10/Feb (Mon)	am	* Travelling (DWS Coordinators and Facilitators)	-
	pm	Participant assembly, meeting about training plan and courtesy call	Office
11/Feb (Tue)	am	DMA configuration	Site
	pm	DMA configuration	Site
12/Feb (Wed)	am	DMA configuration	Site
	pm	DMA configuration, MNF (by step measurement) at night	Site
13/Feb (Thu)	am	Data retrieval and Data analysis	Site and office
	pm	Reporting (Baseline & problem identification)	Office
14/Feb (Fri)	am	Presentation to managers of each Municipality Wrap up workplace training results	Office
	pm	* Travelling (DWS Coordinators and Facilitators)	-
4th week (Buffer)			
	-	(DWS Coordinators support learners if necessary) (MNF and SIV measurement if necessary)	-
5th week (2nd Workplace)			
24/Feb (Mon)	am	Travelling (DWS Coordinators and Facilitators)	-
	pm	Participant assembly and meeting about training plan	Office
25/Feb (Tue)	am	NRW Countermeasures	Site
	pm	NRW Countermeasures	Site
26/Feb (Wed)	am	NRW Countermeasures	Site
	pm	NRW Countermeasures, MNF (by step measurement) at night	Site
27/Feb (Thu)	am	Data retrieval/analysis	Office
	pm	Preparation for presentation (Findings, results, remaining issues, strategic implementation planning with considering funding application)	Office
28/Feb (Fri)	am	Presentation to relevant managers Wrap up workplace training results	Office
	pm	* Travelling (DWS Coordinators and Facilitators)	-

Remarks: Learners should be firstly capable to identify problems. If the team identifies the problems properly, selecting/taking effective countermeasures are a piece of cake.

Table 3: Training in IBTC (6th week)

Day	Time	Contents	Venue
6th week (2nd IBTC)			
2/Mar (Mon)	-	-	-
3/Mar (Tue)	-	-	-
4/Mar (Wed)	-	* Traveling (facilitators and learners)	-
5/Mar (Thu)	8:30-9:45	Workplace Training Results (Presentation) drafting	Room
	10:00-12:00	Workplace Training Results (Presentation) and Q&A [Presentation, 30 minutes each]	Room
	Lunch		
	13:00-13:50	Technical Review and Recapping [Interactive Session]	Room
	14:00-15:15	Follow-up Lectures with Supplemental Notes [Theory & Practices]	
	15:30-16:30	Revision of Workplace Training Results (Presentation)	Room / Yard
6/Mar (Fri)	8:30-9:00	**Output Sharing Seminar * Invite various stakeholders** Introduction of Participants [Orientation]	Room
	9:00-11:00	**Output Sharing Seminar * Invite various stakeholders** Presentation and Q&A [Presentation, 30 minutes each]	Room
	11:15-11:45	Overall Evaluation	Room
	11:45-12:30	Certification, Closing Remarks, Group Photos	Room
	Lunch		
	pm	* Travelling (facilitators and learners)	-

Remarks:

END

PROGRAMME OUTLINE

(3RD GROUP/INTAKE, ONLINE)

THE NATIONAL NRW TRAINING

Date: Tuesday 17th to Friday 20th November 2020

4-half-days Course for **Online Training** on **Knowledge** Component only

Partnering Municipalities for Facilitation

Cape Town, Tshwane, Ekurhuleni, eThekwini, Johannesburg, Buffalo City, Mombela, Ugu and George

PROGRAMME OUTLINE

Time	Module	Presenter	Support
17th Nov. Day-1: I. Introduction and Icebreak			
9:00-10:00	a. Orientation and Introduction	DWS WUE	DWS IBTC
10:00-11:00	b. WCWDM and NRW in Municipal Water Services of South Africa	DWS WUE	DWS IBTC
11:00-12:00	c. NRW-related Problem Awareness Workshop	DWS WUE / Ndzululwazi Joni	WUE / Ndzululwazi Joni
12:00-12:15	Orientation to Day-2, Questionnaire and Homework (if any)	DWS WUE	DWS IBTC
18th Nov. Day-2: II. Fundamental Knowledge and Skills for NRW			
9:00-10:00	d. Technical Aspects: Water Reticulation	Nico Schmulian	Koena Moabelo Mahdi Pathan
10:00-11:00	e. Institutional Aspects: Metering and Billing	Koena Moabelo	Nico Schmulian Mahdi Pathan
11:00-12:00	f. Data Collection (Logging)	Mahdi Pathan	Nico Schmulian Koena Moabelo
12:00-12:15	Orientation to Day-3, Questionnaire and Homework (if any)	DWS WUE	DWS IBTC
19th Nov. Day-3: III. Current State Analysis on the ground to Start Now			
9:00-10:00	g. Zone Configuration (Drop Test)	Unathi Noludwe	Sikiza Yekane Mulalo Bvumbi
10:00-11:00	h. MNF and Step Test	Mulalo Bvumbi	Unathi Noludwe Sikiza Yekane
11:00-12:00	i. Practices (by using a simulated DMA)	Sikiza Yekane Siyamcela Mamane	Unathi Noludwe Mulalo Bvumbi
12:00-12:15	Orientation to Day-4, Questionnaire and Homework (if any)	DWS WUE	DWS IBTC

20th Nov. Day-4: IV. Case Study for On-the-Ground Actions			
9:00-10:00	j. Case Studies (from the previous trainings)	DWS WUE / Mckaylin Adonis	Brandon Stevens Ashan Nandal
10:00-11:00	k. Data Management (Utilization/Arrangement) and Presentation	DWS WUE / Brandon Stevens	Mckaylin Adonis Ashan Nandal
11:00-12:00	l. Actions and Way Forward	DWS WUE / Ashan Nandal	Brandon Stevens Mckaylin Adonis
12:00-12:30	Orientation to the Practices/Workplace Training and Questionnaire	DWS WUE	DWS IBTC

Practices @ Yard (IBTC, Pretoria) and Workplace components will be in February and March 2021.

PRESENTATIONS

(1ST GROUP/INTAKE)

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Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

Background to Water Conservation and Water Demand Management: South African Perspective

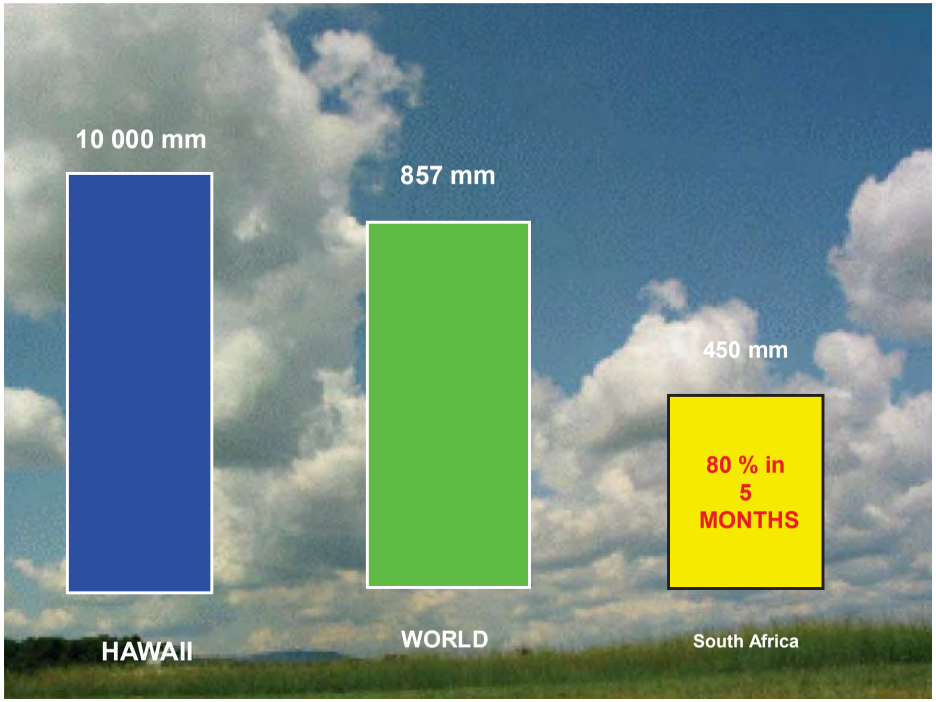
THE NATIONAL NON REVENUE WATER TRAINING
DWS, SALGA AND JICA

"More Water Conservation, Water Losses and Non Revenue Water Management"

Thabo Masike
Directorate: Water Use Efficiency
Date: 07 October 2019

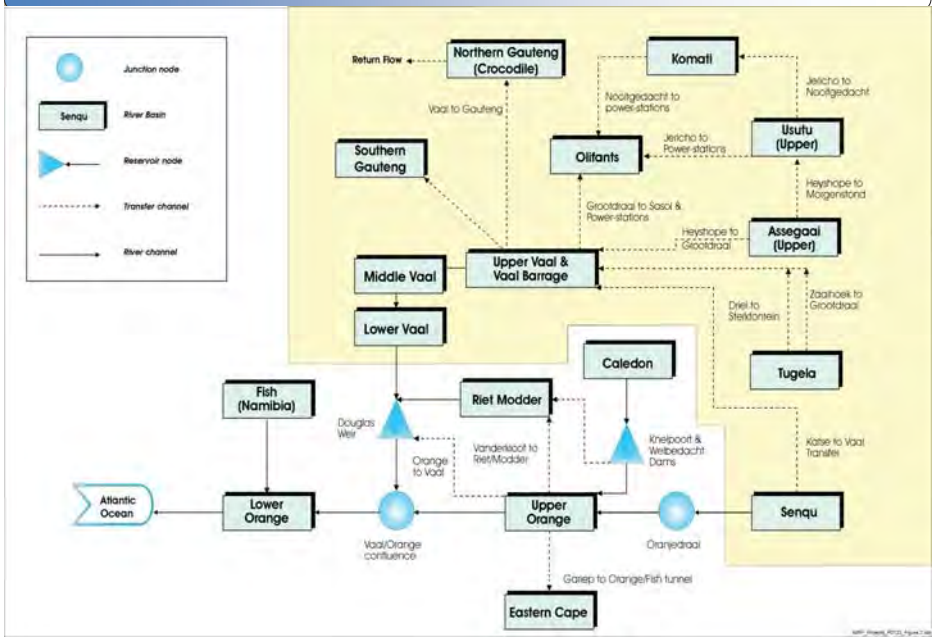
Presentation Overview

- **Water availability Situation**
  - Water Scarcity and climate change
  - Competition for it
- **Need for WC/WDM**
  - Water losses, wastages and inefficient across sectors
  - WC/WDM Challenges
- **WC/WDM Planning Regime**
  - Logical framework approach to WC/WDM
  - IWA Water Balance
  - Situation Assessment, develop Business Plan and Implementation Strategies with monitoring and reporting
- **What needs to be done**
  - Explore simple WC/WDM solutions in the Municipalities
  - WC/DM forms part of WSDP and
  - National Water Services Information System
- **Conclusions**
  - WC/WDM integral part of water services macro planning

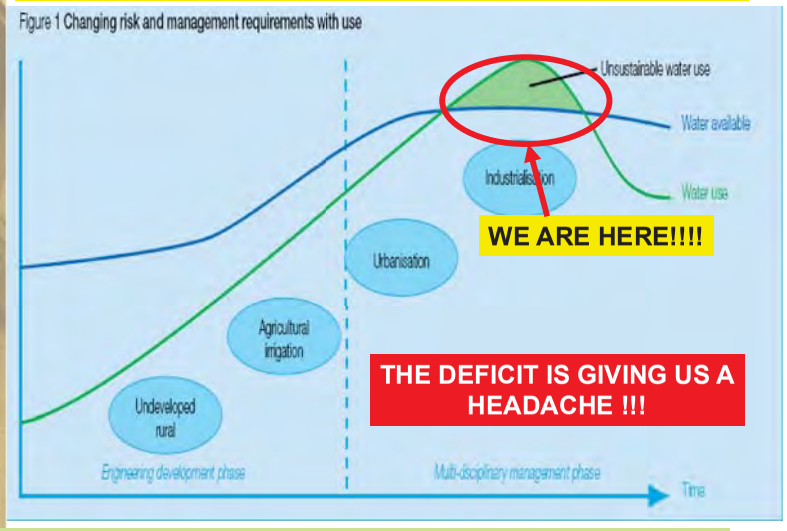




Simplified Complicated Integrated Vaal River System



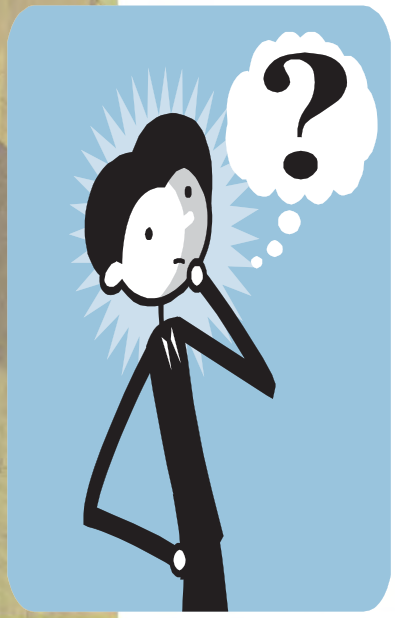
PUTTING THINGS IN PERSPECTIVE….



Pegram et al, 2007: ALLOCATING SCARCE WATER :
A Primer on Water Allocation , Water Rights & Water Markets…

In the nut there is for WCWDM…

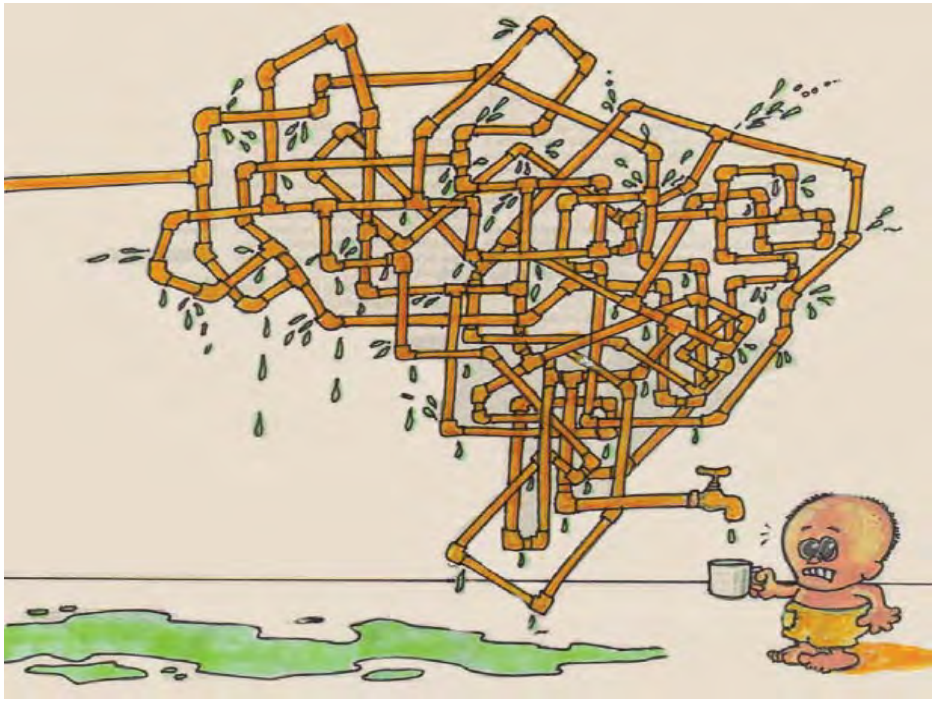
- SA is a water scarce country
- Many catchments are already in (water) deficit
- Water is required for:
  - Economic growth (6% NDP)
  - Basic human needs (Social dev)
  - Reserve (environment)
  - International agreements (Inco-Maputo)
  - Equity/ redistribution (WAR)
- Further augmentation increasingly expensive:
- **TRUE VALUE OF H_2O=Sustainable Water Services**

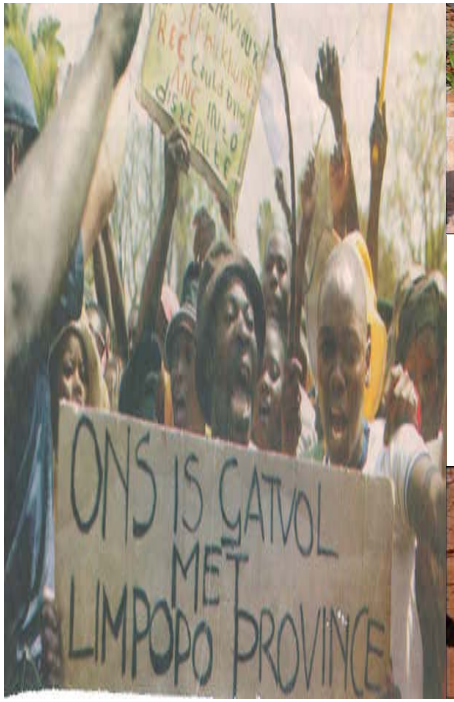


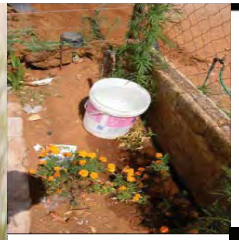
Reflecting On It

Do Opportunities exist for…

WC/WDM







Attributes of erratic water supply system





Feeding The Soil

Free: 0800 200 200 www.dwa.gov.za

A 09 - 20

Emfuleni Local Municipality

System Input Volume 36 962 000 m³/annum	Billed and paid for Consumption 1 848 000 m³/annum	5%
	Free basic water 7 246 000 m³/annum	20%
	Apparent losses 1 396 000 m³/annum	4%
	UARL (2 to 3 times) 4 396 000 m³/annum	12%
	Potential saving on physical leakage and inefficient consumption 22 300 000 m³/annum	59%

Sebokeng Evaton Water Balance



Wondering Why Is It Not Happening?

- No institutionalization of WC/WDM within WIs
- WC/WDM NOT a PRIORITY (just a nice talk about)
- No Funding for WC/WDM programmes
- No Commitment, Teachability & Focus on WC/WDM

MINDSET ISSUE: A PARADIGM SHIFT TO OVERCOME THE WC/WDM INERTIA

WATER IS LIFE - SANITATION IS DIGNITY Toll Free: 0800 200 200 www.dwa.gov.za

WATER SERVICES PLANNING APPROACH FOR WC/WDM

- How much water is being lost?
- Where is the water being lost?
- Why is the water being lost
- What strategies (WC/WDM interventions) can
- be used to reduce water losses/manage demand and improve performance?
- How we maintain the WDM strategy & sustain the achievement gained?

IWA WATER BALANCE AT THE HEART OF MUNICIPAL WC/WDM PLANNING

System Input Volume	Authorised Consumption	Billed Authorised Consumption	Billed Metered Consumption	Potential Revenue Water	Free basic / Recovered revenue
			Billed Unmetered Consumption		Non-Recovered revenue
		Unbilled Authorised Consumption	Unbilled Metered Consumption	Non Revenue Water	
			Unbilled Unmetered Consumption		
	Water Losses	Apparent Losses	Unauthorised Consumption		
			Customer Meter Inaccuracies		
		Real Losses	Leakage on Transmission and Distribution Mains		
			Leakage on Overflows at Storage Tanks		
			Leakage on Service Connections up to point of Customer Meter		



Prioritization = Know What To Do But Nothing Gets Done

–

Concentration = Demonstrate Excellence With No Progress

Prioritization

+

Concentration

=

Delivers Excellency In Service Delivery:

Hopefully Is Enjoyable Too!!

Project Approach & Methodology

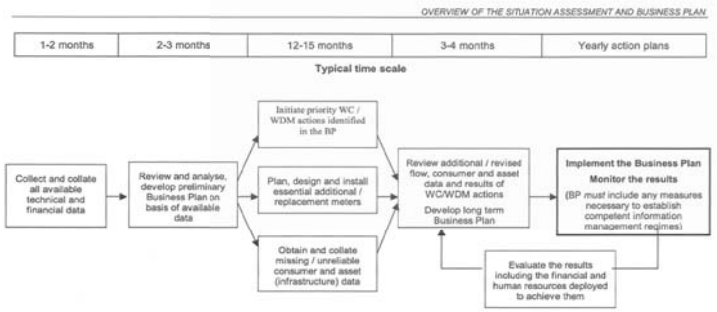


Figure 2.1: Stages in planning and implementation of WCDM Business Plan

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Conclusions – Key Take Away Points

- ✓ WC/WDM important part of Macro Planning
- ✓ Provision of reliable, cost effective and sustainable water service rest on WC/WDM
- ✓ Every Municipality must develop WC/WDM strategy plan as part of WSDP and IDP
- ✓ Progress must be reported quarterly as part of reporting
- ✓ No need to plan and develop new or upgrade existing infrastructure at municipalities with high water losses.
- ✓ Priority requirement reduce water losses and Non Revenue Water

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Thank You



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The Project for Strengthening the Training Capacity of IBTC on NRW

The National Non-Revenue Water (NRW) Training for Municipalities by Municipalities in South Africa

Outline of the Training

Project Team

This presentation is
for
Possible **Collaboration** with
Stakeholders and ongoing Projects/Programmes
which leads to **Synergy Effects**,
and for
Participation in the Training
by Municipalities for Municipalities
with supports from Stakeholders.

Contents

1. Observation in Baseline Survey
2. Concepts of the National NRW Training
3. Aims of the National NRW Training
4. Basic Modules of the National NRW Training
5. Course Overview of a Training Cycle
6. Business Model of the National NRW Training

1. Observation in Baseline Survey

- The **NRW is still high** in municipalities for the past decade.
- A lot of municipalities have **not calculated/evaluated NRW** properly. This may not lead to effective interventions.
- The municipalities **need proper analysis** based on adequate "measuring and metering".
- Have municipalities conducted **adequate reticulation management** and O&M ? (Inadequacy of essential information and analysis ability)
- Have municipalities taken actions with **strategic planning and budgeting** for tackling with NRW?
- Have real issues and problems been informed properly from working-level staff to decision makers?
- Does South Africa need to have a function/opportunity to cooperate at the working level among municipalities for tacking with NRW?

2. Concept of the National NRW Training

- Problem-solving oriented and flexible training programme for participating municipalities
- Training programme - targeting cross-sectoral/departmental/ hierarchical participants as a team
- Training programme- participating municipalities to approach root causes of the problems in the NRW management
- Training programme - establishing the municipal working-level network and encouraging municipalities to take positive actions.
- Training programme leading to strategic/effective use of limited resources through prioritization
- Stakeholders' participatory/interactive Training programme organized by DWS/SALGA
- Sustainable training programme contrbuting to nationwide water services and capacity development by accumulating knowledge/information

3. Aims the National NRW Training

Participants will be able to:	Understand the NRW management using a pilot area, model District-Metered Area (DMA)
	Look into and analyze NRW situation properly through adequate measuring and metering in DMA
	Select/take effective countermeasures or further investigation and see/utilize the results
Furthermore:	Learn the importance of fundamentals and basics for O&M through the NRW management

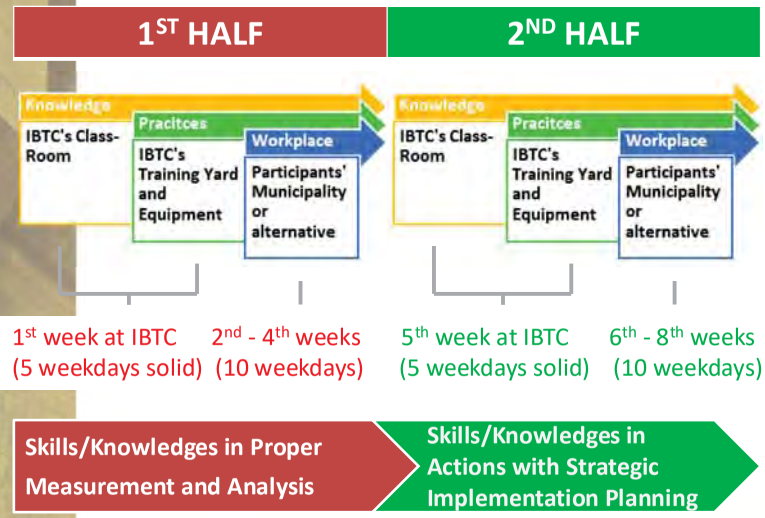
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4. Basic Modules of the National NRW Training

1. Bulk Meter Knowledge and Technique
2. Customer Meter Knowledge and Technique
3. Reticulation Facility Planning and O&M (Valves, Fire Hydrant, Air Valves, etc.)
4. DMA and Measurement Planning
5. Data Logging and Analysis
6. Water Balance Analysis
7. NRW Reduction Strategic Planning & Presentation
8. Fundamental Knowledge of Active Leakage Detection
9. Fundamental Knowledge of Conditional Assessment

Remarks:
- The training should be customized and flexibly . This is based on participating municipalities' needs and status-quos.
- Full knowledge/skills of "8" and "9" should be targeted more intensively in the next stage.

5. Course Overview of a Training Cycle



5. Course Overview of a Training Cycle

- Orientation
- Significance of the NRW Management
- Bulk Metering
- Customer Metering
- Appurtenance
- Measuring & Logging
- DMA Plan
- Data Acquisition & Analysis
- Measurement Planning
- Orientation for Workplace Training
- Workplace Training (OJT) with Results

DMA Selection/Creation, Data Measurement/ Collection/Analysis and Baseline Report

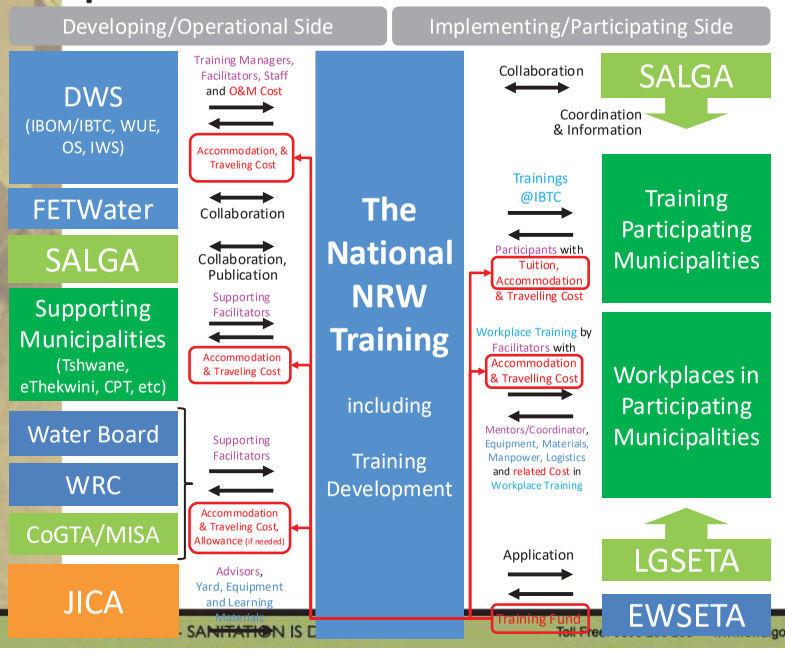
Real Issues & Problems to be identified throughout the Training

- Strategy and Countermeasures
- Strategic Action Planning
- Presentation drafting
- Introduction of Presentations
- Orientation for Workplace Training
- Workplace Training (OJT) with Outcomes

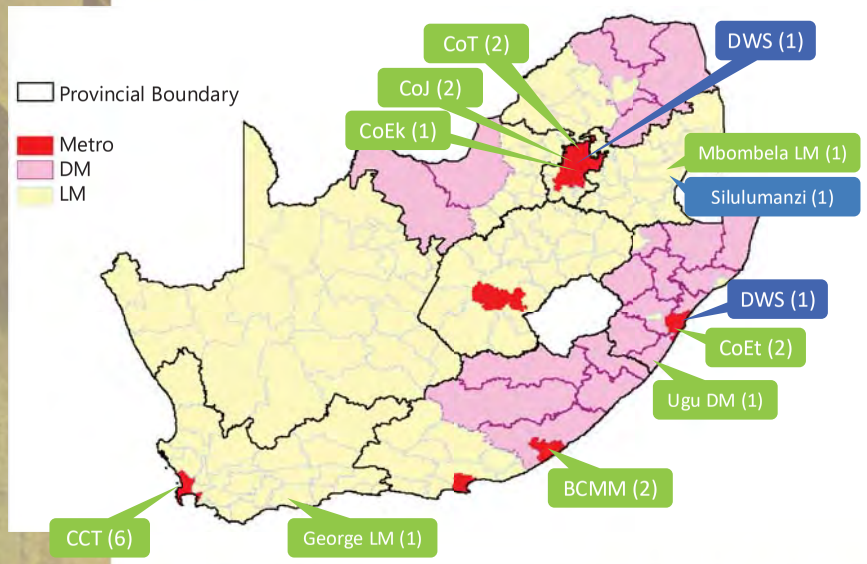
Strategic action plans, Countermeasures, Further Investigation and Wrap-up Report

Legend (Components) : Knowledge @ IBTC : Practices @ IBTC : Workplace Training

6. Development Model of the National NRW Training



7. Nominated Facilitators



Source: Strategic Overview of the Water Services Sector in South Africa, 2015, DWS

Thank you very much for your attention. Your cooperation and participation in the National NRW Training is welcome and key to its success.

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The Project for Strengthening the Training Capacity of IBTC on NRW

The National Non-Revenue Water (NRW) Training

Introduction of Municipalities

By Participating Municipalities

1. **Profile of the municipality**: population, location, geography, climate, socio-economy, industry, etc.
2. **Outline of water services of the municipality**: population serve, service connection, water sources, supply capacities (m3 per day), water section's organizational information, NRW and ongoing interventions if any, etc.
3. **Outline of a proposed pilot DMA(s)**: location, area, land use, service connections, reasons of proposal, etc.
4. **Anticipation/wishes** from the National NRW Training

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The Project for Strengthening the Training Capacity of IBTC on NRW

The National Non-Revenue Water (NRW) Training

NRW, Water Balance and Reticulation Basics

Project Team

A 09 - 27

Aims of the Module

1. To understand the concept of municipal NRW
2. To understand why NRW management is necessary
3. To understand what a water balance is
4. To understand water reticulation basics

Non-Revenue Water Basics

Non-Revenue Water (NRW) in municipal water services is:

"Water that has been produced and is 'lost' before it reaches the customer and which is not billed. Losses can be real (physical) losses (for example through leaks) or apparent losses (for example through theft or metering inaccuracies)"

Non-Revenue Water Basics

How to identify municipal NRW

Technical Term

System Input Volume (SIV)

- The volume of water produced or purchased, and supplying municipal water supply system(s);
- These systems could be an entire water supply system, or a zone or an isolated area;
- The input volume must be measured by bulk input flow meter(s);
- Period of measurement could be on an annual, monthly, or daily basis etc (annual is more common)

Non-Revenue Water Basics

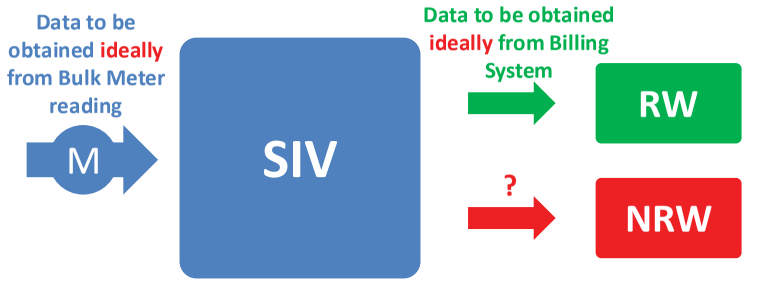
How to identify municipal Revenue Water

Revenue Water (RW) — Technical Term

- This is all billed metered and billed unmetered water consumption, which is measured and supplied to customers. In South Africa, free basic water is also considered to be revenue water.

Non-Revenue Water Basics

Simple way to identify municipal NRW



$SIV\ (m^3) = RW\ (m^3) + NRW\ (m^3)$

Volumes to be in the same period!

i.e. NRW = SIV – RW

$NRW\ Ratio\ (\%) = (SIV-RW)/SIV \times 100\%$

Non-Revenue Water Basics

NRW is:

A performance indicator of water services efficiency which include the following processes

- Gathering of information for analysis
- Initiatives to reduce water loss and improve revenue

Calculation of NRW can lead to incorrect results if SIV and RW data is "NOT" reliable or accurate in your municipality...

For example, on the condition that SIV reading differs from 80 to 90 due to its inaccuracy and RW is 60,

$$\text{NRW ratio} = \frac{90 - 60}{90} = 33\% \quad \Leftrightarrow \quad \frac{80 - 60}{80} = 25\%$$

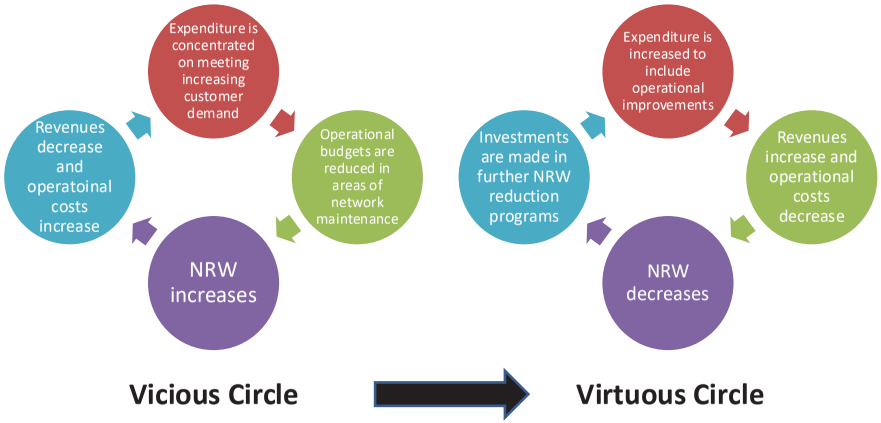
Non-Revenue Water Basics

A variety of aspects on NRW in water services needs wide-ranging viewpoints, understanding and efforts.

Fundamental Data (Network Drawings, GIS, Bulk/In-Flow Metering, etc.)	Information and Data (Meter Reading, Billing, etc.)	Operation & Maintenance	Commercial Operations
Capacity and Know-how	Strategy and Planning	Financial Resources / Allocation	Management Support
Political Buy-In	Asset Management	Staff	Logistics
Equipment, Materials and Supplies	Customer Support	Other 1	Other 2

Non-Revenue Water Basics

Challenges in municipalities from NRW viewpoint



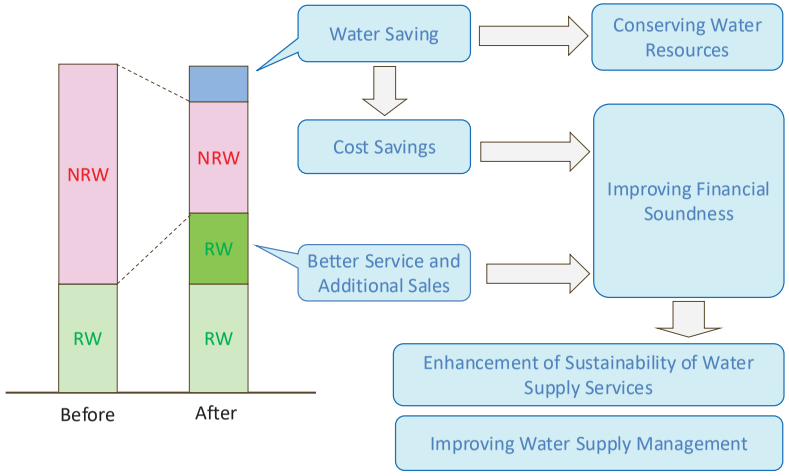
Non-Revenue Water Basics

Impact of NRW management

- Reduction of production and O&M cost
- Increased revenue generation
- Contribution to water conservation
- Saving/delaying capital investments
- Improvement in efficiency and financial sustainability
- Increase in water supply coverage
- Improvement in customer satisfaction

Non-Revenue Water Basics

Impacts by NRW management (example)



Water Balance Analysis

An exercise by each municipality or all:

1. **Brainstorm any possible NRW items from your experience in your municipality.**
2. **All items brainstormed should be recorded and/or written in sticky notes.**
3. **Representative should present them.**
4. **Allocate them by components in water balance**

Actions to be prioritized for possible quick-win and long-term NRW initiatives for your municipality by using knowledge of experienced municipalities.

Water Balance Analysis

Water Balance by International Water Association (IWA)

System Input Volume	Authorized Consumption	Billed Authorized Consumption	Billed Metered Consumption	Revenue Water
			Billed Unmetered Consumption	
		Unbilled Authorized Consumption	Unbilled Metered Consumption	Non-Revenue Water (NRW)
			Unbilled Unmetered Consumption	
	Water Losses	Commercial (Apparent) Losses	Unauthorized Consumption	
			Customer Metering Inaccuracies and Data Handling Errors	
		Physical (Real) Losses	Leakage on Transmission and/or Distribution Mains	
			Leakage and Overflows at Utility's Storage Tanks	
			Leakage on Service Connections up to Point of Customer Use	

*Note: Free basic water is considered to be Revenue Water in SA

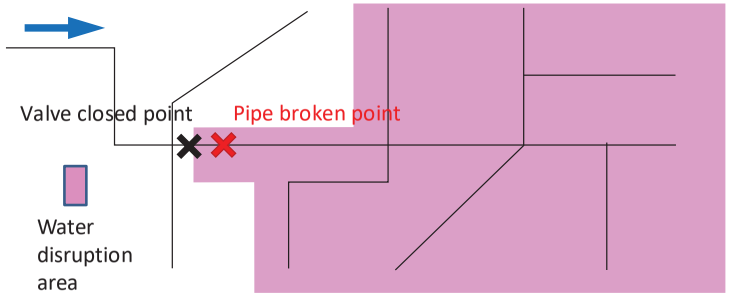
Water Balance Analysis

Discussion points for the South African context

1. Free Basic Water
2. Excessive use of flat-rate billing for customers
3. Internal leaks (eg water running in toilet)
4. Non-payment culture
5. Political interference
6. Any other items?

Water Reticulation Basics

Piping System: Branch Piping

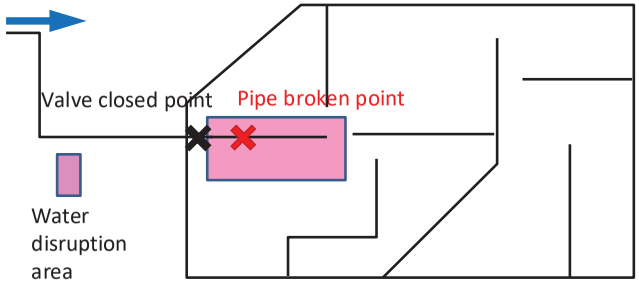


Advantage: Pipeline installation cost is low, etc.

Disadvantage: Area without water becomes large, etc.

Water Reticulation Basics

Piping System: Annular Piping

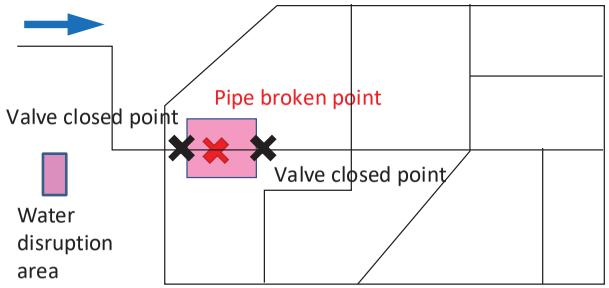


Advantage: Area without water becomes smaller than with branch piping system, etc.

Disadvantage: Installation cost is higher than branch piping, etc.

Water Reticulation Basics

Piping System: Network Piping

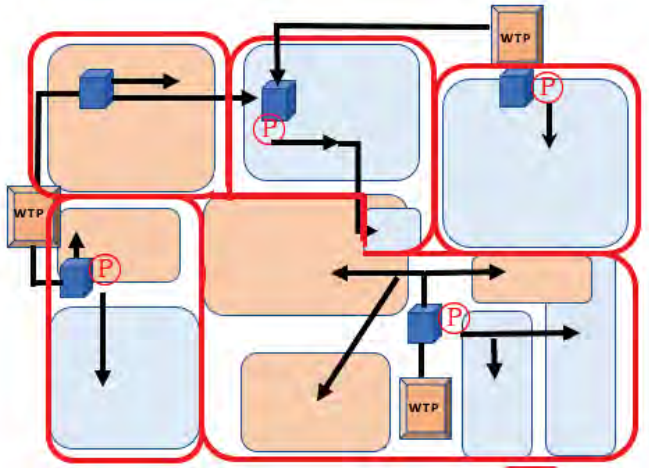


Advantage: Area without water can be minimized and kept pressurized.

Disadvantage: Higher installation cost, etc.

Water Reticulation Basics

Zoning/Sectorization



Water Reticulation Basics

Zoning/Sectorization

Large-size zones are managed in accordance with the following principles for instance:

- Each zone contains a distribution reservoir for its exclusive use
- Tower and pumping systems will be used for areas around the reservoir that don't have sufficient pressure. These systems are normally smaller in size
- Clearly defined natural gravity supply areas and pressurized pumping or tower areas
- Install pipeline with zone valves in order to make enable the transfer of water between zones (problematic)

Water Reticulation Basics

Zoning/Sectorization

Multiple Benefits of Zoning:

- Comparison of the delivered quantity of SIV and the volume used for each zone is made possible. Leakage is estimated more accurately. Leakage prevention works become effective. Furthermore, distribution control is attained.
- In case of a disaster, the system is very effective in resuming normal service. After a disaster, the repair of damaged components, filling of pipelines to ensure service, the emptying pipelines for further repair works will be repeated, from larger size networks to smaller networks. The work period for those operations will be shortened remarkably when a reticulation network is organized in zones.
- Control of distributed volume into a zone is easier to manage, for example when the supply is to be reduced under drought conditions or in the case of intermittent supply (not recommended), the number of valves for control is less, saving operator's workload.

