

**S13.3-33 水道の基本計画検討と水理解析に係る
講義（活動 1-3 および 3-1、3-2、3-4、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

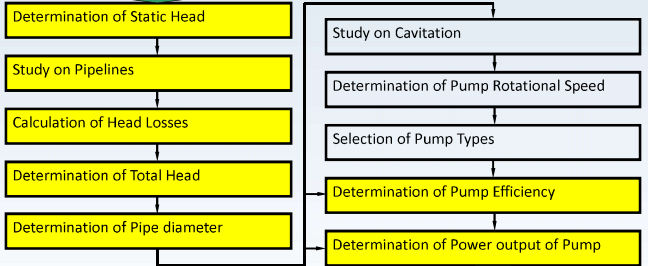
NRW Project Team

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

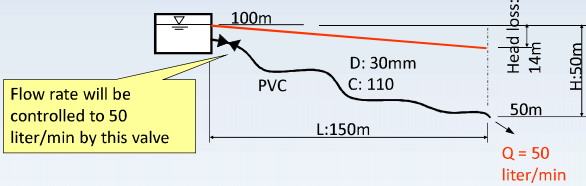


Pump Type:

Pump diameter(mm) × Flow(m³/min) × Total suction head(m) × Power output(kW) × [Rotating speed(min⁻¹)]

3

Example on Gravity Flow



Flow rate will be controlled to 50 liter/min by this valve

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

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

$$= 0.0936$$

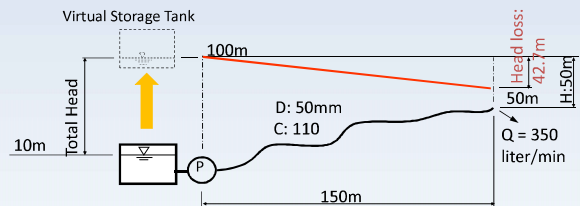
$$\text{Head loss} = I \times L$$

$$= 0.0936 \times 150$$

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

2

Example on Pumping Flow



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

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

$$= 0.2847$$

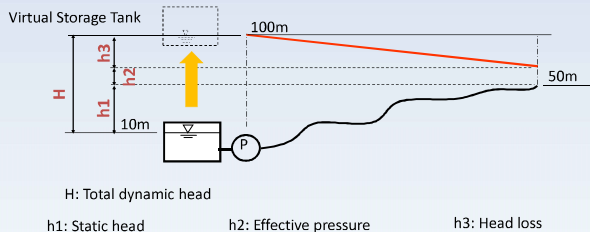
$$\text{Head loss} = I \times L$$

$$= 0.2847 \times 150$$

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

4

Definition of Pumping Flow



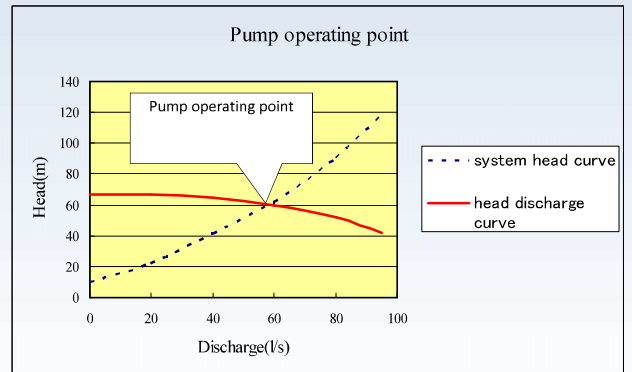
H: Total dynamic head
h1: Static head h2: Effective pressure h3: Head loss

