Mission 13 – Report

Institutional and Organisational Strengthening of WASCO Saint Lucia and Regional Water Utilities

Saint Lucia

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October 2019
| **Title** | **Mission 5 Report**  
Institutional and Organisational Strengthening of WASCO Saint Lucia and Regional Water Utilities  
Saint Lucia |
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| **Consultant** | **JOINT VENTURE**  
CONSULAQUA Hamburg Beratungs-GmbH - Como Consult GmbH  
CONSULAQUA Beratungsgesellschaft mbH Hamburg  
Ausschläger Elbdeich 2, D-20539 Hamburg, Germany  
Como Consult GmbH,  
Winterstraße 4-8, D-22765 Hamburg |
| **Contacts for this report** | **Marc Luedtke**  
**Jan Overbeek**  
MarcLuedtke@consulaqua.de  
jw.overbeek@gmail.com |
CONTENT

List of Abbreviations

1 Introduction

2 Mission Objectives, Activities and Deliverables

3 Regional Training Conference

4 SOP ‘DMA Development’

5 Analysis of Northern Line

  5.1 Hydraulic Analysis - Status Quo

  5.2 Population & Demand Forecast

  5.3 Portable Flow Device

  5.4 Next Steps

Annexes

Annex 1: Mission Agenda

Annex 2: Regional Training Conference - Program

Annex 3: SOP ‘DMA Development’

Annex 4: Deliverable C.1.1: Training Flow and Pressure Mgmt., etc.
LIST OF ABBREVIATIONS

CAH  CONSULAQUA Hamburg Beratungsgesellschaft mbH
CAWASA  Caribbean Water & Sewerage Association Inc.
CIS  Customer Information System
CSD  Customer Service Department
Como  Como Consult GmbH
DN  Nominal Diameter (‘Diametre Nominal’)
GIS  Geographic Information System
GIZ  Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH
GM  General Manager
HW  HAMBURG WASSER
LDU  Leak Detection Unit
MGD  (imperial) Mega Gallons per day
MSL  Mean Sea Level
NA  Network Administrator
NRW  Non-Revenue Water
O&M, O+M  Operation and Maintenance
SCADA  Supervisory Control and Data Acquisition (Program)
SOP  Standard Operating Procedure(s)
SPD  Strategic Planning Department
ToR  Terms of References
WASCO  Water Supply and Sewerage Company Inc., Saint Lucia
WOF  Work Order Form
WSD  Water Services Department
1 INTRODUCTION

This is the Report on Mission 13 of the project “Institutional and Organizational Strengthening of WASCO Saint Lucia and Regional Water Utilities”. The project started on 1st of November 2018, it has a duration of 13 months and is carried out by a joint venture between CONSULAQUA Hamburg, which is a 100% subsidiary of HAMBURG WASSER, public Water Utility of Hamburg, and COMO Consult, both from Germany. The project objectives are depicted in Figure 1.

![Figure 1: Project objectives](image)

2 MISSION OBJECTIVES, ACTIVITIES AND DELIVERABLES

The mission was undertaken by the Water Balance Expert, Mr. Marc Luedtke, from 21st September to 2nd October 2019. The mission had the following objectives:

Conduct a four-day regional training conference on Repair, Documentation, HDPE and specific NRW reduction measures (see program in Mission 13)

**Draft Terms of Reference**

**Area(s) of focus:** Hydraulic Modelling & Water Balance

<table>
<thead>
<tr>
<th>Expert(s)</th>
<th>Non-Key-Expert “Hydraulic &amp; Water Balancing” Marc Lüdtke, National Planning Engineer, Lester Arnold</th>
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➢ Arrival: 17 September 2019  
➢ Departure 28 September 2019 | Hamburg  
Castries  
Hamburg |
| **Mission Objective** | • Finalizing SOP ‘DMA Development’  
• Follow up work plan for the Northern Line, with focus on demand analysis & forecast, installation of Water Meter and Pressure Loggers  
• Schematic Hydraulic analysis of Northern Line (behind Choc Tank)  
• Conduct a four-day training course on Repair, Documentation, HDPE, specific NRW reduction measures (see attached ‘Regional Upscaling Training’ program in September 2019) |
| **Involved Staff WASCO:** | Head and staff of Strategic Planning Department  
Head and staff of Water Services,  
Head and Staff of LDU Unit  
Head and staff of Design and Construction  
Head and staff of Customer Service Department |
| **Activities according to work plan:** | - Preparation of Mission: Review documents, planning the activities and develop Agenda of the mission  
- Video/Skype conference with WASCO | In Hamburg  
To be scheduled with WASCO |
|  | - Review WASCO’s activities related to  
  • Northern line; Demand Analysis & Forecast  
- Support in data gathering and data analysis for Northern Line (precondition: flow and pressure measurement equipment in place)  
- Prepare hydraulic analysis for northern line (beyond Choc Tank)  
  ➢ Conduct a four-day Training for staff of utilities of the CAWASA Region (program attached) | Interviews with Strategic Planning Department, data review, field visit & mini Workshops with WASCO staff |
| **Deliverables:** | ➢ Final SOP for DMA Development  
➢ Schematic hydraulic analysis of Northern Line (based on measurements and demand analysis by WASCO)  
➢ 4 day training session (‘CAWASA regional Upscaling Training’)  
➢ Draft Mission Report |
| **Tentative program/ agenda** | ➢ See separate schedule |
| **Reference documents** | ➢ Inception Report, technical proposal, ToR  
➢ Reports produced during missions 1 - 10  
➢ Reports and findings of previous activities/projects  
➢ Demand Forecast for Northern Line area beyond Choc Tank  
➢ Existing SOPs and guidelines  
➢ All project documents (ToR, Inception Report) |
- Annex 2)