Water Reticulation Basics

Zoning/Sectorization

- Changes of flow conditions in the higher rank zones does not affect the conditions in the lower rank zones. This reduces the possibility of flow disturbance.

District-Metered Area (DMA):

- This is a zone with approximately 500 - 3000 customers at similar ground elevation, preferably supplied through a single metered point where pressure can also be controlled if required. Steps should be taken to ensure that DMAs remain isolated from the rest of the network at all times. DMAs form the core of water loss and pressure management in a distribution system.

Q & A

Bulk Metering

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1. Bulk metering
1.1. Outcome

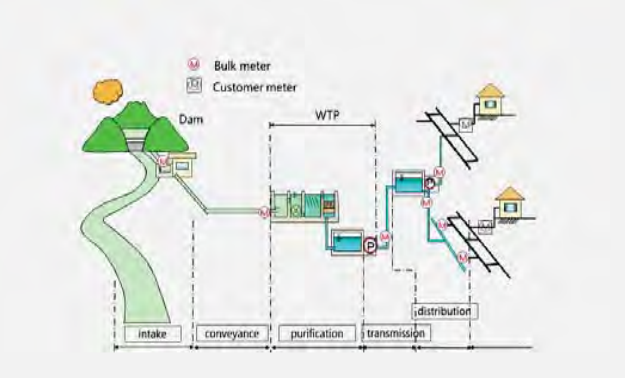
- To understand what are importance and role of bulk flow measurement as function in the system are.
- To understand what features and difference in flow meter type (installation, accuracy, maintenance, advantage, disadvantage, comparison) are.
- To understand what are important points, purpose, and cost on how to select flow mete type.
- To understand how to install and read bulk flow meters.

1. Bulk Metering
1.2. Importance

- A meter shall be selected properly by condition, range, accuracy .
- Especially for transaction meter and bulk meter to measure NRW shall be more accurate.

  - Transmission volume (Flow from Purification plant)
  - Receiving volume (Flow from Bulk supplier such as Rand water)
  - Distribution volume (Flow from Reservoir or DMA)

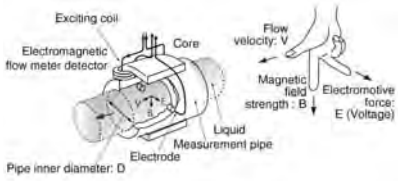
1. Bulk Metering
1.3. Location of water meters



2. Variety of Bulk Meter

- For pipes
  - ➢Electro Magnetic flow meter
  - ➢Ultrasonic flow meter
  - ➢Differential pressure type flow meter
  - ➢Turbine flow meter
- For open half pipes
  - ➢Weir flow meter
  - ➢Area type flow meter

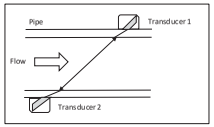
3. Variety of Bulk Meter
3.1. Electromagnetic flow meter



Source: Keyence.com

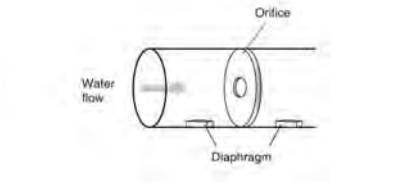
- Faraday's law of electrolysis
- Consist of Transducer to convert flow to electrical signals
- Converter to convert electric signals to instrumentation signal
  - Dia: 2.5mm to 3,000mm
  - Accuracy: ± 0.1-0.5%
  - Use: Raw water, Purified water, Sewage, Chemical,

3. Variety of Bulk Meter
3.2. Ultrasonic flow meter



- Ultrasonic waves are transmitted at an angle across fluid in the pipe. Flow is measured by changes in the transit time for the ultrasonic waves.
  - Dia: 25mm – 3,000 mm
  - Accuracy: ±1%
  - Use: Raw water, Purified Water, Chemicals

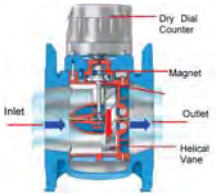
3. Variety of meter
3.3. Differencial pressure flow meter



Source: Keyence.com

- Using Bernoulli's principle.
- An orifice plate is installed into the path of flowing fluid, deliberately causing pressure loss.
- Small flow: Pressure loss is small
- Large flow: Pressure loss is large
  - Dia: 15mm-1500mm
  - Accuracy: ±1-2%
  - Use: Raw water, Purified water, Chemicals

3. Variety of meter
3.4. Turbine flow meter



- By spinning the paddle wheel with the force from the flowing fluid, it becomes possible to measure the rate of this flow from the number of revolutions.
  - Dia: 25mm- 400mm
  - Accuracy: Another Page
  - Purified water

3.4.1 Combination meter (Turbine meter)





3.4.2 Principles of combination meter





- At low flow rate, the change over valve closes and the flow through domestic by-pass
- At the flow increases, the change over valve opens as a result of differential pressure and flow through into the bulk meter.

4. Pros and Cons
4.2. Ultrasonic flow meter

Pros

- Easy installation to clump on the outside pipe
- No pressure loss
- The cost does not increase with the diameter.
- Comparatively lower cost than electro magnetic meter.

Cons

- Measurement is not possible when there are Air bubbles.
- Long section of straight pipe is required.
- Comparatively subject to turbulence if flow.

4. Pros and Cons
4.3 Differential pressure flow meter

Pros

- Measurement is possible with Gas, Liquid, Steam.
- Mechanically simple, No moving parts then, having lower mechanical failure.
- Lower cost when its larger diameter.

Cons

- Because of an orifice plate, great pressure loss occurs.
- Not suited for fluids that include solid (clogging occurs)
- Long section of strait pipe if required.

4. Pros and Cons
4.4 Turbine meter

Pros

- Good reproducibility and responsiveness.
- A simple structure with a low price
- Compact and can perform large-capacity measurement.

Cons

- Extremely sensitive to foreign objects. (Cause clogging),.
- Periodic maintenance is needed because the paddle wheel spins at high speeds.

5. Check point of bulk meter
5.1 Electromagnetic meter

1. The average of flow rate shall be in 2-4m/s.
2. Straight pipe, Upstream L=5D for 90 bend, T-joint, Reducers. L=10D after full open gate valve.
3. Always full of water in pipe
4. Install horizontally.
5. By pass line is recommended for maintenance.
6. Avoid immediately after the chemical pump.
7. Avoid strong magnetic field at transducer.

5. Check point of bulk meter
5.2 Ultrasonic flow meter

1. Accuracy is higher in velocity faster than 1m/s, Temperature in 0-40℃, and turbidity is less than 3,500NTU.
2. Always full of water in pipe.
3. There are methods Z(penetrate), V(reflect), X(cross), and 2V. When it has turburance, 2V is recommended for accurate measurement.
4. Pipe inside lining, “material and thickness” shall be known as a parameter of the measurement.
5. Straight pipe, is basically L=10D for upstream, L=5D for downstream. From upstream valve, L=30D, Pump L=50D.

5. Check point of bulk meter
5.3 Differential pressure flow meter

1. Straight pipe Upstream L=10D, L=5D in downstream.
2. Reducer is often in a chamber, drain system is recommended.
3. Pressure sensor shall be in water pressure always. (Avoid minus pressure)
4. Prevent freezing from the pressure sensor.

5. Check point of bulk meter
5.4 Turbine flow meter

1. The average of flow rate shall be in 2-4m/s.
2. Straight pipe L=5D for 90 bend, T-joint, Reducers, In upstream. L=10D after full open gate valve. L=5D in downstream.
3. Always full of water in pipe
4. Install horizontally.
5. By pass line is recommended for maintenance.
6. Avoid immediately after the chemical pump.
7. Avoid strong magnetic field at transducer.

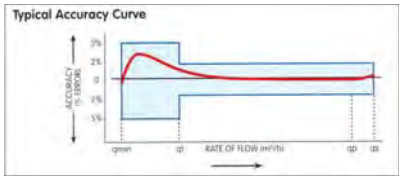
6. Selection of water meter

- SABS (South African Trade Metrology's Standards) approval
- High consumption and Low consumption at the point
- The installation specifications of the meter
- Flow rates
- The type of meter
- The diameter of the meter
- Data required from meter (pulse outputs)
- If power supply is required

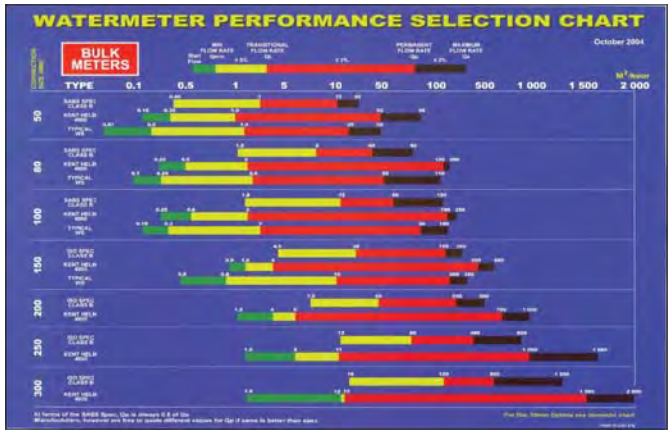
6. Selection of water meter
6.1 Accuracy of flow meter

Terms and definitions

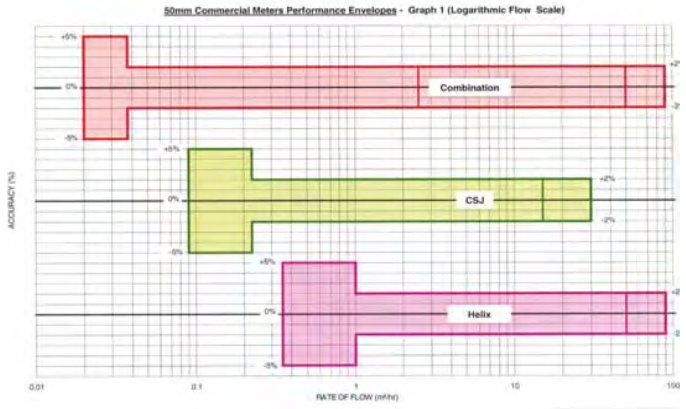
- Qmax: Maximum flow rate
- Qp: Permanent flow rate
- Qt: Transitional flow rate
- Qmin: Minimum flow rate
- Starting flow rate



6. Selection of water meter
6.2 Bulk meter performance



6. Selection of water meter
6.3 3 types of 50mm meter performance sheet



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7. How to maintain flow meter

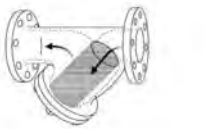
- 6-1 Scaling

The flow path inside the piping narrows and restricts flow.

If a thick layer of scaling attached to the inside of the pipe, the flow meter could become unable to measure the flow and maintenance would be required.

- 6-2 Sludge

Sludge can be removed using a strainer, complete removal is hard and sometimes refusal of sludge (debris) is required.



Source: Keyence.com

7. How to maintain flow meter

- 6-3 Rust

Air in the pipe, such as intermittent supply will be a cause of rust.

Strainer will also prevent a damage due to rust.

- 6-4 Slime

A kind of corrosion in the pipe, sometimes with algae, bacteria in pipe.

Maintenance is needed for turbine type meter.

Source: Keyence.com



7. How to maintain flow meter

- 6-5 Slurry

Same as slime, periodical maintenance Is required for mechanical meter.

Perforated water meter such as electromagnetic or ultrasonic is recommended.

Source: Keyence.com

- 6-6 Air bubbles

Since Coriolis type flow meters measure mass flow, they are unaffected by air bubbles. For electromagnetic type flow meters, bubbles can cause unstable flow readings. This is due to the fact that detection is based on volume and the bubbles are mistaken for fluid.

7. How to maintain flow meter

- 6-7 Irregularity or deviation in flows

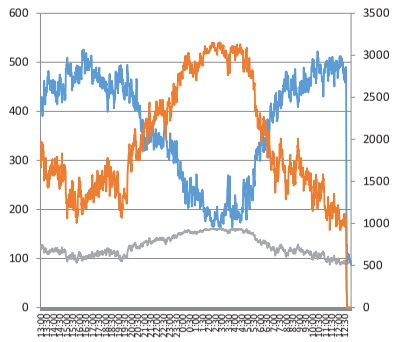
The degree of measurement error depends on the degree of irregularity in the distribution of flow velocity. Measurement performance can be improved by installing straight pipe sections upstream to make the distribution of flow velocity more uniform. (As a rough guide, the straight pipe section should be 5 times the bore diameter of the flow path.)

- 6-8 Pulsating flow

One possible way to reduce pulsations is by using a damper such as an accumulator. Also, if the pulsations cause fluctuations in the numeric values of the flow meter over time, increasing the flow meter's response time is effective at stabilizing the numeric values.

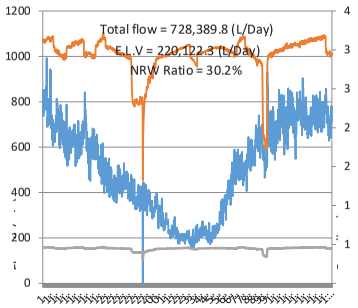
Source: Keyence.com

8. Characteristic of Flow
8.1 Gravity



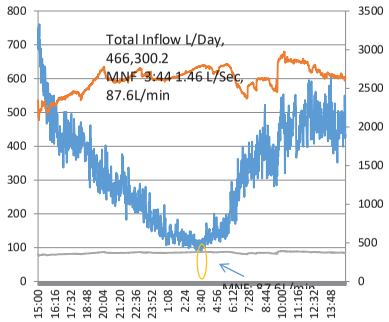
- When consumption is higher, the pressure is lower.
- Minimum Night Flow occurs when the pressure is highest.
- The volume of total leak per day can be estimated with the pressure fluctuation.
- When the pressure 2 times higher, the volume of the leak is √2.

7. Characteristics of flow
7.2 Pumping



- The pressure fluctuates by movement of pumping.
- Do not get the MNF value at lowest flow point. MNF value shall be in higher pressure time.

7. Characteristics of flow
7.3. Pumping 2



- MNF occurs in the higher pressure time.

Pipe and Appurtenance

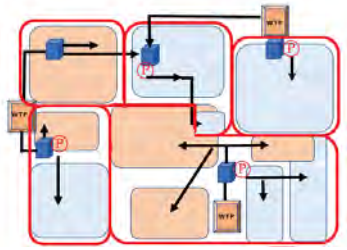
1. Outcomes

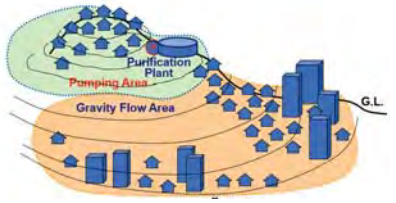
- To understand what reticulation system and its design are. By configuration with layout, gravity and pumping up systems.
- To understand what concept of zone system and DMA.
- To understand how to separate the system (water pressure, valve isolation) are.
- To understand what roles of appurtenances and function by cut models and practices in watr system.

2. Reticulation system

- Reticulation system
  - Gravity
  - Pump-pressure
- Piping system
  - Branch piping
  - Annular piping
  - Network piping
- Zone system (Pressure Area)

3. Zone system (Pressure management area)





4. Pipes

Type of Pipe	Characteristic	Remarks
Cast iron (CIP)	Susceptibility to both internal and external corrosion.	Commonly used up to the middle of the 20th century.
Ductile iron (DIP)	Greater strength, ductility and impact resistance. However it is subject to both internal and external corrosion.	A type of cast iron where the graphite particles in the iron
Steel (SP)	Steel is subject to both internal and external corrosion.	
High density polyethylene (HDPE)	Greater strength and can handle higher temperatures, tough	Welding used to join HDPE requires a high level of workmanship
Polyvinyl chloride (PVC)	High harness and strength, and resistant to corrosion	PVC pipes should not be exposed to direct sunlight
Glass reinforced plastic (GRP)	Highly resistant to corrosion and is sometimes used as a pipe material for large diameter pipes.	
Asbestos cement ACP)	Significant cost and handling advantages over iron before the arrival of plastics. Material is brittle, tending to crack under external loads and is difficult to repair	Popular pipe material from the 1970s to the 90s

4.1 DIP

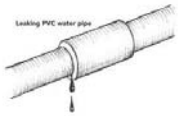


- A lot of joint
- Type A, K, T, U,
- Earthquake, Type S, SII, NS, GX, US,
- Corrosion prevention by coating is needed
- Polyethylene sleeve

4.2 PVC



- TS/HITS joint
- Lubricants (glue)



4.3 HDPE



- Electro fusion joint
- Socket type (Compression fittings)

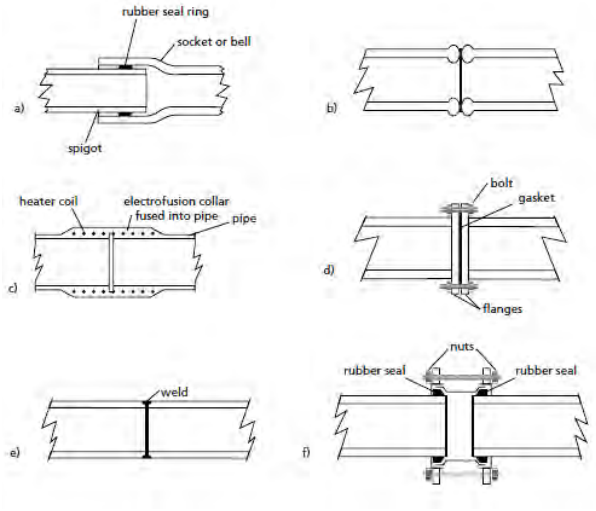


4.3 Installed HDPE Pipe

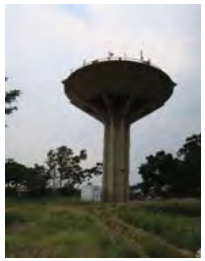




5. Pipe Joints



6. Water tower and Reservoir





7. Pumps

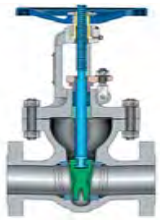




8. Valves







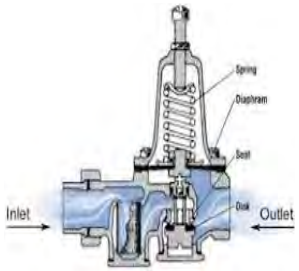
9. Air valve





10. PRV (Pressure reducing valve)





10.1 Four (4) settings for pressure control

1	Fixed-outlet pressure control is done using a standard PRV that limits the pressure on its outlet to a certain maximum value. This is a cost-effective and simple solution, but it does not have the ability to modulate pressure in response to the demand in the system, and thus pressures will still be higher at night than during the day.
2	Time-modulated pressure control is done using a PRV similar to that of fixed-outlet control, but varies the pressure setting over a 24-hour period. Thus, it is able to reduce pressures more during the night when demand is at a minimum. Time-modulated control is able to reduce leakage more than fixed-outlet control and is still relatively simple to implement.
3	Flow-modulated pressure control is done by adjusting the PRV setting based on the flow rate into the PMZ and can thus adjust system pressure to the actual demand. It is significantly more sophisticated than time-modulated control but has the potential to reduce losses further. A major advantage of flow-modulated control is that the system is able to automatically respond when the fire service requires high fire flows.
4	Closed-loop pressure control is done by adjusting the PRV setting based on the pressure at a critical point in the PMZ, and thus has the best potential for maximizing the benefits of pressure management. However, these systems are also the most sophisticated and expensive.

CUSTOMER METERING

Type, Accuracy、etc.

Aims of the Module

- Legal Requirements
- To understand the importance and role of customer meter measurement as function in the system are.
- To understand the features and difference in customer meter types (installation, accuracy, maintenance, advantage and disadvantage, comparison) are.
- To understand the important points, accuracy and durability on how to select customer meter type are.

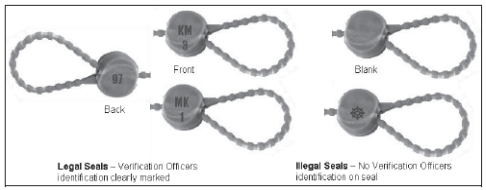
Aims of the Module

- To learn how to install customer meters (vertical, horizontal) and right location
- To understand how to read customer meters.

Legal Requirements

- New water meters must be approved by the legally recognized agency, South African National Standard (SANS) Specifications 1529-1.
- Water utility must be able to confirm the meters approval number and Lead Seal.
- Where meters have been exempted from compliance with SANS 1529 (various parts), an exemption letter from the SABS shall be submitted





Role of customer meter

- Metering provides an equitable basis for charging consumers based on the amount of water that they consume. It also allows cross-subsidisation to be done fairly, and needy consumers to receive a free basic amount of water.
- Metering shows the value of water to the consumer and creates strong incentives for consumers to use water more efficiently.
- Measured consumption forms the basis of most water accounts, and thus affects municipal revenue directly — water meters are the cash registers of water suppliers.

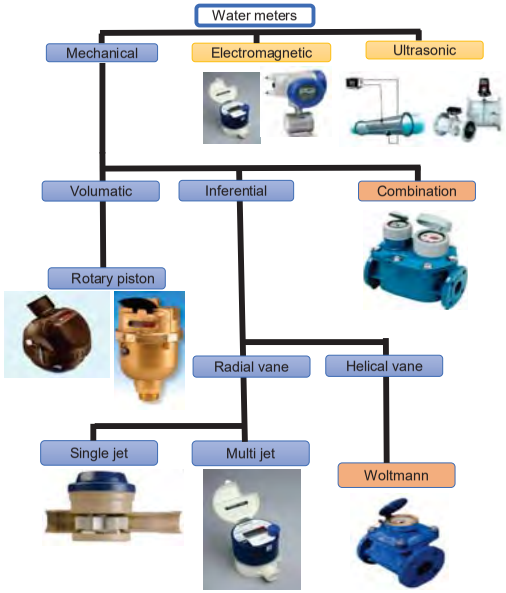
Role of customer meter

- Many of the technical benefits of water meters, such as accurately measuring municipal water purchases, reducing water losses, and identifying and removing illegal connections.
- The demand data is critical to building accurate computer models for simulating water distribution systems.

Meter Types

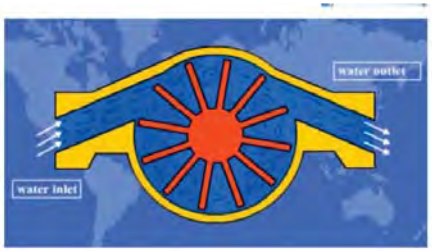
- Displacement (Volumetric) meter
- Velocity meter (turbine meter)
- Ultrasonic
- Electromagnetic
- Advanced meters: Prepaid meter and Automatic Meter Reading meter (AMR)

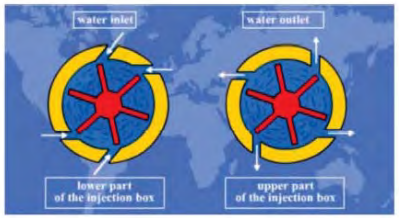
Meter Types



Meter Types

Inferential meter: Single & Multi Jet Meter









Meter Types

- **Volumetric meter**



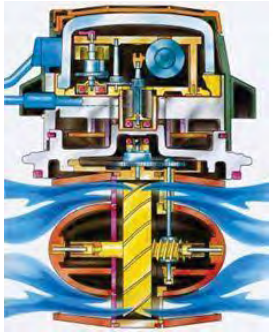
- **Displacement piston**



Meter Types

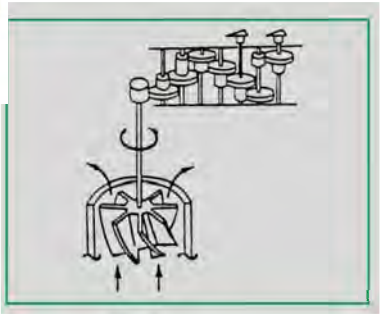
Woltmann type meter, Horizontal & Vertical

Horizontal(WP)





Vertical(WS)



Meter Types

Combination Meters

- Meters has areas with poor precision. In the case of a large-sized meter for example commercial and factory, it is difficult to accurately sense a small amount of water used at night. In order to complement the measurement of the small amount of water area, combining a large meter with a small meter is used.

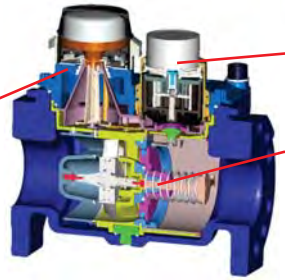
Meter Types

Combination meter
Combined Type



Combination meter
Separate type

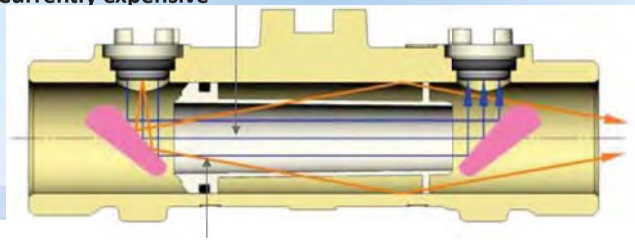




Meter Types

Ultrasonic Meter(Static Meter)

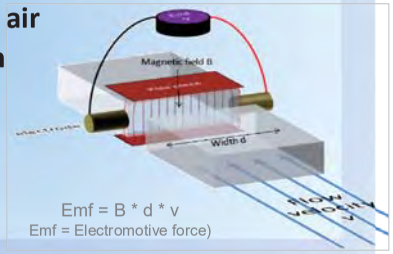
- Static meter-No moving parts!
- Ideal for large installations
- Clamp-on ultrasonic meter non-invasive, clamped on to the outside of the pipe
- Dependent on material and thickness of pipe-can be complicated
- Mains powered
- Accuracy affected by entrained air
- Currently expensive



Meter Types

Electromagnetic(Static Meter)

- Static meter-No moving parts!
- Very low starting flow (1 L/h)
- Zero wear over life of the meter
- No affect from suspended particles
- Does not measure air
- Expensive solution



Meter Types

Prepaid Meters consist of an Intelligent Valve fitted to a meter, intended to shut off once water credit has run out.

Primary use is to curb non-payment of water

Pros:

Effective method to control non-payment.

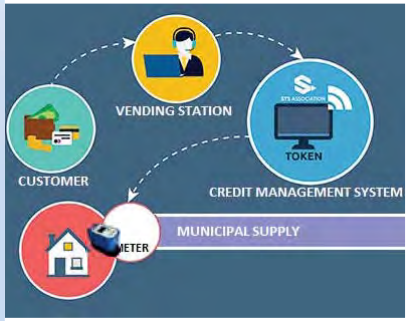
Money is paid up front for services

Cons:

High operational cost (services, management systems)

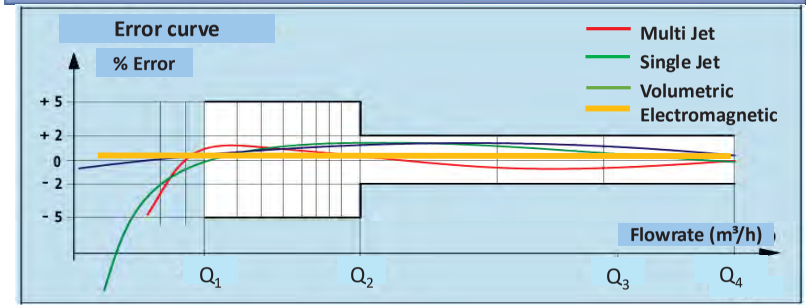
Battery driven. Battery life approx. 8 years

Require additional maintenance. Not an "install and forget" solution!





Meter accuracy curve-1



Definitions

Q4/Qmax – Maximum flow rate (Overload Flow Rate): The highest flow rate at which the meter is required to operate in a satisfactory manner for a short period without deteriorating (± 2% error).

Q3/Qp – Permanent flow rate: Permissible continuous load. Half the maximum flow rate (± 2% error).

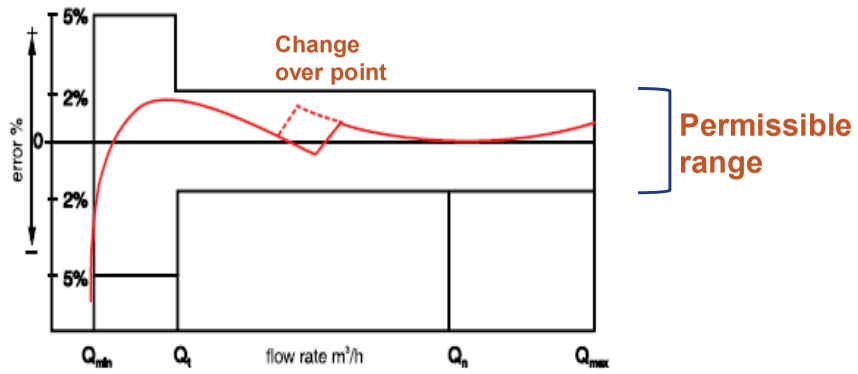
Q2/Qt – Transitional flow rate: The flow rate at which the maximum permissible error of the water changes in value from ± 5% error to ± 2% error.

Q1/Qmin – Minimum flow rate: The lowest flow rate at which the meter is required to give indications within the maximum permissible error tolerance (± 5% error).

Starting flow rate: The flow rate at which the meter starts to measure without any known accuracy.

Meter accuracy curve-2

Combination meter accuracy curve



Increasing flow ——— Decreasing flow - - - - - -

Improve an unregistered flow amount

Meter class

Water meters classified as Class A, B, C , D

Class B, C, D are allowed install in SA for measurement of customer water consumption

15mm meter performance by Class

CLASS	ℓ/h	(Qmin ± 5%) Minimum Flow Rate	(Qt ± 2%) Transitional Flow Rate	(Qp ± 2%) Permanent Flow Rate	(Qs ± 2%) Maximum Flow Rate
A	ℓ/h	60	150	1 500	3 000
B	ℓ/h	30	120	1 500	3 000
C	ℓ/h	15	22.5	1 500	3 000
D	ℓ/h	11.25	17.25	1 500	3 000

- **Meter classes are defined by range from Qmin to Qt**
- **It means that all classes have same accuracy but classified according to differences in the range that can be measured accurately**

Water meter selection

- Vary important that a Municipality must have a policy on water meter selection.
- Water meter must be correctly sized

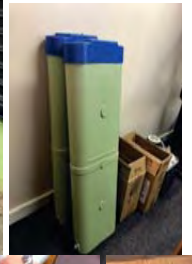
➢Is the meter rated for the expected flow rates and operating conditions?

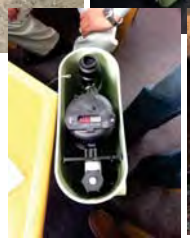
➢Which is most economical meter to use?

A 09 - 50

Meter Installation

Meter Box

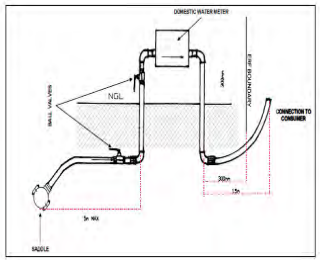



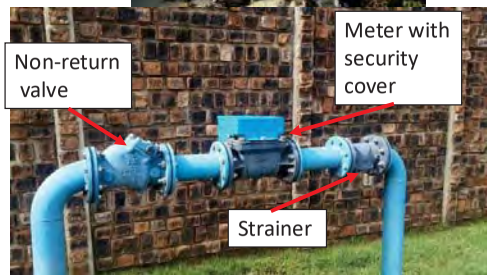




Meter Installation

Meter above the ground







Meter Installation



10 x Ø		Old Meters	5 x Ø	
	5 x Ø	Most Makes	3 x Ø	
	3 x Ø	WPD	No abrupt restriction	
No Straight pipe		Combo	No Straight pipe	
	5 x Ø	Magnetic	3 x Ø	
Up to 40 Ø (Depending on restriction)		Ultrasonic	3 x Ø	

3 Core Characteristics for Good Metering

Measuring Range (Turndown Ratio) gives an indication of the lowest flow rates attainable. Higher R value denotes better meter

Correct installation-prevents damage to metering components and ensures that the metering components perform as designed

Accurate **meter reading** (inaccurate readings reduce billing accuracy, which affects revenue generation!

Cause of Meter inaccuracy

- **Inadequate size and class of meter installation(Large meter will not register low flows)**
- **Meter not installed properly according to the manufacturer's specification.(straight pipe length, horizontal installation only. Poor plumbing prat)**
- **Sediment to form the internal parts of meters(poor water quality)**
- **Damage by intermittent water supply(certain volume of air, sudden large increase in pressure)**
- **Aging of meter**
- **Meter tampering**

Meter Reading



Analog and mechanical type





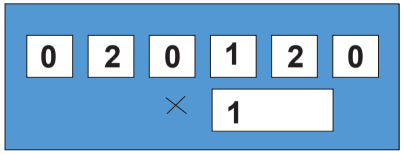




Meter Reading

Meter Reading:

- **Record all numbers including 0**
- **Ensure reading is right way up.**
- **Record Meter Factor (1 / 10 / 100)**





Meter Reading

Meter Reading:

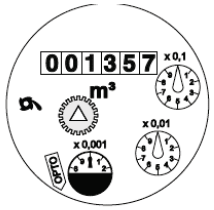
- **Record all numbers including 0**
- **Ensure reading is right way up.**
- **Record Meter Factor (1 / 10 / 100)**

1	2	3	8	6	5

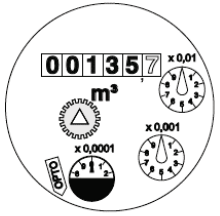
× 10



Meter Reading



Main meter



By-pass meter
(type 612MTW-HRI)



For a Combination meter, both registers must be added together.

Note the by-pass meter measures in 0.1m3 intervals!

Cause of Meter reading error

- **Meters not install properly**
- **Stained glass of register**
- **Algae growth inside of the glass of meter(wet dial meter)**
- **Incompetent or inexperienced meter reader**
- **Corrupt meter readers**

DMA PLANNING





DMA PLANNING

Aims of the Module

- To understand what DMA and its concept are, and why DMA in the training.
- To understand what DMA planning and procedures for NRW management are.
- To understand how to select/create DMA by locating measurement point and isolating area.
- To understand what importance of measurement of water volume: system Input volume (SIV) and the consumption volume used by customer are.

Contents of the Module

- Reference: TEXT 6, "DMA PLANNING"
  - **Purpose of DMA and How to create DMA?**
  - **How to create DMA**
  - **How to Maintain DMA**
  - **Data Required and Detail activities of measurement**
  - **Drill-1 DMA creation on the sample pipelines.**
  - **Q & A**

Purpose of DMA

Why supply areas are segmented as DMAs? What is the purpose of DMA?

- **-To easy water supply management, such as water supply volume, water pressure.**
- **-In large supply area it has a difficulty to find what is the reason of NRW affected in detail. The smaller the area, the easier to find the reason for the most impact on high NRW ratio.**
- **/ In DMAs, flow measurement is carried out to know the important factor of NRW. And it is possible to estimate the amount of water leakage that is generally said to have caused the worst NRW rate.**

Purpose of DMA Continue

- To easy to monitor flows and pressure in each DMA;
- To identify the required WDM interventions to reduce non-revenue water in each DMA;
- To enable better management of water supply systems as any future changes to DMA status will be easily identified;
- To identify and resolve internal closed network valves within each DMA.
- Easy to conduct Minimum night flow

Purpose of DMA Continue

- To enable a zonal Water balance to be created for each DMA to identify the level of Non-Revenue Water in each DMA
- To improve pressure distribution within the water reticulation network
- To improve operational activities as sectorised areas can be isolated more easily;
- To easily identify and resolve internal closed network valves within each DMA;

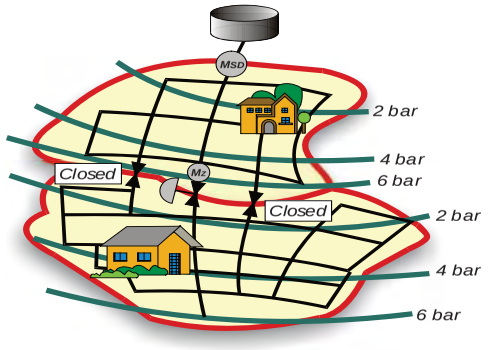
How to create DMA

- Desktop study
- **Demand zone desktop study** using As-built drawings/IMQS information
- **Demand zone audit** Site Visit, Verify Provided data, Comprehensive assessment (Hydraulic Test), Capture info, Verify Discreetness (Zero Pressure Test), Pressure and flow logging
- Implementation of DMA by focusing on supply meters and demand zone maintenance
- Assessment of meters and demand zone following maintenance
- Demand zone maintenance completion report

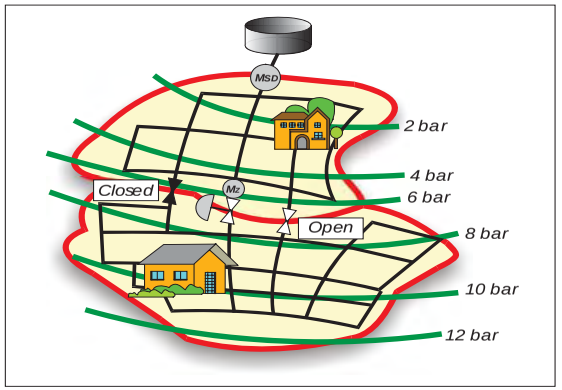
How to Maintain DMA/Zone Discreetness

- The boundary conditions of the DMA or Zone must be known and maintained. (inlet & outlet meters must be operational, Boundary valves must be kept closed)
- Operation and Maintenance is critical

Boundary Valves Closed



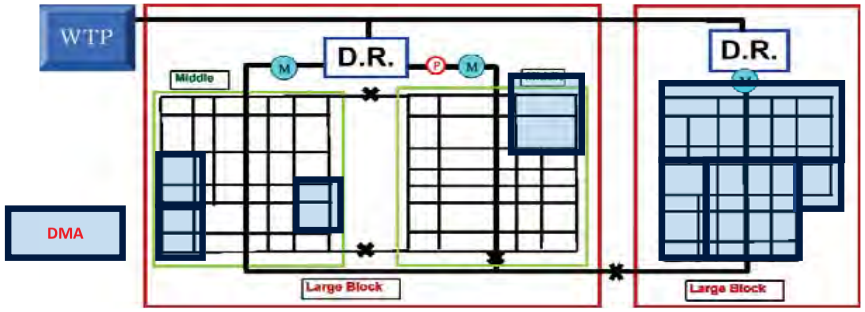
Boundary Valves Open



Why supply areas are segmented as DMAs?

Image of large size water management area

Block system: Water reservoir is the base of supply area



What kind of data are required for DMA Planning?

- **For the planning, it is very important collecting existing data and field investigation.**

1, Pipeline maps with description of valves, fire hydrants, air valves, location of existing bulk meter

- Customer list with water consumption/service connections

2, Prefer; As-built drawings, pipe material, elevation of facility, population, number of residents in each house(connection), leakage and repair data

/Pipe length and material affect selection of the leakage detection equipment and required input data to operate the equipment.

/Elevation of facility for checking water pressure.

@ [Google Earth is alternative for pipe length and elevation]

Detail activities of DMA planning-1

- 1, Steps from ① to ⑤

①DMA area boundary confirmation: topography (river, mountain, hill etc.), pipeline (supply end, existing valves, etc.) with consideration of required bulk meter and valves.

②Subsection area boundary confirmation: same as above

③Field survey:

-Based on collected data, field survey must be done and confirm condition of pipeline and valves.

@ Actually, at the field activities 1,2,3 should be done repeated.

