

**S13.3-33 LECTURE FOR TAKE-HOME**  
**EXAMINATION ON BASIC PLANNING OF**  
**WATER SUPPLY AND HYDRAULIC**  
**ANALYSIS FOR ACTIVITY 1-3, 3-1, 3-2, 3-4**  
**AND 3-8**



# The Project for Improvement of Non-Revenue Water Reduction Capacity for Solomon Islands Water Authority in Solomon Island

## Lecture for Take-Home Examination on Basic Planning of Water Supply and Hydraulic Analysis for Activity 1-3, 3-1, 3-2, 3-4 and 3-8

August 2015

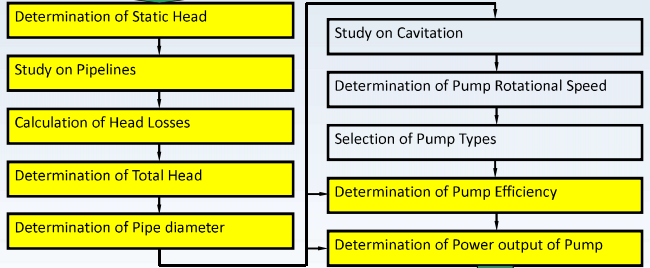
NRW Project Team

1

### Flowchart on determination of Pump Specification

Confirmation on Planning Conditions:

Purpose of use, Flow, Water level of suction & delivery, Distance of lifting up and Location

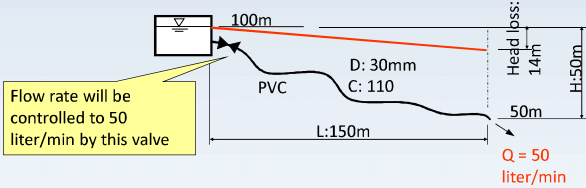


Pump Type:

Pump diameter(mm) × Flow(m<sup>3</sup>/min) × Total suction head(m) × Power output(kW) × [Rotating speed(min<sup>-1</sup>)]

3

### Example on Gravity Flow



$$I = 10.666 \times C^{-1.85} \times D^{-4.87} \times Q^{1.85}$$

$$= 10.666 \times 110^{-1.85} \times (30/1000)^{-4.87} \times (50 / 1000/60)^{1.85}$$

$$= 0.0936$$

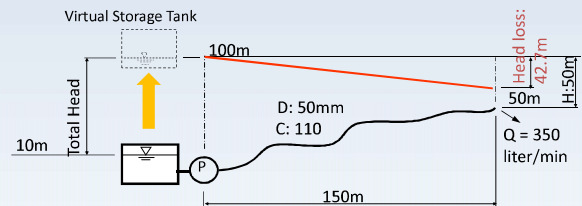
$$\text{Head loss} = I \times L$$

$$= 0.0936 \times 150$$

$$= 14 \text{ (m)}$$

2

### Example on Pumping Flow



$$I = 10.666 \times C^{-1.85} \times D^{-4.87} \times Q^{1.85}$$

$$= 10.666 \times 110^{-1.85} \times (50/1000)^{-4.87} \times (350/1000/60)^{1.85}$$