**FINALIZING THE SOP ‘DMA DEVELOPMENT’ (SEE SOP IN**
ANNEX 3: SOP ‘DMA DEVELOPMENT’

- Following up on the work plan for the Northern Line, with focus on demand analysis & forecast, installation of Water Meter and Pressure Loggers

A copy of the mission ToR is attached as Annex 1.

3 REGIONAL TRAINING CONFERENCE

A Regional Training Conference with the overall objective of NRW-Reduction was held from the 24th to 27th of September in Gros Islet, St. Lucia. The program of the training is attached in

Mission 13

Draft Terms of Reference

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Hamburg  
Castries  
Hamburg |
| Reference to Project: | Final Inception Report, January 2019  
Progress Report, July 2019  
Mission Report 5 – Action Plan for DMA Development in Pilot Zone & NRW reduction |
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Annex 2. Among the 23 participants were technicians and engineers from the following institutions:

- 15 participants from WASCO
- 7 participants from regional utilities (Belize, St. Vincent & the Grenadines, St. Kitts & Nevis, Dominica, Jamaica, Grenada and the British Virgin Islands)
- 1 participant from GIZ (CATS Program)

A **USB flash-drive with all presentations** and exercises from the training has been provided to each participant during the handing-over of certificates.

### 3.1 DAY 1

**Day 1** of the training focussed on Organization of Repair and Documentation Practices. Besides optimal repair procedures, survey methods were practiced in field and tailor-made inspection sheet were prepared in groups.

**Activities:** 3 x presentation; 3 x exercise (see program in Annex 2)

### 3.2 DAY 2

On **Day 2**, a field exercise was conducted in groups to train and understand the importance of Assessment of Network Assets and its documentation. Afterwards, the field experience was used to prepare a theoretical action plan.

**Activities:** 1 x field work; 2 x exercise (see program in Annex 2)

### 3.3 DAY 3

**Day 3** focussed on Maintenance and Maintenance Strategies, as well as the work with HDPE material. As a main activity on this day, a case study for methodological approaches on maintenance concepts was executed.

**Activities:** 2 x presentation; 1 x case study (see program in Annex 2)

### 3.4 DAY 4

On **Day 4**, the focus was laid on specific approaches for NRW-Reduction, namely the common problem of leaking appurtenances as well as pressure management.

**Activities:** 3 x presentation; 1 x exercise (see program in Annex 2)
During the first mission in the field of ‘Hydraulics’ in April 2019 it was observed, that WASCO in the past started implementing District Metered Areas (DMA) but these areas were not functional DMAs (meaning isolated and with bulk metering). Therefore, it was agreed to prepare a SOP for the development of DMAs based on which WASCO will successively create working DMAs in its service area.

During a workshop on the 9th of April, the participants, under guidance of the consultant, jointly prepared a workflow for the development of DMAs.

Based on the workshop, the consultant drafted a SOP and WASCO has since provided comments. During this mission, WASCO’s comments were incorporated and a meeting was held to finalize the SOP. The final version is attached in...

4 SOP ‘DMA Development’
ANNEX 3: SOP ‘DMA DEVELOPMENT’

Also in April, and after the workshop on DMA Development, an Action Plan was prepared for the NRW-Reduction in the Pilot Zone (refer to Mission 5 Report). The Action Plan includes Water balancing activities as pre-condition for an effective NRW Reduction programme.