④Confirm required bulk meter and valve size and number(If need)

Drop Test procedures-1

a. Install pressure loggers for each subsection
b. Closing isolation valves of the DMA and subsections.
/The order in which the subsections are separated should normally be confirmed by measuring the water pressure from a location far from the DMA inflow point.
c. Check water pressure by pressure gauges or flow from t he taps

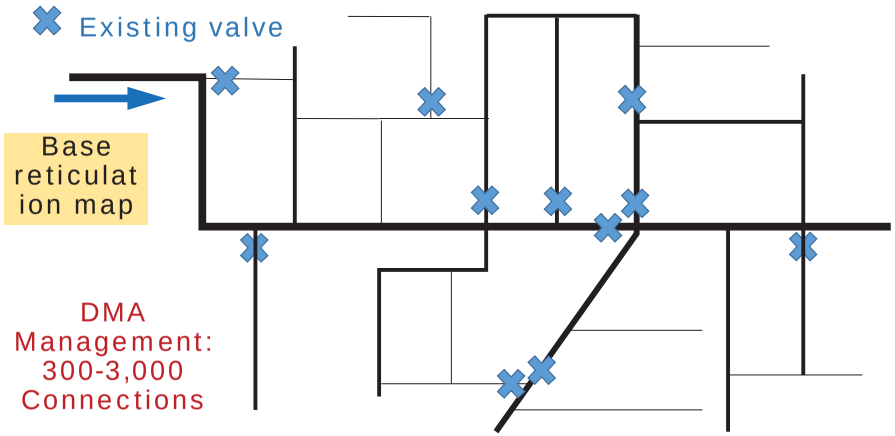
Drop Test procedures-2

c. Check water pressure by pressure gauges or flow from the taps
d. If it does not reach the expected water pressure drain water by opening hydrants and drain valves
/Other reason①: the pipe may be connected unknown pipe
/Other reason② : Valves are nor close completely.
/Other reason③ : Pipe is connected with an elevated water tank

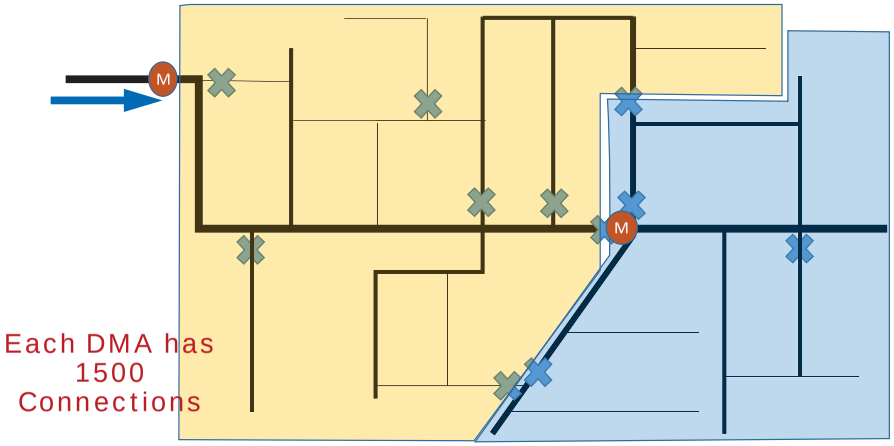
DMA creation and subdivision



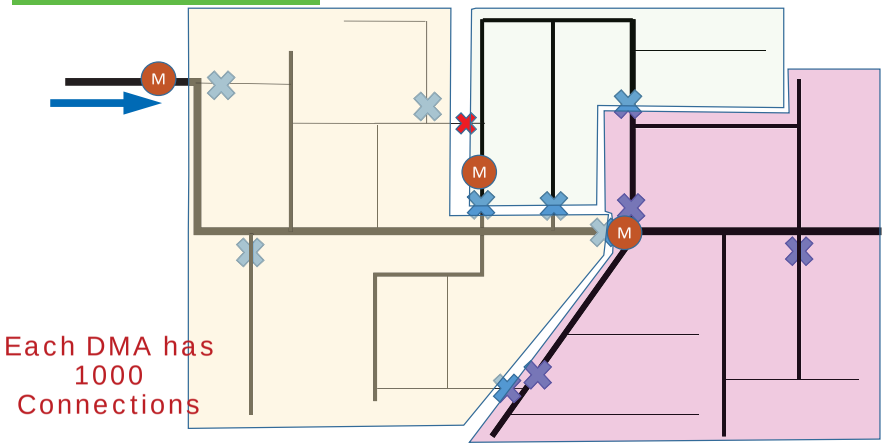
DMA Creation 6,000 Connections



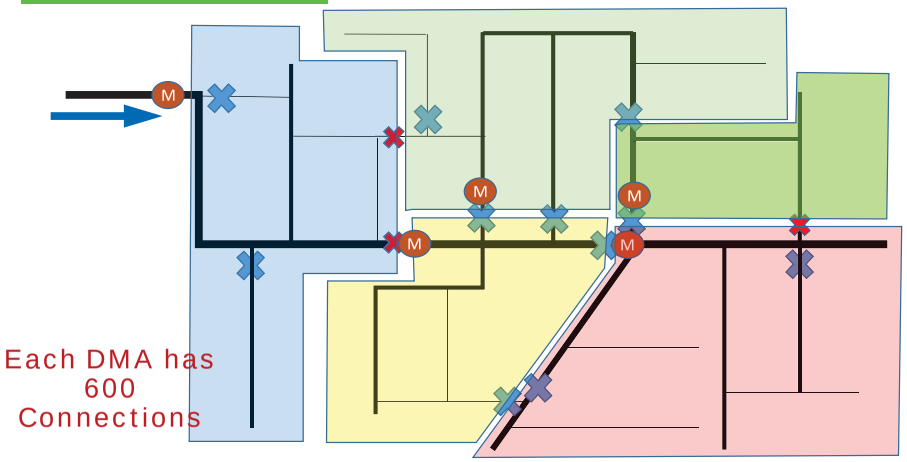
DMA Creation-1 Exiting facilities: 0 Valve, 2 DMAs



DMA Creation-2 1 Valve, 3 DMAs

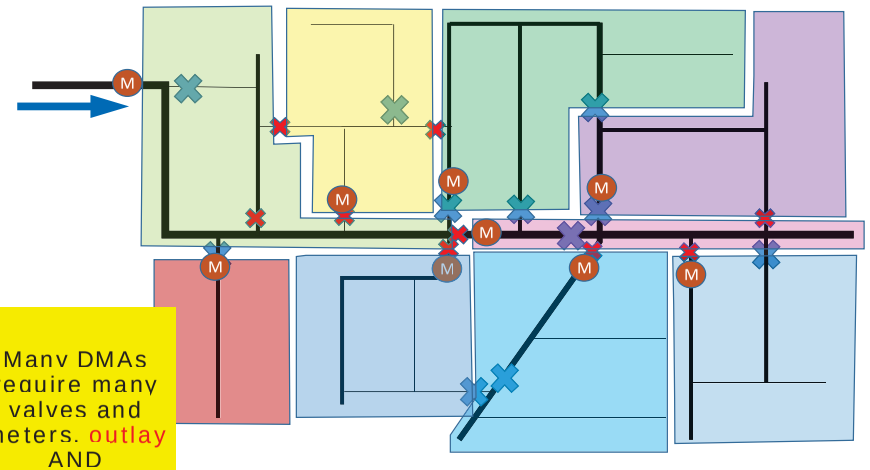


DMA Creation-3 3 Valves, 5 DMAs



DMA Creation-4

9 Valves, 9 DMAs



Many DMAs require many valves and meters. outlay AND Occur water stagnation

Question and Answer

DMA STEP TESTING





Contents of the Module

- Reference: TEXT 6, "DMA PLANNING"
  - **Introduction**
  - **Purpose of Step Testing**
  - **Benefits of Conducting Step Testing**
  - **Detail activities of measurement**
  - **Drill-2 Step Test**
  - **Conclusion**
  - **Q & A**

Introduction

- **Step-testing is the process of localizing leakage into specific pipe segments of the distribution system for subsequent replacement or repair.**
- **Water distribution systems can experience high levels of leakage**
- **These systems can experience high levels of leakage resulting in major financial, supply and pressure losses.**
- **Locating and repairing system leaks can drastically reduce the amount of water that is lost**
- **Leakage occurs in transmission and distribution mains, service connection lines, valves, joints, and fire hydrants.**
- **Step testing is one of Active Leakage Control Methodologies**

Purpose and Benefits of Step testing

- **Main purpose is narrow down the leak occurring area.**
- **The advantage of this method is its short time for finding leak points**
- **Step testing can be done using existing resources**
- **The method can effectively narrow down leaks to specific pipe segments of the distribution system**
- **minimizes the use of detection required**

Purpose and Benefits of Step testing

- It becomes possible to select the area and pipelines where water leakage investigation is prioritized.
- This enables efficient water leakage investigation
- Contribute to improvement of NRW.

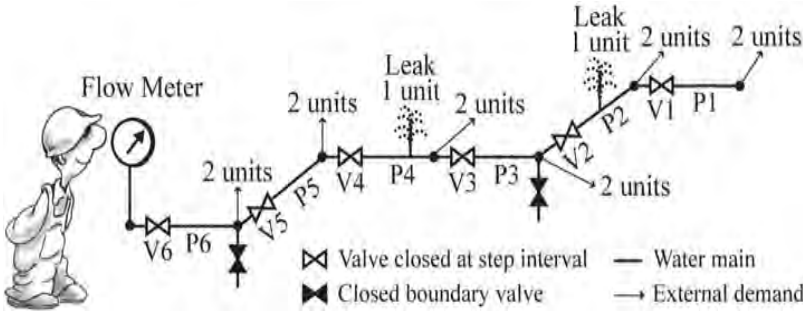
How to conduct step testing

- Step-test at night during period of low/slack demand;
- Define step area with suspected high leakage;
- Close all boundary valves (to establish a tight area);
- Close all circulating valves to remove loops and create a tree network;
- Attach data logger to the flow meter installed on the main supplying the step-test area or Manually record the flow
- Start at the pipe/valve farthest from the flow meter;

How to conduct step testing

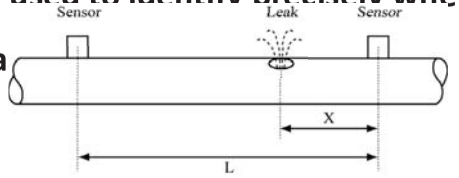
- Close step valves in succession such that less and less of the step area is supplied via the flow meter and record measured flow values;
- Follow the sequence of closing valves (as determined by the network model) back towards the meter;
- Keep each step long enough to notice a reading impact at the meter; and
- Reopen the step valves in reverse order.

Example of step testing

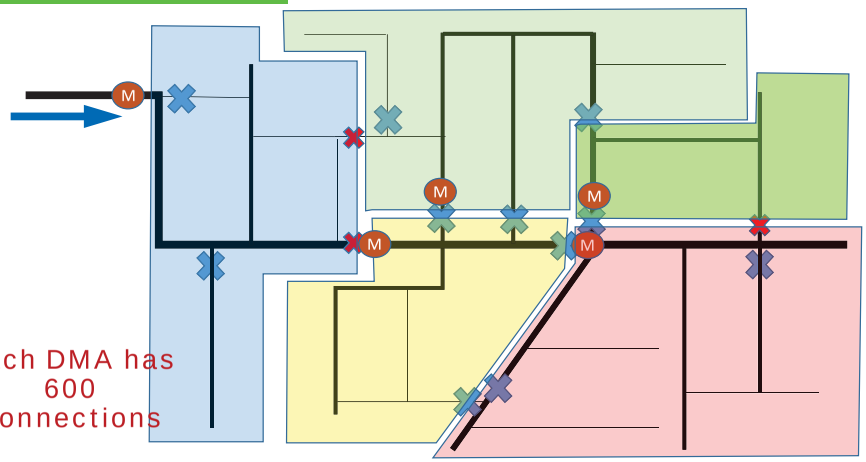


Leak Location

- Once leakage has been localized to specific pipes within a step area, leak noise correlation can be effectively used to identify precisely where the leak is loca

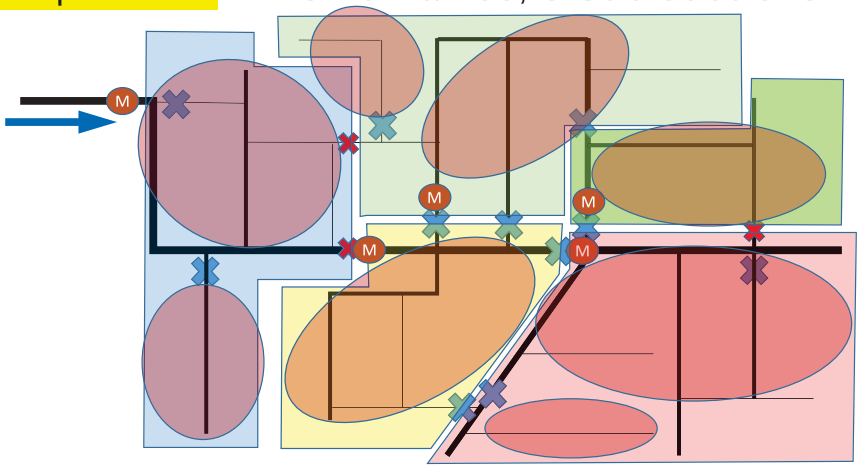


DMA Creation-3 3 Valves, 5 DMAs

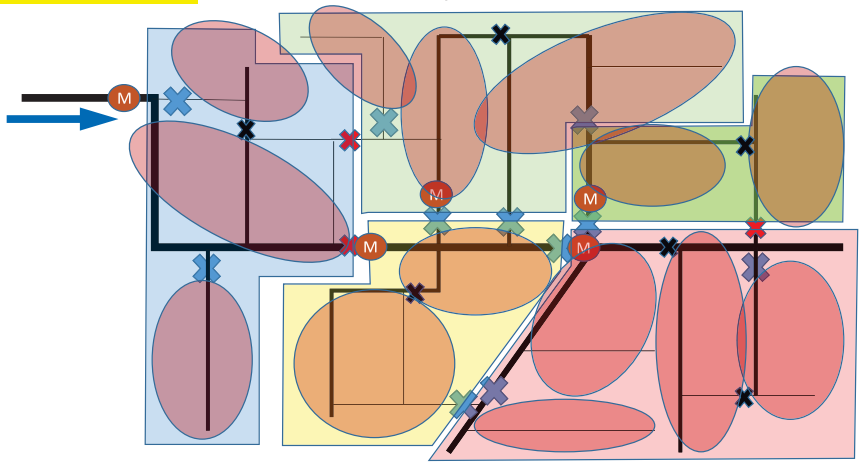


Each DMA has 600 Connections

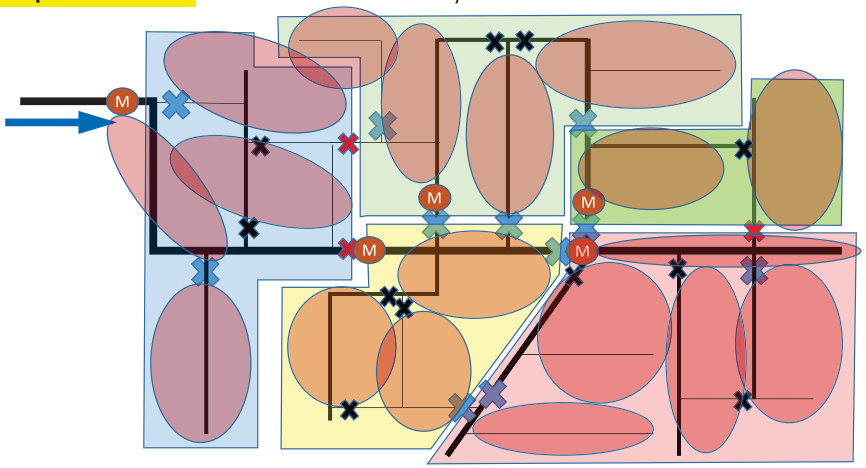
Step Test-1 3✚0 Valves, 8 Sub-sections



Step Test-2 3+6 Valves, 14 Sub-sections

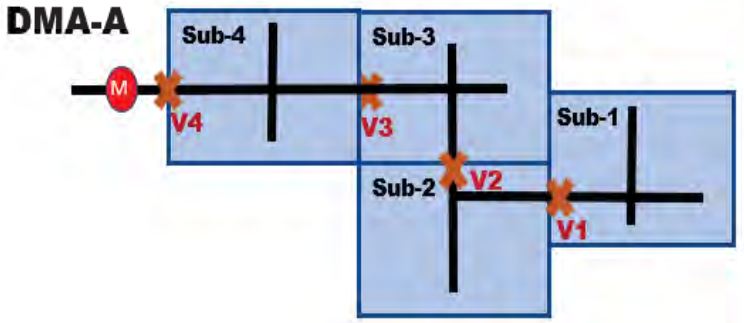


Step Test-3 3+11 Valves, 18 Sub-sections

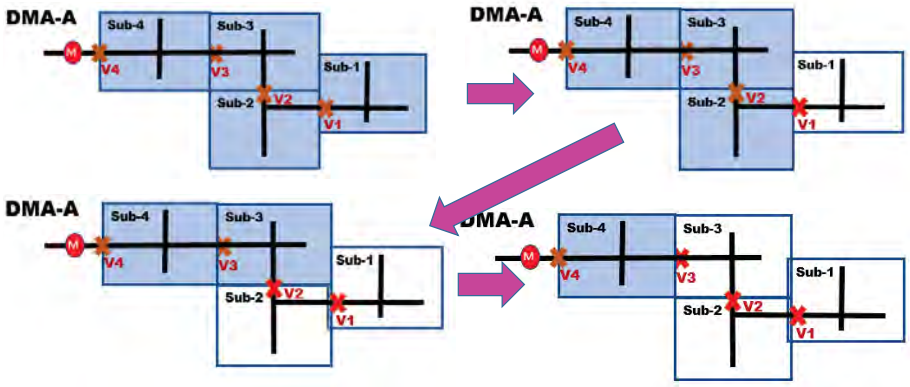


Drill: Step Test

- Model DMA: **What order of valve operation is**



Drill: Step Test



Drill: Step Test

- Calculate the deference of each step

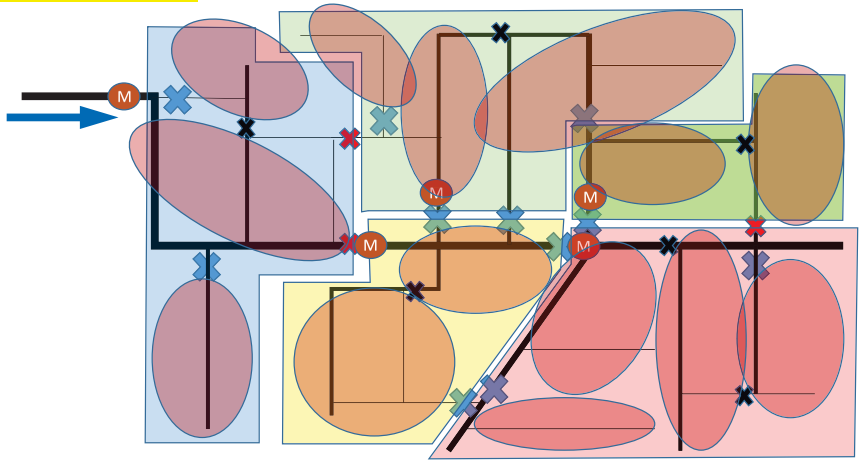
DMA-A	SIV	Volume m2/h	500				
	MNF	Volume m3/h	100				
Step Test	Valve oper	Volume m3/h	Difference		Order		
Subsection		100					
1	Close V1	80					
2	Close V2	75					
3	Close V3	25					
4	(Close V4)						

Drill: Answer

Sample Data

DMA-A	SIV	Volume m2/h	500				
	MNF	Volume m3/h	100				
Step Test	Valve operation	Volume m3/h	Difference		Order		
Subsection		100					
1	Close V1	80	100-80	20	3		
2	Close V2	75	80-75	5	4	Min	Low priority
3	Close V3	25	75-25	50	1	Max	High priority
4	(Close V4)	100-(20+5+50)		25	2		

Step Test-2 3+6 Valves, 14 Sub-sections



Conclusions

- **Step-testing is the process of localizing leakage into specific pipe segments of the distribution system for subsequent replacement or repair.**
- **presented an efficient approach to optimally identifying pipes with suspected leaks by field testing**
- **The leak in a pipe segment is determined by analyzing the rate of change in field measures**

Question and Answer

CUSTOMER METER ISSUES AND BILLING DATA ANALYSIS

Aims of the Module

- To understand the types and sources of inaccurate data of customer billing records. (Finding causes of error and correction method will be conducted 2nd IBTC training program)
- To understand illegal water use
- To understand how to handle FBW





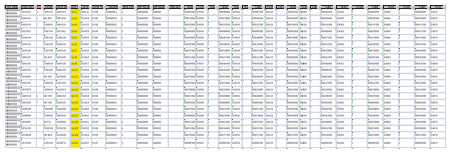
Data verification and processing

- To deal with customer bills and NRW analysis, customer consumption record is the essential database.

However, the databases are often not as accurate.

- It is important to know where to look in the data to see inaccuracies, how to check, and how to fix it into usable data.

How to get correct and accurate customer consumption data for NRW calculation?
Which department does supply the data?
What do you think about data reliability?



Identification of errors-1

- A missing of data exists on the system, but no or too few water meter readings are available to estimate its consumption.
- Inconsistent dates. The system could not determine the order in which the readings took place due to date inconsistencies.
- A meter clock-over that will cause a very large water reading one month to be followed by a very small reading the next. It is important to include information on the number of digits on the indicator to identify meter clock-overs.



Identification of errors-2

- Spikes or dips in consumption. Abnormally high or low consumption for a stand are often signs of errors in the meter readings.
- Missing readings. Where no readings are available for the last month, the system has to estimate consumption based on the consumption history for the stand.
- Today we deal with these data in the practice part

Identification of errors-3

- Long gaps in the meter reading. When a meter has not been read for a certain number of months (typically 3), consumption estimates become uncertain and an instruction should be given for a reading to be taken.
- Incorrect data needs to be corrected as much as possible for more accurate NRW calculations. The Municipalities need to decide in advance how to deal with the incorrect data if it found. Because some of them can be corrected with a software system, adoption such system should be considered.

Illegal water use

Part of NRW: Unauthorized consumption

Important points:

- The first thing to do is to check if the water user is fully registered as a customer.
- Two ways are possible to find illegal water use, site investigation and the consumption data analysis. Combination of these ways are the most effective. At first data analysis, then site investigation based on the result of data analysis.
- Follow up measures after found an illegal connection is necessary to register a normal customer.

Type of Illegal water use









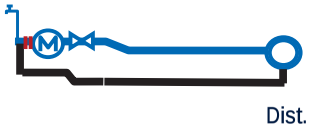
Type of Illegal Use 1

① Without meter

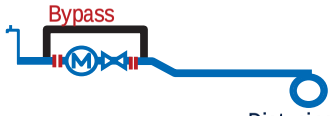
◆ Remove meter & connect short pipe



◆ Connect personal pipe directly to the distribution pipe



◆ By- pass pipe







◆ □ □□□□è9©□□□ □

A 09 - 66

Type of Illegal Use 3

③ Theft from Pipe and fittings

◆Reopen cock themselves if disconnected due to non-payment
◆ Brake pipe and fittings and get leaking water: pipe bridge, hydrant, air valve, loosen flange
◆ Theft water from facility: fire hydrant, Fetch accidental leak water, Public taps







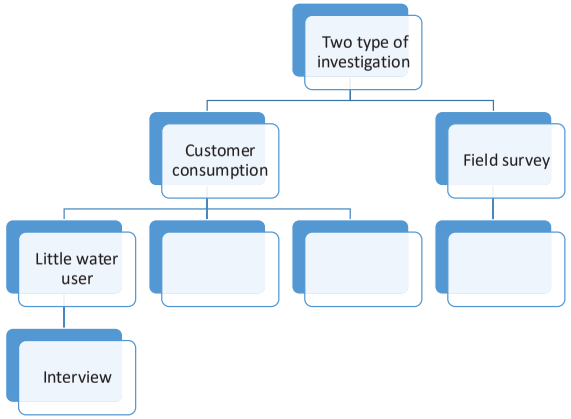


Grab signs of illegal use



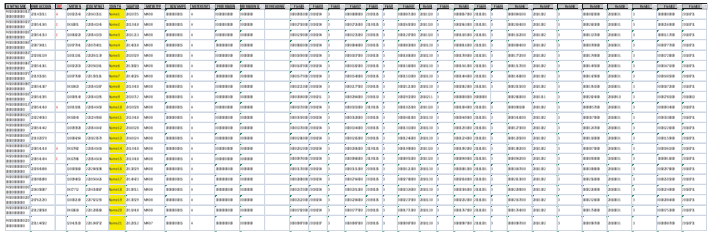


Grab signs of illegal use



Investigation of customer list-1

- **As a first step, it is necessary to check whether all the people who using water are registered as customers.**



Investigation of customer list-2

1, Investigation of low consumption customers

- **Low consumption data imply illegal use sometimes.**
- **Field investigation and interview to the customer are required after listed up suspicious customers.**

2, Data survey: Determine the amount of standard water consumption to be classified.

- **This is also influenced by the living environment of the area, so consider the situation carefully and decide.**
- **List up low consumption customer**

Site survey: Confirmation customer situation

- **First check, if the property is been occupied or vacant.**
- **In investigating the minimum and maximum flow of meters should be looked at by the bill record. If a meter is too big or starting flow rate is to low the meter will not register small amounts.**
- **Check for signs of the meter being by-passed.**
- **Should the meter be older than ten years it is advisable to have the meter tested.**

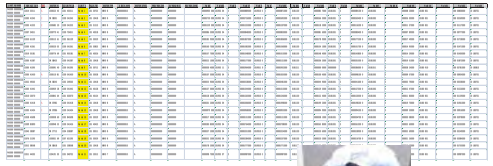
Countermeasures for Illegal use-1

Institutionalization

- The first step in addressing illegal usage is institutionalizing an illegal use reduction frame work. And base to on this frame work municipality must deal equally with violators, for instance, stop water supply, charge excess bill, fine, etc.
- Strengthening of penalties for violator.
- At the end it is important that offender must be registered as a regular customer and encourage them to pay regularly.
- Improvement of illegal connection discovery techniques by water flow volume management.
- Preparation of subsidies, discount system of installation of connection, and reduction of water charge. (Other than FBW).
- Incentive scheme to staff who discovered illegal connection.

Investigation of customer list-1

- As a first step, it is necessary to check whether all the people using water are registered as customers.



- If possible, this activity be combined other work such as house to house water leakage detection, at the point of meter.



Countermeasures for Illegal use-1

- **Enhance Public Relation**
- Promotion of educational activities of anti-illegal connection to customers.
- It must be understood that illegal connection is a true crime for the offender.
- Enlighten saving water and economical use, so that it is not used beyond what is permitted by the FBW.

Countermeasures for Illegal use-3

- **Communication with the public-1**
- Some points to be kept in mind in communication with the public are:
- When unexplained actions or answers are given the receiver creates his own interpretation that is often incorrect.
- It is generally true that people are very impressed with figures and statistics. There is a pronounced tendency to accept figures as fact.
- Statistics is one of the most valuable means of communicating. However, understand that statistics can be misused.



Physical survey

Investigation of customer meter

- If possible, illegal connection survey should be implemented with other work such as house to house water leakage detection, at the point of the meter.
  - Excavation traces around the meter
  - Water leak around the meter
  - The sound even when the meter is stopped



Countermeasures for Illegal use

- **Communication with the public-2**

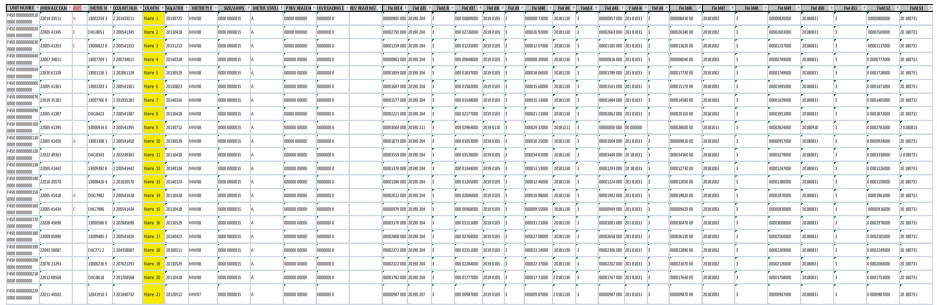
Show interest in your listener. He will be more inclined to react favorable to what you say if you show you are personally interested in him.

Do not pass on information based on assumptions, inadequate facts and gossip.

Organize your information before you present it. Do not confuse your story with a mass of meaningless details, facts out of sequence and points not related to the main topic. Unnecessary comments can confuse the issue. Remember that your objective is to give a straightforward answer or presentation, not a puzzle to be worked out.

Data analysis (sample data)

- Extract sample data from the original database
- 100 customers, 12 months meter reading data



Finding suspicious data

- Insert columns and calculate monthly billed water
- Average, Maximum, Minimum data
- Finding suspicious data: 0 consumption, too much consumption



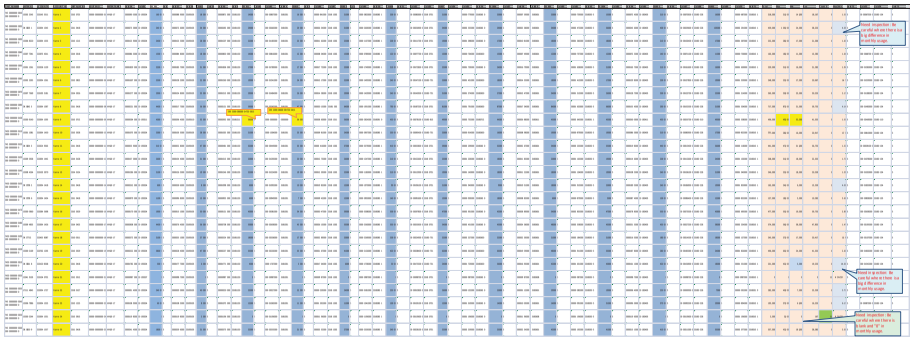
Finding suspicious data

- Excel function ;=MAX(AJ2:AJ103), =MIN(AJ2:AJ103), =AVERAGE(AJ2:AJ103)
- Find the abnormal value from them. Too much Max data, Too little Mini data

20190204	16000	3	00000820000	20190108	26000	3	00000794000	20181130	21000	3	00000773000	20181031	22000
20190204	53000	3	00001269000	20190105	57000	3	00001212000	20181130	50000	3	00001162000	20181031	49000
20190204	25000	3	00001936000	20190105	29000	3	00001907000	20181130	21000	3	00001886000	20181031	20000
20190204	22000	3	00002492000	20190105	29000	3	00002463000	20181130	18000	3	00002445000	20181031	17000
Max	119,000				152,000				3,089,000				109000
Min	0				0				0				-3007000
Ave	23,490				28,176				80,980				-37227.723

Corrected data & Display of caution data

- Finding suspicious data: Customer data with a large difference between the consumption of the maximum and minimum monthly data



Corrected data & Display of caution data

- Finding suspicious data: Customer data with a large difference between the consumption of the maximum and minimum monthly data

- Data with a difference of 4 times or more

(There is no particular reason for quadrupling)

Total	Max	Min	Ave	Count 0	Max/Mi
218,000	21,000	14,000	18,167	0	1.50
459,000	105,000	24,000	38,250	0	4.38
252,000	28,000	17,000	21,000	0	1.65
		11,00	3,583	0	1.64
		,000	21,583	0	1.94
		17,000	20,667	0	1.47
			0,250	0	2.17
717,000	87,000	21,000	59,750	0	4.14

Need inspection: Be careful where there is a big difference in monthly usage.

DMA PLANNING





DMA PLANNING

Aims of the Module

- To understand what DMA and its concept are, and why DMA in the training.
- To understand what DMA planning and procedures for NRW management are.
- To understand how to select/create DMA by locating measurement point and isolating area.
- To understand what importance of measurement of water volume: system Input volume (SIV) and the consumption volume used by customer are.

Procedures of the Module

- Reference: TEXT 6, "DMA PLANNING"
  - **Purpose of DMA and How to create DMA?**
  - **Confirmation of hydraulic separation**
  - **DMA subdivision**
  - **Detail activities of measurement**
  - **Drill-1 DMA creation on the sample pipelines.**
  - **Drill-2 Step Test**
  - **Q & A**

Purpose of DMA and How to create DMA

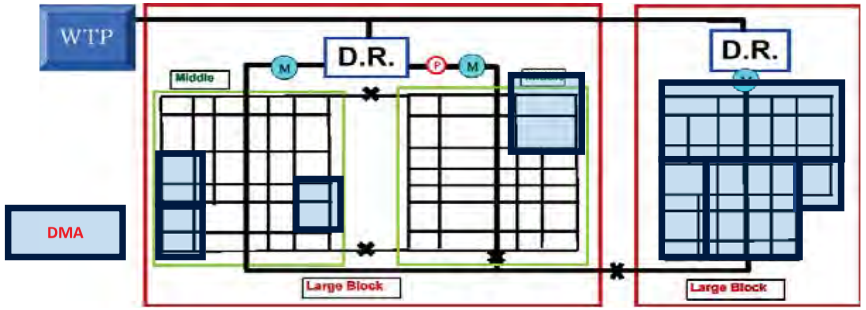
Why supply areas are segmented as DMAs? What is the purpose of DMA?

- **-To easy water supply management, such as water supply volume, water pressure.**
- **-In large supply area it has a difficulty to find what is the reason of NRW affected in detail. The smaller the area, the easier to find the reason for the most impact on high NRW ratio.**
- **/ In DMAs, flow measurement is carried out to know the important factor of NRW. And it is possible to estimate the amount of water leakage that is generally said to have caused the worst NRW rate.**

Why supply areas are segmented as DMAs? What is the purpose of DMA?

Image of large size water management area

Block system: Water reservoir is the base of supply area



DMA subdivision

What can be understood by subdivision and the Step Test-1

- Main purpose is narrow down the leak occurring area.
- It becomes possible to select the area and pipelines where water leakage investigation is prioritized.
- This enables efficient water leakage investigation

- Contribute to improvement of NRW.

What kind of data are required?

- For the planning, it is very important collecting existing data and field investigation.

1, Must; Pipeline maps with description of valves, fire hydrants, air valves, location of existing bulk meter

- Customer list with water consumption

2, Prefer; As-built drawings, pipe material, elevation of facility, population, number of residents in each house(connection), leakage and repair data

/Pipe length and material affect selection of the leakage detection equipment and required input data to operate the equipment.

/Elevation of facility for checking water pressure.

@ [Google Earth is alternative for pipe length and elevation]

Detail activities of DMA planning-1

- 1, Steps from ① to ⑤

①DMA area boundary confirmation: topography (river, mountain, hill etc.), pipeline (supply end, existing valves, etc.) with consideration of required bulk meter and valves.

②Subsection area boundary confirmation: same as above

③Field survey:

-Based on collected data, field survey must be done and confirm condition of pipeline and valves.

@ Actually, at the field activities 1,2,3 should be done repeated.

④Confirm required bulk meter and valve size and number(If need)

Drop Test procedures-1

a. Install pressure loggers for each subsection
b. Closing isolation valves of the DMA and subsections.
/The order in which the subsections are separated should normally be confirmed by measuring the water pressure from a location far from the DMA inflow point.
c. Check water pressure by pressure gauges or flow from t he taps

Drop Test procedures-2

c. Check water pressure by pressure gauges or flow from the taps
d. If it does not reach the expected water pressure drain water by opening hydrants and drain valves
/Other reason①: the pipe may be connected unknown pipe
/Other reason② : Valves are nor close completely.
/Other reason③ : Pipe is connected with an elevated water tank

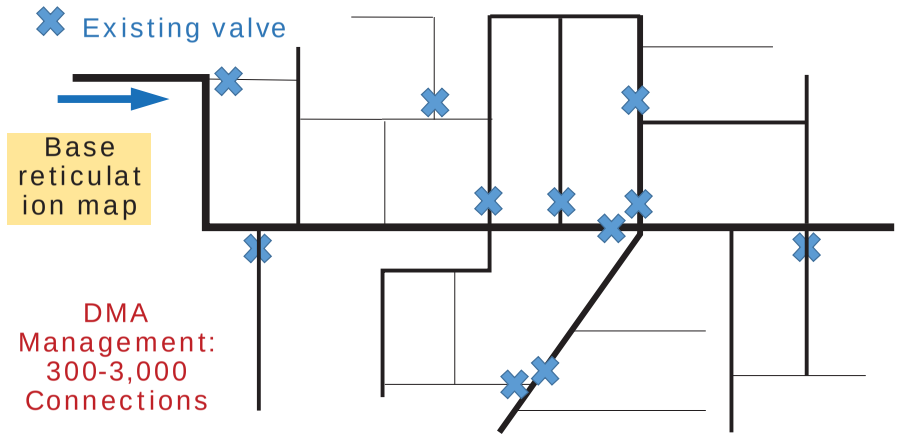
Drill

1.DMA creation and subdivision

2. Step Test

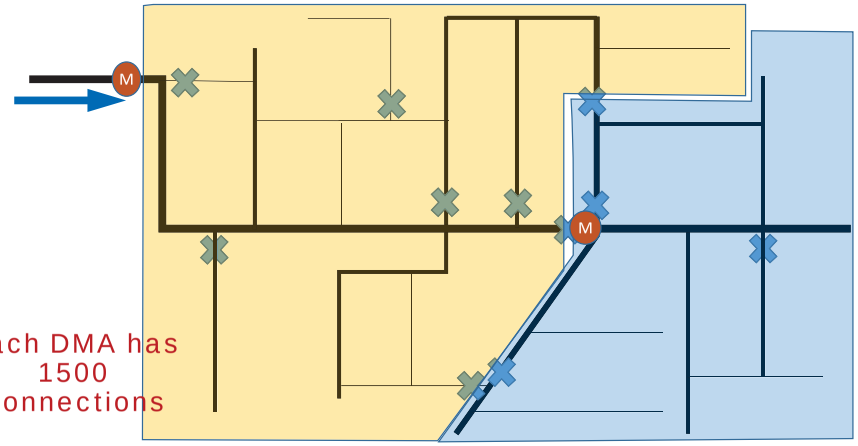


DMA Creation 6,000 Connections



DMA Creation-1

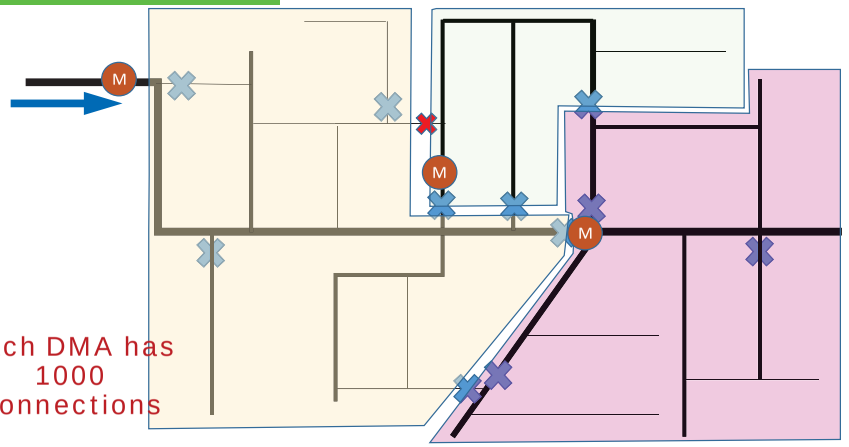
Exiting facilities: 0 Valve, 2 DMAs



Each DMA has 1500 Connections

DMA Creation-2

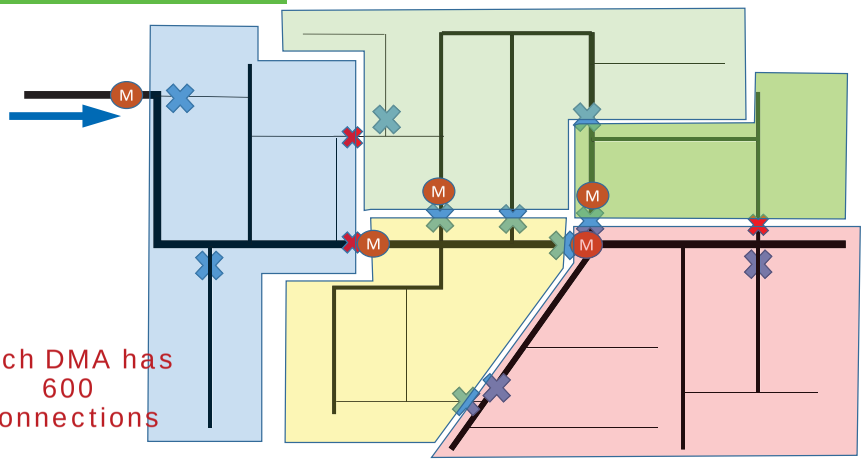
1 Valve, 3 DMAs



Each DMA has 1000 Connections

DMA Creation-3

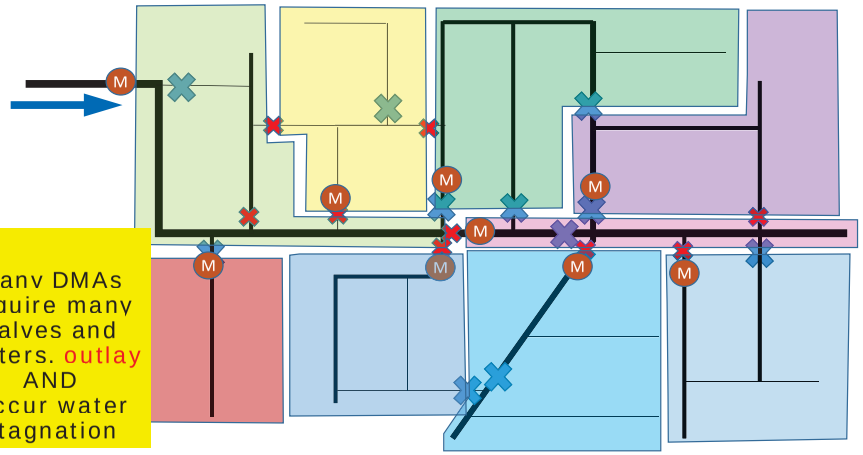
3 Valves, 5 DMAs



Each DMA has 600 Connections

DMA Creation-4

9 Valves, 9 DMAs



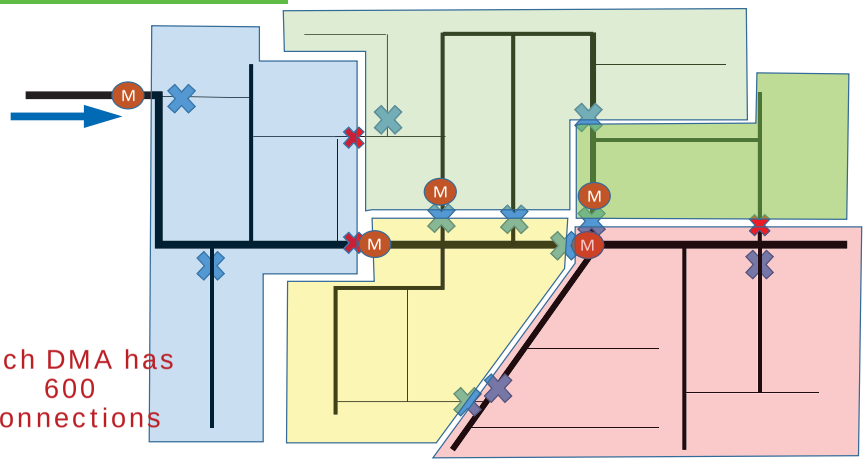
Many DMAs require many valves and meters. outlay AND Occur water stagnation