$$= 0.2847$$

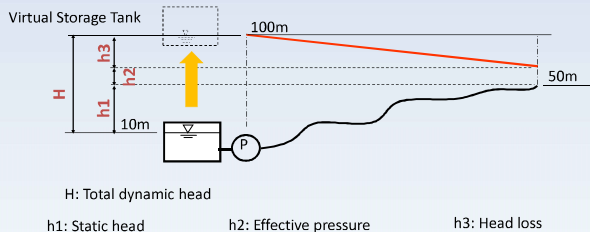
$$\text{Head loss} = I \times L$$

$$= 0.2847 \times 150$$

$$= 42.7 \text{ (m)}$$

4

### Definition of Pumping Flow



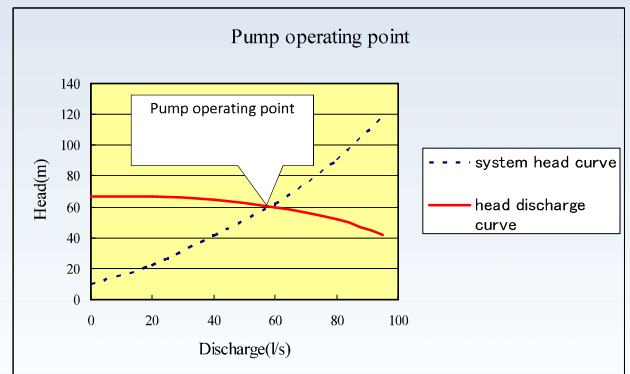
H: Total dynamic head  
 h1: Static head      h2: Effective pressure      h3: Head loss

$$H = h1 + h2 + h3$$

### Definition of total dynamic head

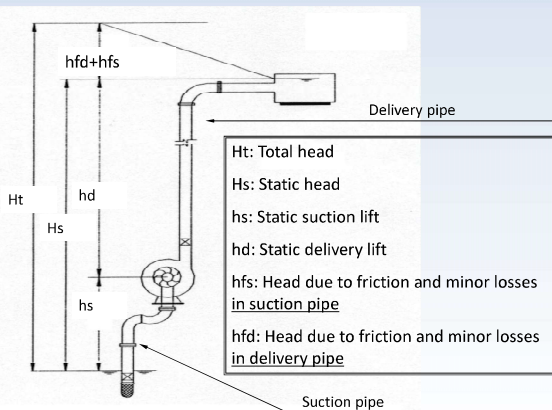
5

### Pump Operating Point and System Head Curve



7

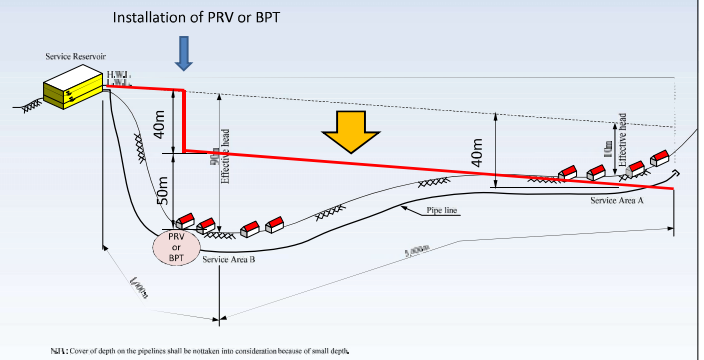
### Head of Centrifugal Pump in Detail



Ht: Total head  
 Hs: Static head  
 hs: Static suction lift  
 hd: Static delivery lift  
 hfs: Head due to friction and minor losses in suction pipe  
 hfd: Head due to friction and minor losses in delivery pipe

6

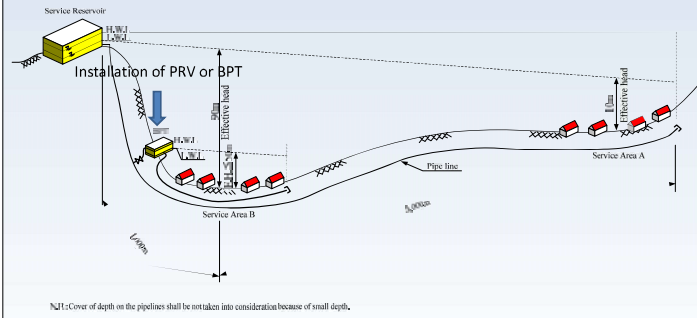
### Solution-1



NAL: Cover of depth on the pipelines shall be not taken into consideration because of small depth.

8

## Solution-2



NOTE: Cover of depth on the pipelines shall be not taken into consideration because of small depth.

**S13.3-34 LECTURE ON GIS REVIEW**  
**(OUTLINE OF GIS & GPS)**



# Solomon Water – Geographic Information Systems (GIS)

Gavin Bare  
GIS Technician

## Role of GIS

- Solomon Water’s operation and service covers large area of land(Honiara ≈ 74 km<sup>2</sup>).
- Mapping of Facilities, Features, Assets or incidents are important to hold information for immediate planning or future reference.