Figure 6: Summarizing proposed actions to obtain data for Water Balancing and reducing NRW

5 ANALYSIS OF THE NORTHERN LINE

5.1 HYDRAULIC ANALYSIS - STATUS QUO

Before the first mission in the field of Hydraulics, it was agreed that the consultants would assist in preparing a schematic hydraulic model for the Northern transport line between the Theobalds Water Treatment plant (WTP) and Cap Estate, together with the GIS Unit from the Strategic Planning Department (SPD). It was subsequently observed, that the pipe section between the WTP and the Choc Tank has recently been renewed and the main bottleneck is the section between the Choc Tank and Cap Estate. Thus, the analysis will focus on that section.

The following consecutive steps were agreed in April to be executed by Strategic planning Department (SPD), Customer Service Department (CSD) and the consultant. For all steps, the status is indicated (‘done’ or ‘pending’).

1. Schematisation of the line in GIS (SPD) done
2. Schematisation of relevant meter reading routes in the areas which are supplied by the Northern line (SPD + CSD) pending
3. Split the line in GIS in relevant sections (SPD) pending
   • According to reading routes and distribution offtakes

Figure 7: Northern Line between Choc and Cape Estate
• For all sections provide information on internal diameter (mm) or specifications (material, DN, inner lining) and their lengths (m)

4. Installation of Bulk WM behind Choc Tank (additional task, added later) pending

Note: WASCO reported, that the installation of a MagFlow meter after the Choc tank would be risky based on the unknown condition of the line and the disruption in supply as this line supplies the entire northern corridor with potable water. Thus, it was agreed, that WASCO would conduct a 48-h flow measurement with their ultrasonic flow device

5. Preparation of a water demand forecast (SPD + CSD + Consultant). done

• Domestic, commercial/industrial, government, hotels and boats demand
• Seasonal peak factors
• Years 2018 – 2025 – 2030 – 2038

6. Assignment of demand ratio for all nodes in the model (SPD + Consultant) pending

• Estimate the demand for each node (or at least for several sections, as elaborated under 3) as percentage of total demand

7. Preparation of Hydraulic Model for 2018 and 2040 water demands (Consultant) pending

• Model construction, run and evaluation (Consultant)
• Determination of required pipe dimensions

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In order to estimate future average and maximum demands at the NL, a flow measurement needs to be conducted to verify or correct the actual demand calculation.

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5.2 Population & Demand Forecast

The following population and water demand figures have been calculated for the area covering the Northern line beyond Choc Tank. The figures are based on an average demand of 60.8 gallons per customer and day (indicated from customer service dpmt.) and an estimated average of 2.5 capita per household. The demand for commercial customers, hotels and government institutions has been estimated in addition to the domestic demand and is based on actual billing figures.

It is further assumed, that the amount of NRW will gradually drop from actually estimated 40 % to 20 % in 2038. The reduction of NRW is supposed to be a result of the NRW Strategy, which is currently under preparation.

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Figure 8: Population & Supply Forecast for the NL beyond Choc Tank
5.3Portable Flow Device

During this mission, the newly purchased ultrasonic flow device was tested at Theobalds WTP. It was agreed that storage, operation and overall responsibility of the device is at the Leak Detection Unit within Water Services.

Figure 9: Testing of Ultrasonic Flow Device at Theobalds WTP

Figure 10: Introduction to the new device and installation of Software on Smartphones

5.4Next Steps

Next and final steps which were agreed to be carried out by WASCO (under guidance of SPD):

1. Schematisation of meter reading routes in GIS
2. Define sections of Northern Line, based on meter reading routes and offtakes (with Consultant). For each of the sections, a percentage of demand is to be estimated, based on the total demand on the northern line beyond Choc tank.
3. Ultrasonic Flow Measurement (at least 48 h) beyond Choc Tank. The measurement point (chamber) has been identified during this mission. If possible: pressure logging nearby.

With the information gained by the above-named steps, the consultant can prepare the hydraulic model, evaluate current and future operation and provide recommendations thereto.

Next and final steps of the Consultant in the field of Hydraulics:

4. Hydraulic analysis of Northern Line
Figure 11: Chamber beyond Choc Tank – to be used for portable flow measurement

ANNEXES

ANNEX 1: MISSION AGENDA

ANNEX 2: REGIONAL TRAINING CONFERENCE - PROGRAM

ANNEX 3: SOP ‘DMA DEVELOPMENT’