Create subsections

- Step Test

DMA Creation-3

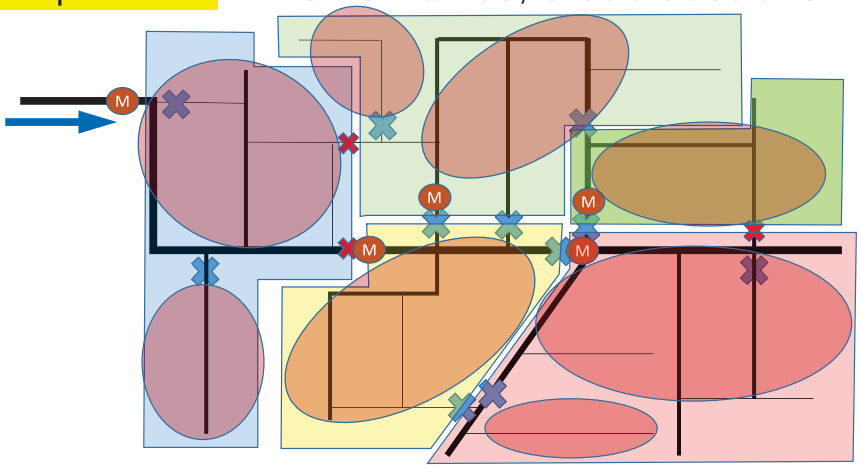
3 Valves, 5 DMAs



Each DMA has 600 Connections

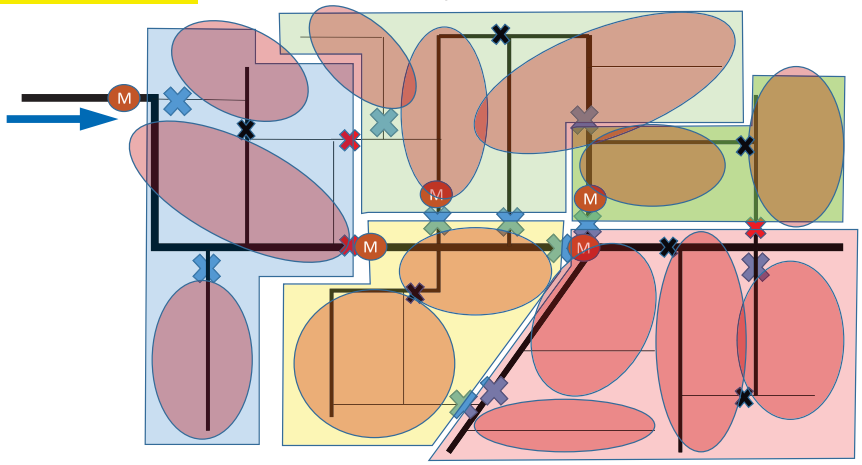
Step Test-1

3+0 Valves, 8 Sub-sections

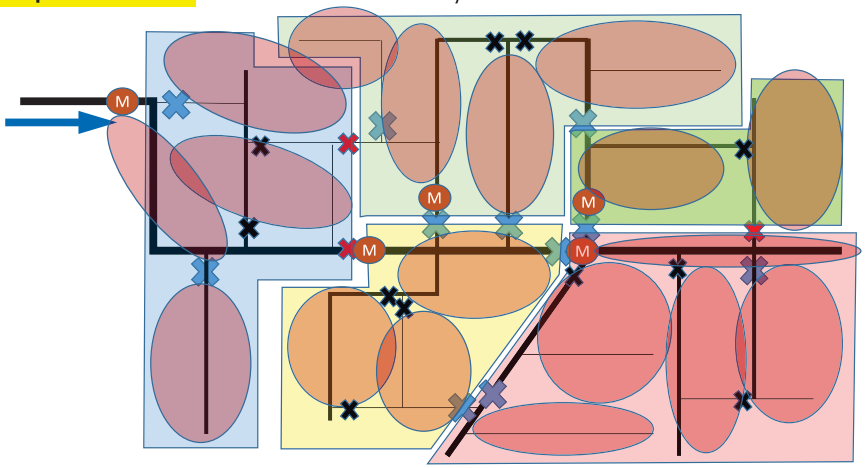


Step Test-2

3+6 Valves, 14 Sub-sections

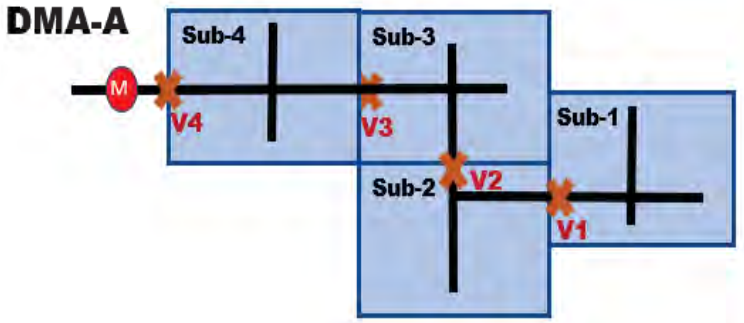


Step Test-3 3+11 Valves, 18 Sub-sections

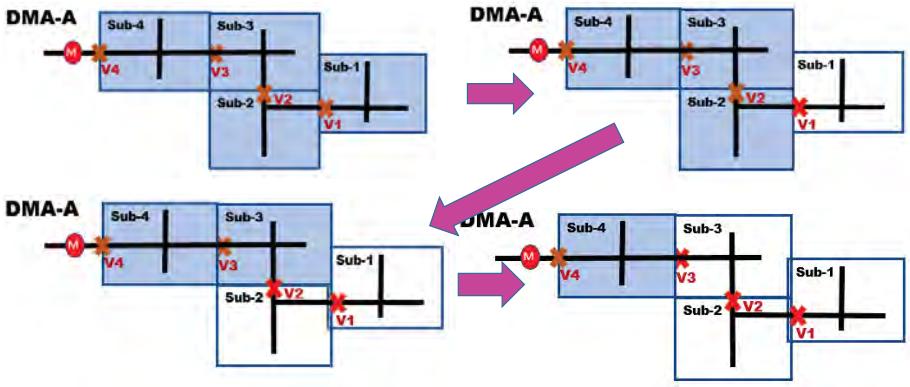


Drill: Step Test

- Model DMA: **What order of valve operation is**



Drill: tep Test



Drill: Step Test

- Calculate the deference of each step

DMA-A	SIV	Volume m2/h	500				
	MNF	Volume m3/h	100				
Step Test	Valve oper	Volume m3/h	Difference		Order		
Subsection		100					
1	Close V1	80					
2	Close V2	75					
3	Close V3	25					
4	(Close V4)						

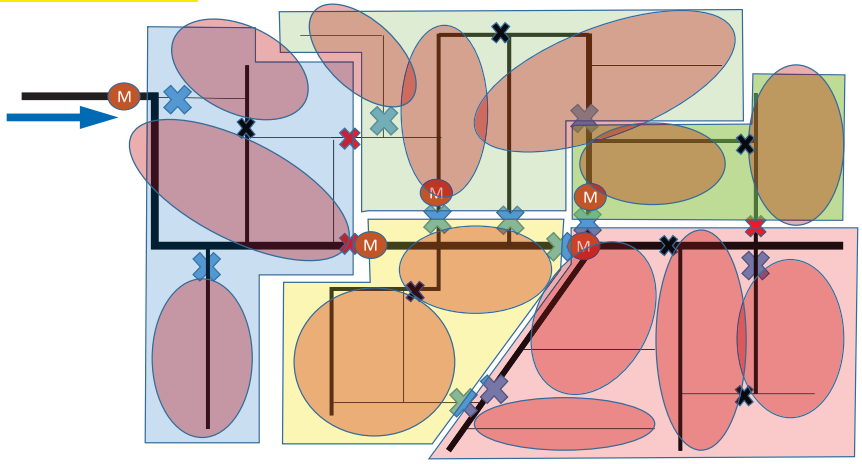
Drill: Answer

Sample Data

DMA-A	SIV	Volume m2/h	500				
	MNF	Volume m3/h	100				
Step Test	Valve operation	Volume m3/h	Difference		Order		
Subsection		100					
1	Close V1	80	100-80	20	3		
2	Close V2	75	80-75	5	4	Min	Low priority
3	Close V3	25	75-25	50	1	Max	High priority
4	(Close V4)	100-(20+5+50)		25	2		

Step Test-2

3+6 Valves, 14 Sub-sections



Workplace Training

"Learning whole practical skills through DMA; small pilot area"

Let's Not only reduce NRW but get back trust and smiles for water service!

What will happen in Work Place Training?

- 1. Select Pilot Focus Area (Pilot Area)
- 2. Isolate and make DMA (District metered area)
- 3. Measure the DMA
- 4. Analyze the data

We can

Get foundational skills to tackle NRW using Pilot DMA !!!

1. Select Pilot Focus Area (Pilot Area)



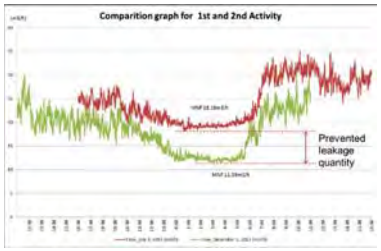
Just select service area which has same character and the number of connection < 300.

2. Isolate and make DMA (District metered area)



3. Measure the DMA





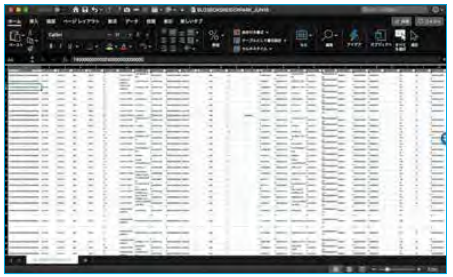
The pilot DMA

Divide the DMA into 2-3 area



MNF 1st Day ⇨ MNF 2nd Day ⇨ MNF 3rd Day ⇨ MNF 4th Day

4. Analyze the data







Why do we do DMA measurement by small pilot?

- 1. Small start => No pain! No special cost
- 2. Even we can't reduce NRW in small area, how can we achieve wider complicated area?
- 3. DMA request us enhancing reticulation management skills => O&M upskills
- 4. Small DMA gives us specific result

1. Start from small area => no pain!



We have already have our own valves, fire hydrants, pipes. Just we need a data logger.

2. Even we can't reduce small area NRW, why can we achieve wide complicated areas?



We can learn from each pilot activity, and improve our way of activities.

3. DMA request us enhancing reticulation management skills => O&M upskills

- **You must operate properly;**

Valves, Meters, Air valves, Fire hydrants, Cleaning valves, PRVs, Loggers, Communication tools

- **You must understand;**

Flow Direction, Velocity, Water Pressure, Topographical feature, Land use, the Community,

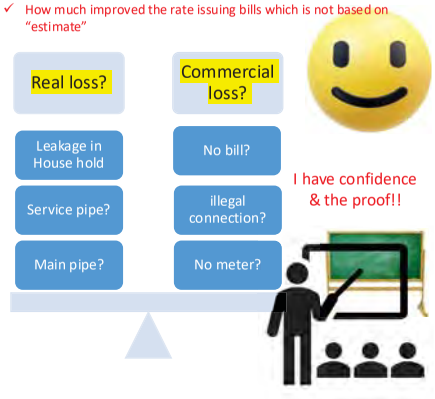


4. DMA gives us specific result

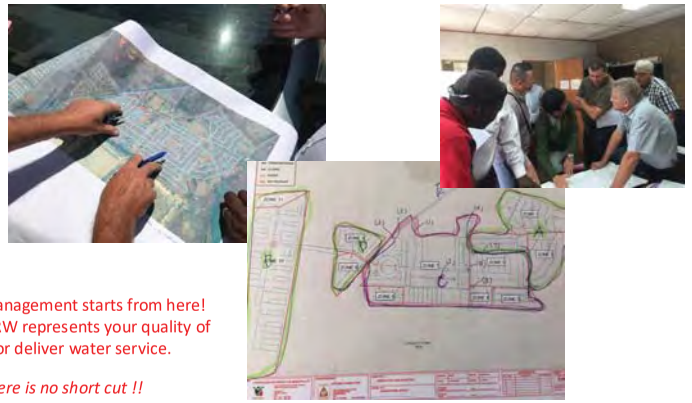
"What is the main cause of your NRW?" Can you explain?



- ✓ How much water have saved
- ✓ How much commercial loss have reduced
- ✓ How much water purchase from Water Board have saved
- ✓ How much NRW have reduced
- ✓ How our reaction time for next burst improved
- ✓ How much improved the rate issuing bills which is not based on "estimate"



Why don't we try to make & manage DMA!



All NRW management starts from here! Because, NRW represents your quality of skills for deliver water service.

There is no short cut !!

Hints!

- DMA size – under 300 connection
- Isolation confirmation
- Pressure measurement
- Precise MNF measurement (measurement period: within 1second)
- Measure(**BL**) – Bring Measure(**intervention**) – Measure(**output**)!
- Meter selection – by Flow Rate
- Team work
- Flow image of distribution

The facilitator Team support your WP activities.
No worry!!

How should we deal with these situation?

- The DMA which has two input line
- The boundary valve which doesn't work
- Over two story building (High building)
- Factory running even in the night time
- Houses which have water storage tank
- Bulk customer(School, Commercial complex, Factory)

Learn by doing!

Schedule of Work Place Training (1st):

Mon : Courtesy visit & site survey
Tue : Meter & logger installation, start SIV measurement
Wed : Isolation work
Thu : MNF measurement & Data analysis
Fri : MNF measurement & Data analysis
Mon : Data analysis (optional day of MNF)
Tue : Data analysis (optional day of MNF)
Wed : Water balance analysis
Thu : Make presentation material
Fri : Presentation the result



Schedule of Work Place Training (1st):

Key technique:
Isolation
Measurement

Mon : Courtesy visit & site survey
Tue : Meter & logger installation, start SIV measurement
Wed : Isolation work
Thu : MNF measurement & Data analysis
Fri : MNF measurement & Data analysis
Mon : Data analysis (optional day of MNF)
Tue : Data analysis (optional day of MNF)
Wed : Water balance analysis
Thu : Make presentation material
Fri : Presentation the result

There is no shortcut to succeed!
Practice makes perfect!



WORKPLACE TRAINING PREPARATION

14th to 18th Oct: Preparation by municipalities as well as DWS(WUE&IBTC) & JICA Team for their trip

21st Oct (Mon): Courtesy visit & site reconnaisence

22nd Oct (Tue): Meter & logger installation, start SIV measurement

23rd Oct (Wed): Isolation work

24th Oct (Thu): MNF measurement & Data analysis

25th Oct (Fri): MNF measurement & Data analysis

28th Oct (Mon): Data analysis (MNF if necessary)

29th Oct (Tue): Data analysis (MNF if necessary)

30th Oct (Wed): Water balance analysis

31th Oct (Thu): Make presentation material (report)

01th Nov (Fri): Presentation (report) of the result

Daily activity: 9h00 to 16h00 (standard)

Preparation Items from 14th to 18th Oct

General (important)

- To inform/remind your Managers and colleagues of workplace training from 21st Oct to 1st Nov and their understanding/cooperation.
- Appointment of courtesy call on them at 9:00 (tentative) on 21st Oct.
- Explanation/request to your colleagues (site teams) for cooperation/ participation in workplace training.
- Engagement of community leaders, traditional leaders and ward councilors for workplace training if necessary (notice, explanation, security, etc.). *Should we meet them on 21st Oct when we start at site?
- Desk-work or meeting space in municipality office and workplace or near during workplace
- Confirmation of security for the team in pilot DMA. *Should we inform SAPS or others? Do we need police escort particularly in night time?

Technical information

- Pipeline drawing(s) of pilot DMA, and its pipeline information (bulk meter(s), pipe materials, diameter, valves, air valves, hydrants, PRV, washout/scour valves, etc.)
- Conditions/function of bulk meter(s) to measure SIV to pilot DMA
- Diameter, manufacturer and model of bulk meter(s) *Important for data logging setting
- List and billing data (monthly data for last 12 months) of customers including major consumers and prepaid customers in pilot DMA

And if possible,

- Any available equipment/device with specification for workplace training which exist in your municipality if any (e.c. data logger)
- Any available data from IMQS or equivalent (water flow volume, flow direction, velocity, maximum/minimum pressure, etc.)
- Confirmation of location of boundary and isolation valves at sites, and also their function if possible
- Confirmation of location of the hydrant and PRV at the highest point in pilot DMA, and also their function if possible (to be used for isolation check)
- Confirmation of location of major consumers and their customer meters.
- Confirmation of location of high buildings and water storage tanks if any

If any challenges in preparation, please let us know promptly.

Emails and Contact Details of the Team

(Team deployment plan for each municipality will be confirmed soon.)

DWS/WUE

Mr Hadebe Xolani
Mr Michael Singh*KZN only
Mr Thabo MASIKE
Mr Andries Padi
Mr Tapiwanashe Musara

DWS/IBTC

Ms Rosa M. Rahube*Centre M.
Ms Kgoputso Sekgoilane *Logistics
Mr Armand Basson
Mr Riaan Stassen

Municipal Facilitators

TBC

JICA Team

Mr Akinori Miyoshi
Mr Nobutaka Maruyama
Mr Hiroyuki Morita
Mr Hiroki Niimura

PRESENTATIONS

(2ND GROUP/INTAKE)

water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

SALGA
Inspiring service delivery

Japan International Cooperation Agency
JICA

The Project for Strengthening the Training Capacity of IBTC on NRW

Outline of the Training

The National
Non-Revenue Water (NRW) Training
for Municipalities by Municipalities
in South Africa

A 09 - 85

Basic Concept:

”By Municipalities for Municipalities”

Contents

1. Observation in Baseline Survey
2. Concepts of the National NRW Training
3. Basic Modules of the National NRW Training
4. Course Overview of a Training Cycle
5. Development Model of the National NRW Training
6. Nominated Facilitators

1. Observation in Baseline Survey

- The **NRW is still high** in municipalities for the past decade.
- A lot of municipalities have **not calculated/evaluated NRW** properly. This may not lead to effective interventions.
- The municipalities **need proper analysis** based on adequate “measuring and metering”.
- Have municipalities conducted **adequate reticulation management** and O&M ? (Inadequacy of essential information and analysis ability)
- Have municipalities taken actions with **strategic planning and budgeting** for tackling with NRW?
- Have real issues and problems been informed properly from working-level staff to decision makers?
- Does South Africa need to have a function/opportunity to cooperate at the working level among municipalities for tacking with NRW?

2. Concept of the National NRW Training

- Problem-solving oriented and flexible training programme for participating municipalities
- Training programme - targeting cross-sectoral/departmental/ hierarchical participants as a team
- Training programme- participating municipalities to approach root causes of the problems in the NRW management
- Training programme - establishing the municipal working-level network and encouraging municipalities to take positive actions.
- Training programme leading to strategic/effective use of limited resources through prioritization
- Stakeholders' participatory/interactive Training programme organized by DWS/SALGA
- Sustainable training programme contrbuting to nationwide water services and capacity development by accumulating knowledge/information

A 09 - 86

3. Basic Modules of the National NRW Training





0. ORIENTATION AND GENERAL OVERVIEW
1. BULK METER KNOWLEDGE, TECHNIQUE (INCLUDING PIPE FITTING)
2. CUSTMER METER KOWLEDGE, TECHNIQUE 
3. RETICULATION FACILITY PLANNING, O&M (VALVES, FIRE HYDRANT, AIR VALVES, ETC.)
4. MEASUREMENT PLANNING 
5. DATA LOGGING AND ANALYSIS   
6. WATER BALANCE ANALYSIS
7. NRW REDUCTION STRATEGY PLANNING & PRESENTATION
8. FUNDAMENTAL KNOWLEDGE OF ACTIVE LEAKAGE DETECTION Theory Equipment



9. FUNDAMENTAL KNOWLEDGE OF CONDITIONAL ASSESMENT 

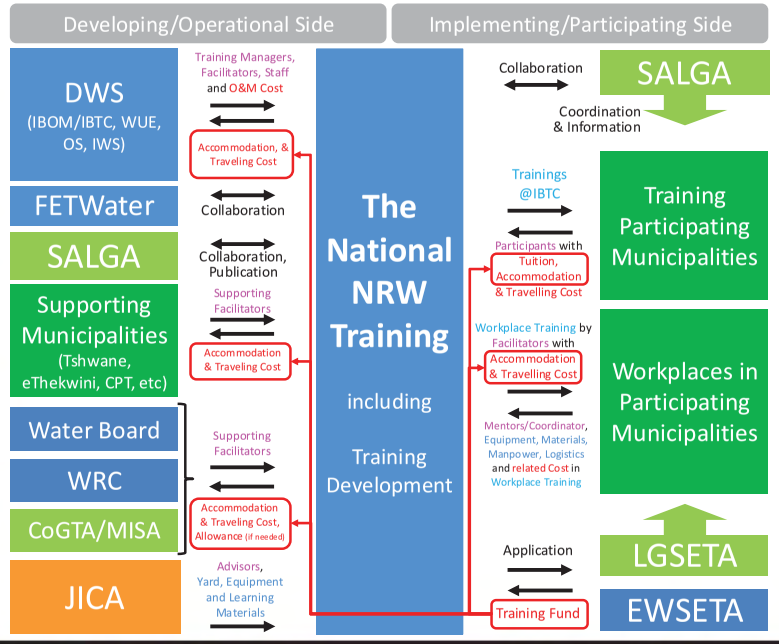
6

4. Course Overview of a Training Cycle

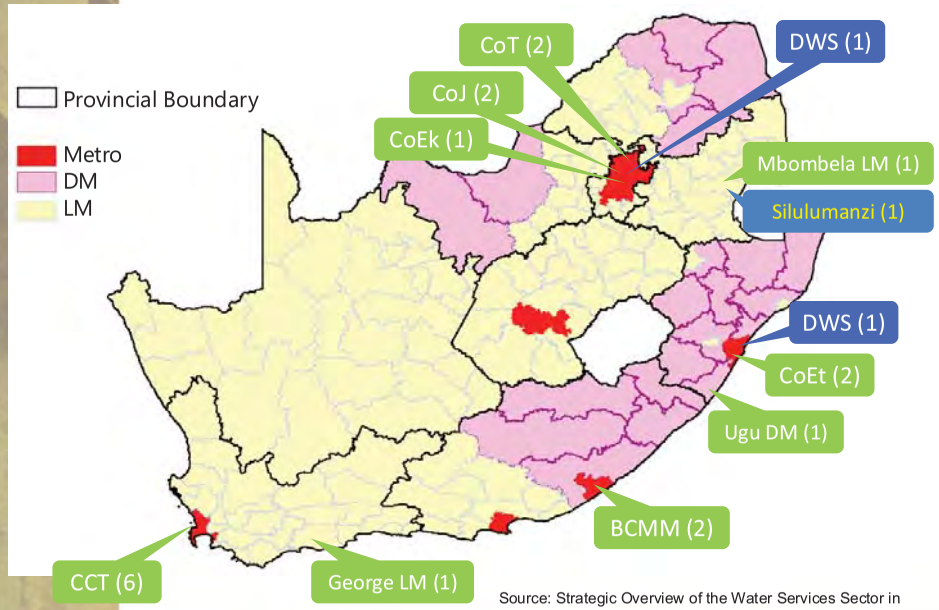
Programme Conceptual Flow

1st IBTC	NRW and Reticulation System Basics
1st WP	Problem Identification / Obtaining the Baseline / Workplace **Zone/area Configuration, Flow Measurement, Billing Data Analysis** A weak point of municipalities Most crucial part of this programme
2nd WP	Effective Countermeasures / Workplace
2nd IBTC	Outcome, Findings and Actions to be taken
	Way forward

5. Development Model of the National NRW Training



6. Nominated Facilitators (Start-up)



Source: Strategic Overview of the Water Services Sector in South Africa, 2015, DWS

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Thank you very much for your attention

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Department:
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The Project for Strengthening the Training Capacity of IBTC on NRW

The National Non-Revenue Water (NRW) Training

Introduction of Municipalities

By Participating Municipalities

A 09 - 88

Presentation Contents

1. **Profile of the municipality**: population, location, geography, climate, socio-economy, industry, etc.
2. **Outline of water services of the municipality**: population serve, service connection, water sources, supply capacities (m3 per day), water section's organizational information, NRW and ongoing interventions if any, etc.
3. **Profile of the proposed pilot DMA**: location, area, land use, service connections, reasons of proposal, etc.
4. **Anticipation/wishes** from the National NRW Training

Tips for Presentation

- Full-Coverage Information
- Reconfiguration according to Audiences
- If audiences are decision makers, Simple Facts and Recommendation in their languages
- If audiences are colleagues in the practical level, Details in Procedures and Setting
- If audiences are non-technical, interpretation to their languages
- Highlighting by coloring, bold and inducing audiences' interests and questions
- Slide numbering, Recording, Photos, Graphic (Visualization)
- List of Team members and Contacts (in this training proramme)

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Towards Effective and Responsive National Non Revenue Water Training Curriculum

The National
Non-Revenue Water (NRW) Training
for Municipalities by Municipalities
in South Africa

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Presentation Outline

- Outline of the Curriculum
- Comparison with the Curriculum of Water Reticulation Practitioner
- Key message & Conclusion remarks

The aim of IBTC Training

- The purpose of this Training is actual NRW reduction in each MPs.
- Based on Base Line survey **many municipalities don't have accurate Water Balance** and percentage of NRW.
- The situation shows that "they are still **at the stage of metering**".
- The curriculum, therefore, focuses on water measurement, create "Water Balance" and then propose NRW reduction strategy.
- **Once the water balance is clarified, implementation of other interventions become much easier**
- In the future phase, section 8 and 9 to be done more intensively.

Comprehending Water Balance and for that Technique is the key

Key Curriculum Considerations

1. Concept: (for curriculum making)

Contents are to be Integrated but to be simple (selected) as much as possible for changing Municipalities' situation
=> **output oriented**

2. Aim: (for this course)

Do work in Local Governments' actual site for improving water service and build capacity for each participants as a public servant (Technical aspect, Mindset change aspect)



3. Discipline:

Breed key discipline to work efficiently in a team:
consideration, **confirmation**, communication, **time keeping**, **commitment** etc)



Contents of Curriculum







0. ORIENTATION AND GENERAL OVERVIEW
1. BULK METER KNOWLEDGE, TECHNIQUE (INCLUDING PIPE FITTING)
2. CUSTMER METER KOWLEDGE, TECHNIQUE



3. RETICULATION FACILITY PLANNING, O&M (VALVES, FIRE HYDRANT, AIR VALVES, ETC.)



4. MEASUREMENT PLANNING



5. DATA LOGGING AND ANALYSIS



6. WATER BALANCE ANALYSIS



7. NRW REDUCTION STRATEGY PLANNING & PRESENTATION
8. FUNDAMENTAL KNOWLEDGE OF ACTIVE LEAKAGE DETECTION EQUIPMENT, THEORY
9. FUNDAMENTAL KNOWLEDGE OF CONDITIONAL ASSESMENT



A 09 - 90

Contents of Curriculum

0. ORIENTATION AND GENERAL OVERVIEW
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8. FUNDAMENTAL KNOWLEDGE OF ACTIVE LEAKAGE DETECTION EQUIPMENT, THEORY
9. FUNDAMENTAL KNOWLEDGE OF CONDITIONAL ASSESMENT

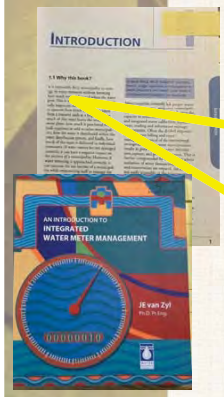
NRW and Reticulation Basics (IBTC-1)

Sharing experience (IBTC-2)

Problem Identification / Obtaining the Baseline (Workplace-1)

Effective Countermeasures after measurement (Workplace-2)

0. ORIENTATION AND GENERAL OVERVIEW

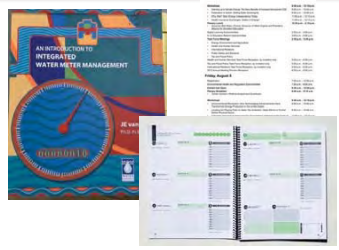


1.1 Why this book?

It is impossible for a municipality to manage its water resources without knowing how much water it has and where the water goes. This is where water meters play a critically important role: water meters are used

- What is water service – social and business aspect
- What are the problems of water service in local government in SA
- What is NRW and Why
- Roadmap to problem solving – starting from" see waht's happning properly" (*back bone of this training course)
- Why are you here? – Purpose of this training course
- Course schedule

0. ORIENTATION AND GENERAL OVERVIEW

1. Opening Lecture	2. Orientation
	
3. Self introduction(icebreaking)	**Target of this module**
Self-Introduction: trainer Self-Introduction: staffs Self-Introduction: trainee	✓ Ice break ✓ Give whole picture of this course ✓ Motivate Participants

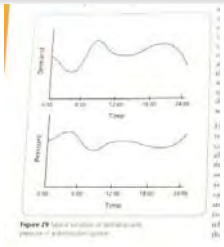


1. BULK METER KNOWLEDGE, TECHNIQUE (INCLUDING PIPE FITTING)

1. Function



2. Characteristics of Bulk inflow



3. Setup and Operation



Target of this module

- ✓ Get accurate System Input Volume
- ✓ Grasp characteristics of Bulk flow
- ✓ Obtain maintenance skills of Bulk meter

A 09 - 91

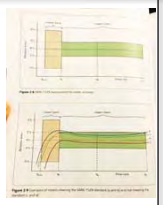
2. CUSTMER METER KOWLEDGE, TECHNIQUE

1. Function









2. From data to situation



3. Installation and Operation









Target of this module

- ✓ Get accurate consumption data
- ✓ Grasp situation from consumption data
- ✓ Obtain installation skills and maintenance skills of customer meter

3. RETICULATION FACILITY PLANNING, O&M (VALVES, FIRE HYDRANT, AIR VALVES, ETC.)

1. Function & Position







2. Relation of NRW and Facilities



3. Points of maintenance









Target of this module

- ✓ Get ideas of proper position in reticulation
- ✓ Get ideas of how it can work for WCWDM measures
- ✓ Obtain maintenance skills to make them function properly 24/7

4. MEASUREMENT PLANNING

1. Clarify Purpose



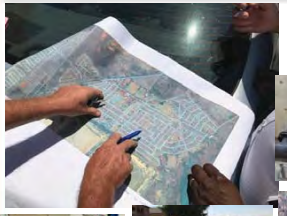
2. Making Measurement plan



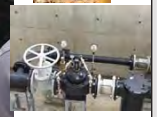




3. Coordinating facility













Target of this module

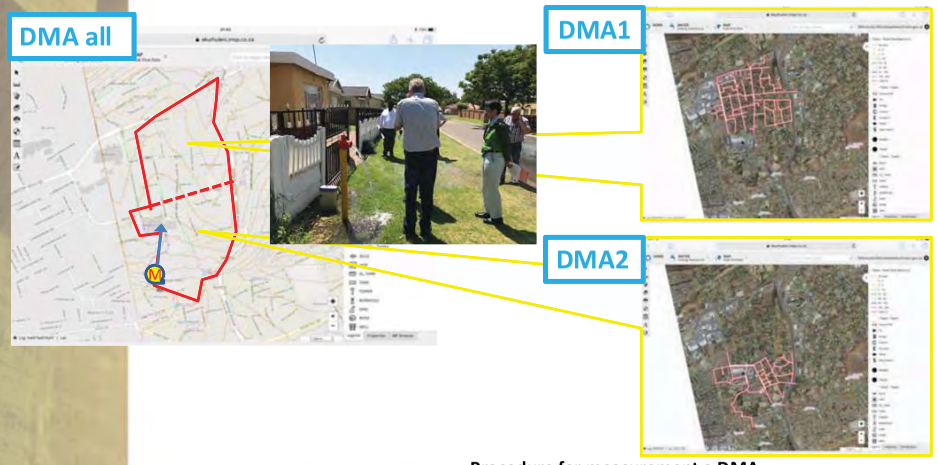
- ✓ Select water meter properly
- ✓ Select measurement point properly
- ✓ Demonstrate resource planning for measurement and "DANKAKU"

"DANKAKU" method

(for Sectorization, Zone configuration)

"Divide and confirm, measure each small DMA





Procedure for measurement a DMA
(case of TOKYO Metro)

A 09 - 92

Why **DANKAKU** ?

(Sectorization, Zone configuration)

- Whole basic techniques for reticulation O&M are included (valve, air, pressure, flow, etc..)
- Realize actual flow of the reticulation
- Breed team work

If you have done DANKAKU completely:

- Enable to grasp accurate water balance of each Small-DMA
- After this, installing new technology becomes much easier & effective

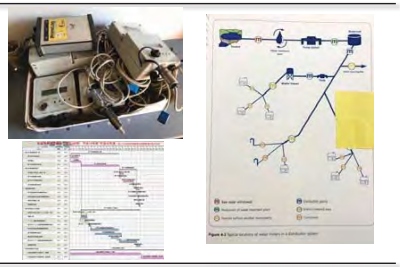
--- This is the most crucial part of this training course ---

5. DATA LOGGING AND ANALYSIS

1. Clarify Purpose



2. Making logging plan



3. Log and organize the data

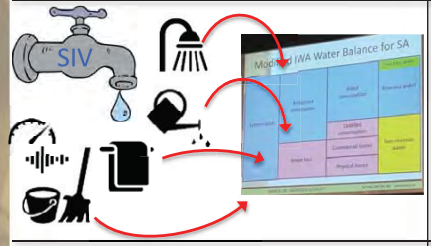


Target of this module

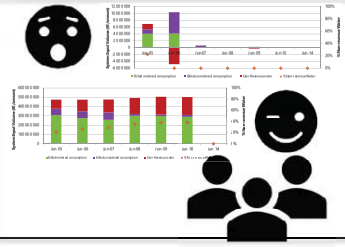
- ✓ Set properly of logging specs
- ✓ Install data logger properly
- ✓ Secure the data and secure logging equipment
- ✓ Organize and analyze the data

6. WATER BALANCE ANALYSIS

1. Making water balance



2. Discuss each Munic's situation



3. Decipher situation from WB



Target of this module

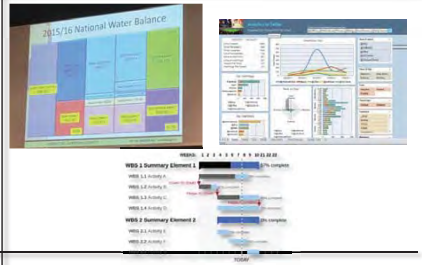
- ✓ Obtain skills of making Water Balance
- ✓ Understand System Input Volume, Consumption, Leakage, especially FBW
- ✓ Obtain a skill to decipher water balance to grasp actual situation of the DMA

7. NRW REDUCTION STRATEGY PLANNING & PRESENTATION

1. Clarify Purpose



2. Make strategy from Water Balance



3. Presentation and getting fund



Target of this module

- ✓ Getting ability to set target and to select intervention
- ✓ Be able to make strategic project plan
- ✓ Be able to make a report to commence actual intervention

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8. FUNDAMENTAL KNOWLEDGE OF ACTIVE LEAKAGE EQUIPMENT, THEORY*

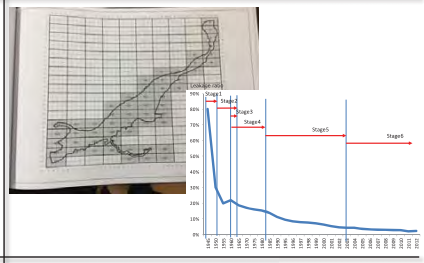
1. Principles and Function







2. Effective usage



3. Find leak, fix, record, reflect to plan



Target of this module

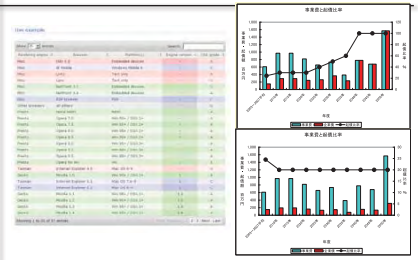
- ✓ Understand principle of leak detection and how to use it
- ✓ Be able to supervise consultant
- ✓ Be able to make an intervention strategy and its plan of operation

9. FUNDAMENTAL KNOWLEDGE OF CONDITIONAL ASSESMENT*

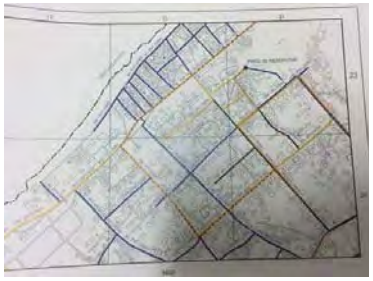
1. Understand Principles



2. Make database and do assessment



3. Make asset management plan



Target of this module

- ✓ Understand principle of conditional assessment and how to do it
- ✓ Be able to draw long term perspective to maintain facility
- ✓ Be able to make strategy and operation plan

3. Training schedule outline

IBTC National NRW Training

- WEEK ONE (1): THEORY AND PRACTICAL **[at IBTC]**
- WEEK TWO (2): WORK PLACE
- WEEK THREE (3): WORK PLACE
- WEEK FOUR (4): Presentation & Sharing **[at IBTC]**

THE PERIOD: 3.5 WEEKS (≒ **1 MONTH**)

Water Reticulation Practitioner (WRP)

- **SECTION 3A:** KNOWLEDGE SUBJECT
- Total credits: 67
- Total days: 84 (4^{-2}month)

- **SECTION 3B:** PRACTICAL SKILL **MODULE**
- Total credits: 64
- Total days: 80 (4^{0}month)

- **SECTION 3C:** WORK EXPERIENCE **MODULE**
- Total: 114 credits
- No. of days: 142.5 (6^{-7}month)

- **Total**
- Total credits: 245.0
- Total days: 306.5 **(15 MONTHS)**

Key message from DWS/SALGA/JICA

A 09 - 94

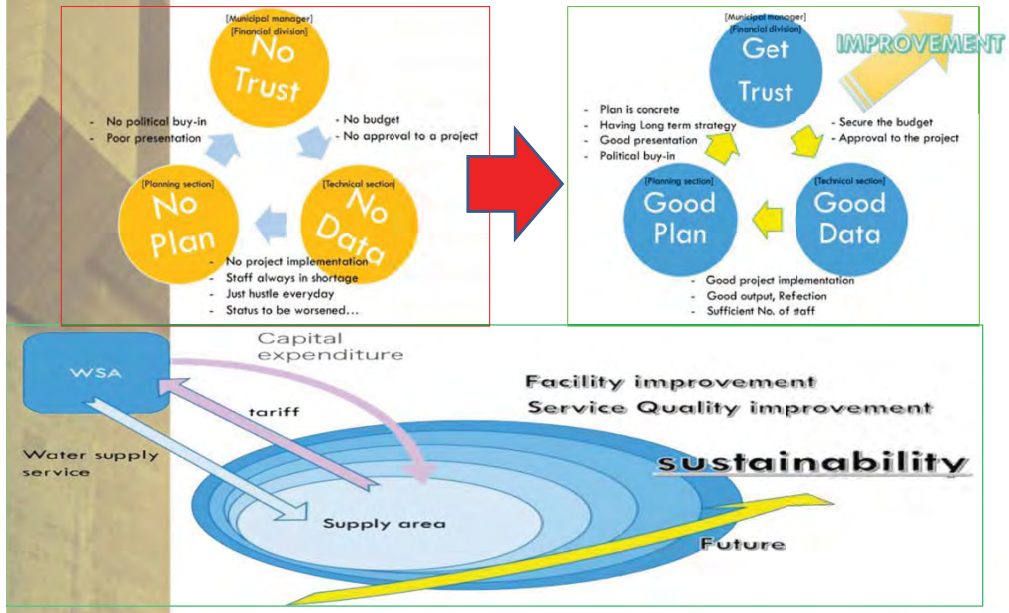
Important Points

- NRW rate shows all aspects of the water service and results.
- Targeting just NRW does not help to reduce the NRW rate.
- Analyzing the structure of Water Balance and identifying the weak points of the water service is very important

To that end, the first thing to do is Zone configuration & flow measurement to see the status-quo accurately.

- It is important to shift the viewpoint from how to reduce the NRW rate to how to create a proactive work style. As long as there is a water service, it will continue forever.
- In other words, the NRW measure is to ensure the permanence of water services.