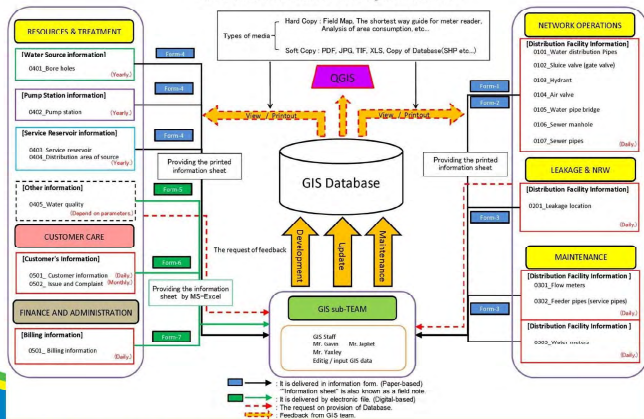
## Introduction

Geographic Information Systems is the technology to locate and hold information about objects.

## GIS Current/Ongoing Activities

- Mapping of:
  - Water supply distribution network
    - Upgrade Modelling
    - For more accurate maps for field operation and distribution.
  - Honiara Customer accounts
    - Put a location to Volume Consumption
    - Link Billing and GIS – DMA Management.
- Development of a GIS workflow for Database
  - Establish procedural link between GIS and SW departments.

The workflow for database development and data



## Result of Activities 2 Operation & Maintenance Manual

1. Introduction
  - 1.1 Outline of the Manual
  - 1.2 GIS Database Structure
  - 1.3 GIS Database Specifications
2. GPS Measurement
  - 2.1 Workflow for Observation of GPS signals
  - 2.2 GPS measurement in the field
  - 2.3 Convert and Import the GPS log files to desktop PC
  - 2.4 Preparation
3. Location map for observation
  - 3.1 Field Work
  - 3.2 Data Arrangement
4. GIS Data Creation
  - 4.1 Workflow
  - 4.2 Import GPS Data
  - 4.3 Create GIS Data
  - 4.4 Edit Attribute Data
5. Troubleshooting
  - 5.1 GPS Device
  - 5.2 GIS Database

## Result of Activities 1 Rulebook

1. Introduction
2. GIS data operational structure
  - 2.1. Database management structure
3. Database Content and Management Policy
  - 3.1. Data development, update and accuracy management
  - 3.2. Data backup policy
  - 3.3. Operation Flow and Database Improvement
4. Data Update Policy
  - 4.1. Access control
  - 4.2. Data Update Method
  - 4.3. Update Procedure
5. Data Update Details
  - 5.1. Update details and procedures
  - 5.2. Updating customer information
  - 5.3. Preparation for update operation
6. Training and Human Resource Development
7. Recommendation

## Result of Activities 3 GIS Database Layer list (18layers)

Water distribution Pipes / Sluice valve (gate valve) / Hydrant / Air valve / Water pipe bridge / Sewer manhole / Sewer pipes / Leakage location / Flow meters / Feeder pipes / Water meters  
Bore holes / Pump station / Service reservoir / Distribution area of source / Customer information and Billing information / Issue and Complaint / Water quality