ANNEX 4: WORKSHOP OM FLOW AND PRESSURE MGMT.
## ANNEX 1: MISSION AGENDA

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## ANNEX 2: REGIONAL TRAINING CONFERENCE — PROGRAM

### Day 01 - Focus on Organization of Repair and Documentation

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<tr>
<td>08:30</td>
<td>Welcome and Introduction of Participants, Trainer Team and Program</td>
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</table>
| 09:30 | **Presentation**  
Methods & Instruments of Water Loss Reduction  
Various approaches and instruments of Water Loss Reduction |
| 10:00 | **Exercise**  
The Repair Cycle  
Participants structure their current repair work practices, reflect activities and discuss improvement measures (break included) |
| 12:00 | Lunch |
| 13:00 | **Presentation**  
Philosophy and Organization of Repair (M3.4)  
Following the sustainable cycle for repair works: Explanation of Steps and Purposes. Best practice examples from Hamburg Wasser |
| 13:30 | **Presentation**  
Simple Survey Methods |
| 14:00 | **Exercise**  
Asset Survey and Documentation  
Execution of simple survey methods and preparation of sketches for proper documentation and recording of repair and construction |
| 15:15 | **Presentation**  
Assessment and Inspection Sheets |
| 15:30 | **Exercise**  
Assessment and Inspection Sheets  
Development of documentation sheets as basis for asset assessment and repair and construction works. Reflection of best practices. Preparation for Day 2 (break included) |
| 16:30 | Wrap up of day 01 |
| 17:00 | Get-together with drinks |

### Day 02 – Focus on Condition Assessment and Documentation (Field Work)

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<td>09:00</td>
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| 09:45 | **Field Work**  
Condition Assessment & Documentation  
Assessing condition of WS infrastructure in the field and documentation with tailor-made Form Sheets |
| 12:30 | Lunch |
| 13:30 | **Exercise**  
Evaluation of Condition Assessments  
Evaluation of collected data and clustering according action needed |
| 14:30 | **Exercise**  
Action Plan / Strategy  
Planned action or immediate measures? Own staff or contractor? Scheduling of replacement, maintenance or repair (break included) |
| 16:00 | Wrap up of day 02 |
### Day 03 – Focus on HDPE and Maintenance Strategies

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<tr>
<td>09:00</td>
<td>View back on day 02</td>
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</table>
| 09:30 | **Presentation**                             | Preventative Maintenance  
| 10:15 | **Exercise**                                 | Maintenance Strategy (group work)  
Participants apply the general maintenance concept. Understanding general necessity for maintenance *(break included)* |
| 12:15 | **Lunch**                                    |                                                                         |
| 13:15 | **Exercise**                                 | Maintenance Strategy (presentation of results)                          |
| 14:15 | **Presentation**                             | HDPE Pipes: basics, advantages, disadvantages                           |
| 14:45 | **Presentation**                             | Working with HDPE *(best practice @ Hamburg)*                          |
| 15:15 | **break**                                    |                                                                         |
| 15:30 | **Discussion**                               | Strategy for the change of material  
Joint development of a basic strategy for the change of material on Utility level, based on the example of HDPE |
| 16:15 | **Wrap up of day 03**                        |                                                                         |

### Day 04 – Focus on specific Methods & Instruments of NRW Reduction

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<tr>
<td>09:00</td>
<td>View back on day 03</td>
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| 09:30 | **Presentation**                             | Leaking valves  
Why is it important? What influence does it have on NRW? Ways to tackle this common problem. |
| 11:00 | **Presentation**                             | Smart metering  
Best practice & experiences from HAMBURG WASSER                          |
| 12:00 | **Lunch**                                    |                                                                         |
| 13:00 | **Presentation**                             | Purpose of Pressure Management  
Objectives and different methods of pressure management. Influence on NRW. |
| 13:30 | **Exercise**                                 | Benefits of Pressure Reduction  
Assessment of economic benefits that can be expected from the introduction of pressure management |
| 14:30 | **Wrap up of the Training, Certificates, Good bye** |                                                                         |
| 15:30 | **End**                                      |                                                                         |
ANNEX 3: SOP ‘DMA DEVELOPMENT’
ANNEX 4: DELIVERABLE C.1.1: TRAINING FLOW AND PRESSURE MANAGEMENT

The deliverable C.1.1 has been addressed through various interventions during missions from the Hydraulic and Water Balance Expert.

In April 2019, a training workshop has been conducted with focus on Hydraulic Analysis of Transport Systems. After an introduction and presentation of basic engineering a complex exercise was prepared as group work and afterwards presented in plenary.

Also in April 2019, a workshop has been conducted for the implementation of a DMA pilot zone (in Babonneau). In this workshop training focused on the use of PRVs, the possible re-structuring of reticulation systems and the optimal use of reservoirs.

During the first regional training conference in July 2019, one day focussed on Hydraulic Analysis, including the requirements to efficient flow and pressure measurements.

During the second regional training conference, pressure management was discussed in detail and an exercise was carried out by the participants.

Further, during the mission in April, as well as in September, practical training in the use of ultrasonic flow and pressure measurement devices has been provided in the field.

Figure 12: Workshop for implementation of a pilot DMA

Figure 13: using the ultrasonic measurement device