Vicious cycle to Virtuous cycle





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Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

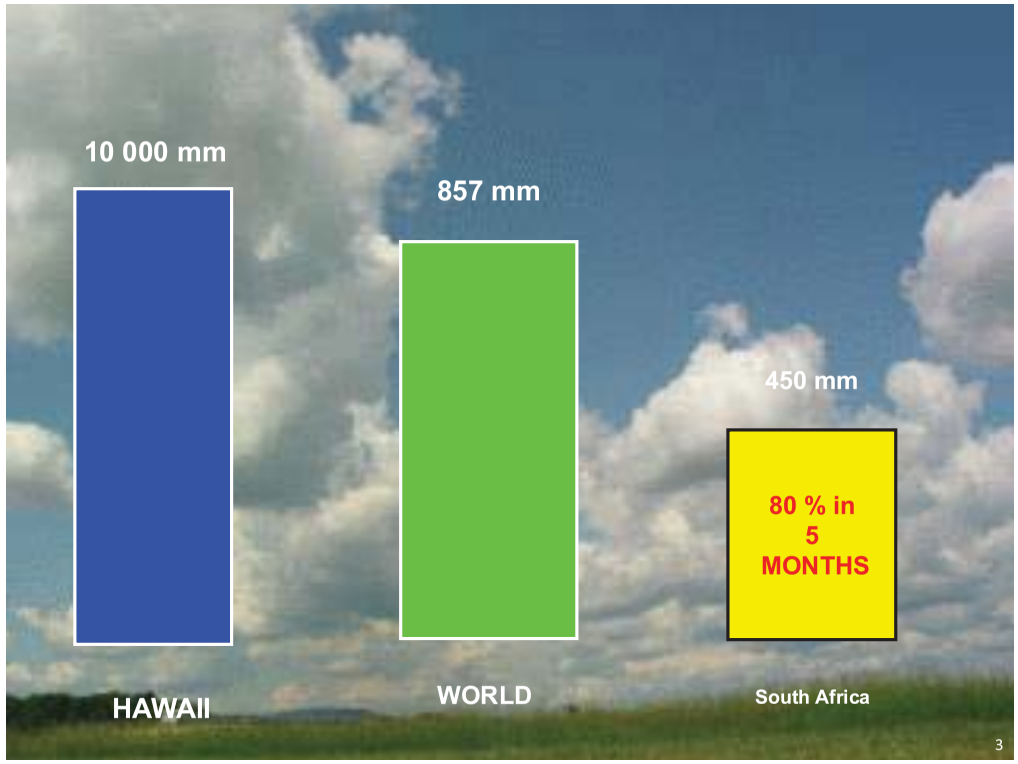
Background to Water Conservation and Water Demand Management: South African Perspective

THE NATIONAL NON REVENUE WATER TRAINING
DWS, SALGA AND JICA

"More Water Conservation, Water Losses and Non Revenue Water Management"

Directorate: Water Use Efficiency

A 09 - 95

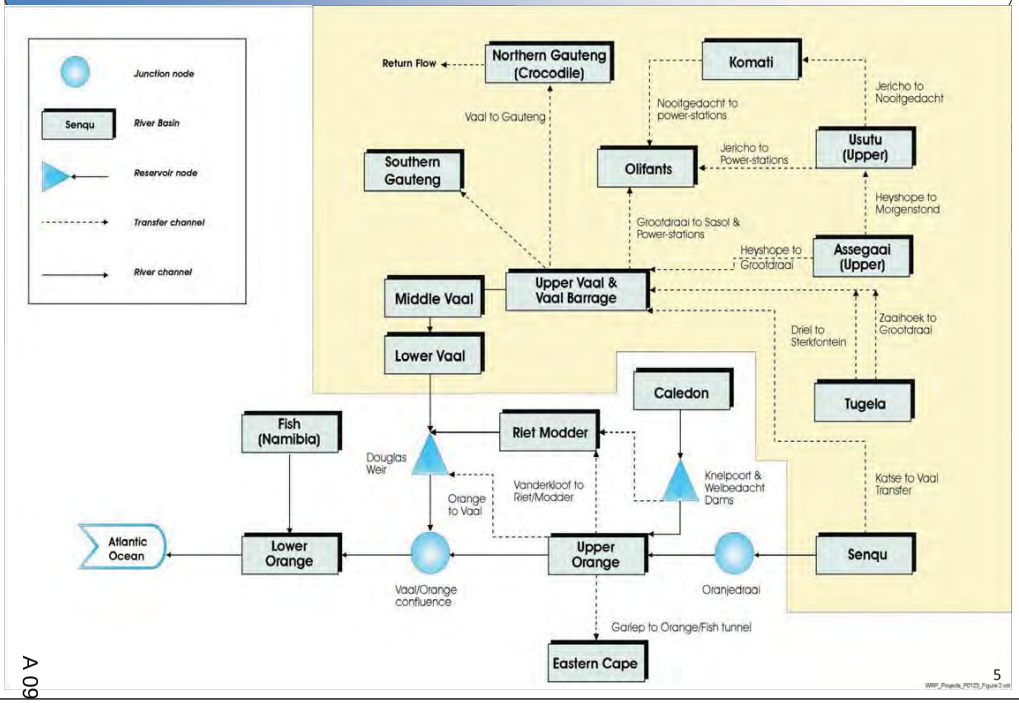


Presentation Overview

- **Water availability Situation**
  - Water Scarcity and climate change
  - Competition for it
- **Need for WC/WDM**
  - Water losses, wastages and inefficient across sectors
  - WC/WDM Challenges
- **WC/WDM Planning Regime**
  - Logical framework approach to WC/WDM
  - IWA Water Balance
  - Situation Assessment, develop Business Plan and Implementation Strategies with monitoring and reporting
- **What needs to be done**
  - Explore simple WC/WDM solutions in the Municipalities
  - WC/DM forms part of WSDP and
  - National Water Services Information System
- **Conclusions**
  - WC/WDM integral part of water services macro planning



Simplified Complicated Integrated Vaal River System



5

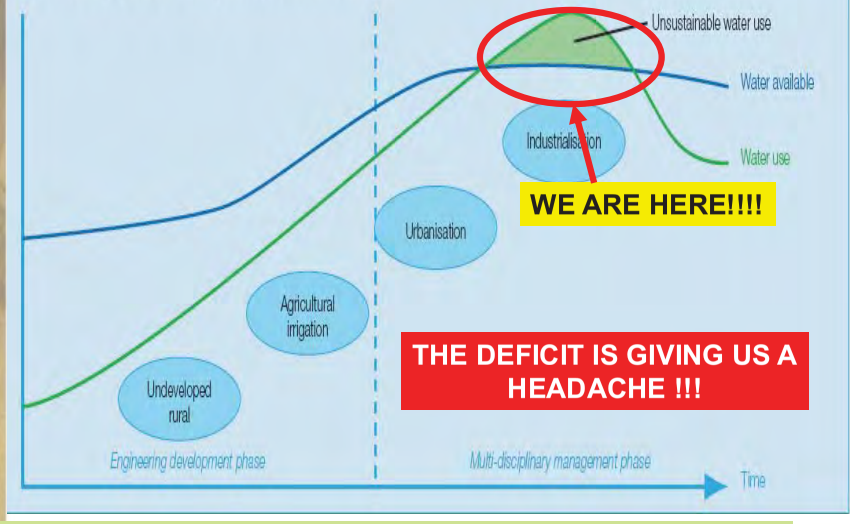
A 09-96

In the nut there is for WCWDM...

- SA is a water scarce country
- Many catchments are already in (water) deficit
- Water is required for:
  - Economic growth (6% NDP)
  - Basic human needs (Social dev)
  - Reserve (environment)
  - International agreements (Inco-Maputo)
  - Equity/ redistribution (WAR)
- Further augmentation increasingly expensive:
- **TRUE VALUE OF H_2O=Sustainable Water Services**

PUTTING THINGS IN PERSPECTIVE....

Figure 1 Changing risk and management requirements with use



Pegram et al, 2007: ALLOCATING SCARCE WATER :
A Primer on Water Allocation , Water Rights & Water Markets...



Reflecting On It

Do Opportunities exist for...

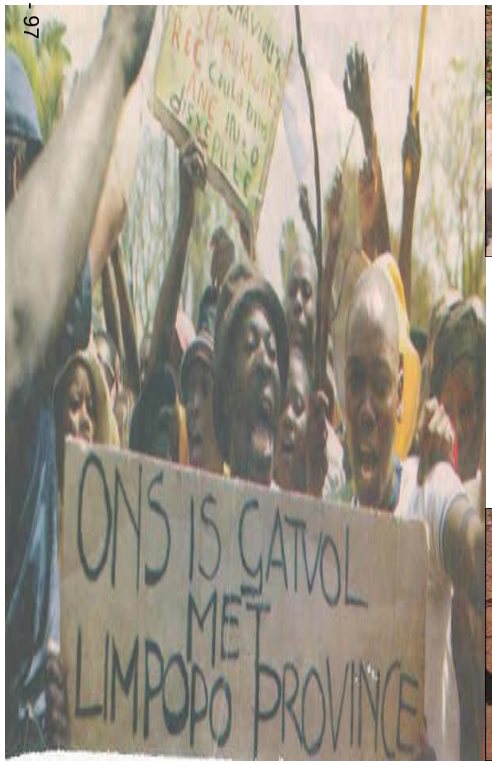
WC/WDM



Emfuleni Local Municipality

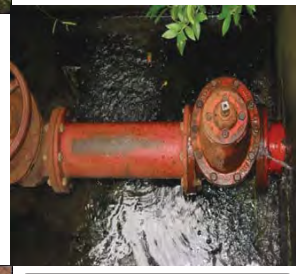
System Input Volume		
36 962 000 m³/annum	Billed and paid for Consumption 1 848 000 m³/annum	5%
	Free basic water 7 246 000 m³/annum	20%
	Apparent losses 1 396 000 m³/annum	4%
	UARL (2 to 3 times) 4 396 000 m³/annum	12%
	Potential saving on physical leakage and inefficient consumption 22 300 000 m³/annum	59%

Sebokeng Evaton Water Balance





Attributes of erratic water supply system





Feeding The Soil

Wondering Why Is It Not Happening?

- No institutionalization of WC/WDM within WIs
- WC/WDM NOT a PRIORITY (just a nice talk about)
- No Funding for WC/WDM programmes
- No Commitment, Teachability & Focus on WC/WDM

MINDSET ISSUE: A PARADIGM SHIFT TO OVERCOME THE WC/WDM INERTIA

WATER SERVICES PLANNING APPROACH FOR WC/WDM

- How much water is being lost?
- Where is the water being lost?
- Why is the water being lost
- What strategies (WC/WDM interventions) can
- be used to reduce water losses/manage demand and improve performance?
- How we maintain the WDM strategy & sustain the achievement gained?



A 09 - 98

IWA WATER BALANCE AT THE HEART OF MUNICIPAL WC/WDM PLANNING

System Input Volume	Authorised Consumption	Billed Authorised Consumption	Billed Metered Consumption	Potential Revenue Water	Free basic / Recovered revenue / Non-Recovered revenue
			Billed Unmetered Consumption		
		Unbilled Authorised Consumption	Unbilled Metered Consumption	Non Revenue Water	
			Unbilled Unmetered Consumption		
	Water Losses	Apparent Losses	Unauthorised Consumption		
			Customer Meter Inaccuracies		
		Real Losses	Leakage on Transmission and Distribution Mains		
			Leakage on Overflows at Storage Tanks		
			Leakage on Service Connections up to point of Customer Meter		

Prioritization = Know What To Do But Nothing Gets Done

–

Concentration = Demonstrate Excellence With No Progress

Prioritization

+

Concentration

=

Delivers Excellency In Service Delivery:

Hopefully Is Enjoyable Too!!

A 09 - 99

Project Approach & Methodology

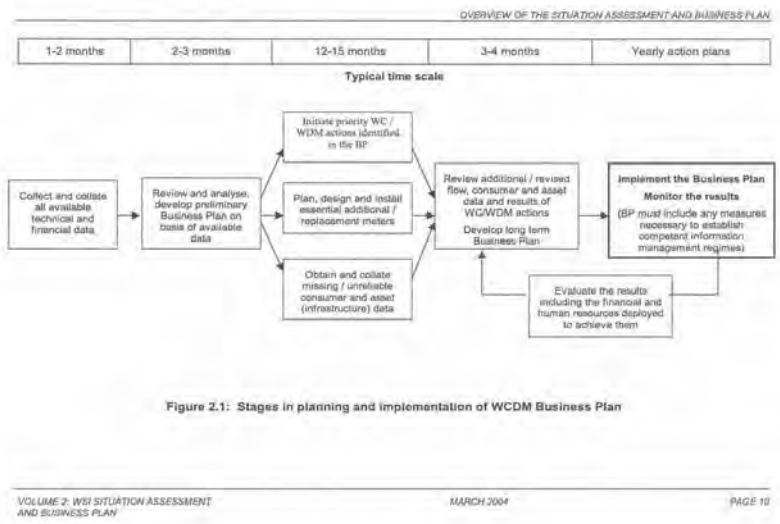


Figure 2.1: Stages in planning and implementation of WCDM Business Plan

Conclusions – Key Take Away Points

- ✓ WC/WDM important part of Macro Planning
- ✓ Provision of reliable, cost effective and sustainable water service rest on WC/WDM
- ✓ Every Municipality must develop WC/WDM strategy plan as part of WSDP and IDP
- ✓ Progress must be reported quarterly as part of reporting
- ✓ No need to plan and develop new or upgrade existing infrastructure at municipalities with high water losses.
- ✓ Priority requirement reduce water losses and Non Revenue Water

water & sanitation

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Thank You



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The National Non-Revenue Water (NRW) Training

NRW and Water Balance

The National
Non-Revenue Water (NRW) Training
for Municipalities by Municipalities
in South Africa

A 09 - 100

Aims of this Module

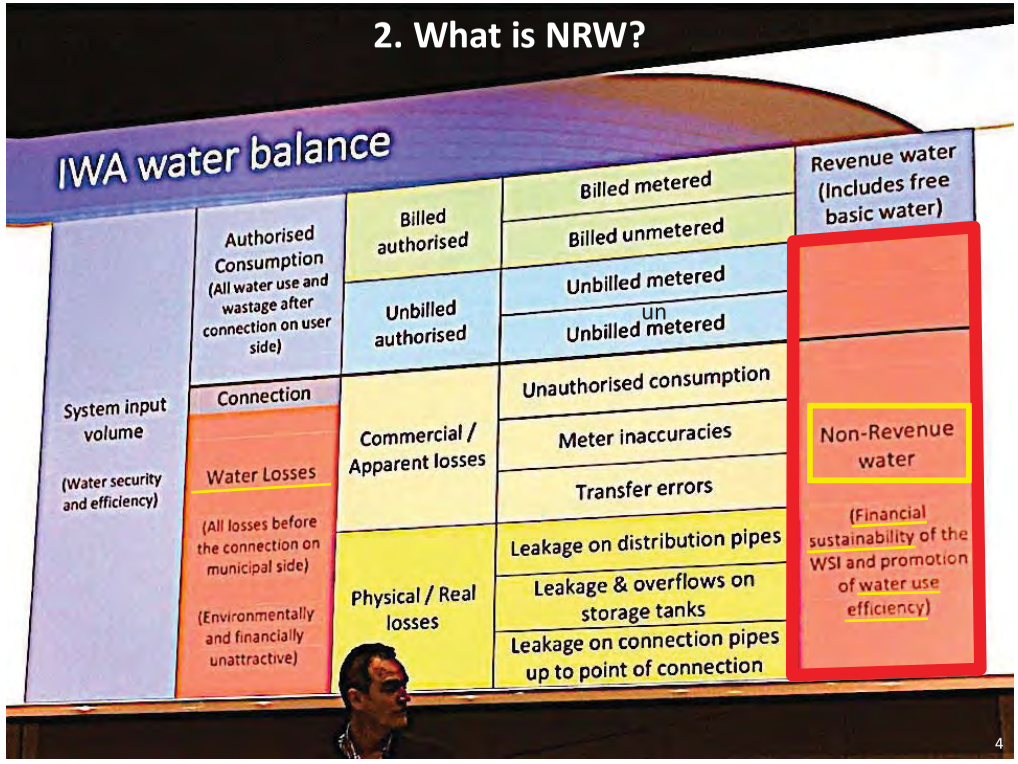
1. To understand the concept NRW
2. To understand why NRW management is necessary
3. To understand what water balance is

Non-Revenue Water Basics

Non-Revenue Water (NRW) :

Water that has been produced and is 'lost' before it reaches the customer, and which is not billed. Losses can be real (physical) losses (for example through leaks) or apparent losses (for example through theft, metering inaccuracies, data handling error, and so on)

2. What is NRW?



2. What is NRW(IWA)?

NRW is a KPI, INCLUDES;

- Physical Losses → *Technical aspect*
- Commercial Losses, billing → *Institutional aspect*

it represents:

"EFFICIENCY OF WATERWORKS AS A BUSINESS"

of each municipality

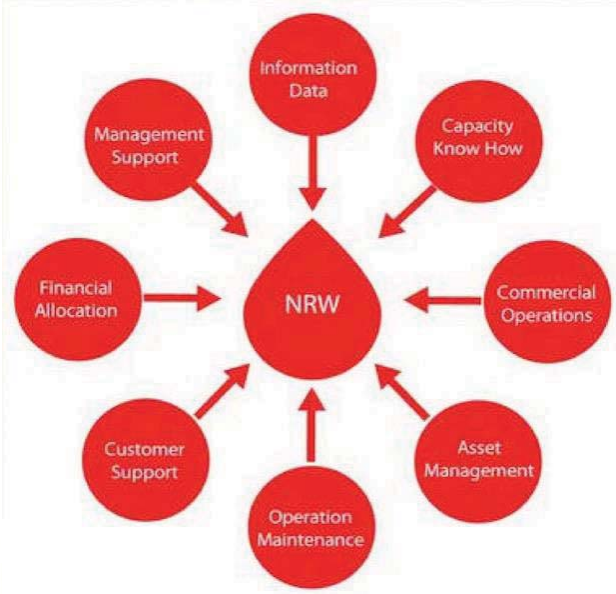
Why business? :

Sustainability is vital !

(including financial aspect)

A 09-101

2. WHAT IS NRW?



Non-Revenue Water Basics

How to identify municipal NRW

Technical Term

System Input Volume (SIV)

- **The volume of water produced or purchased, and supplying municipal water supply system(s);**
- **These systems could be an entire water supply system, or a zone or an isolated area;**
- **The input volume must be measured by bulk input flow meter(s);**
- **Period of measurement could be on an annual, monthly, or daily basis etc (annual is more common)**

Non-Revenue Water Basics

How to identify municipal Revenue Water

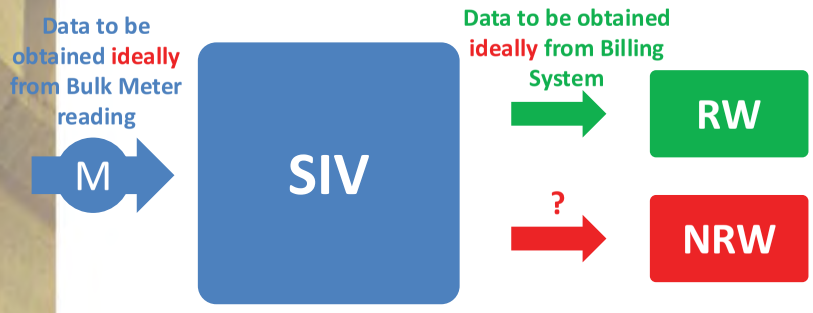
Technical Term

Revenue Water (RW)

- **This is all billed metered and billed unmetered water consumption, which is measured and supplied to customers. In South Africa, free basic water is also considered to be revenue water.**

Non-Revenue Water Basics

Simple way to identify municipal NRW



SIV (m^3) = RW (m^3) + NRW (m^3)

i.e. NRW = SIV – RW

NRW Ratio (%) = (SIV-RW)/SIV x 100%

Volumes to be in the same period!

Non-Revenue Water Basics

A variety of aspects on NRW in water services needs wide-ranging viewpoints, understanding and efforts.

Fundamental Data (Network Drawings, GIS, Bulk/In-Flow Metering, etc.)	Information and Data (Meter Reading, Billing, etc.)	Operation & Maintenance	Commercial Operations
Capacity and Know-how	Strategy and Planning	Financial Resources / Allocation	Management Support
Political Buy-In	Asset Management	Staff	Logistics
	Equipment, Materials and Supplies	Customer Support	

A 09 - 102

Non-Revenue Water Basics

NRW is:

A performance indicator of water services efficiency which include the following processes

- **Gathering of information for analysis**
- **Initiatives to reduce water loss and improve revenue**

Calculation of NRW can lead to incorrect results if SIV and RW data is "NOT" reliable or accurate in your municipality...

For example, on the condition that SIV reading differs from 80 to 90 due to its inaccuracy and RW is 60,

$$\text{NRW ratio} = \frac{90 - 60}{90} = 33\% \Leftrightarrow \frac{80 - 60}{80} = 25\%$$

3.The situation of NRW in SA

In general, We don't know Actual situation of NRW.

Because of lacking of the data (Water balance)

No drop submission and valid data set is only half!

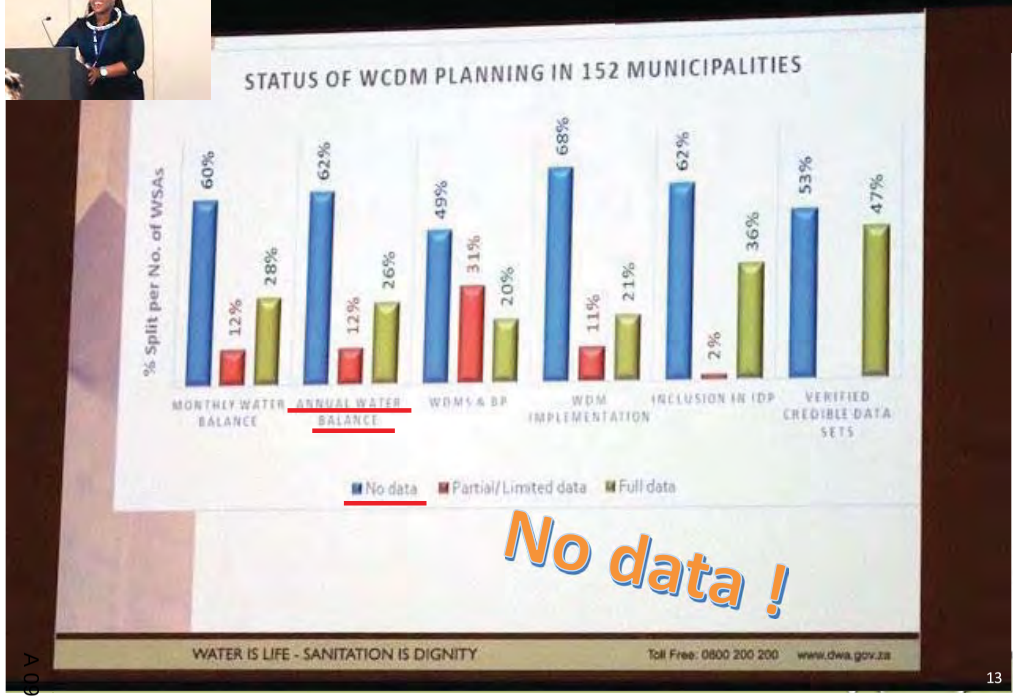
The situation is that we don't know the status quo of NRW!

-very primitive !

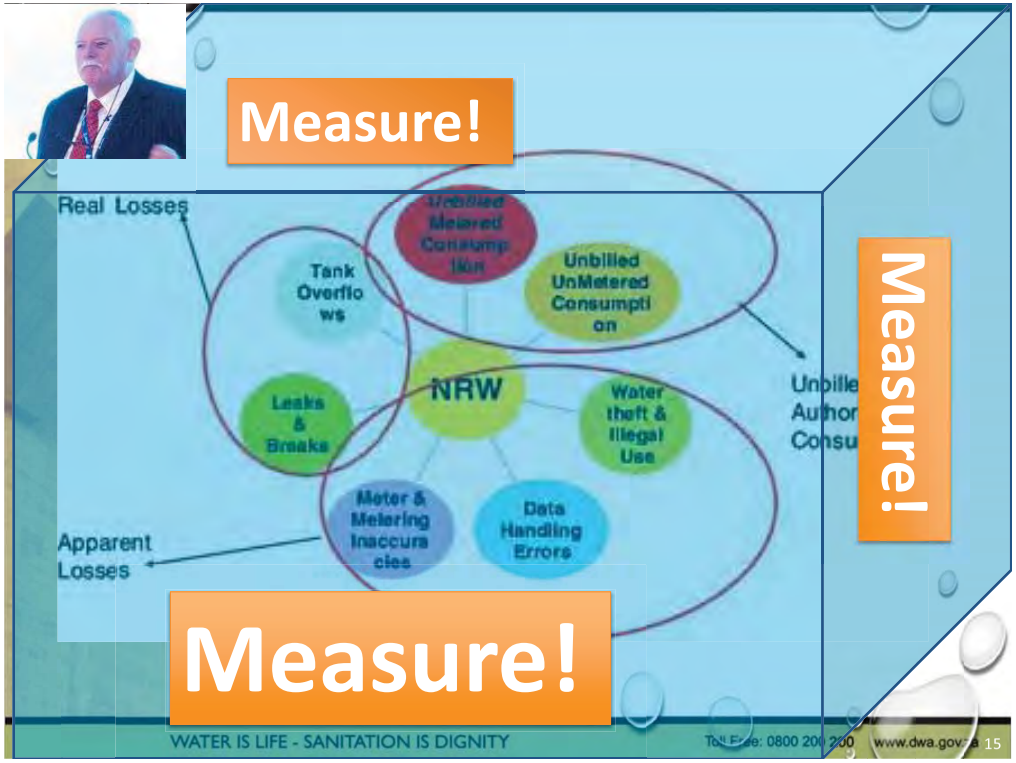


THE SITUATION OF NRW IN SA
(IWA WATER LOSS CAPE TOWN 2018)

DWS: WUE



13

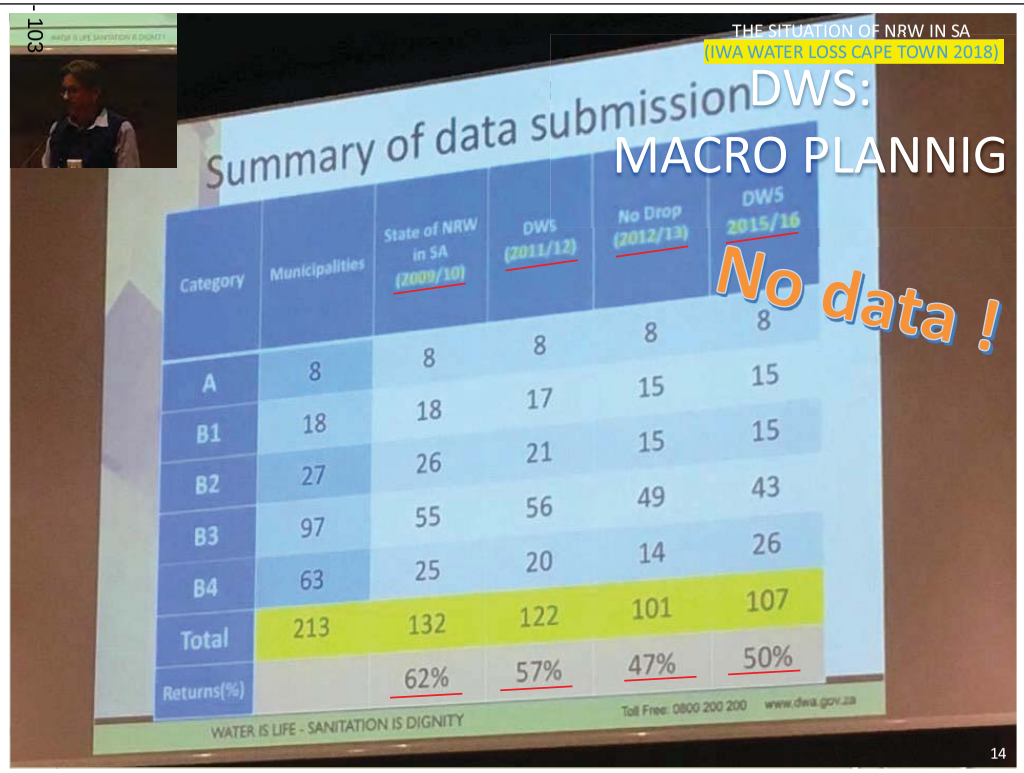


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A C9 - 103

THE SITUATION OF NRW IN SA
(IWA WATER LOSS CAPE TOWN 2018)

DWS: MACRO PLANNIG

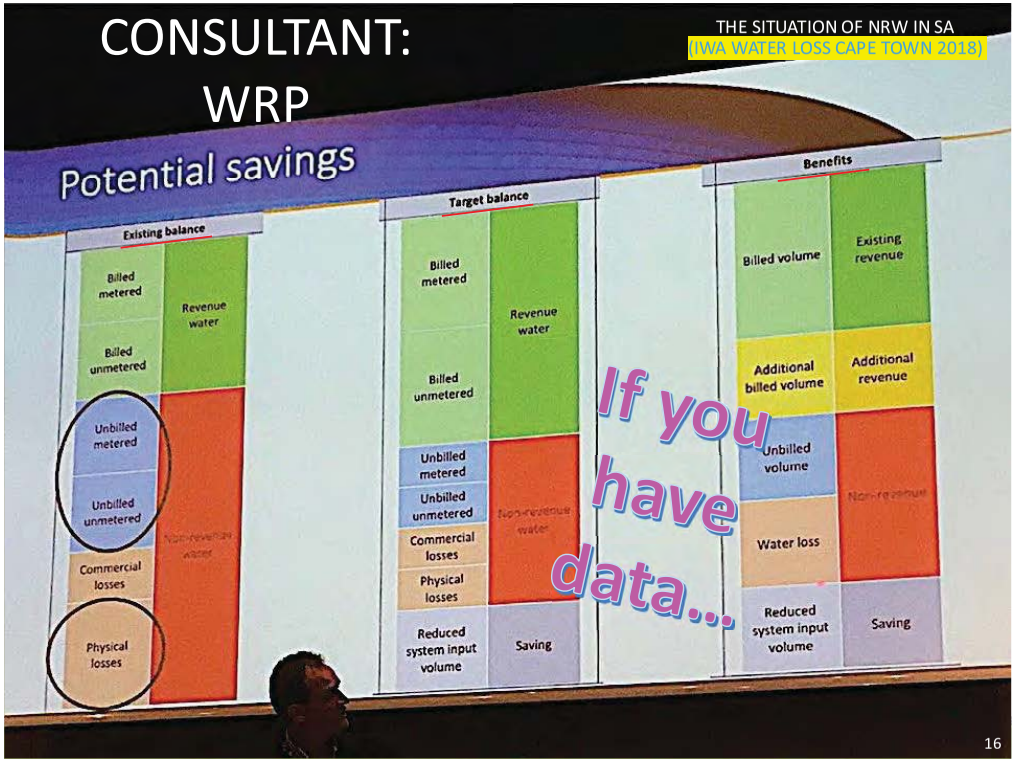


Category	Municipalities	State of NRW in SA (2009/10)	DWS (2011/12)	No Drop (2012/13)	DWS 2015/16
A	8	8	8	8	8
B1	18	18	17	15	15
B2	27	26	21	15	15
B3	97	55	56	49	43
B4	63	25	20	14	26
Total	213	132	122	101	107
Returns(%)		62%	57%	47%	50%

14

CONSULTANT: WRP

THE SITUATION OF NRW IN SA
(IWA WATER LOSS CAPE TOWN 2018)



16

FUNDING AGENCY: DBSA



STATUS QUO ANALYSIS

MANAGE DEMAND RISK

SYSTEM REDESIGN OPPORTUNITY

FUTURE DEVELOPMENT IMPACT

If you have data...

Findings and Conclusions



- Pilot study
  - Pre-feasibility assessment – interventions make sense (theoretically)
  - Mayor and Councilors of Laingsburg have adopted tool to help address their NRW issues
  - Other key concerns remain: tariffs steps and smart metering
- Further tool refinement
  - IMESA funding
- Interested in learning more?
  - Contact Claire or Philip for more info





If you have data...

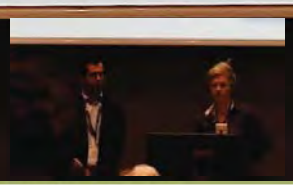
CONSULTANT: GREEN CAPE

Top Priority Interventions



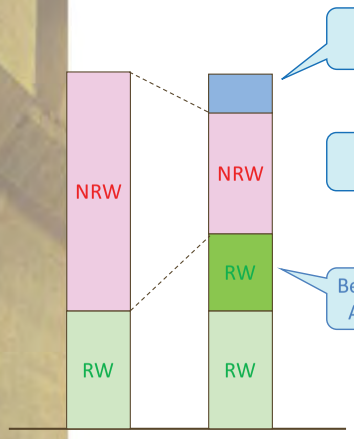
- Bulk meter installation (accurate water balance)
- Implement "no cost" projects:
  - Remove illegal connections
  - Improve speed and quality of repairs
  - Improve revenue collection efficiency
  - Validate/calibrate smart meters
- Implement short payback interventions:
  - Meter all customers (cost = R25,600, payback = 0.4 years)
  - Pressure reduction (cost = R1,8 million, payback = 3.3 years)
  - Improve data transfer errors (cost = R200,000, payback 4.3 years)





Why NRW management is necessary?

Impacts by NRW management (example)



Water Saving → Conserving Water Resources

Cost Savings

Better Service and Additional Sales → Improving Financial Soundness

Enhancement of Sustainability of Water Supply Services

Improving Water Supply Management

Why NRW management is necessary?

Impact of NRW management

- Reduction of production cost
- Reduction of O&M cost
- Increased revenue generation
- Contribution to water conservation
- Saving/delaying capital investments
- Improvement of efficiency and financial sustainability
- Increase water supply coverage
- Improvement of customer satisfaction

A 09 - 105

Drill

Water Balance

1. Brainstorm any possible NRW items from your experience in your municipality.
2. All items brainstormed should be recorded and/or written in sticky notes.
3. Representative should present them.
4. Allocate them by components in water balance

Actions to be prioritized for possible quick-win and long-term NRW initiatives for your municipality by using knowledge of experienced municipalities.

Drill

Water Balance

Water Balance by International Water Association (IWA)

System Input Volume	Authorized Consumption	Billed Authorized Consumption	Billed Metered Consumption	Revenue Water
			Billed Unmetered Consumption	
		Unbilled Authorized Consumption	Unbilled Metered Consumption	Non-Revenue Water (NRW)
			Unbilled Unmetered Consumption	
	Water Losses	Commercial (Apparent) Losses	Unauthorized Consumption	
			Customer Metering Inaccuracies and Data Handling Errors	
		Physical (Real) Losses	Leakage on Transmission and/or Distribution Mains	
			Leakage and Overflows at Utility's Storage Tanks	
			Leakage on Service Connections up to Point of Customer Use	

*Note: Free basic water is considered to be Revenue Water in SA

Drill

Water Balance

Discussion points for the South African context

1. Free Basic Water
2. Excessive use of flat-rate billing for customers
3. Internal leaks (eg. water running in toilet)
4. Non-payment culture
5. Political interference
6. Any other items?

Vicious cycle to Virtuous cycle

NOW IN SA

[Municipal manager]
[Financial division]
No Trust

- No political buy-in
- Poor presentation

- No budget
- No approval to a project

[Planning section]
No Plan

[Technical section]
No Data

- No project implementation
- Staff always in shortage
- Just hustle everyday
- Status to be worsened…

A 09-106

Vicious cycle to Virtuous cycle

NEAR FUTURE IN SA !

[Municipal manager]
[Financial division]
Get Trust

IMPROVEMENT

- Plan is concrete
- Having Long term strategy
- Good presentation
- Political buy-in

- Secure the budget
- Approval to the project

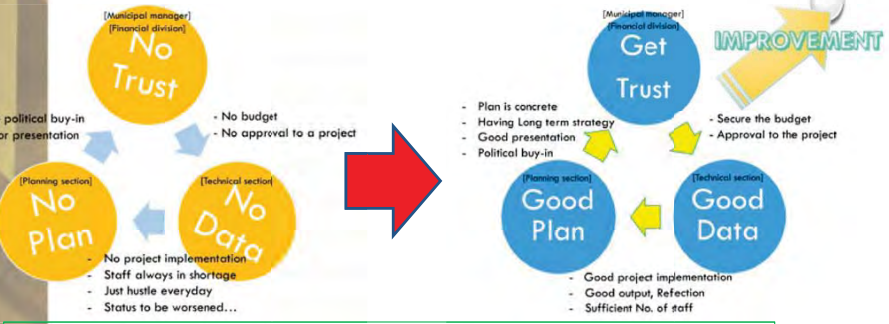
intervention

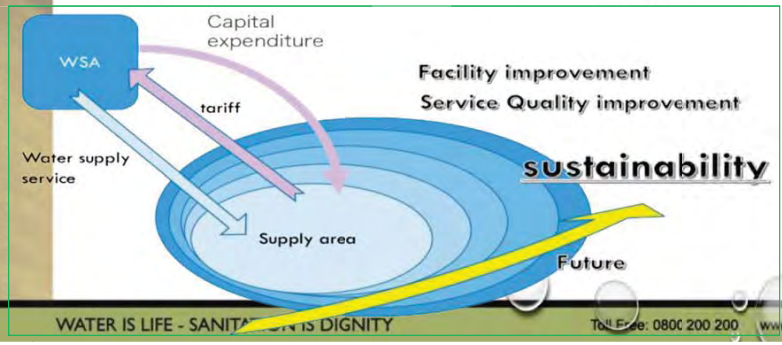
[Planning section]
Good Plan

[Technical section]
Good Data

- Good project implementation
- Good output, Reflection
- Sufficient No. of staff

Vicious cycle to Virtuous cycle





Q & A

water & sanitation
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Water Supply Infrastructure

The National
Non-Revenue Water (NRW) Training
for Municipalities by Municipalities
in South Africa

A 09 - 107

contents

1. Water Distribution (Reticulation) Systems 5-slides
2. Water Supply Structures 2-slides
3. Water Supply Facilities 3-slides
4. Pipes 14-slides
5. Appurtenance 9-slides
6. Water Meter 35-slides

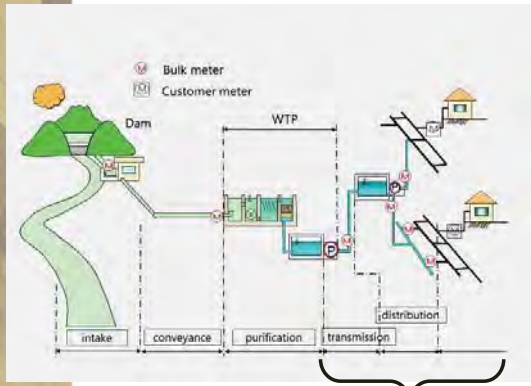
Expected Outcomes

To understand & able to demonstrate:

- Reticulation systems and its design
- Benefits of zoning (DMA)
- Roles of water distribution structures and facilities
- Roles of appurtenances and its function
- Characteristics of bulk water flow
- Meter types, installation procedure, accuracy, maintenance, advantage & disadvantage, costs, durability, and selection criteria
- Role of customer meter
- Legal Requirements for meters

1. Water Distribution (Reticulation) Systems

1. Water Distribution (Reticulation) System

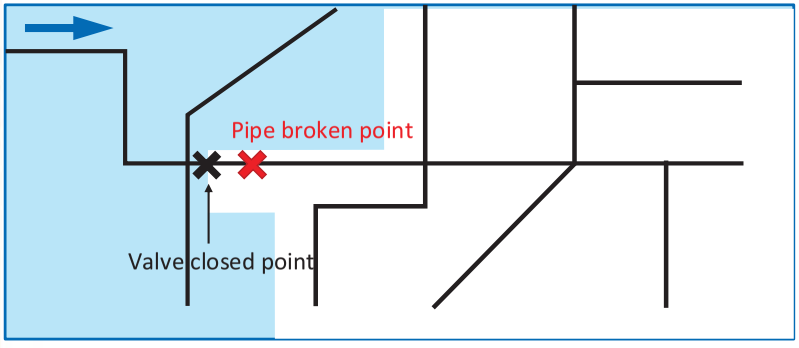


- By energy:
  - Gravity
  - Pumping
- By piping system
  - Branch piping
  - **Network piping**

Network piping have high redundancy, and if the zones are grouped by elevation, water volume/pressure management, and crisis management become easier (although initial costs are high).

Piping System: Branch Piping

- When pipe broken, affected area become large

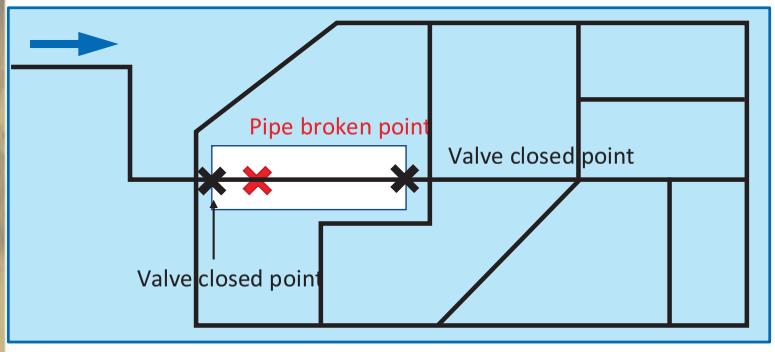


- **Advantage**: Pipeline installation cost is low, etc.
- **Disadvantage**: Area without water becomes large, etc.

A 09 - 108

Piping System: Network Piping

- When pipe broken, affected area could be very limited



- **Advantage**: Area without water can be minimized and kept pressurized. And other benefits described on next slide.
- **Disadvantage**: Higher installation cost, etc.