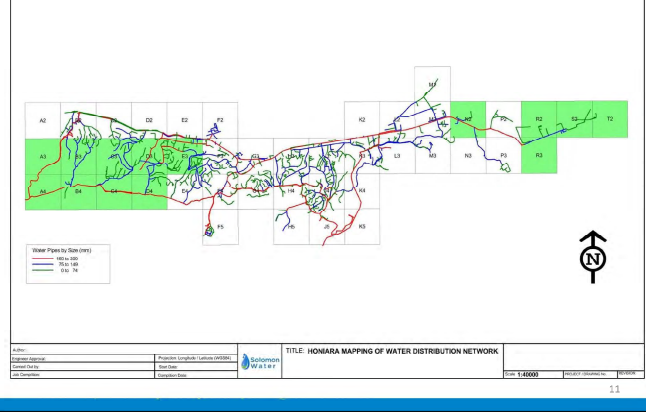
# Result of Activities 4

## GIS Database Specifications

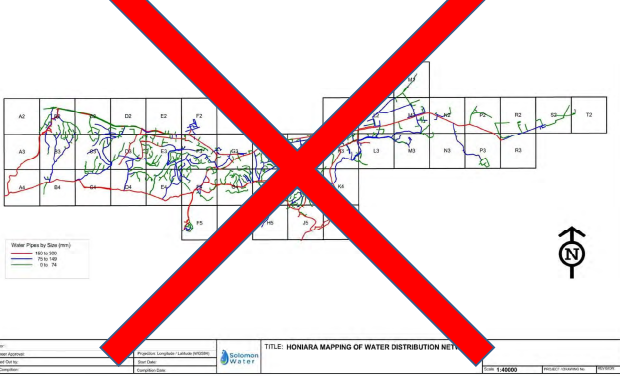
For example) Water Pipes

Field_name	Type	Length	Descriptions
P_ID	Character	10	Pipe Number
Networks	Character	30	Supply Source
Systems	Character	30	Distribution System
P_Type	Character	10	Pipe material
P_Size	Integer	5	Pipe diameters
P_Length	Double	(7,2)	Pipe length
P_Depth	Double	(8,2)	Pipe Depth
Pipe_Use	Character	15	Whether Transmission or Distribution
dt_install	Date	8	Completion year (Date of Pipe laid)
dt_Maintained	Date	8	Date of last maintenance
dt_Replace	Date	8	Date of Replacement / Rehabilitation
dt_Repair	Date	8	Date of Repairing
dt_Leakage	Date	8	Date of Leakage detection
Pipe_Notes	Character	51	Comments

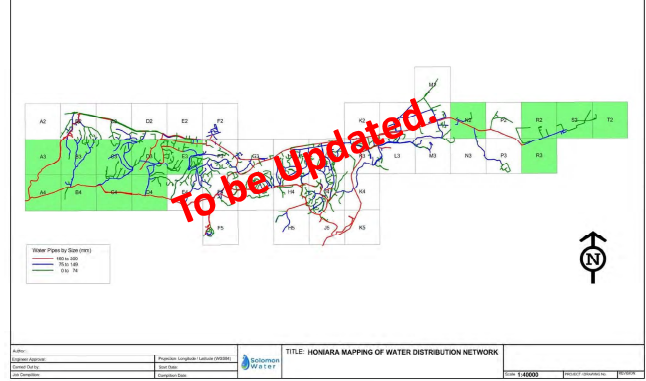
### PROGRESS OF AREAS SURVEYED and UPDATED ( June, 2014 )