$$H = h1 + h2 + h3$$

Definition of total dynamic head

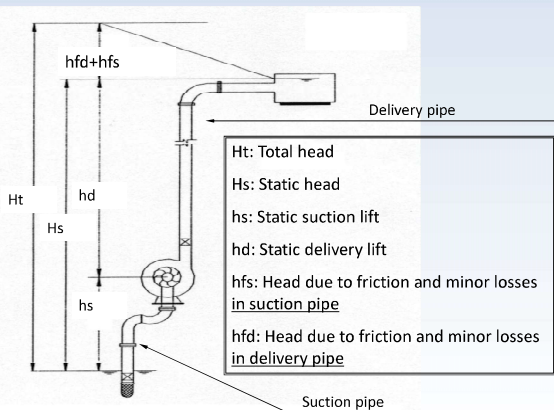
5

Pump Operating Point and System Head Curve



7

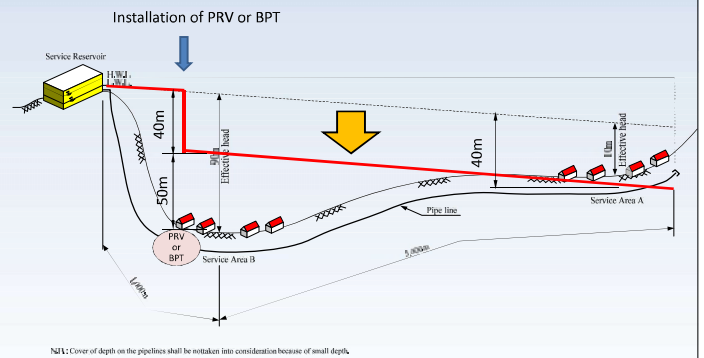
Head of Centrifugal Pump in Detail



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

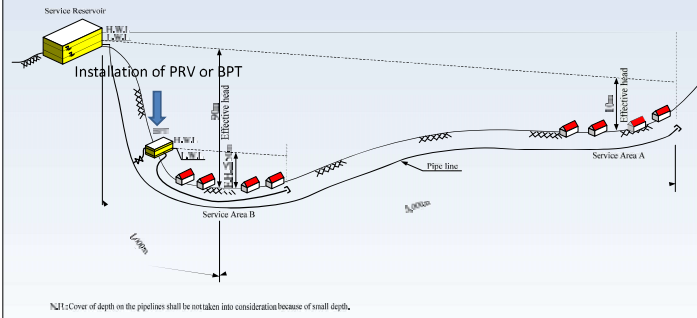
Solution-1



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

8

Solution-2



S13.3-34 GIS レビュー (GIS および GPS 概要)

に係る講義

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 km²).
- Mapping of Facilities, Features, Assets or incidents are important to hold information for immediate planning or future reference.