Benefit of the Network Piping (with Flow & Pressure Management Area: Zone; DMA)

Summary:

- Dividing and managing the distribution area makes it easier to control the flow rate and water pressure

The main elements to make up zones:

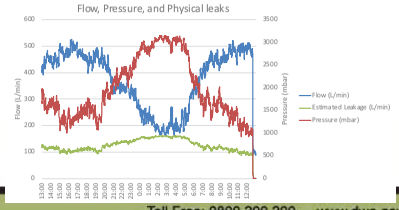
- By the water treatment plant's supply area
- By the water reservoir's supply area (under a bulk water supply receiving point)
- By the number of household
- By the land use
- By the area which supplied by Gravity
- By the area which supplied by Pumping
- By community, district zones
- By Street

[DMA is one of the zoning system]

Advantage of zoning:

Water distribution management become much easy and effective

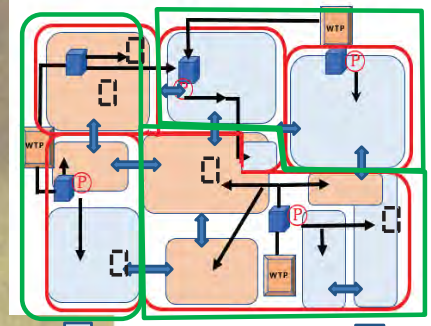
- To measure SIV in the zones
- To select and implement of NRW countermeasures
- To change volume of water according to the usage during the day and night
- To suit different water usage patterns, such as residential areas, industrial areas, and commercial areas
- To reduce water pressure rises when the time usage is low, such as at night
- To send proper water supply volume and hydraulic pressure during peak use
- To minimize the impact in the emergency

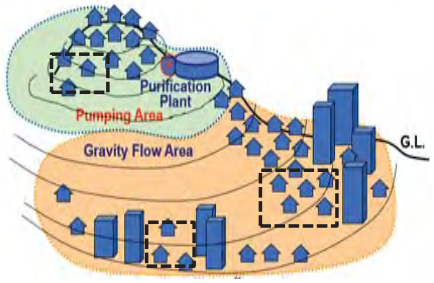


Case of Yokohama City: Population 3.8mil: Example

Basic concept of sectorization in Yokohama:

- Water sources are water treatment plant and water reservoir(Bulk water supply receiving point)
- Separate gravity area and Pump-pressure area by altitude, elevation.
- Location of existing pipes and valves in the network
- Number of customers
- Land use category (residential, industry, commercial)





Pumped supply area gravity supply area DMA

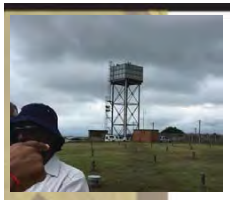
Once distribution management system and billing system are in place, large DMAs can be managed properly

4 Zones (Water TT)
37 Blocks

A 09 - 609

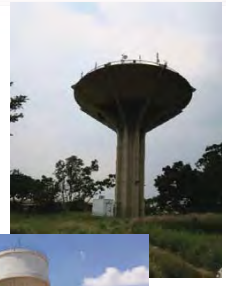
Question and Answer

2. Water Supply Structures



Water tower and Reservoir

Structure of water source





<Role>

1. Reserve water source
2. Adjust & control water supply volume(depending on demand)
3. Pressure reduction



<Design>

1. Location ⇒ Upland for energy saving
2. Capacity ⇒ Customer consumption volume (Example: 12 hours)
3. Structure ⇒ Durability, water-tightness

Pit (for measurement/operation)










<Role>

1. Store & protect measuring equipment
2. Store & protect valves and other facility
3. Make valve and other kind of operation easier
4. Reduce noise

<Design>

1. Secure enough space for operating valves and measurement equipment
2. Secure enough space for replace equipment and an equipment to carry heavy material
3. Durable, water-tight (for the structure)

A 09 - 110

Question and Answer

3. Water Supply Facilities

Pump & Motors





Point to note for installation:

- Be careful of lightning and submergence
- Be prepared for power outages

Electrical Facilities

- Control panel



- Electric panel



Point to note for installation:

- Be careful of lightning and submergence
- Be prepared for power outages

A 09 - 111

How to keep the function of mechanical & electric facilities to be stable for a long term ?

Inspection

Examine

- Daily, Weekly, Monthly quarterly, yearly, every other year, etc.
- Visual examination, Equipment examination Maker examination
- Based on the management plan

Data storage

Store

- the inspection record
- the maintenance work record
- the maintenance management document

Evaluation

Evaluate

- the contents of maintenance
- efficiency of the maintenance

Review

- the maintenance cycle

Question and Answer

4. Pipes

As a professional water practitioner you need to know only two things for the pipes:

1. Characteristic of the materials(PVC, PE, ACP, Galvanized, CIP, DIC, Steel)

- Strength
- Corrosion resistance
- Flexibility
- Unit weight
- Unit price

2. How to ensure the water tightness of each pipe connection

- Rubber ring
- Mechanical compression
- Fusion
- Adhesive
- Seal tape

A 09 - 112

Pipes

The main types used in SA are as follows:

(1) Polyvinyl chloride (PVC)

(2) High density polyethylene (HDPE)

(3) Asbestos cement (ACP)

(4) Steel (Galvanized)

(5) Steel (SP)

(6) Ductile iron (DIP)

Type of pipe material

Type of Material	Type of Pipe
Vinyl	High density polyethylene (HDPE)
	Polyvinyl chloride (PVC)
Cement	Asbestos cement ACP
Iron	Cast iron (CIP)
	Ductile iron (DIP)
	Steel (SP)

Type of Pipes

Type of Pipe	Characteristic
Polyvinyl chloride (PVC)	High harness and strength, and resistant to corrosion. PVC pipes should not be exposed to direct sunlight.
High density polyethylene (HDPE)	Greater strength and can handle higher temperatures, tough. Welding used to join HDPE requires a high level of workmanship.
Steel (SP)	Steel is subject to both internal and external corrosion.
Ductile iron (DIP)	A type of cast iron where the graphite particles in the iron. Greater strength, ductility and impact resistance. However it is subject to both internal and external corrosion.
Asbestos cement ACP)	Popular pipe material from the 1970s to the 90s. Significant cost and handling advantages over iron before the arrival of plastics. Material is brittle, tending to crack under external loads and is difficult to repair.

Drill

As a professional water practitioner you need to know only two things:

Characteristic of the materials (PVC, PE, ACP, Galvanized, Steel DIP)

	PVC	PE	ACP	Galva-nized	SP	DIP
Durability						
Strength						
Flexibility						
Unit weight						
Unit price						

A 09 - 113

Drill

As a professional water practitioner you need to know only two things:

How to ensure the water tightness of each pipe connection

	PVC	PE	ACP	Galva-nized	SP	DIP
Rubber ring						
Mechanical compression						
Fusion						
Adhesive						
Seal tape						

(1) PVC Pipe



Advantage of Polyvinyl chloride (PVC)

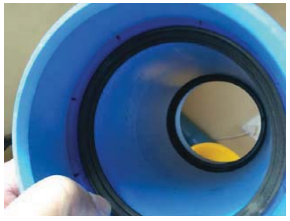
- **Light weight:** PVC Pipes offer a tremendous weight advantage over alternative piping materials.
- **Some Flexibility:** PVC Pipe's resistance to fracture is an extremely important performance advantage.
- **Watertight Joints:** A major requirement for all piping applications is joint tightness.
- **Coefficient of Friction:** PVC Pipes provide smoother wall surfaces that reduce fluid friction and resistance to flow.
- **Safe Material:** PVC pipe is a non-toxic and safe material
- **Resistant to corrosion**
- PVC pipes should **not be exposed to direct sunlight**





(1) PVC Pipe (Joint)

- Socket joint



Thread jointing with rubber ring



- Cement Glue



(2) HDPE Pipe



Advantage of HDPE (High Density Polyethylene)

- **Rugged, flexible, and durable. HDPE has outstanding chemical and environmental stress crack resistance.**
- **Corrosion Resistance:** HDPE pipe does not rust, rot or corrode. It is resistant to biological growth.
- **Fatigue Resistance:** HDPE pipe is flexible and ductile, not rigid.
- **Extended Service Life:** HDPE pipe is a safe and durable product
- **Leak-Free Joints:** HDPE piping systems can be joined with heat fusion to produce permanent leak free joints.
- **Adaptability:** In addition to joining HDPE with heat fusion, HDPE pipe can also be joined with Stab or Mechanical Fittings.
- **Trenchless Installation:** The flexibility of HDPE, combined with its outstanding tensile strength and abrasion resistance, make it the preferred and proven choice for trenchless installation technology.

A 09 - 114

(2) HDPE Pipe (Joint)

For bulk line

- Electric fusion type



Easy to manage using a system for fusion management. Auto calc for each diameter: Temp., and Time

- Butt fusion type



Welding joint requires a high level of workmanship to joint properly.

For service pipe

- Compression type



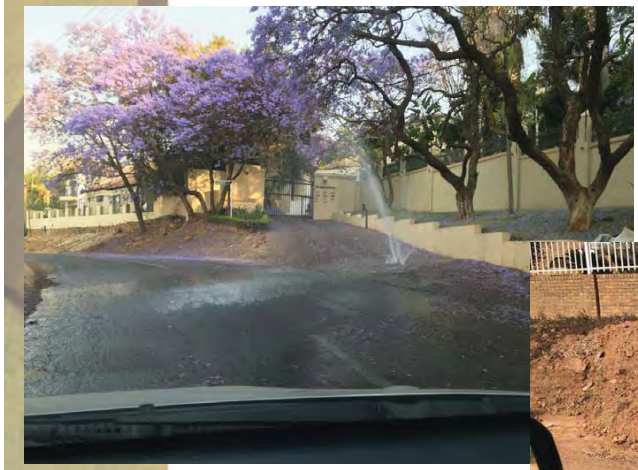
- Socket fusion type



- Metal joint type



(3) Asbestos Pipe (ACP)





(4) Steel Pipe (galvanized)

- Joint is mostly mechanical type.
- Can be arranged suitable shape of layout.
- Subject to both internal and external corrosion.(Zink coating)
- Characterized by being slim and lighter than ductile cast iron pipes because thickness of pipe wall is thin.





(5) Steel pipe

- Joint types are welding and flange type.
- Steel pipe can be arranged suitable shape of layout.
- Steel is subject to both internal and external corrosion.
- Steel pipes are characterized by being slim and lighter than ductile cast
- iron pipes because thickness of pipe wall is thin and the joints are welded. For this reason, it is used in places narrower than ductile cast iron pipes of the same diameter and in water pipe bridges.





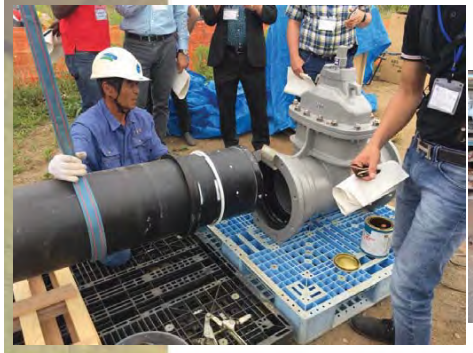
A 09 - 115



(6) DIP



- The strength of ductile cast iron is due to spheroidal graphite.
- A lot of joint types.
- For Corrosion prevention coating is in need.
- Polyethylene sleeve is used for preventing outer surface corrosion.




Polyethylene sleeve



Question and Answer

5. Appurtenance

As a professional water practitioner you need to know only two things for the appurtenances:

1. The mechanism of Appurtenance(valve, Air valv, Fire hydrant, Control valvs)

- Moving part
- Shutting plate
- float
- Rotate part
- Vane
- Spring
- Bolt

2. How to ensure the water tightness for the appurtenances

- Rubber ring
- Mechanical compression
- Gasket

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Valves

Various types of valves are used in distribution systems to shut down sections of the network, release air or regulate flow or pressure in the system. The main types are the following:

(1) Isolation valves

(2) Air valves

(3) Scour valves

(4) Non-return or check valves

(5) Fire hydrant

(6) Control valves (including PRV)

(1) Isolation valves



- Isolation valves are used to close off and thus prevent any flow through pipes.
- Isolation valves are installed at junctions in pipe networks and at regular intervals of one to two kilometres on transmission lines. They should be located near street corners and in line with property side-boundaries so that they are easier to find.
- Butterfly valve is compact and suitable for large diameter pipes.

Butterfly valve

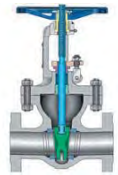




Gate valve



Cut model of gate valve



(2) Air valve

- Air valves are installed on pipelines to control the flow of air into and out of the system.
- If the air is not released, it will accumulate at high points in pipes, restricting and even preventing flow altogether.
- Air valves operate by automatically opening a valve when air accumulates in the valve body or negative pressures occur in the system.
- High compressed air is very dangerous to pipelines and operators, it requires extreme caution.





(3) Scour valve

- Scour valves are used to drainpipes for maintenance purposes. It typically consists of a reduced diameter off-take pipe closed with an isolation valve. In distribution networks, fire hydrants are mostly used to drainpipes instead of scour valves.
- On long pipelines, scour valves should be provided at the lowest points in the pipe profile. Each section of pipe that may require draining should be provided with a scour valve.





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(4) Non-return or check valves



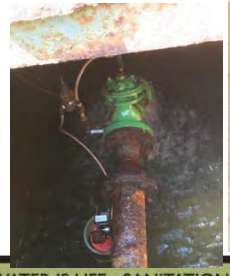

(5) Fire hydrant

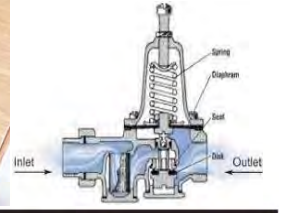
- Fire hydrants are used to provide water from the distribution system for fire fighting. Fire hydrants incorporate an isolation valve and a standard fitting for connecting a fire hose.
- Hydrants are often used for operation and maintenance functions in water distribution systems, such as flushing pipes, releasing air and logging pressures.
- Hydrants should be serviced and their flow rate checked to comply with the required flow rate at least once per year.




(6) Control valves (including PRV)

- The pressure in a DMA should be maintained as close to the minimum level as possible, as excess pressures increase the burst rates and reduce the service lives of pipes, potentially increase leakage rates substantially, increase water demands and require more energy (in pumped systems).
- However if the distribution water pressure is partially high due to terrain or other conditions, use PRV. The use of PRV is only for the case mentioned before in water distribution management in the zone. Many numbers of use of PRVs to lower distribution water pressure should be avoided as a measure against NRW.
- When set up a secondary pressure with a PRV, it is necessary to consider the water pressure at the location where the water pressure is highest.



Example

Ex. Inspection Record

① Inspection record database

Record the results of daily inspections, periodic inspections, detailed inspections, and temporary inspections, and describes the following items.

- Valve management number
- Inspection date
- Inspection results (Evaluation of each inspection item)
- Specific damage status where damage is significant and urgent repair work is required or when detailed investigation is required
- When requesting repair work, the name of the department in charge of the request

② Inspection management database

It manages the aging change such as the deterioration status in periodic and temporary inspection, and describes the following items.

- Inspection Date
- Inspection results
- Damage situation
- Responsibility of repair work

* It is desirable to manage the large valves and plugs of the main pipeline in the ledger for each database. In addition, for small valve and plugs, the status of problems and countermeasures are managed in the inspection record management database

Reference: "Water Valve Maintenance Manual" (Japan Water Association)

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Question and Answer

4. Water Meters

As a professional water practitioner you need to know only two things for water meters:

1. The mechanism of the meters

- Rotate part
- Vane
- Spring
- Counter
- Of which part does water flow

2. Factors which affect measurement accuracy

- Velocity
- Turbulence & straight length of pipes
- Installation
- Reading
- Aging

Water Meters

The main types used in SA are the following:

(1) Volumatic meter (customer meter)

(2) Single Jet, Multi Jet meter (customer meter)

(3) Waltmann meter (customer meter)

(4) Turbine flow meter

(5) Combination meter

(6) Electromagnetic flow meter

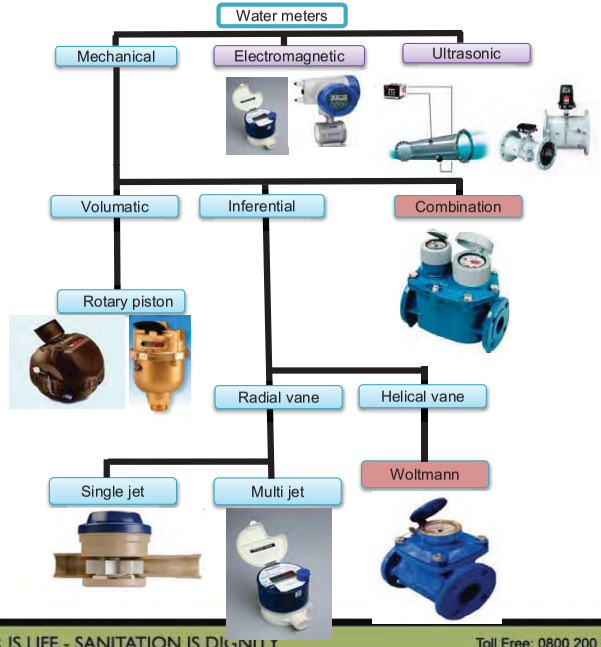
(7) Ultrasonic flow meter

(8) Differential pressure flow meter

(9) Prepaid meter (customer meter)

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4.1 Types of Water Meter



4.1 Types of water meter

(1) Volumatic meter (customer meter)

Volumetric meter



- There are displacement type, Volumetric meters.
- Common displacement designs nutating piston and oscillating piston meters.
- This method relies on the water physically displace the moving measuring element in direct proportion to the amount of water that passes through the meter. The disc or piston moves a magnet that drives the register.
- The meter incorporates a small bucket or piston with a known volume. The water flows through one orifice and fills the bucket which then rotates and lets the water flow out through a second orifice. The number of buckets of water is converted to a total volume by the counter gearing.

You can see the displacement piston in the sample meter →

Displacement piston



Source: [TT490-11_Introduction to Integrated Water Meter Management]

4.1 Types of water meter

(2) Single Jet, Multi Jet meter (customer meter)

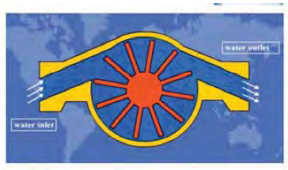
Inferential meter: Single & Multi Jet Meter

-There are two common type to flow measurement, velocity and displacement, each making use of technology and has many different models.

-Velocity-based designs include single- and multi-jet meters and turbine meters.

-Single-jet use a single flow stream to move the impeller which is converted to a flow rate. Sizes 15mm-40mm

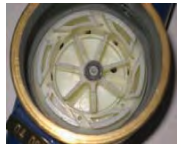
Single –jet

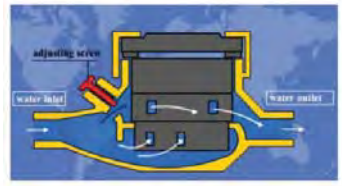


Multi-jet



-Multi-jet operates similar to the Single –jet but use a multiple openings to direct the flow to move the impeller which is converted to a flow rate. Sizes 15mm-50mm





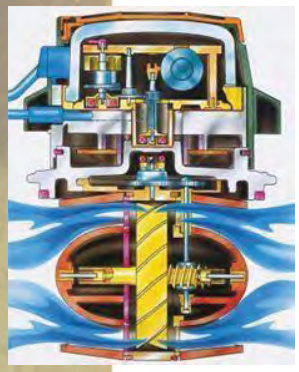
Source: [Water Meter Training Manual]

4.1 Types of water meter
(3) Waltmann meter (customer meter)

Waltmann type meter, Horizontal & Vertical

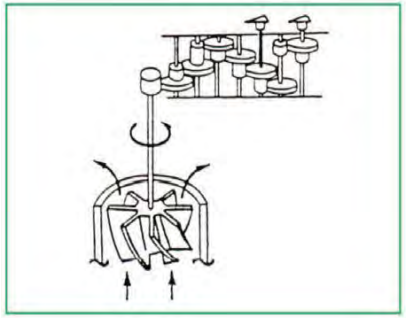
- Sizes 40-500mm and are the most commonly use over the world. Class B

Horizontal(WP)





Vertical(WS)



Source: [Water Meter Training Manual]

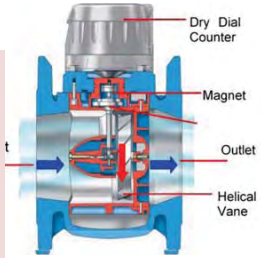
A 09 - 120

4.1 Types of water meter
(4) Turbine flow meter

Check points

1. The average of flow rate shall be in 2-4m/s.
2. Straight pipe L=5D for 90 bend, T-joint, Reducers, In upstream. L=10D after full open gate valve. L=5D in downstream.
3. Always full of water in pipe
4. Install horizontally.
5. By pass line is recommended for maintenance.
6. Avoid immediately after the chemical pump.
7. Avoid strong magnetic field at transducer.

- By spinning the paddle wheel with the force from the flowing fluid, it becomes possible to measure the rate of this flow from the number of revolutions.
  - Dia: 25mm- 400mm
  - Accuracy: Another Page
  - Purified water

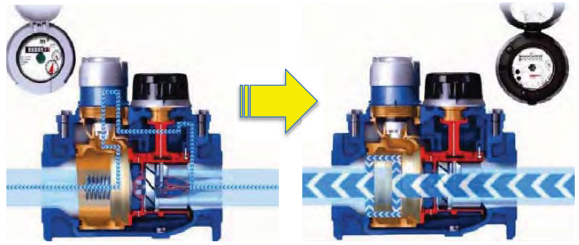


Source: [Water Meter Training Manual]

Pros	Cons
• Good reproducibility and responsiveness. • A simple structure with a low price • Compact and can perform large-capacity measurement.	• Extremely sensitive to foreign objects. (Cause clogging),. • Periodic maintenance is needed because the paddle wheel spins at high speeds.

4.1 Types of water meter
(5) Combination meter

At low flow rate, the change over valve closes and the flow through domestic by-pass
At the flow increases, the change over valve opens as a result of differential pressure and flow through into the bulk meter.



By-pass meter Main meter

Combined Type

Separate type



- -Combination meter is the combination of two different classes(Piston, single or multijet with Woltmann) in such a way they act as one meter(bypass meter and bulk meter). Widest measuring range of any meter.
- Meters has areas with poor precision. In the case of a large-sized meter for example commercial and factory, it is difficult to accurately sense a small amount of water used at night. In order to complement the measurement of the small amount of water area, combining a large meter with a small meter is used.

Source: [Water Meter Training Manual]

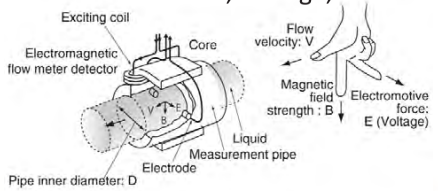
4.1 Types of water meter
(6) Electromagnetic flow meter

Check points

1. The average of flow rate shall be in 2-4m/s.
2. Straight pipe, Upstream L=5D for 90 bend, T-joint, Reducers. L=10D after full open gate valve.
3. Always full of water in pipe
4. Install horizontally.
5. By pass line is recommended for maintenance.
6. Avoid immediately after the chemical pump.
7. Avoid strong magnetic field at transducer.



- Faraday's law of electrolysis
- Consist of Transducer to convert flow to electrical signals
- Converter to convert electric signals to instrumentation signal
  - Dia: 2.5mm to 3,000mm
  - Accuracy: ± 0.1-0.5%(in ideal flow)
  - Use: Raw water, Purified water, Sewage, Chemical,



Source: Keyence.com

4.1 Types of water meter
(7) Ultrasonic flow meter

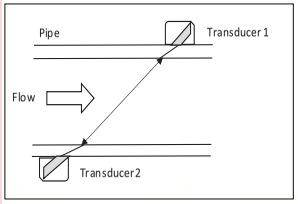


Check Points

1. Accuracy is higher in velocity faster than 1m/s, Temperature in 0-40°C, and turbidity is less than 3,500NTU.
2. Always full of water in pipe.
3. There are methods Z(penetrate), V(reflect), X(cross), and 2V. When it has turbulence, 2V is recommended for accurate measurement.
4. Pipe inside lining, "material and thickness" shall be known as a parameter of the measurement.
5. Straight pipe, is basically L=10D for upstream, L=5D for downstream. From upstream valve, L=30D, Pump L=50D.

- Ultrasonic waves are transmitted at an angle across fluid in the pipe. Flow is measured by changes in the transit time for the ultrasonic waves.
  - Dia: 25mm – 3,000 mm
  - Accuracy: ±1%(in ideal flow)
  - Use: Raw water, Purified Water, Chemicals

Pros	Cons
• Easy installation to clump on the outside pipe • No pressure loss • The cost does not increase with the diameter. • Comparatively lower cost than electro magnetic meter.	• Measurement is not possible when there are Air bubbles. • Long section of straight pipe is required. • Comparatively subject to turbulence if flow.



Source: [Water Meter Training Manual]

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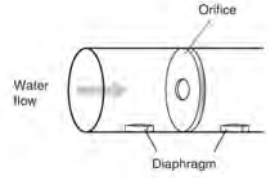
4.1 Types of water meter
(8) Differential pressure flow meter

Check points

1. Straight pipe Upstream L=10D, L=5D in downstream.
2. Reducer is often in a chamber, drain system is recommended.
3. Pressure sensor shall be in water pressure always. (Avoid minus pressure)
4. Prevent freezing from the pressure sensor.

- Using Bernoulli's principle.
- An orifice plate is installed into the path of flowing fluid, deliberately causing pressure loss.
- Small flow: Pressure loss is small
- Large flow: Pressure loss is large
  - Dia: 15mm-1500mm
  - Accuracy: ±1-2%(in ideal flow)
  - Use: Raw water, Purified water, Chemicals

Pros	Cons
• Measurement is possible with Gas, Liquid, Steam. • Mechanically simple, No moving parts then, having lower mechanical failure. • Lower cost when its larger diameter.	• Because of an orifice plate, great pressure loss occurs. • Not suited for fluids that include solid (clogging occurs) • Long section of strait pipe if required.



Source: [Water Meter Training Manual]

4.1 Types of water meter
(9) Prepaid meter (customer meter)

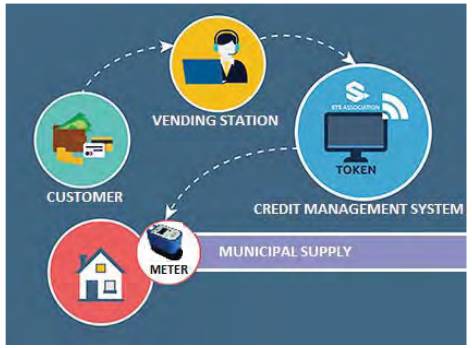
- Prepaid Meters consist of an Intelligent Valve fitted to a meter, intended to shut off once water credit has run out.
- Primary use is to curb non-payment of water

Pros:

- Effective method to control non-payment.
- Money is paid up front for services

Cons:

- High operational cost (services, management systems)
- Battery driven. Battery life approx. 8 years
- Require additional maintenance. Not an "install and forget" solution!



Prepaid Meters



Question and Answer

4.1 Types of water meter
How to maintain flow meter

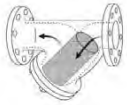
1 Scaling

The flow path inside the piping narrows and restricts flow.

If a thick layer of scaling attached to the inside of the pipe, the flow meter could become unable to measure the flow and maintenance would be required.

2 Sludge

Sludge can be removed using a strainer, complete removal is hard and sometimes refusal of sludge (debris) is required.



3 Rust

Air in the pipe, such as intermittent supply will be a cause of rust.

Strainer will also prevent a damage due to rust.

4 Slime

A kind of corrosion in the pipe, sometimes with algae, bacteria in pipe.

Maintenance is needed for turbine type meter.



Source: Keyence.com

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4.1 Types of water meter
How to maintain flow meter

5 Slurry

Same as slime, periodical maintenance Is required for mechanical meter.

Perforated water meter such as electromagnetic or ultrasonic is recommended.

6 Air bubbles

Since Coriolis type flow meters measure mass flow, they are unaffected by air bubbles. For electromagnetic type flow meters, bubbles can cause unstable flow readings. This is due to the fact that detection is based on volume and the bubbles are mistaken for fluid.

7 Irregularity or deviation in flows

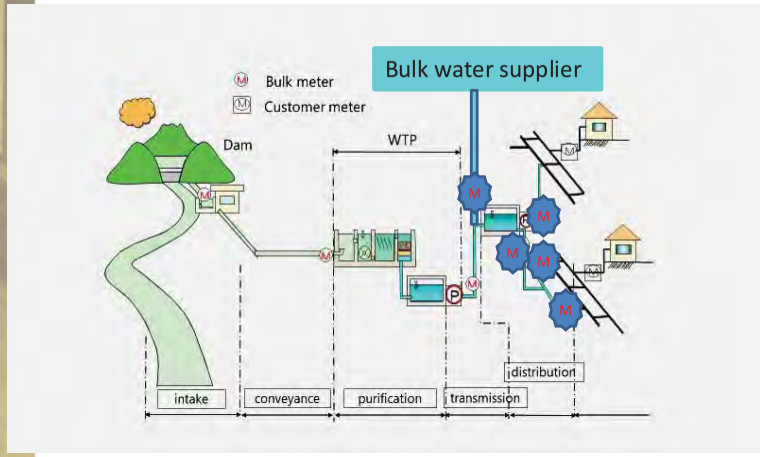
The degree of measurement error depends on the degree of irregularity in the distribution of flow velocity. Measurement performance can be improved by installing straight pipe sections upstream to make the distribution of flow velocity more uniform. (As a rough guide, the straight pipe section should be 5 times the bore diameter of the flow path.)

8 Pulsating flow

One possible way to reduce pulsations is by using a damper such as an accumulator. Also, if the pulsations cause fluctuations in the numeric values of the flow meter over time, increasing the flow meter's response time is effective at stabilizing the numeric values.

Source: Keyence.com

4.1 Types of water meter
Here... Position of bulk meters



M Bulk Meter for NRW measurement: -Out flow from Distribution plant,
-In flow to the DMAs
-Receiving flow from bulk supplier

4.1 Types of water meter
About Bulk Meters (in this training)

What is bulk meter?

(In this training)

- Mostly used for large water volume measurement. Bigger than customer meters, >=40mm depend on municipality

Types of bulk meter:

- Electro Magnetic flow meter
- Ultrasonic flow meter
- Differential pressure type flow meter
- Turbine flow meter

Setting Position:

- Transmission volume (Flow from Purification plant)
- Receiving volume (Flow from Bulk supplier such as Rand water)
- Distribution volume (Flow from Reservoir or DMA)

Question and Answer

A 09 - 123

Core Characteristics for Good Metering

4.2

Measuring Range (Turndown Ratio) gives an indication of the lowest flow rates attainable. Higher R value denotes better meter

4.3

Correct installation-prevents damage to metering components and ensures that the metering components perform as designed

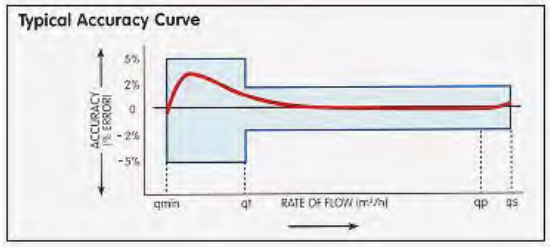
4.4

Accurate **meter reading** (inaccurate readings reduce billing accuracy, which affects revenue generation!

4.2 Meter Accuracy

-Meters have permissible range of error in Standard specifications. It can mitigate proper selection of meter size.

-Inaccuracies in meters tend to increase with age.



Source: web

Definitions

Q4/Qs – Maximum flow rate (Overload Flow Rate): The highest flow rate at which the meter operate(within the required accuracy) for a short period without permanent damage to its accuracy (±2% error).

Q3/Qp – Permanent flow rate: Permissible continuous load. Half the maximum flow rate (± 2% error).

Q2/Qt – Transitional flow rate: The flow rate at which the maximum permissible error of the water changes in value from ± 5% error to ± 2% error.

Q1/Qmin – Minimum flow rate: The lowest flow rate at which the meter is required to give indications within the maximum permissible error tolerance (± 5% error).

*(Q1-Q4 in the new international standards)

4.2 Meter Accuracy

Cause of Meter inaccuracy

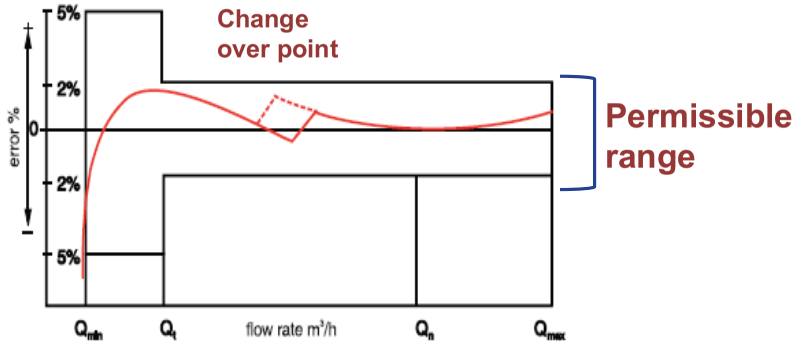
- Inadequate size and class of meter installation(Large meter will not register low flows)
- Meter not installed properly according to the manufacturer's specification.(straight pipe length, horizontal installation only. Poor plumbing prat)
- Sediment to form the internal parts of meters(poor water quality)
- Damage by intermittent water supply(certain volume of air, sudden large increase in pressure)
- Aging of meter
- Meter tampering

4.2 Meter Accuracy

Meter accuracy curve-2 (combination meter)

-Improve an unregistered flow amount by two different size meters

- Combination meter accuracy curve



Increasing flow ——— Decreasing flow - - - - - -

Source: [Water Meter Training Manual]

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4.2 Meter Accuracy

Meter class

- Water meters classified as Class A, B, C , D
- Class B, C, D are allowed install in SA for measurement of customer water consumption

4.2 Meter Accuracy

15mm meter performance by Class

- Meter classes are defined by range from Qmin to Qt (Q1 to Q2)
- It means that all classes have same accuracy but classified according to differences in the range that can be measured accurately

CLASS	ℓ/h	(Qmin ± 5%) Minimum Flow Rate	(Qt ± 2%) Transitional Flow Rate	(Qp ± 2%) Permanent Flow Rate	(Qs ± 2%) Maximum Flow Rate
A	ℓ/h	60	150	1 500	3 000
B	ℓ/h	30	120	1 500	3 000
C	ℓ/h	15	22.5	1 500	3 000
D	ℓ/h	11.25	17.25	1 500	3 000

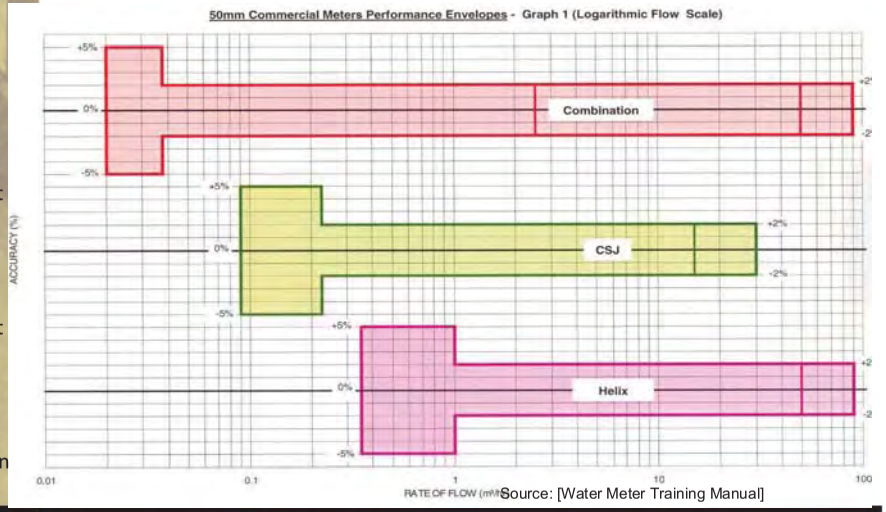
This range

Source: [Water Meter Training Manual]

4.2 Meter Accuracy

Selection of water meter type
Three types of 50mm meter performance sheet

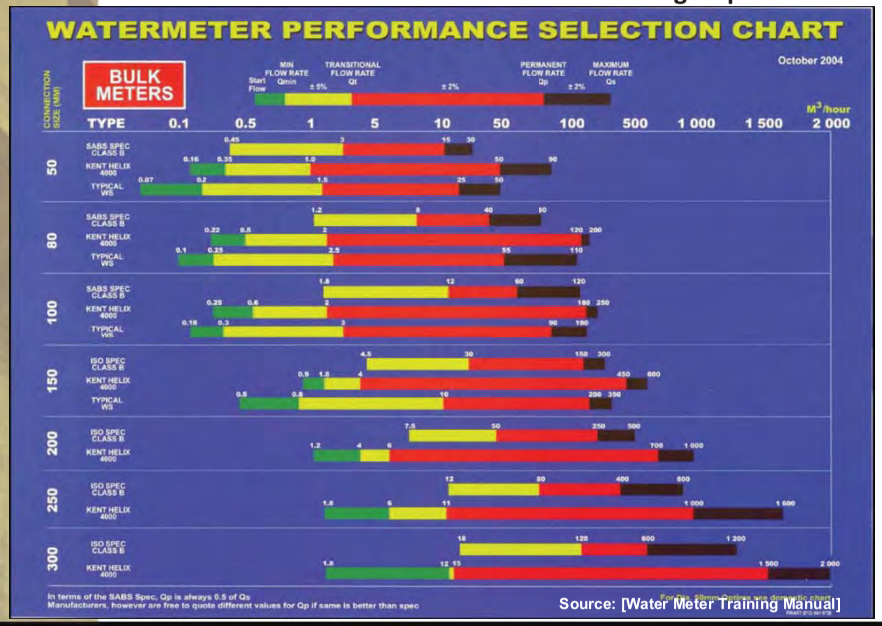
If the flow rate is very different such as between day and night, and it is thought that a large size meter cannot supplement the small flow rate, it is desirable to select a combination meter



Source: [Water Meter Training Manual]

4.2 Meter Accuracy

Meters should be selected its size and class considering its performance

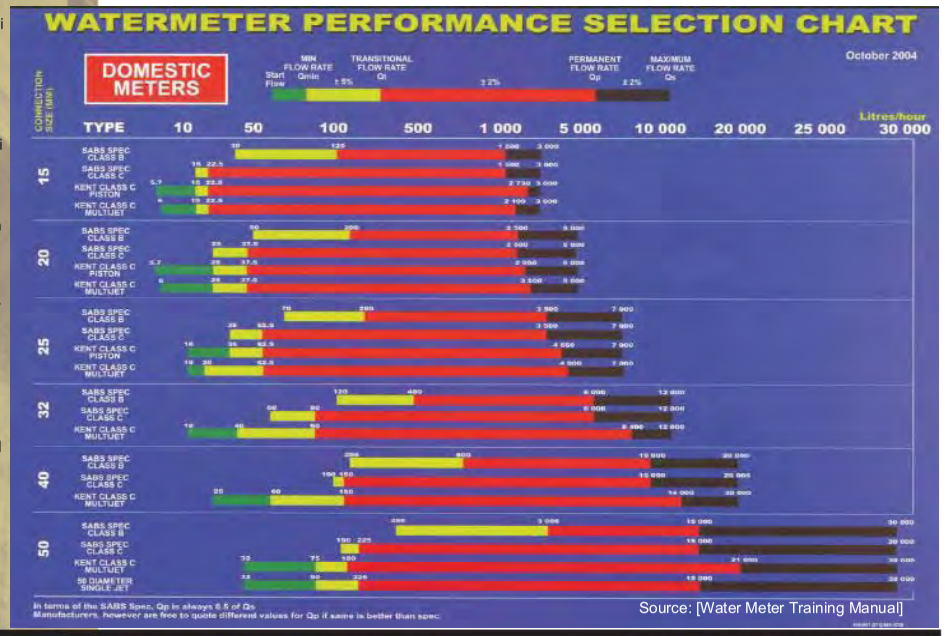


A 09 - 125

4.2 Meter Accuracy

Meters should be selected its size and class considering its performance

Mechanical water meters as with all mechanical devices wear out with use. Water meters therefore have a working lifespan of 10 ± years once installed.



4.2 Meter Accuracy

Customer (Domestic) Meters

Role of customer meters:

- Metering provides an equitable basis for charging consumers based on the amount of water that they consume. It also allows cross-subsidisation to be done fairly, and needy consumers to receive a free basic amount of water.
- Metering shows the value of water to the consumer and creates strong incentives for consumers to use water more efficiently.
- Measured consumption forms the basis of most water accounts, and thus affects municipal revenue directly — water meters are the cash registers of water suppliers.
- Many of the technical benefits of water meters, such as accurately measuring municipal water purchases, reducing water losses, and identifying and removing illegal connections.
- The demand data is critical to building accurate computer models for simulating water distribution systems.

Types of customer meter:

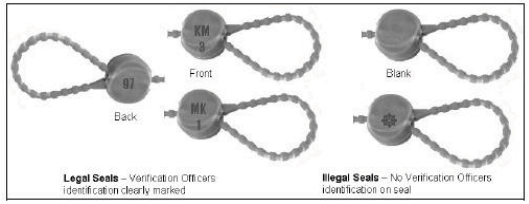
- Displacement (Volumetric) meter
- Velocity meter (turbine meter)
- Ultrasonic
- Electromagnetic
- Advanced meters: Prepaid meter and Automatic Meter Reading meter (AMR)

4.2 Meter Accuracy

Legal Requirements

- New water meters must be approved by the legally recognized agency, South African National Standard (SANS) Specifications 1529-1.
- Water utility must be able to confirm the meters approval number and Lead Seal.
- Where meters have been exempted from compliance with SANS 1529 (various parts), an exemption letter from the SABS shall be submitted





Source: Water Meter Training Manual

Drill

Water Meter Selection

- Municipality must have a policy on water meter selection.
- Water meter must be correct size
  - Is the meter rated for the expected flow rates and operating conditions?
  - Which is most economical meter to use?