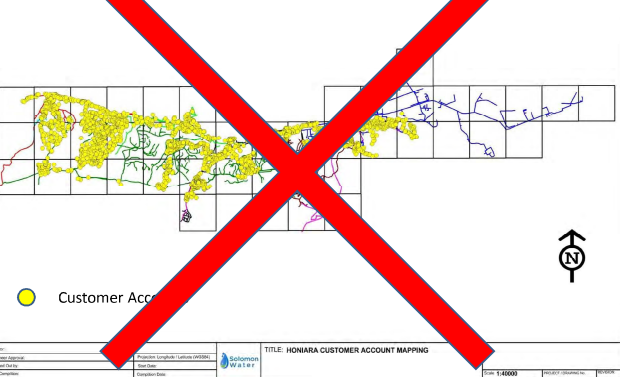
### HONIARA DISTRIBUTION NETWORK



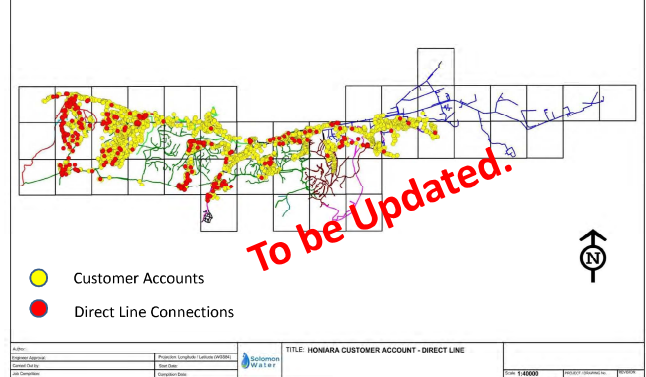
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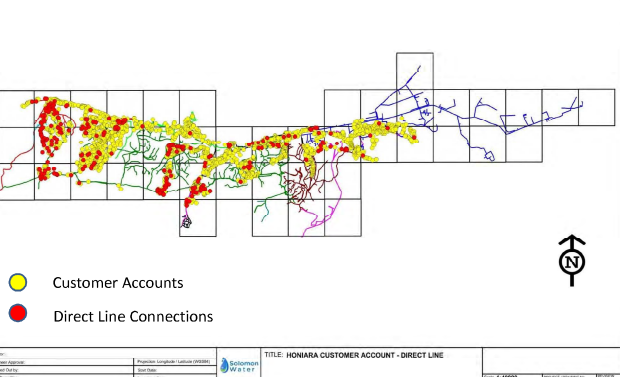
### PROGRESS OF MAPPING OF CUSTOMER ACCOUNT



### PROGRESS OF MAPPING OF CUSTOMER ACCOUNTS ( September, 2015 )



### PROGRESS OF MAPPING OF CUSTOMER ACCOUNTS ( June, 2014 )



### Example of Output about Customers and Consumption by GIS

ZONE	Meters	No of DL	Illegal	Discon.	Consumption (m3/month)
ZONE-1	100	10	10	4	3,500
ZONE-2	60	5	5	10	3,000
ZONE-3	20	60	2	20	2,500



## Challenges

- Information availability
  - Lots of features are underground
  - Many records have been lost
- Information Sharing
  - No formal process in acquiring information yet.
- Precise data and quality information data

## Demonstration

- Searching
  - ~Simulation of workflow~
  - Relation to billing data
  - Monthly Consumption

## Conclusion

- A better understanding of the role GIS plays in this organisation is achieved.
- Smooth cooperation between departments towards a more effective operation and much improved Solomon Water service.

## Q & A Session

- Please do not hesitate to ask.
- Is there anything else that isn't clear?



**S13.3-35 WORKSHOP OF GIS ON NRW**  
**PROJECT**



# Solomon Water – Geographic Information Systems (GIS)

Gavin Bare  
GIS Technician  
07, October, 2015

## 1. GIS Current/Ongoing Activities

- Mapping of:
  - Water supply distribution network
    - Upgrade Modelling
    - For more accurate maps for field operation and distribution.
  - Honiara Customer accounts
    - Put a location to Volume Consumption
    - Link Billing and GIS – DMA Management.
- Development of a GIS workflow for Database
  - Establish procedural link between GIS and SW departments.

## Contents of Presentation

1. GIS Current / Ongoing Activities
2. Result of Activities
3. Challenges
4. Conclusion
5. Demonstration of GIS Database
6. Q & A session

## 2. Result of Activities 1

### Rulebook

1. Introduction
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  - 5.1. Update details and procedures
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## 2. Result of Activities 2

### Operation & Maintenance Manual

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5. Troubleshooting
  - 5.1 GPS Device
  - 5.2 GIS Database

## 2. Result of Activities 4

### GIS Database Layer list (18layers)

#### Distribution facility information:

Water distribution Pipes / Sluice valve (gate valve) / Hydrant / Air valve / Water pipe bridge / Sewer manhole / Sewer pipes / Leakage location / Flow meters / Feeder pipes / Water meters