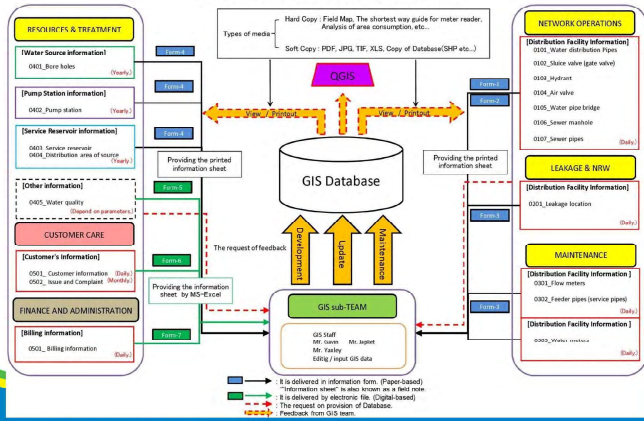
Introduction

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

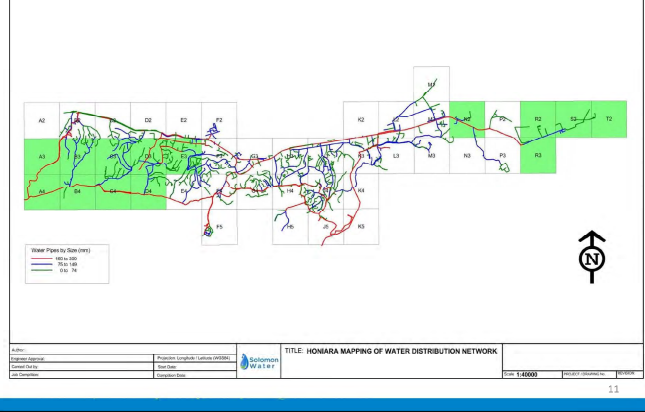
Result of Activities 4

GIS Database Specifications

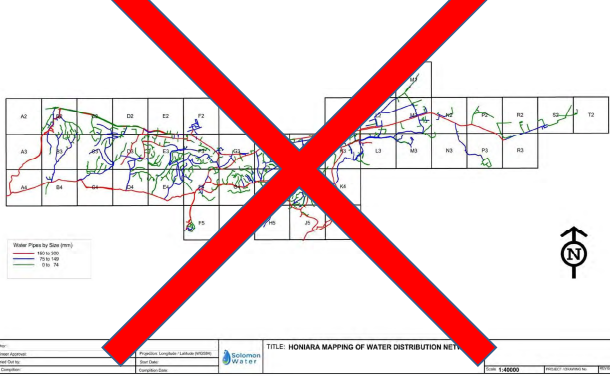
For example) Water Pipes

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

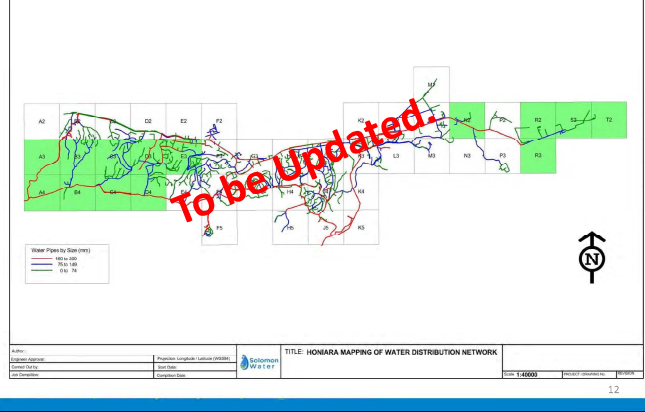
PROGRESS OF AREAS SURVEYED and UPDATED (June, 2014)



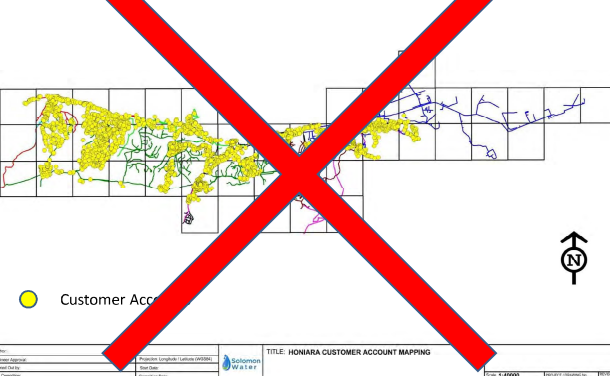
HONIARA DISTRIBUTION NETWORK



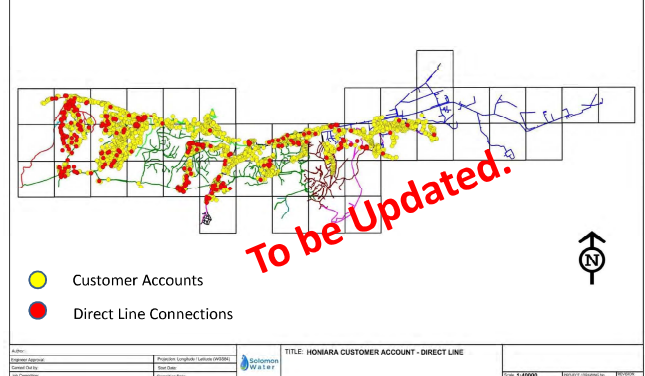
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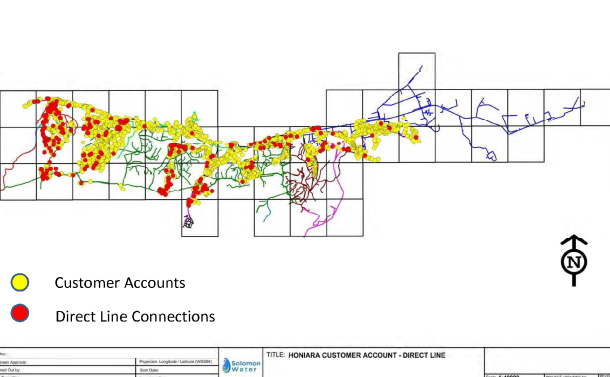
PROGRESS OF MAPPING OF CUSTOMER ACCOUNT