A 09 - 126

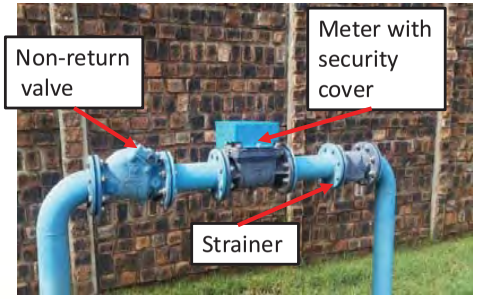
Question and Answer

4.3 Meter Installation

Meter above the ground

- -Typical above ground brass domestic meter installation- a lot of Municipalities moving away from these installations due to theft.
- -Larger domestic or industrial Meter installation- meter with security cover, strainer upstream with none-return downstream. Installation should have up and downstream isolating valves.
- -Multi-jet meters are approved for horizontal installation only.





4.3 Meter Installation

Meter Box

- -The first step in a meters service life is the installation and if done to manufactures specification and good plumbing practice the service life of that meter will be much shorter.
- -Orientation of the meter installed is very critical,- a **multi-jet meter** should always be installed in a horizontal position with the register facing upwards and **never in a vertical position!!**
- -Typical meter plastic box installations: Above and below ground installations(problematic- filling soil, dirt or rubbish and taking readings difficult)
- -Meter chambers: heavy lids, making readings difficult











4.3 Meter Installation

- Recommended straight pipe length from the meter.
- -Length depends on meter type.
- -Domestic meters in the box do not need to consider spacing



Upstream → Downstream



10 x Ø		Old Meters	5 x Ø	
	5 x Ø	Most Makes	3 x Ø	
	3 x Ø	WPD	No abrupt restriction	
No Straight pipe		Combo	No Straight pipe	
	5 x Ø	Magnetic	3 x Ø	
Up to 40 Ø (Depending on restriction)		Ultrasonic	3 x Ø	

Question and Answer

4.4 How to read Meters

Drill

There are some type of indicator, analog, digital and combined. Staff must be able to read to the last digit.(?)

Digital and mechanical(Analog) type





146.206m3





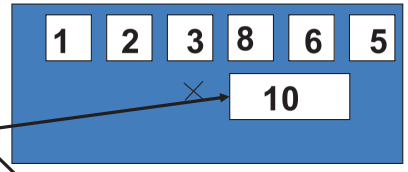
Source: [Water Meter Training Manual]

4.4 How to read Meters

Drill

Meter Reading:

- Record all numbers including 0
- Ensure reading is right way up.
- Record Meter Factor (1 / 10 / 100)

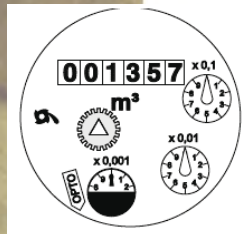




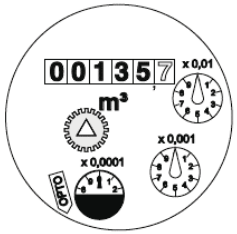
4.4 How to read Meters

Drill

For a Combination meter, both registers must be added together.



Main meter



By-pass meter
(type 612MTW-HRI)



Source: [Water Meter Training Manual]

1357.0 + 135.70 = 2714.7

4.4 How to read Meters

Cause of Meter Reading Error

- Meters not install properly
- Stained glass of register
- Algae growth inside of the glass of meter(wet dial meter)
- Incompetent or inexperienced meter reader
- Corrupt meter readers

Question and Answer

water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

SALGA
Inspiring service delivery

Japan International Cooperation Agency
JICA

Problem identification for NRW reduction (through DMA activities)

And

Workplace Training

The National
Non-Revenue Water (NRW) Training
for Municipalities by Municipalities
in South Africa

A 09 - 129

Contents

(1) Outline of Problem solving

(2) DMA

(3) Drop Test

(4) Step Test (MNF Step Test)

(5) Billing data analysis

How to grasp the NRW situation

(6) Introduction of Workplace Training

(7) Summary of Problem identification for NRW reduction

(1) Outline of Problem solving

Drill

(1) Problem solving...

- What is your problem?
- Why that is problem?
- Why do you feel that is problem?
- Which part do you feel the most problem in the problem?
- In which part is most critical part in the problem in the problem ?

The 8 steps for problem solving

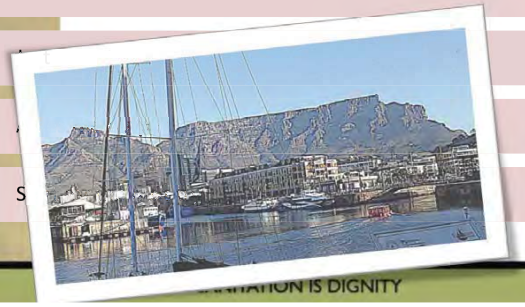
- Start from the Purpose
- See what's actually happening
- Understand the root cause (=problem)
- Confirm which tools or resources you have
- Select the way to solve the problem (to improve 80%)
- Just do it
- Asses the output
- Start for the next try

A 09 - 130

The 8 steps for problem solving

EX-1:Your family case

- Start from the Purpose — **Family trip to CT! (Need R2400 !!)**
- See what's actually happening — Crucial! **Check wallet** | **Check bank account** | **Check bills not yet paid** | **Check shopping list**
- Understand the root cause (=problem)
- Confirm which tools or resources you have — **Just the monthly salary...**
- Select the way to solve the problem (to improve 80%) — **Make a decision:**
- Just do it
- Asses the output — **The output: "How much money saved?"**
- Start for the next try





The 8 steps for problem solving

EX-2:Water Utility



- Start from the Purpose — **Water saving, Revenue generation => Sustainability**
- See what's actually happening — **DMA** | **DROP TEST**
- Understand the root cause (=problem) — **MNF STEP TEST** | **BILLING DATA ANALYSIS**

Crucial! To know your status quo

- Confirm which tools or resources you have
- Select the way to solve the problem (to improve 80%) — **PRESENTATION, DESISION MAKEING**
- Just do it
- Asses the output — **PRESENTATION, DESISION MAKEING**
- Start for the next try



The 8 steps for problem solving

EX-2:Water Utility



- Start from the Purpose — **Water saving, Revenue generation => Sustainability**
- See what's actually happe ng — **DMA** | **DROP TEST**
- Understand the root caus (=problem) — **MNF STEP TEST** | **BILLING DATA ANALYSIS**
- Confirm which tools or re urces you have
- Select the way to solve th problem (to improve 80%) — **PRESENTATION, DESISION MAKEING**
- Just do it
- Asses the output — **PRESENTATION, DESISION MAKEING**
- Start for the next try

National NRW Training

The 8 steps for problem solving

- Start from the Purpose
- See what's actually happening
- Understand the root cause (=problem)
- Confirm which tools or resources you have
- Select the way to solve the problem (to improve 80%)
- Just do it
- Asses the output
- Start for the next try

It is not just one time, improvement system

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Question and Answer

(2) DMA

Contents

- Purpose of the DMA
- How to make the DMA
- Drill-1 DMA creation on the sample maps.
- Confirmation method of hydraulic separation
- Q & A

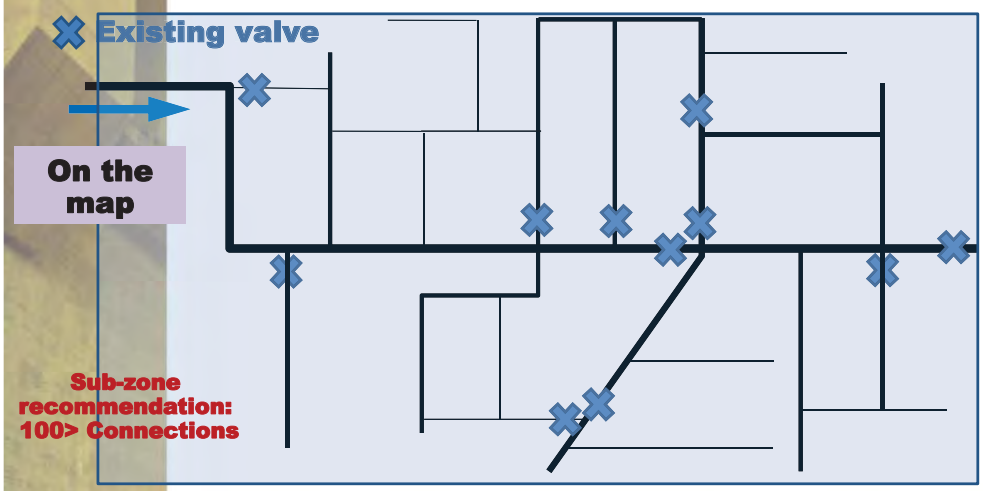
Purpose of the DMA

Why supply areas are segmented as DMAs? What is the purpose of DMA?

- To ease water supply management, such as water supply volume, water pressure.
- In large supply area it has a difficulty to find what is the reason of NRW affected in detail. The smaller the area, the easier to find the reason for the most impacted on high NRW ratio.
- In DMAs, System Input Volume (SIV) measurement is carried out to know the important factor of NRW.
- And it is possible to measure the amount of water leakage by the Minimum Night Flow(MNF) measurement.
- It is easy to identify the required WDM interventions to reduce non-revenue water in each DMA.
- To enable better management of water supply systems as any future changes.

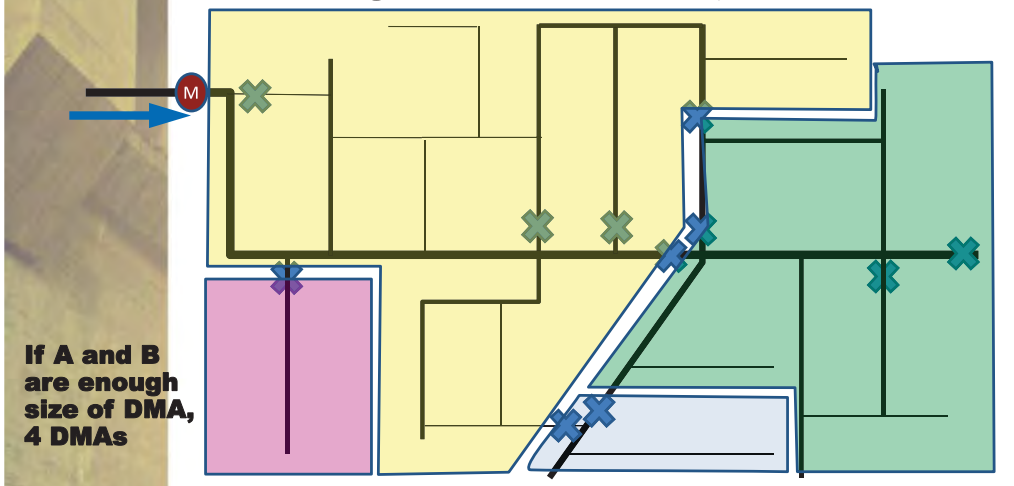


How many Sub-zones can be established in this DMA? Drill



How many Sub-zones can be established in this DMA? Drill

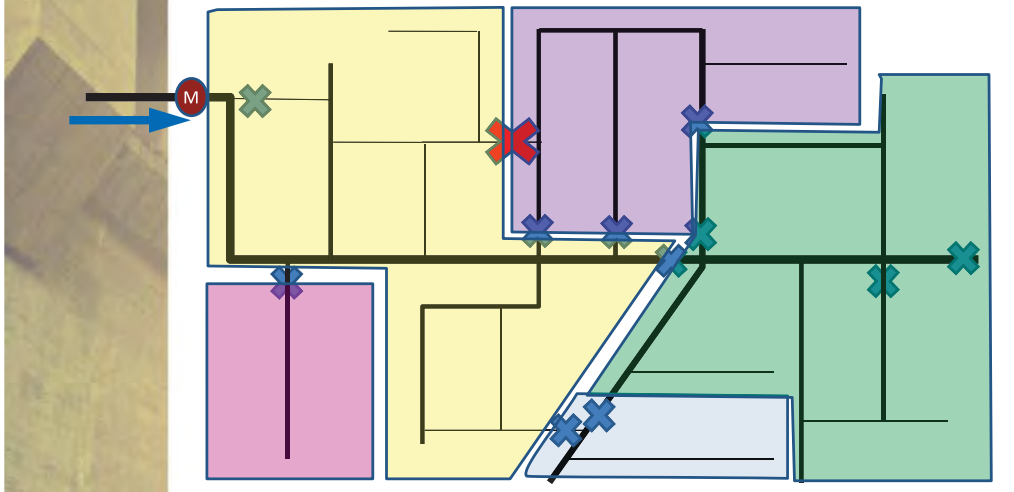
Exiting facilities: 0 Valve, 4 Sub-Zones



4 sub-zones can be established by existing valves.

How many Sub-zones can be established in this DMA? Drill

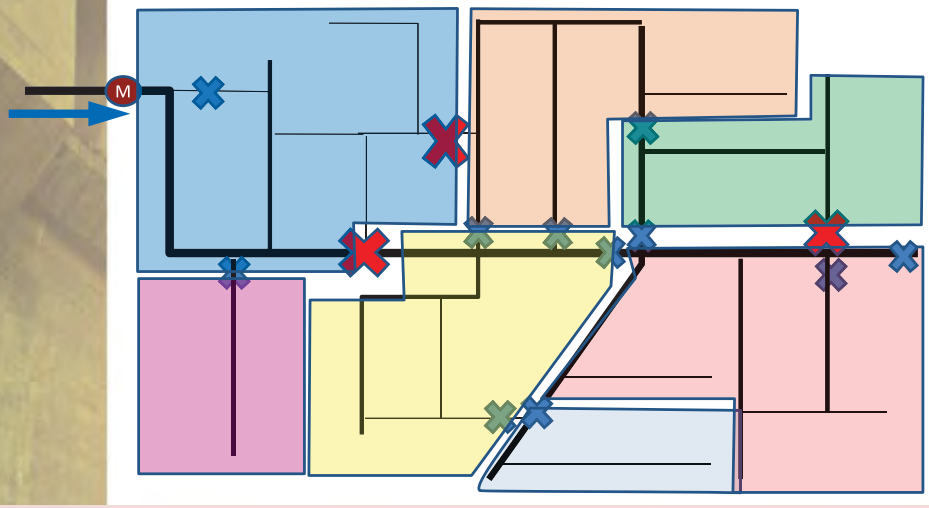
New 1 Valve, 5 Sub-Zones



5 sub-zones can be established by 1 new and existing valves.

How many Sub-zones can be established in this DMA? **Drill**

Add other 2 new valves, 7 Sub-Zones



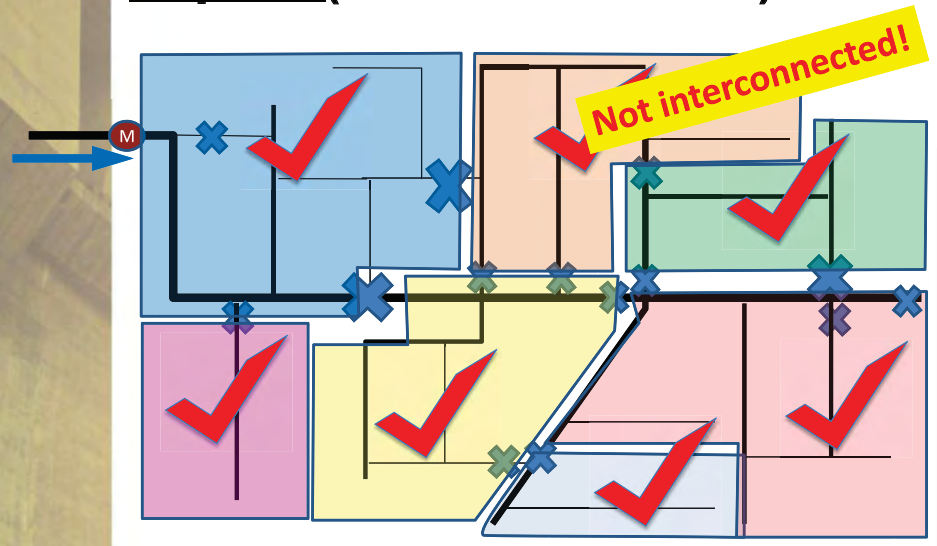
7 sub-zones can be established add 3 new valve and existing valves

(3) Drop Test

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Question and Answer

Confirmation method for hydraulic separation:
Drop Test (Zero '0' Pressure Test)



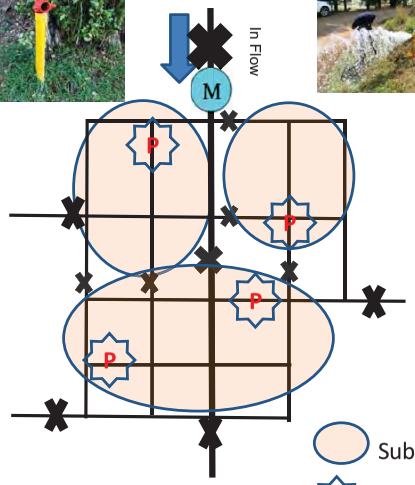
Drop Test = Crucial preparation for MNF, Step test)

Confirmation method for hydraulic separation: Drop Test (Zero '0' Pressure Test)





- Close all boundary valves and close inlet valve for DMA, then check water pressure at some points in the DMA.
- The easiest way is to open fire hydrant of the highest point in the sub-zones.
- It needs consideration the contour of the pipe network etc.



A 09 - 134

Question and Answer

(4) Step test (MNF Step test)

Purpose of the Step test

- Main purpose is narrow down the leak occurring area.
- The advantage of this method is to shorten the time for finding leak points
- It becomes possible
- This enables to select the sub-zone or pipelines where detail water leakage investigation should be prioritized.
- It makes possible to do efficient water leakage investigation

Before conduct Step test you need to know when MNF apereas.

If the MNF occurring period is rather long, doing a step test during that time is most efficient way to identify critical sub-zones.



*Step test can be done using existing resources.

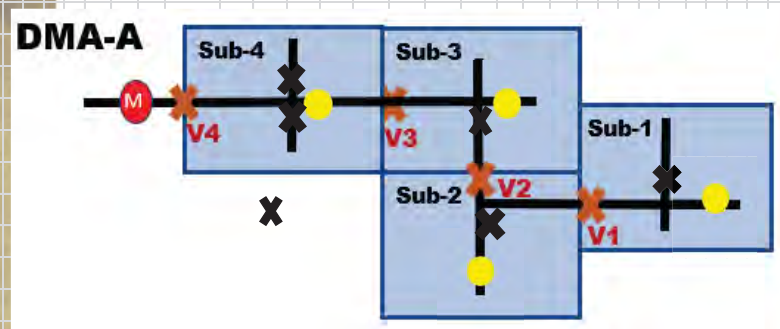


Drill: Step Test

Drill

- Model DMA: **What order of valve operation is correct?**

Operation Valve
Existing valve
=Pressure logger

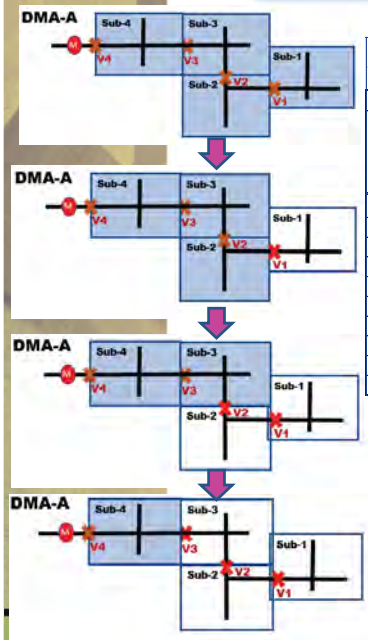


A 09 - 135

Drill: Step Test

Drill

Calculate the deference of each step!



Record Table for Step Test

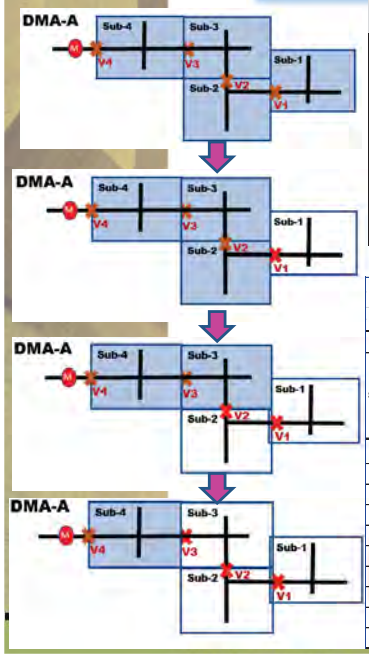
DMA No. : DMA-A
Working Date(Time) : 20/02/2020
Responsible Personnel : HIROYUKI MORITA

Step No.	Operation: Closing Valve ID	Operation: Openning Valve ID	Operation: Time of Valeve Operation	Record: Subsection No.	Pressure(Bar): Before Valve Operation	Pressure(Bar): After Valeve Operation	Pressure(Bar): Diffrence	Flow(m3/h): A:Before Valve Operation	Flow(m3/h): B:After Valeve Operation	Flow(m3/h): A-B: Diffrence	Remark
	-	-	-	MNF				MNF200 m3/h			
1	V1		1:30	1				200			
2	V2		1:45	2							
3	V3		2:00	3							
4	V4		2:15	4							
5	Open valves	V4	2:30								
6		V3	2:40								
7		V2	2:50								
8		V1	3:00								

Drill: Step Test

Drill

Calculate the deference of each step!



Record Table for Step Test

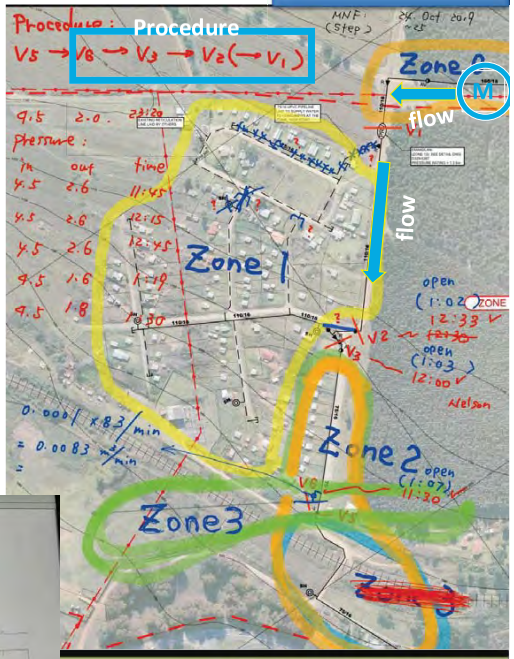
DMA No. : DMA-A
Working Date(Time) : 20/02/2020
Responsible Personnel : HIROYUKI MORITA

Step No.	Operation: Closing Valve ID	Operation: Openning Valve ID	Operation: Time of Valeve Operation	Record: Subsection No.	Pressure(Bar): Before Valve Operation	Pressure(Bar): After Valeve Operation	Pressure(Bar): Diffrence	Flow(m3/h): A:Before Valve Operation	Flow(m3/h): B:After Valeve Operation	Flow(m3/h): A-B: Diffrence	Remark
	-	-	-	MNF				MNF200 m3/h			
1	V1		1:30	1	4	4	0	200	180	20.00	3
2	V2		1:45	2	4	4	0	180	170	10.00	4
3	V3		2:00	3	4	4	0	170	130	40.00	2
4	V4		2:15	4	4	4	0	130	55	75.00	1
5	Open valves	V4	2:30								
6		V3	2:40								
7		V2	2:50								
8		V1	3:00								

How to conduct step test

Example

1. Attach data logger to the flow meter of DMA inlet
2. Start to shut off valves from farthest part from the flow meter
3. Close boundary valves one by one of each sub-zone (keep flow logging).
4. Wait 5-30 minutes for each step until flow and pressure would be stabilize. The waiting time depends on size of the sub-zone.
5. When all area have completed, reopen the valves in reverse order.





Question and Answer

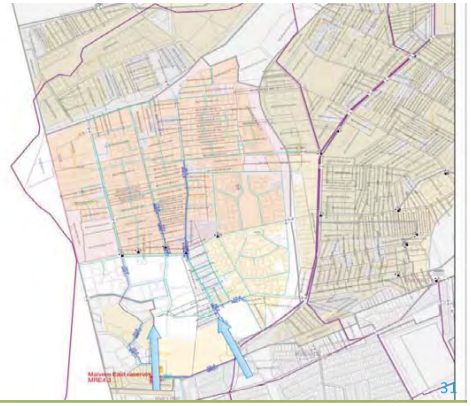
Case example of Actual work

Zone configuration(Drop Test),
MNF measurement, and Step Test

3-1 Zone configuration & MNF



Ex: Germiston, CoE













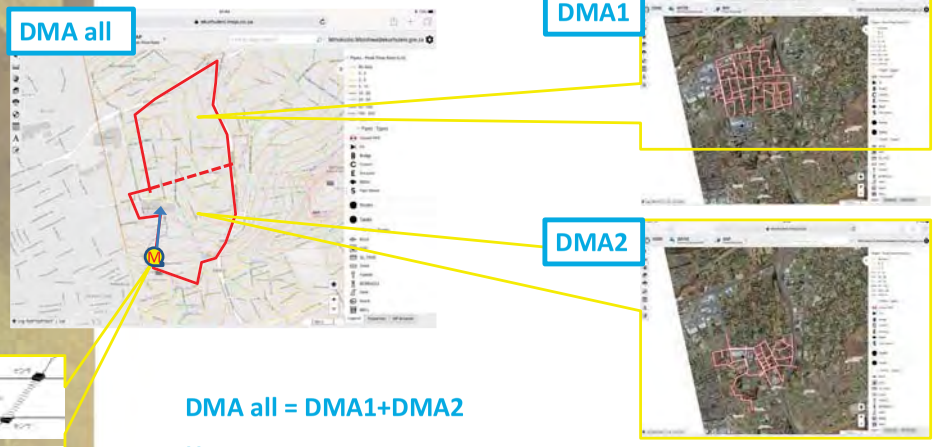
A09-L3T

3-1 Zone configuration & MNF

Procedure for measurement a DMA

- "Divide and measure, each small DMA"





DMA all = DMA1+DMA2

Hence,

∴DMA all – DMA2= DMA1

3-1 Zone configuration & MNF Procedure for DMA measurement

A. **Before four weeks: - Planning and awareness**
   1) Confirm how to shut into areas. Make the procedure on the map
   2) Inform to residents with flier: "water outage and turbid on ◯◯th Sep. 2018."
   3) Inform to company or apartments managers who have tanks

B. **Before two weeks: - Awareness and Confirm the procedure**
   1) Inform to residents again "water outage "
   2) Confirm the procedure within the team

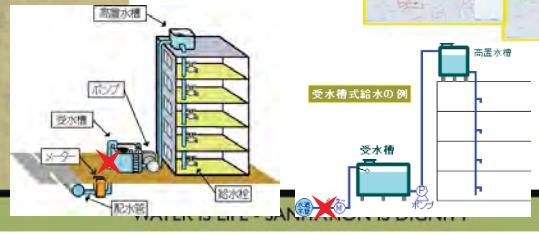
C. **before one week: water outage 11pm-6am - Rehearsal and repair** ⇦ Drop Test
   1) Shut into areas on the site (confirmation)
   2) If improperly valves or facilities, fix or replace before the day

D. **The day: water outage 11pm-6am - Measurement** ⇦ MNF measurement
   1) Install area meter(s)
   2) Close the area and measure
   3) Divide into more small areas and measure
   4) Divide into more small areas and measure

Procedure for measurement a DMA (case of TOKYO Metro)

A. **Before four weeks:**
   1) Confirm how to shut into areas. Make the procedure on the map
   2) Inform to residents with flier: "water outage and turbid on ◯◯th Sep. 2018."
   3) Inform to company or apartments managers who have tanks





Procedure for measurement a DMA (case of TOKYO Metro)

B. Before two weeks:

1) Inform to residents again “water outage ”
2) Confirm the procedure within the team

Dear customers,

“owing to repair work on the service pipe, watersupply will be cut off from 11p.m to 6a.m. in the following areas”
And after repair work please run off the water first few minutes because of it must be turbid”

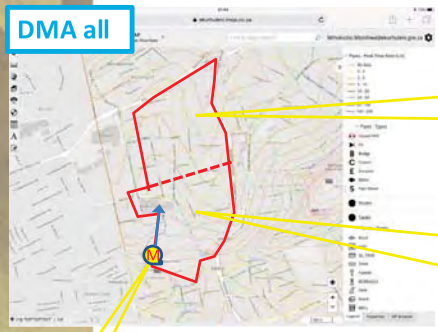


Procedure for measurement a DMA
(case of TOKYO Metro)

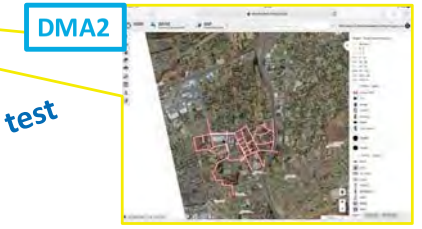
D. The day: water outage 11pm-6am ⇦ MNF measurement

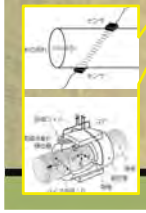
1) Install area meter(s)
2) Close the area and measure
3) Divide into smaller areas and measure
4) Divide into smaller areas and measure











⇦ Step test

DMA all = DMA1+DMA2

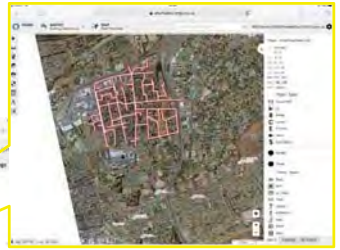
Hence,
∴DMA all – DMA2= DMA1

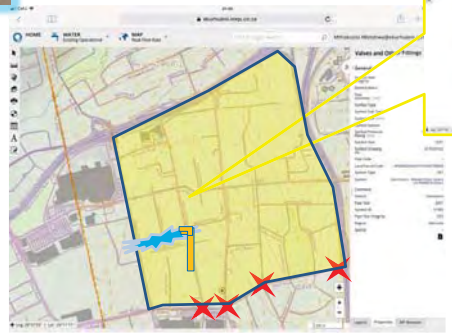
Procedure for measurement a DMA
(case of TOKYO Metro)

C. Before one week: water outage 11pm-6am ⇦ Drop Test

1) Shut into areas on the site (confirmation)
2) If improperly valves or facilities, fix or replace before the day



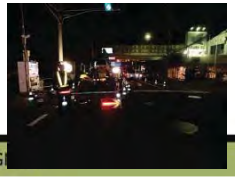






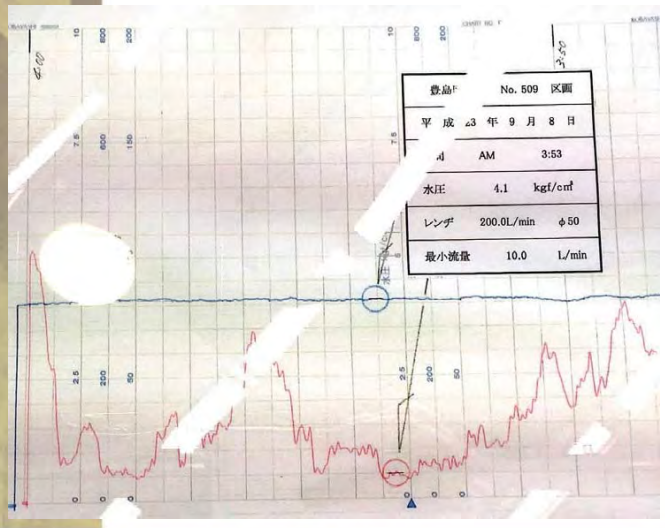






Procedure for measurement a DMA
(case of TOKYO Metro)

What is actual MNF like ?



- Tokyo Metro
- 500 connection
- 10min data

=> Need precise measurement interval (/sec)

A 09 - 138

Conclusions

- Step-testing is the process of localizing leakage into specific pipe segments of the distribution system for leak detection works and subsequent repair works and pipe replacement.
- Presented an efficient approach to optimally identifying pipes with suspected leaks by field testing
- The leak in a pipe segment is determined by analyzing the rate of change in field measures

A 09 - 139

Question and Answer

(5) Billing Data Analysis

Aims of the Module

- **To understand the types and sources of inaccurate data of customer billing records. (Finding causes of error and correction method will be conducted 2nd IBTC training program)**
- **To understand illegal water use**

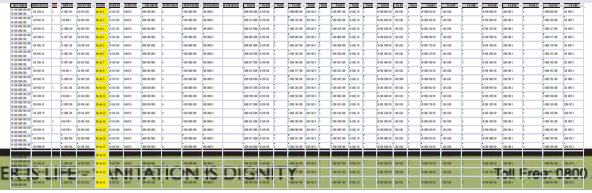




Data verification and processing

- To deal with customer bills and NRW analysis, customer consumption record is the essential database.
- However, the databases are often not as accurate.
- It is important to know where to look in the data to see inaccuracies, how to check, and how to fix it into usable data.

How to get correct and accurate customer consumption data for NRW calculation?
Which department does supply the data?
What do you think about data reliability?



Causes of data errors and how to fix

- **A missing of data** exists on the system, but no or too few water meter readings are available to estimate its consumption.
- **Inconsistent dates**. The system could not determine the order in which the readings took place due to date inconsistencies.
- **Spikes or dips in consumption**. Abnormally high or low consumption for a stand are often signs of errors in the meter readings.
- **Missing readings**. Where no readings are available for the last month, the system has to estimate consumption based on the consumption history for the stand.
- **Long gaps in the meter reading**. When a meter has not been read for a certain number of months (typically 3), consumption estimates become uncertain and an instruction should be given for a reading to be taken.
- **Incorrect data** needs to be corrected as much as possible for more accurate NRW calculations. The Municipalities need to decide in advance how to deal with the incorrect data if it found. Because some of them can be corrected with a software system, adoption such system should be considered.

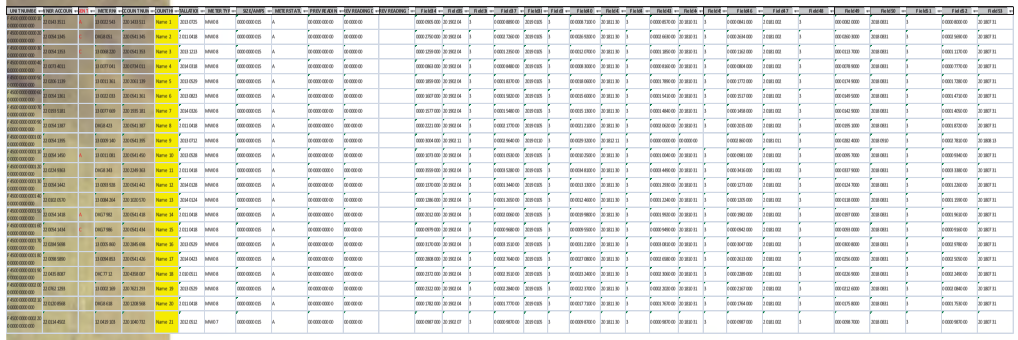
- **A meter clock-over that will cause a very large water reading one month to be followed by a very small reading the next. It is important to include information on the number of digits on the indicator to identify meter clock-overs.**



Drill

Data analysis (sample data)

- **Extract sample data from the original database**
- **100 customers, 12 months meter reading data**



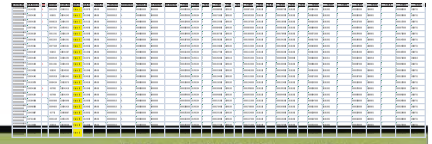
Drill

0. How to find suspicious data

- As a first step, it is necessary to check whether all the people using water are registered as customers.
- It is desirable to investigate with meter readers

1, Investigation of low consumption customers
  - Low consumption data imply illegal use sometimes.
  - Field investigation and interview to the customer are required after listed up suspicious customers.

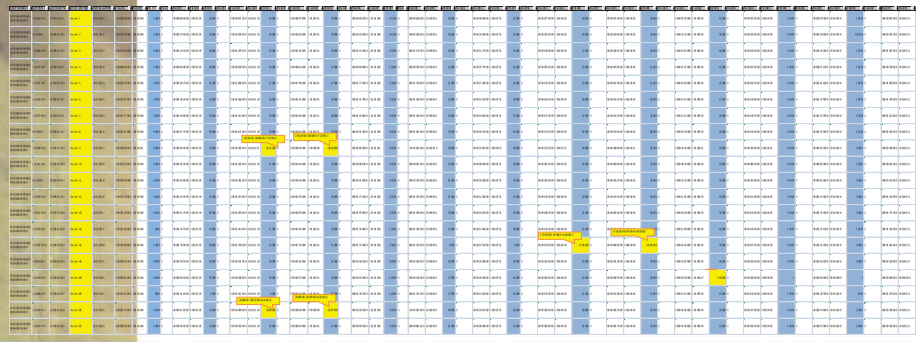
2, Data survey: Determine the amount of standard water consumption to be classified.
  - This is also influenced by the living environment of the area, so consider the situation carefully and decide.
  - List up low consumption customer



1. calculate monthly billed water
Calculate maximum, minimum and average data

Drill

- Insert columns and calculate monthly billed water
- Calculate maximum, minimum and average data and display on screen
- To get average, some number of consumption data such as '0' or extremely high amount would be eliminated.
- Finding suspicious data: 0 or minus(-) consumption, too much consumption



A 09 - 141

(Ans.) 1. calculate monthly billed water
Calculate maximum, minimum and average data

Drill

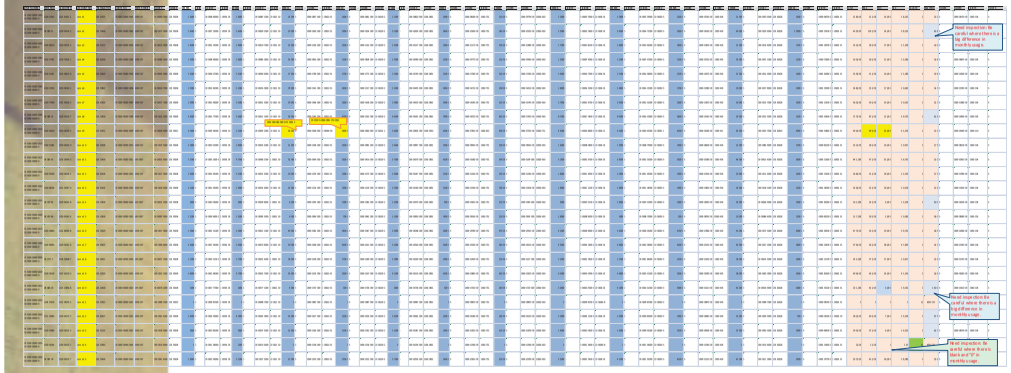
- Excel function ;=MAX(AJ2:AJ103), =MIN(AJ2:AJ103), =AVERAGE(AJ2:AJ103)
- Find the abnormal value from them. Too much Max data, Too little Mini data

20190204	16000	3		00000820000	20190108	26000	3	00000794000	20181130	21000	3	00000773000	20181031	22000
20190204	53000	3		00001269000	20190105	57000	3	00001212000	20181130	50000	3	00001162000	20181031	49000
20190204	25000	3		00001936000	20190105	29000	3	00001907000	20181130	21000	3	00001886000	20181031	20000
20190204	22000	3		00002492000	20190105	29000	3	00002463000	20181130	18000	3	00002445000	20181031	17000
Max	119,000					152,000				3,089,000				109000
Min	0					0				0				-3007000
Ave	23,490					28,176				80,980				-37227.723

2. Big difference in monthly usage

Drill

- Finding suspicious data: Customer monthly data with a large difference between the consumption of the maximum and minimum monthly data



(Ans.) 2. Big difference in monthly usage

Drill

- Finding suspicious data: Customer data with a large difference between the consumption of the maximum and minimum monthly data
- Data with a difference of 4 times or more

(There is no particular reason for quadrupling)

Total	Max	Min	Ave	Count 0	Max/Mi
218,000	21,000	14,000	18,167	0	1.50
459,000	105,000	24,000	38,250	0	4.38
252,000	28,000	17,000	21,000	0	1.65
		11,00	3,583	0	1.64
		,000	21,583	0	1.94
		17,000	20,667	0	1.47
			0,250	0	2.17
717,000	87,000	21,000	59,750	0	4.14

Need inspection: Be careful where there is a big difference in monthly usage.

Collection of customer data

For the Workplace Training

1st Half Workplace Training (Baseline)

- What kind of customer data is required?
  - Billed Authorized Consumption
  - Existing consumption data as up to date as possible
  - 12 months (1 year) data is recommendable

A 09 - 142

Question and Answer

(6) Introduction of workplace Training

"Learn practical O&M skills completely through DMA; Small Pilot Area"

Let's not only reduce NRW but also get back trust for our water service!

The Procedure of 1st-Half Workplace Training (for grasping Baseline)

1) Zone configuration in DMA(Sub-section) to get findings (Interconnection of pipes, position of valves)

2) Identification of problematic sub-section(s) by flow logging data

3) Analysis of Billing data and calculate NRW from Current SIV

4) Finding problems in O&M and Billing

In the first Workplace training, collect customer billing data from finance section which is required for calculating the baseline NRW ratio.

IWA Water Balance Process (in SA)

A. Determine System Input Volume (SIV)
(Reading data of purchase water, outflows from WTWs, boreholes, etc.)

↓

B. Determine/Estimate Billed Authorized Consumption: Revenue Water
(Metered / Unmetered)

A (SIV) - B (Revenue Water) = NRW

C. Determine/Estimate Unbilled Authorized Consumption
(Metered / Unmetered)

↓

D. Estimate Commercial Loss
(Unauthorized consumption, Customer meter inaccuracy)

↓

E. Estimate Physical Losses
Physical Losses (Leakages) = NRW - C - D

A 09 - 143

Water Balance in our DMAs to reflect Reality

A. Determine System Input Volume (SIV)
(Bulk flow measurement)

↓

B. Determine/Accurately-Estimate Billed Authorized Consumption: Revenue Water
(Metered / Unmetered)

A (SIV) - B (Revenue Water) = NRW

Physical Loss

D. Determine Physical Loss ⇦ *Easiest to measure*

Minimum Night Flow = Leakage *There is possibility of inclusive of small consumption and domestic leaks.