#### Water source information:

Bore holes

#### Pump Station information:

Pump station

#### Customer's information:

Customer information / Billing information / Issue and Complaint

#### Other information:

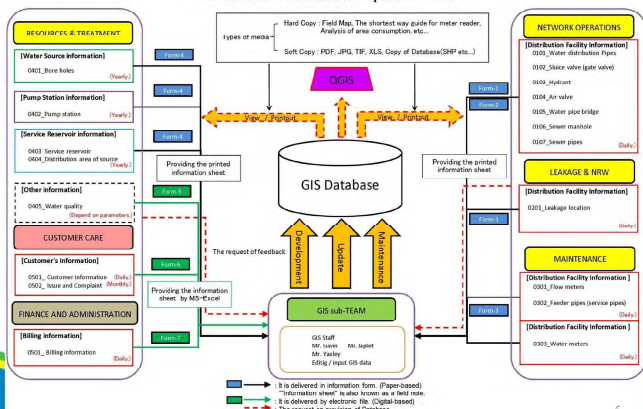
Water quality

#### Service Reservoir information:

Service reservoir / Distribution area of source

## 2. Result of Activities 3 (workflow)

### The workflow for database development and data



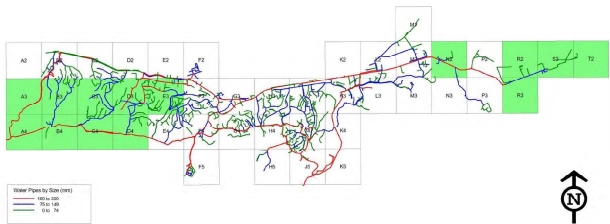
## 2. Result of Activities 5

### GIS Database Specifications

#### For example) Water Pipes

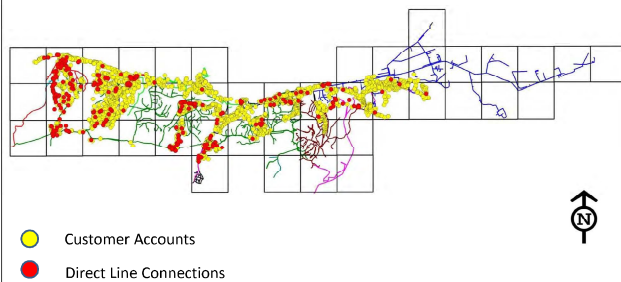
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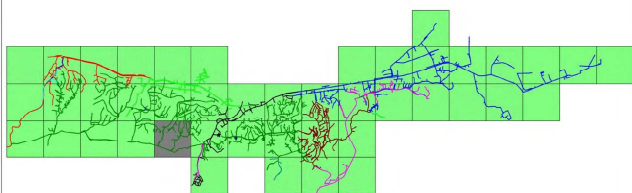
Author:		Project Manager: Caroline WOODS		SOLOMON WATER		TITLE: HONIARA MAPPING OF WATER DISTRIBUTION NETWORK		Scale: 1:8000		PROJECT ID: 23985	
Engineer: [Name]	Cartographer: [Name]	Field Officer: [Name]	Survey Date: [Date]	Logo	Logo	Logo	Logo	Logo	Logo	Logo	Logo

**PROGRESS OF MAPPING OF CUSTOMER ACCOUNTS ( June, 2014 )**



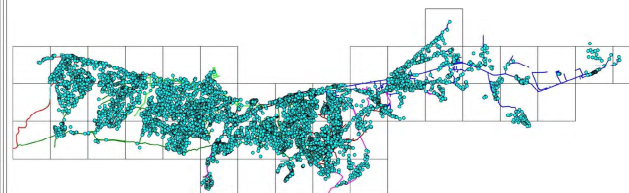
Author:		Project Manager: Caroline WOODS		SOLOMON WATER		TITLE: HONIARA CUSTOMER ACCOUNT - DIRECT LINE		Scale: 1:8000		PROJECT ID: 23985	
Engineer: [Name]	Cartographer: [Name]	Field Officer: [Name]	Survey Date: [Date]	Logo	Logo	Logo	Logo	Logo	Logo	Logo	Logo

**PROGRESS OF AREAS SURVEYED and UPDATED ( September, 2015 )**



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