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 無収水プロジェクトに係る GIS のワー
クシヨツプ

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

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 - 5.2. Updating customer information
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7. Recommendation

2. Result of Activities 2

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 - 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:

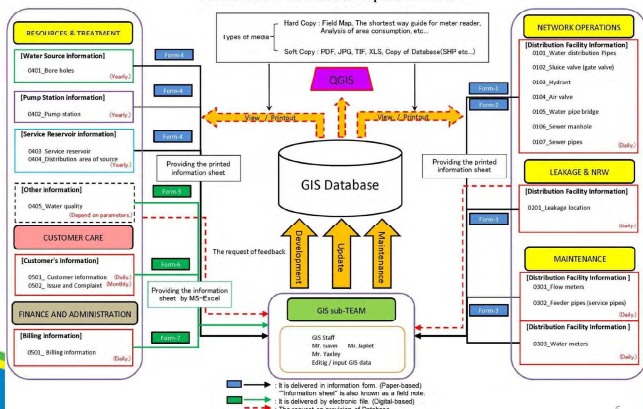
Water quality

Service Reservoir information:

Service reservoir / Distribution area of source

2. Result of Activities 3 (workflow)

The workflow for database development and data



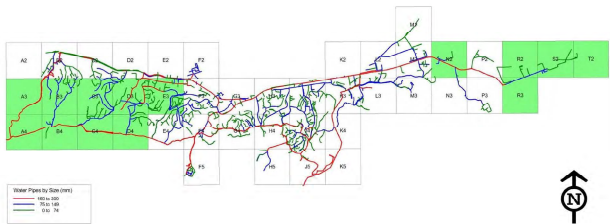
2. Result of Activities 5

GIS Database Specifications

For example) Water Pipes

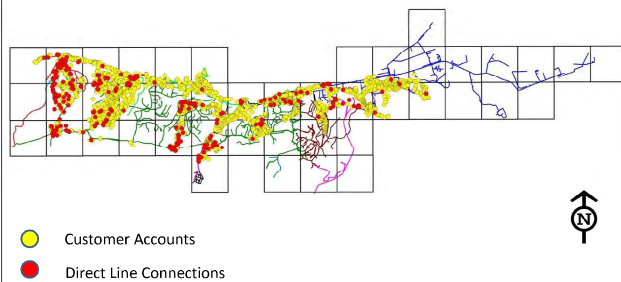
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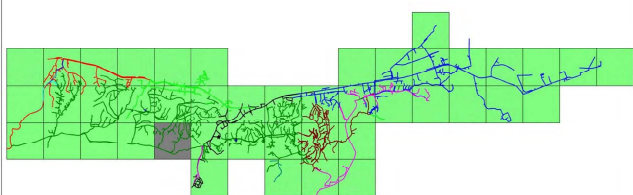
Author:		Project Manager: Caroline WOODS		SOLOMON WATER		TITLE: HONIARA MAPPING OF WATER DISTRIBUTION NETWORK		Scale: 1:8000		Project Number: 11000	
Engineer: Robert	Project Manager: Caroline WOODS	Author:	Project Manager: Caroline WOODS	SOLOMON WATER		TITLE: HONIARA MAPPING OF WATER DISTRIBUTION NETWORK		Scale: 1:8000		Project Number: 11000	
Cartographer: Robert	Project Manager: Caroline WOODS	Author:	Project Manager: Caroline WOODS	SOLOMON WATER		TITLE: HONIARA MAPPING OF WATER DISTRIBUTION NETWORK		Scale: 1:8000		Project Number: 11000	
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PROGRESS OF MAPPING OF CUSTOMER ACCOUNTS (June, 2014)



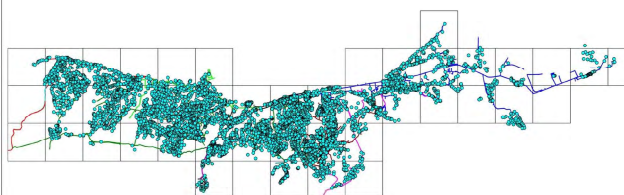
Author:		Project Manager: Caroline WOODS		SOLOMON WATER		TITLE: HONIARA CUSTOMER ACCOUNT - DIRECT LINE		Scale: 1:8000		Project Number: 11000	
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