Apparent Loss

C. Determine/Accurately-Estimate Unbilled Authorized Consumption
(Metered / Unmetered)

E. Accurately-Estimate Commercial Loss
Commercial Loss (Unauthorized consumption, Customer meter inaccuracy) = NRW - D - C

What will happen in the Workplace Training?

- ✓ 1. Select Pilot Focus Area (Pilot Area) --- on the Map
- ✓ 2. Make ideal sub-zones /District Metered Area --- on the desk
- ✓ 3. Zone configuration(sub-zones in the pilot DMA) --- **Drop Test**
- ✓ 4. Flow measurement --- **MNF, Step Test**
- ✓ 5. Analyze the MNF, Step Test data

Get foundational skills to tackle NRW using Pilot DMA !!!

✓ 1. Select a Pilot Area

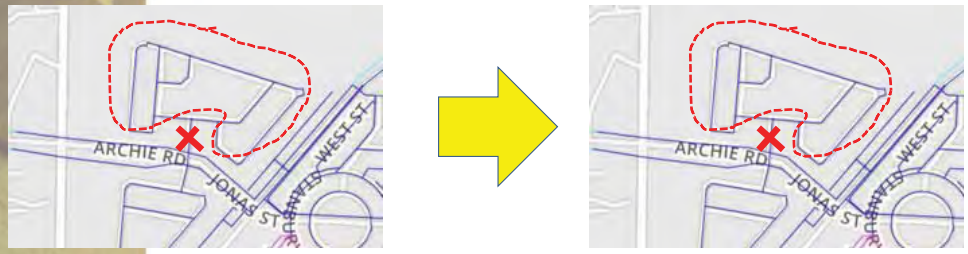






Just select service area which has same character and the number of connection < 100.

✓ 2. Make ideal sub-zones /District Metered Area --- on the desk



✓ 3. Zone configuration(sub-zones in the pilot DMA) --- Drop Test

- Drop test (DMA & each every zone)













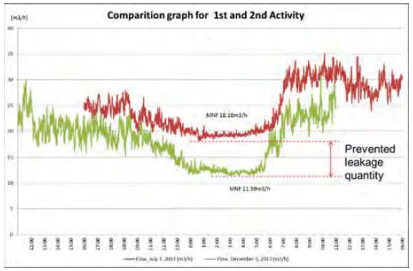
A 09 - 144

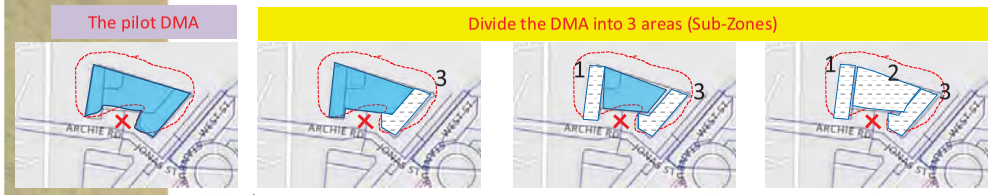
✓ 4. Flow measurement --- MNF, Step Test

- Conduct MNF, Step Test

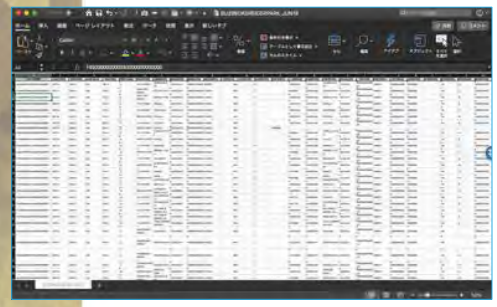








✓ 5. Analyze the MNF, Step Test data (Collect and analyze the billing data as well)







Why do we start DMA from small Pilot?

- ✓ 1. Small start => No pain! No special cost
- ✓ 2. Even we can't reduce NRW in small area, how can we achieve wider complicated area?
- ✓ 3. DMA requires us to enhance reticulation management skills => O&M upskill
- ✓ 4. Small DMA gives us concrete result

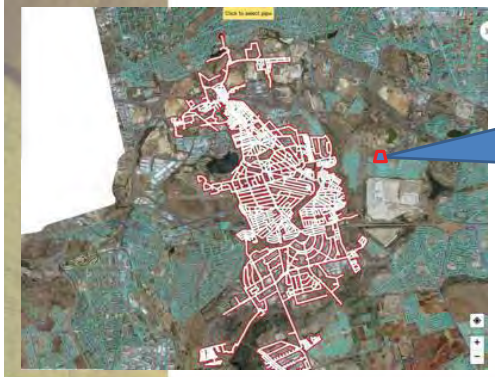
A 09 - 145

✓ 1. Start from small area => no pain!



We've already have our own valves, fire hydrants, pipes, and water.
Just we need a data logger.

✓ 2. Even we can't reduce small area's NRW, How can we achieve wide complicated areas?





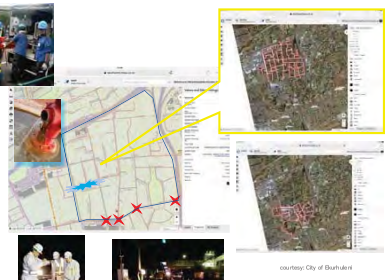
We can learn from each pilot activity and improve.

✓ 3. DMA request us to enhance reticulation management skills => O&M upskills

Municipality must operate reticulation properly;

- Valves, Meters, Air valves, Fire hydrants, Cleaning valves, PRVs, Loggers, Communication tools





Municipality must understand reticulation properly;

- Flow Direction, Velocity, Water Pressure, Topographical feature, Land use, the Community,











✓ 4. Small DMA gives us specific result

"What is the main cause of your NRW?" Can you explain?



- ✓ How much water have saved
- ✓ How much commercial loss have reduced
- ✓ How much water purchase from Water Board have saved
- ✓ How much NRW have reduced
- ✓ How our reaction time for next burst improved
- ✓ How much improved the rate issuing bills which is not based on "estimate"

Real loss?	Commercial loss?
Leakage in Household	No bill?
Service pipe?	illegal connection?
Main pipe?	No meter?



I have confidence & the proof!!



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Why don't we try to make & manage DMA!







All NRW management starts from here! Because, NRW represents your quality of skills for deliver water service.

There is no short cut !!

Hints!

- DMA size – under 100 connection
- Zone configuration
- Pressure measurement
- Precise MNF measurement (measurement period: within 1second)
- Measure(**Baseline**) – Take Measure(**Intervention**) – Measure(**Output**)!
- Meter selection – according to the flow rate
- Teamwork
- Image of flow to each zones

The facilitator Team support your WP activities.
No worry!!

How should we deal with these situation?

- The DMA which has two input line
- The boundary valve that doesn't work
- Over two story building (High building)
- Factories running even in the nighttime
- Houses which have water storage tank
- Bulk customer(School, Commercial complex, Factory)

Let's learn by doing!

(7) Summary of Problem identification for NRW reduction (through DMA activities)

A 09 - 147

Key Techniques

1. Zone configuration (Drop Test)



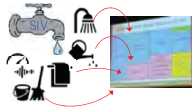

2. Measurement (MNF, Step Test)




3. Data Analysis (Billing data, Flow measurement data)



- ✓ **Confirm every time**
- ✓ **Log everything**
- ✓ **Safety first**



There is no shortcut to succeed! Practice makes perfect!

Question and Answer

water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

SALGA
Inspiring service delivery

Japan International Cooperation Agency
JICA

DATA LOGGING AND ANALYSIS

The National
Non-Revenue Water (NRW) Training
for Municipalities by Municipalities
in South Africa

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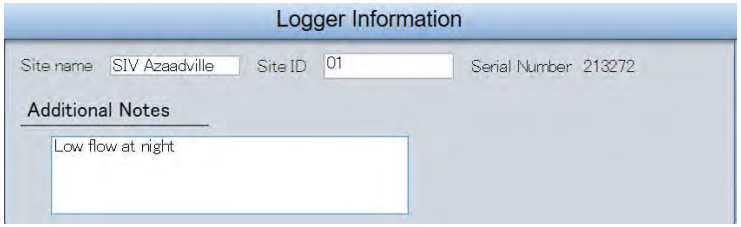
PrimeLog+ Basic Prgramming 1

1. Open Primeworks software and a PrimeLog + will automatically populate the Primelog+ control panel when connected via a communication cable



PrimeLog+ Basic Prgramming 2

2. Expand the Logger Informattion Tray and enter the following information



PrimeLog+ Basic Prgramming 3

3. Next stage is to define what is to be measured by expanding the channels tray.

To log flow,,,, Select Digital 1 Flow from the drop down menu and ensure the Enabled box is ticked. This a green circle in the drop down menu showing that this channel is enabled.



PrimeLog+ Basic Prgramming 3-2

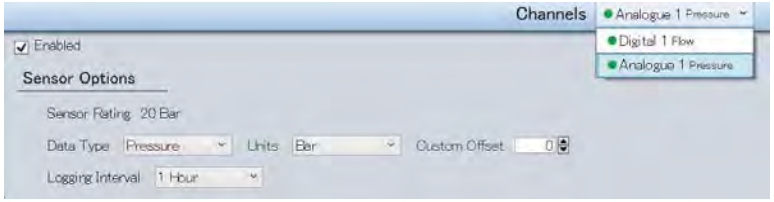
Select the type of pulse unit/meter being used form the sensor profile drop down menu. This will automatically populate sensor options with the appropriate settings. Alternatively if the pulse unit/meter being used is not predefined in the sensor profile list, then selecting custom will enable the options in sensor options for the user to customise accordingly. See below for guidance if sensor is not predefined.



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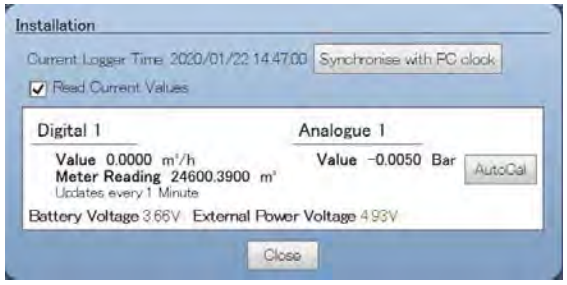
PrimeLog+ Basic Prgramming 4

4. And/or to log pressure…
Select Analogue 1 Pressure from the drop down menu and ensure the enabled box is ticked (see picture below). This circle in the drop down menu showing that this channel is enabled.



PrimeLog+ Basic Prgramming 5

5. Open the installation window to display real time values to provide a final check after the logger is connected to the flow meter and/or pressure tapping. It also provides an opportunity to check the clock matchs the PC time.



NOTE: Before connecting a pressure hose to the pressure tapping, ensure the AutoZero button is pressed to reset the transducer to zero.

PrimeLog+ Basic Prgramming 6

6. The logger settings can now be saved by opening the communication tray and either selecting:



1) Program All- This option will send the current selected programing settings to the logger, deleting all previous data from the logger (including synchronize with PC cleck).
2) Program changes only-this option will program only the changes made since the programming settings were read from the logger, meanng any data in the logger is still available for readback.

The logger is now ready for deployment.

PrimeLog+ Basic Prgramming 7

7. **Downloading Data**
   After retrieving the logger after it has finished logging the site, connect the logger to the PC and open PrimeWorks.Then click readback to download data into Primeworks for analysis.

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Primeflow T Quick Start 1



- **Select a measuring point with sufficient straight pipe to obtain accurate measurements. Please consult the manual for the recommended distances from sourc3es or disturbance.**
- **For a horizontal pipe, mount the sensors on the side of the pipe. For a verticfal pipe, moutn the sensors at a location wher the lquid flows upwards,. (pic1)**
- **Mount the sensors in the direction of the flow (pic2)**
- **Clean the pipe at the measurement point. Remove loose paint and rust with a wire brush or file.**
- **Apply coupling paste to the face of the clamp on sensors before attaching them to the pipe.**



Pic1



Pic2

Primeflow T Quick Start 2

- Show **NEXT(**1) available item
- **Qon** (2)=Start totalizer function
- Show next Display (3)
- **Qoff** (8) = Stop totalizer function
- **DIRECT** (9) access to trend plot
- Move menu / selection item **UP**
- Move menu / selection item **DOWN**
- **ESC**ape entry without saving
  Switch device OFF (press>2 sec.)
- =**Enter** or Switch device ON (press >2sec.)



Primeflow T Quick Start 3-1



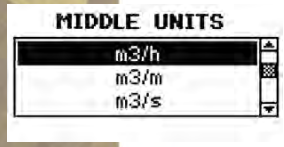


The flow meter can be prepared for measurement with the **Setup Wizard** as found in the **Quick Start Menu**.

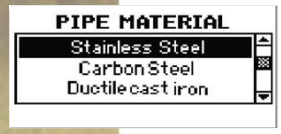
Upon first power on and the boot up sequence, The **Man Menu** is displayed. Use the **UP** and **DOWN** cursor keys to select **Quick Start** and confirm by pressing ENTER

Select **Setup Wizard** to set up the flow meter for measurement. If the sensors are recognized, the serial number will bee shown. If not, they can be selected.

Primeflow T Quick Start 3-2



Select the main measurement unit using the cursor keys and confirm with **ENTER**. This **unit** will be displayed in the middle of the measurement screen.
Selecting **OFF** deactivates the measurement channel.

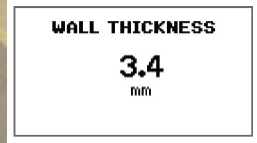


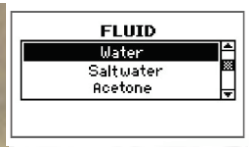
Select the **pipe material** using the cursor keys and confirm with **ENTER**.
Enter the outer pipe diameter using the keypad an confirm with **ENTER.** Use **UP** key as backspace to correct any entry errors. If is entered and confirmed, and additional screen appears that allows entry of the circumference. Press **ENTER** to confirm.

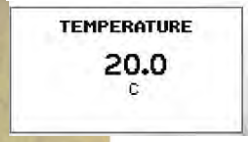


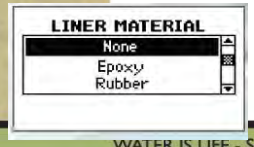
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Primeflow T Quick Start 3-3







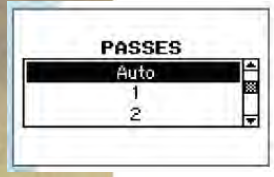


Enter pipe wall thick ness using the keypad and confirm with ENTER. Use Up key as a back stace to correct for entry errors.
Select fluid using cursor keys. Confirm by pressing ENTER.

Enter the fluid temperature using the keypad. Confirm by pressing ENTER

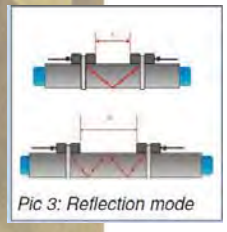
Select pipe liner material using cursor keys and confirm by pressing ENTER. If a liner material is chosen, an additional screen appeas that allows entry of liner thick ness.

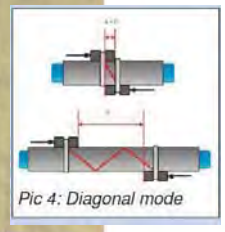
Primeflow T Quick Start 3-4



Select number of sound passes (sound paths) using cursor keys. Auto: Selection by flow meter according to entered parameters (number of passes shown later on senso Positioning Screen).
1 pass (diagonal mode)
2 passes (reflection mode)
3 passes (diagonal mode)
4 passes (reflection mode)
5 passes (diagonal mode)
Even number of passes: Both sensors on same side of pipe.
Odd number of passes: Sensors on opposite sides (see below for more information).
Confirm with **ENTER**.

Primeflow T Quick Start 3-5


Pic 3: Reflection mode


Pic 4: Diagonal mode

1. **Reflection mode**
   The flow meter uses an even number of passes. This is the most convenient mounting arrangemet. As the transducer separation distance can be measured very easily and the sensos can be accurately aligned. Use whenever possible. (pic 3)
2. **Diagonal mode**
   Signal travels on odd number of passes through the pipe. Used for larger pipes and dirty/aerated liquids where greater sgnal attenualtion can occur. The sensos distance on this mounting configuration can be negative (sensors overlapping) (pic 4).

Primeflow T Quick Start 3-6



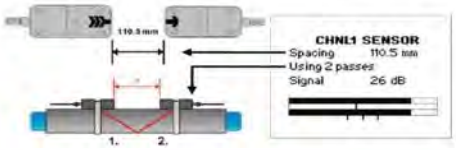
Select Start Measurement and confirm with ENTER to start the sensor positioning procedure.

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Primeflow T Quick Start 3-7

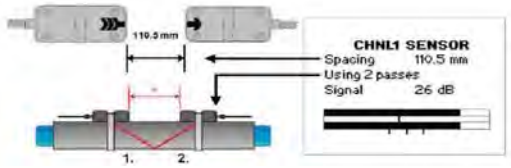
Sensor Positioning Procedure

Mount the transducers with the suggested spacing between the inside of the sensor heads. This distance has been determined by the flow meter on the basis of the entered parameters. Use the displayed number of passes to install the sensors on the correct side of the pipe (see modes above). Observe the upper bar (signal-to-noise ratio) and lower bar (signal quality). These should be both filled to about the same level with a filling level of around 1/3 or more desired. Use the moving mark between the two signal bars for the fine adjustment of the sensor position



Primeflow T Quick Start 3-8

With correct pipe parameters entered and the sensors mounted at the suggested spacing, the mark should be near the central indication line (see three lines below the bottom signal bar). If the mark is to the left-hand side of the central indication line, the sensors are too close to each other. If the mark is to the right, the sensors are too far apart. Slide one sensor carefully along the pipe to bring the mark into a more central position.
Measurements can be obtained with the mark being between the left and right indication line. Press **ENTER** to start measurement.



Primeflow T Quick Start 3-9



Measurement Screen

The main measurement unit is displayed when first entering the measurement screen.
Press NEXT to see up to 3 units displayed with the main one in the middle.
Two further measurement units can be assigned to that screen by going to Mani Menu-Output – Display.

Primeflow T Quick Start 3-10

Totalizer

The totalizer is shown when in measurement mode after pressing NEXT three times. It can also be assigned to the three line display, data logger or process outputs by selecting a volumetric unit. The totalizer function is started with Qon when in measurement mode (measurement screen displayed). Pressing Q resets the total in positive flow direction. Pressing Q- resets the total in negative flow direction . The totalizer function can be stopped with Qoff Pressing Qon again will reset the positive, negative and overall totalizer. Change displays without resetting the totalizer by pressing DISP or NEXT.

Primeflow T Quick Start 3-11

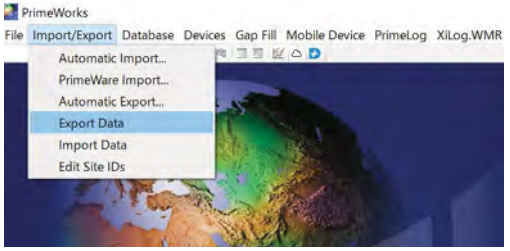
Internal Data Logger

The data logger is reached via Main Menu-Output. It is activated in Data logger- Interval by entering and confirming a no-zero value. Enter 0 and Confirm to disable the logger. Up to 10 measurement units can be selected for logging under *Data logger - Selection*. Use the cursor keys to highlight a unit and press **ENTER** to select it. Press 0 to deselect it. An activated data logger is indicated by a document symbol in the top left corner of the display. On start of measurement (measurement screen displayed) the logger records the selected measurement units. A blinking document symbol indicates a recording data logger. Separation markers are set by the data logger whenever a session begins. Leave the measurement screen by pressing
ESC to stop recording. The recording interval can be changed in *Data logger - Interval.* The data logger is cleared under *Data logger - Log Erase*. Ensure all required data has been downloaded.

Primeworks Export data

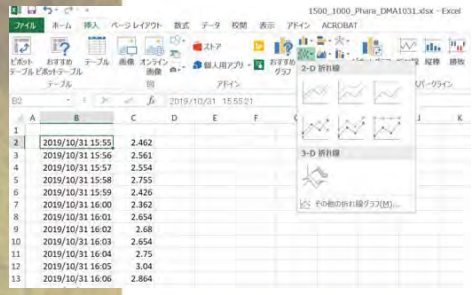
Export data to CSV format (Comma Separated Value)

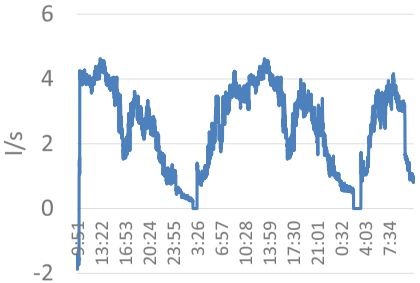
Select Import/Export, then Export data, choose the downloaded file to export to CSV file.



Data Analysis using “Excel”

Make a graph from CSV file





water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

SALGA
Inspiring service delivery

Japan International Cooperation Agency
JICA

The National Non-Revenue Water (NRW) Training

NRW Countermeasures

The National
Non-Revenue Water (NRW) Training
for Municipalities by Municipalities
in South Africa

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Contents

1. Leakage Control Plan
2. Leakage Survey Methods
3. Meter Management
4. Illegal Water Use
5. Construction Works Improvement

1. Leakage Control Plan

1. Leakage Control Plan

	Measure	Items	To do
1	Basic Measure	Water balance	Minimum Night Flow, System Input Volume, Pressure control
		Research and Development	Innovation of pipe materials, socket, fittings, leak detection, pipe location, leak volume measurement
2	Corrective Measure	Visible leak repair	Repair visible leaks and record a leak repair sheet
		Invisible leak repair	Do leak detection for invisible leaks using leak detector Repair invisible leaks and record a leak repair sheet
3	Preventive Measure	Monitoring construction of the other utility company	Supervise the other company's excavation work near water pipelines to prevent damage and accurate mapping.
		Replacement of Pipes	Planned replacement of old pipes.
		Pressure control	Review distribution network, Installation of PRV

1. Leakage Control Plan

Corrective Measure
Patrol

- Earlier visible leak detection and the repair
- Chamber, Valve boxes, Drain pit, Drain lines, Rainwater drainage.
- Sometimes leakage is not just below the water. (leak water travels soft part of the soil and come up to ground)
- Sounding and boring to check the leak point

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1. Leakage Control Plan

Corrective Measure
Invisible Leak Detection

- Plan survey areas to periodical leak survey.

Planning
- Area, Method, Team

Preliminary Survey
- Mappings
- Environmental Noises, Traffics

Individual Connection Survey
- Listening survey at meter or stop valve by listening stick

Ground Surface Survey
- Listening survey on ground surface by ground microphones

Confirmation
- Drilling at resembling leak sound point to confirm water and jet sound.

1. Leakage Control Plan

Corrective Measure
Invisible Leak Detection
Listening Stick

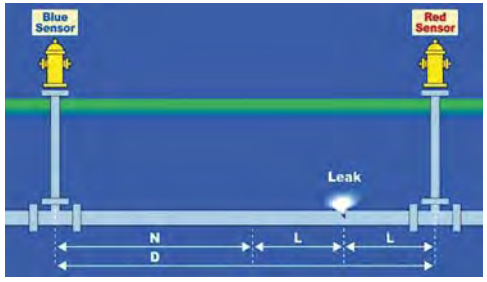
- Metallic bar with a vibration chamber and a plate.
- Attach the tip to pipe fittings such as water meter, stop cock, valves, and the sound travels on metallic bar and the traveled noise echoes inside the chamber.
- To detect noise at fittings only, not for the pinpointing.



1. Leakage Control Plan

Corrective Measure
Invisible Leak Detection
Leak Noise Correlator





Benefit

- It is not affected by the noise such as traffic and factory, therefore survey is possible in the noisy condition.
- It is possible to detect the pinpoint even though leak sound does not reach to the surface (by water leak detector is not available to find.)

1. Leakage Control Plan

Note-1 Invisible Leak Detection Characteristics of Leak sound

Conditions	Travelling Distance		Tips
	Longer	Shorter	
Diameter	Small Dia	Large dia	Larger has less vibration
Material	Iron, Copper, Ductile Iron	PVC, PE, Asbestos	
Connection	Socket	Packing	Packing rubber attenuate leak sound
Leak volume	Large	Small	Small volume leak is small sound
Pressure	High	Low	Higher pressure makes louder noise
Depth	Shallow	Deep	The deeper, the smaller
Compaction of soil	Hard	Soft	The softer, the smaller

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1. Leakage Control Plan

Note-2 Invisible Leak Detection Resembling Noise to Leak sound

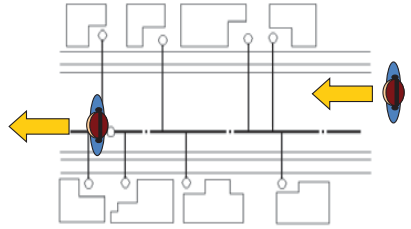
Resembling Noise	Remarks
Using water	Using water sound traveling service pipes
Sewage flowing	Similar noise to leaks, sometimes including echoing noise
Wind noise	4-6m/sec is similar to leaks, and the stronger masks leak noise
Traffic noise	Fricative sound by tire and road surface, the 60 m away .
City noise	Wind noise in buildings, and inside buildings
Electric Transformer	Vibration noise of magnetic electric transformer
Motor noise (AC outdoor unit, Vending machine, blower for septic tank,	Motor sound of AC outdoor unit, or motor

1. Leakage Control Plan

Ground Microphone Survey

Effective for leaks in Main pipe, Connection, Saddle, and Boundary to house and road.

- Night time survey
  - Low Environmental/Traffic noise
  - High water pressure
  - 2 person per team
  - 4-5km per night/team
  - Person in charge of main and service pipe
  - Avoid to close distance to avoid noise from the person

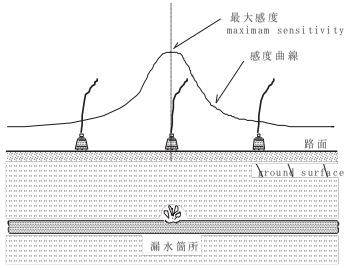


1. Leakage Control Plan

Ground Microphone Survey

Difficulty: Easier ⇒ Difficulty: Harder

Asphalt ⇒Concrete ⇒ Tile⇒Soil⇒Sand⇒Grass





1. Leakage Control Plan

Ground Microphone Survey

- Place sensor at the ground surface and listen the traveled leak noise from the surface.
- Move sensor to the loudest noise point and the loudest point is above the leak point.



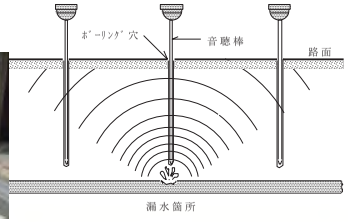
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1. Leakage Control Plan

Drilling Confirmation

- To do a minimum excavation of repair
- Confirm Jet water noise and “water” itself







1. Leakage Control Plan

Note: Drilling Confirmation

- Know depth and location of the other buried objects (Cables, Pipes)
- Caution for traffic and pedestrians
- Do a cap after drilling to avoid leak water comes to surface
- Water (High Turbidity far), Jet (Loud close)





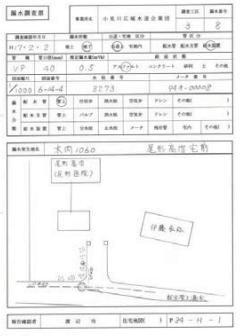




1. Leakage Control Plan

Leakage Report

- Date
- Address
- House No.
- Person in charge/Surveyor
- Kind of leaks（Main, Service connection, diameter, Kind of Pipes)
- Leak point (Estimated Leak Volume, Meter number, Map number)
- Condition of the site (road)
- Condition of the leak
- Location of the leak(Site info 3 points offset)



1. Leakage Control Plan

Basic Measure
Leakage Database

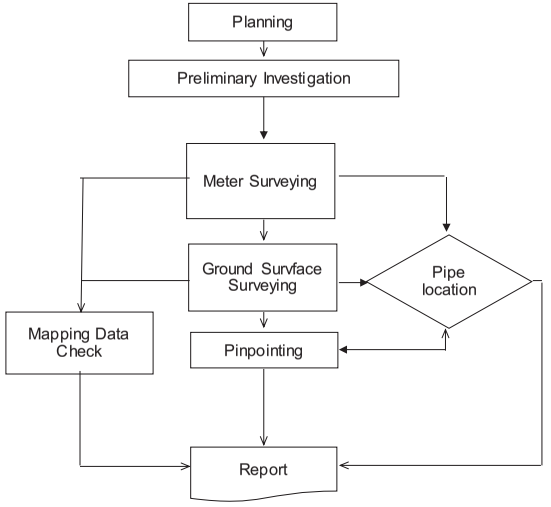
Category		
Types	Above Ground	Under ground
Place	Transmission main	Distribution main, sub
	Service connection	Reservoir
Cause	Natural	Material, Diameter, Age, Connection, Crack, Pin hole, Loose Joint, Corrosion , valves, packing (gasket),
	Accidental	Material, Diameter, Age, Cause, Condition, Repaired condition
Area	Soil	Corrosion, Soft ground, Reclamation
	Traffic	Traffic Volume, (National, Prefecture, City, Farm, Private, Personal)

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Question and Answer

2. Leak Survey Method

2. Leak Survey Method



2. Leak Survey Method

Meter Listening Survey

Check noise at the meters and fittings travelling along the pipeline
- House Connection Survey: At the meter
- Fittings Survey ・・・・・Valves and Hydrants





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2. Leak Survey Method



Meter listening survey

At Meters, Valves, hydrants

9:30-11:30:

150 Service Lines

In Two Hours

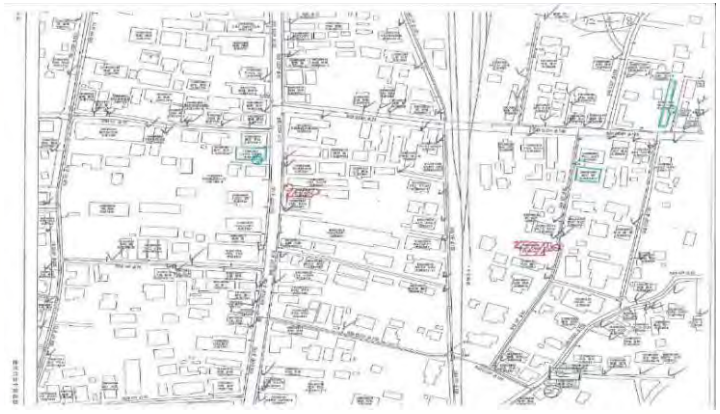
No sound: BLUE

Un done: GREEN

Leak Sound: RED

2. Leak Survey Method

Meter Listening Survey
Blue: Done, Green: Undone, Red: Noise



2. Leak Survey Method

Leak Survey Report

- Date
- Surveyor
- Surveyed Area
- Surveyed Meter No. (houses)
- Surveyed Length (Km)
- Detected Leaks



作 業 日 報

小見川広域水道企業団

2. Leak Survey Method

Meter Listening Survey
Benefits and Check points

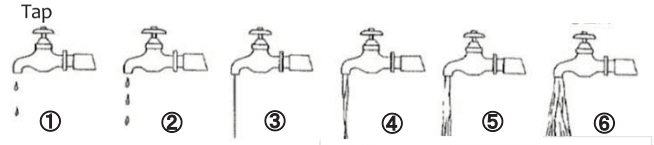
- Benefits
  - More than 90% of leaks occur on saddles
  - Immediate detection
  - Easy work
- Note
  - Close house connection valve, every time when sound occurs.
  - Leak sound does not travel when the saddle is far away from the meter.

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2. Leak Survey Method

Reference material

Assuming Leakage Quantity



Dia:13mm Unit:m3/h

	①	②	③	④	⑤	⑥
Tap	0.0005	0.0015	0.004	0.129	1.65	2.36

$Q1 = Q\sqrt{(P1/P)}$ (Conversion formula of water pressure)

Fujitecom

Question and Answer

3. Meter Management

To measure consumption volume accurately, read meter properly, and keep meter in good condition

3. Meter Management

To keep good meter condition

- Keep record of installation information such as
  - meter-number
  - customer name
  - address that make it possible to confirm the location of the installed meter
  - Install date
  - manufacturer
  - etc. and update.
- Supervise a meter installation work by appropriate staff.
- Perform periodic maintenance
- Lifespan should be less than 10 years

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3. Meter Management

Example of interference with meter reading

- Buried in the soil
- No meter
- Borehole users are not grasped
- Leave the pre-paid meter broken
- Leaking water
- Some digital numbers can't be read because the inside of the glass surface is dirty

Question and Answer

4. Illegal Water Use

4. Illegal Water Use

Important points to find it:

- The first thing to do is to check if the water user is fully registered as a customer.
- Two ways are possible to find illegal water use, site investigation and the consumption data analysis. Combination of these ways are the most effective. At first data analysis, then site investigation based on the result of data analysis.

Follow up measures:

- Follow up measures after found an illegal connection is necessary to register a normal customer.

Illegal water use => **Part of NRW: Unauthorized consumption**

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4. Illegal Water Use

Illegal Water Use









4. Illegal Water Use

Type of Illegal Water Use 1

A. Without meter

◆Remove meter & connect short pipe



◆Connect personal pipe directly to the distribution pipe



◆By-pass pipe





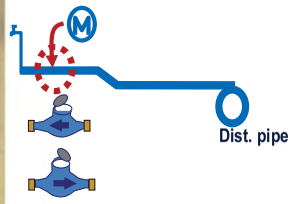


4. Illegal water use

Type of Illegal Water Use 2

B. Improper meter use

◆ Reverse meter & set reverse



◆ Tempering meter (magnet, put something in the gear, etc.)



Type of Illegal Water Use 3

C. Theft from Pipe and fittings

- Reopen cock themselves if disconnected due to non-payment
- Brake pipe and fittings and get leaking water: pipe bridge, hydrant, air valve, loosen flange
- Theft water from facility: fire hydrant, Fetch accidental leak water, Public taps

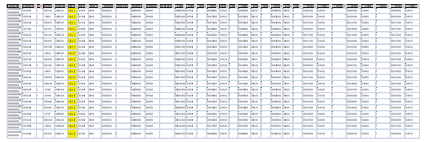





How to find them?

Investigation of Customer List

- As a first step, it is necessary to check whether all the people using water are registered as customers.



- This activity should be conducted meter reader.



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How to find them?

Site survey: Confirmation customer situation

- First check, if the property is been occupied or vacant.
- In investigating the minimum and maximum flow of meters should be looked at by the bill record. If a meter is too big or starting flow rate is to low the meter will not register small amounts.
- Check for signs of the meter being by-passed.
- Should the meter be older than ten years it is advisable to have the meter tested.

How to find them?

Physical Survey

Investigation of customer meter

- If possible, illegal connection survey should be implemented with other work such as house to house water leakage detection at the point of the meter.
  - Excavation traces around the meter
  - Water leak around the meter
  - The sound even when the meter is stopped



Question and Answer

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5. Construction Works Improvement

-- from Japan's experiences --

Purpose of the Construction

Replace from old and weak water pipes to strong earthquake-resistant water pipes.

Old: Over 40 years

Weak: Galvanized Iron Pipe (GIP)
Hard Polyvinyl Chloride Lined Steel Pipe (VLGP) < DN50mm
Old Cast Iron Pipe (CIP)
Old Steel Pipe (SP) > DN75mm

Construction Formation

Orderer: YWWB
Management by Supervisor

Even Ground

No bribery
If they commit bribery, there is big social sanction for them.

Contractor: Construction company selected by tender
Management by Field Representative

Supervisor's Roles & Purpose

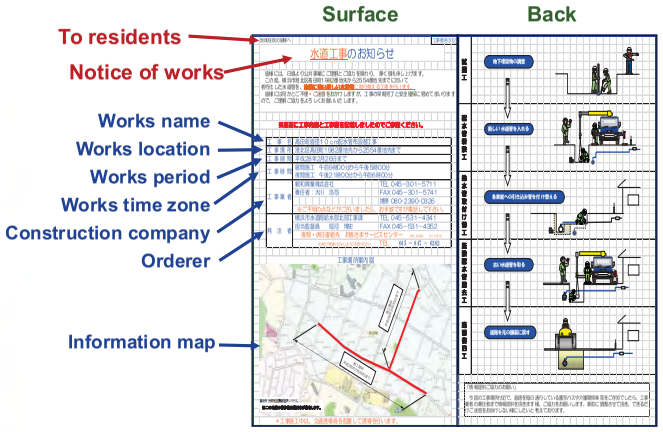
Facilities become the property of Waterworks Bureau.

It must be safe and durable

Check kills of workers and field representatives of contractor
Confirmation of process of construction (No corner-cutting)

Preparatory Works

Understanding of Residents for smooth works



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Preparatory Works

General information and precautions
Construction plan
Completion date and construction work schedule
Explanation of construction works
Notice of the construction
Notice of water supply

Yokohama Water Co., Ltd. / Yokohama Waterworks Bureau

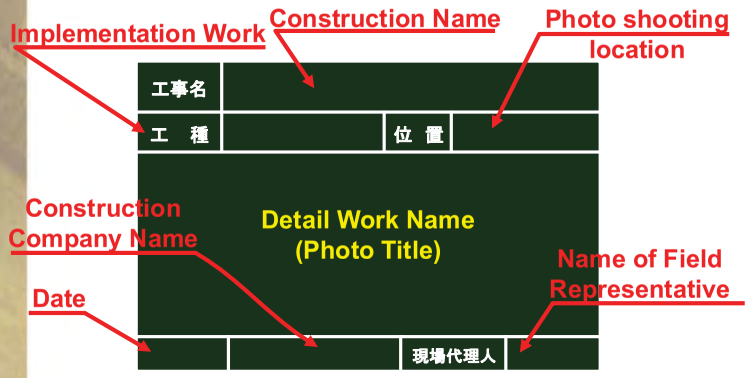
Flow of Construction Works

Pavement Cutting & Breaking
Excavation & Sheet Pile Installation
Waste Soil Disposal
De-Watering
Pipe Foundation & Installation
Pipe Outer Surface Corrosion Control
DIP NS-Type Joints
Pipe Setting Condition Check
Water Pressure Test
Soil Back-Filling & Compaction
Road Pavement Restoration

Blackboard for Construction Photos

Recording of the content of work that was carried out

-Observe & Confirm quality and quantity of works



Pavement Cutting



Pavement Cutting

Loading of Removal Pavement and Roadbed Material





Loading of Excavated Soil and Manpower Excavation





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De-Watering



Simple Steel Sheet Pile





Pipe Mouth Cleaning





Yokohama Water Co., Ltd. / Yokohama Waterworks Bureau

Wrapping Pipe with Polyethylene Sleeve and Applying Lubricant

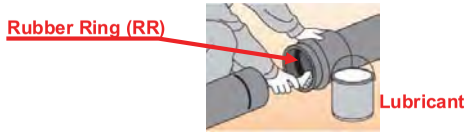




Installing Rubber Ring and Applying Lubricant







Measurement of Insertion Distance



Measurement from Pipe Mouth to Rubber Ring



Measurement from Pipe Mouth to Insertion White Mark

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Coupling





Wrapping pipe with Polyethylene Sleeve and Pipe Install





Service Pipe Branch



Corrugated Stainless Steel Pipe





Hard Polyvinyl Chloride lined Galvanized Steel Pipe (VLGP)

Pavement by Asphalt and Surface Cleaning



Temporary Paving



Cleaning of Surface

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Back Filling



Soil Back-filling



Warning Sheet



Roadbed

Warning Sheet

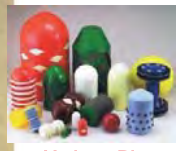




Wash out pipe with Poly-Pig







Various Pig





Various Pig

Fire Hydrant Hole Installation





Hole Base

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Fire Hydrant Hole Installation



Fire Hydrant Hole



Ground Level confirmation of Head of Fire Hydrant Hole

Removed Decrepit Pipes





Confirmation of Removal Pipes

Pavement Restoring



Scatter and Leveling of Roadbed Material



Compacting by Tandem Roller

Pavement Work



Pavement Surface Finishing



Pavement Surface Finishing

Quality Control



Roadbed Finished Work Quality

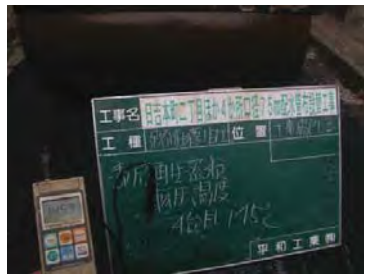


Test Method for Soil Density by Sand Replacement Method

Quality Control



Finished Work Quality



Asphalt Temperature Test of Asphalt Pavement Outline

Traffic Control



Safety Management to Pedestrian



Vehicle Guidance of One-Way

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Contructor Worker's Meeting and Rescue Training



Pointing and Calling



Training of Cardiac Massage

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Construction Machinery



Mini Backhoe



Pavement Cutter

Construction Machinery



Tire Roller



Tandem Roller

Construction Machinery



Asphalt Finisher



Asphalt Finisher

After Construction Works

- → Inspection for completion of construction works by YWWB — If failure, need to repair subject places
- → Performance evaluation of construction works from YWWB to contractor — Award system
- → Delivery of completed facilities, integrated document, drawings and calculation documents from contractor to YWWB
- → Storage of construction related documents by YWWB Administrative
- → Final payment from YWWB to contractor

Remaining amount = Contract amount - Prepayment (40%) - Partial payment

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Question and Answer