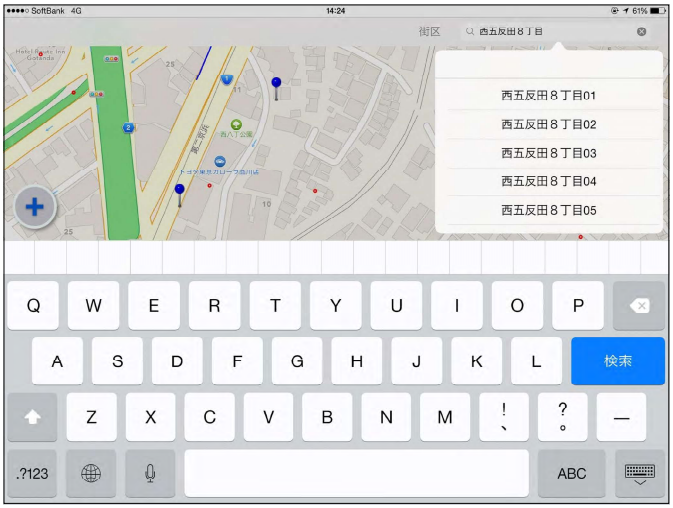
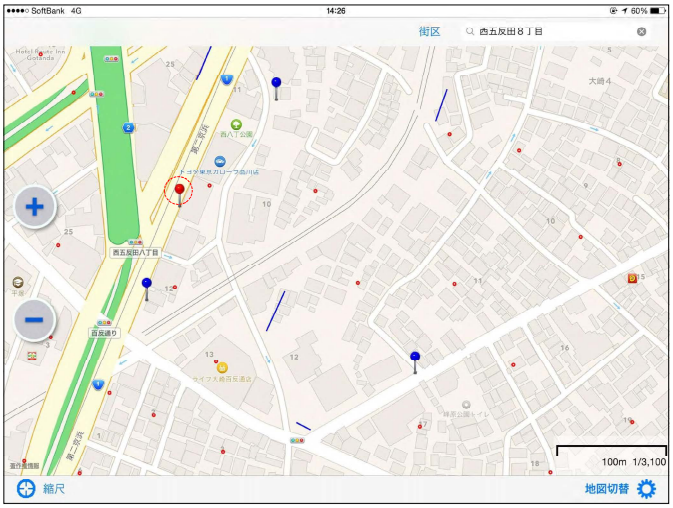
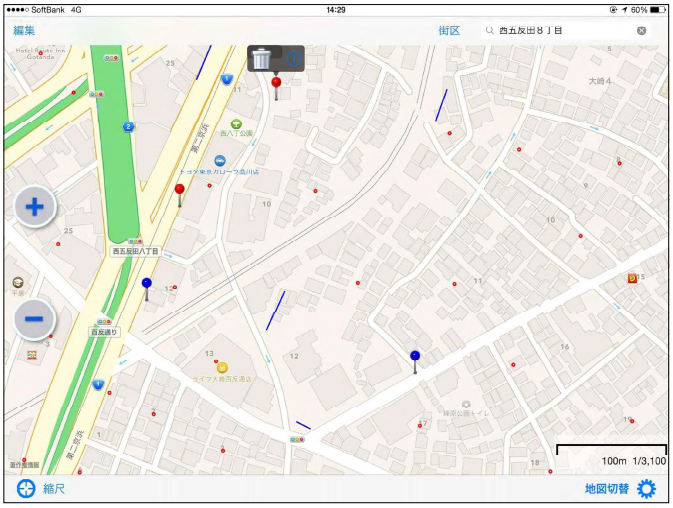
S13.3-27 LECTURE ON GIS REVIEW

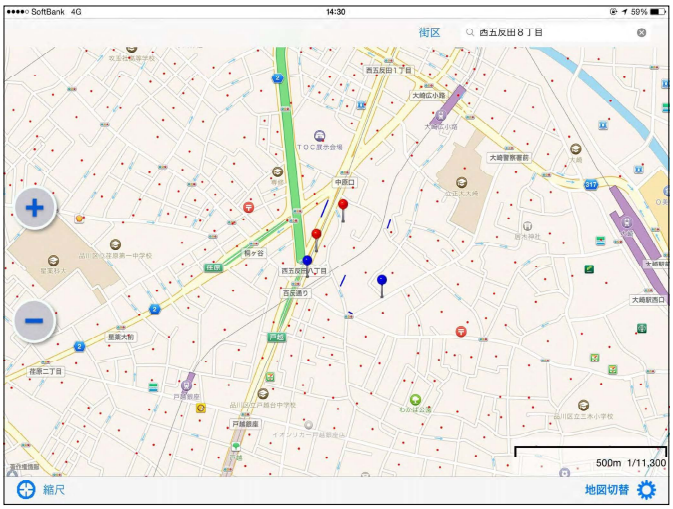
(OUTLINE OF GIS & GPS)


街区
西五反田８丁目
西五反田８丁目01
西五反田８丁目02
西五反田８丁目03
西五反田８丁目04
西五反田８丁目05
検索
ABC


街区
西五反田８丁目
100m 1/3,100
縮尺
地図切替


属性値一覧
調査種別 : 細街路協議
番号 : ykhm-0002
調査内容 : 側溝の詰まり
備考 :
メモ :
調査状況
調査中
調査完了
保存しない
Cancel


編集
街区
西五反田８丁目
100m 1/3,100
縮尺
地図切替


街区
西五反田８丁目
500m 1/11,300
縮尺
地図切替

S13.3-28 LECTURE FOR 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

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

May 2015

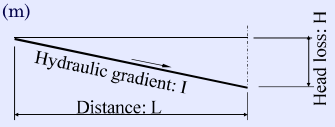
NRW Project Team

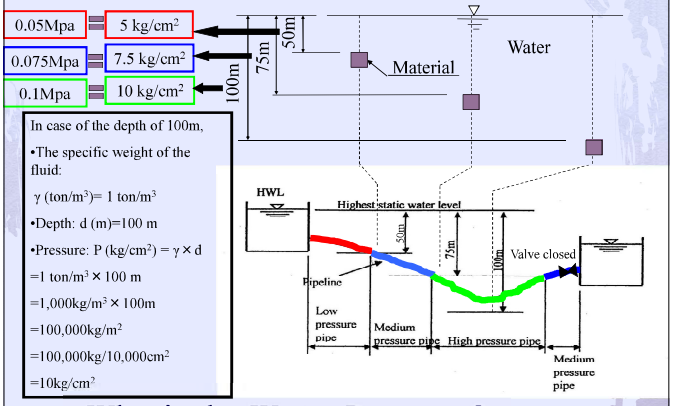
Head loss in the pipes

Head loss in the pipeline is expressed as follows:

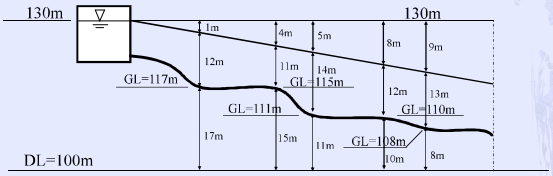
$H = I \times L, (I = H / L)$

Where,
H: Head loss (m)
I: Hydraulic gradient (dimensionless)
L: Distance (m)





What's the Water Pressure?



Energy exchange

due to **Bernoulli's relationship**

Head loss, effective water head and elevation head

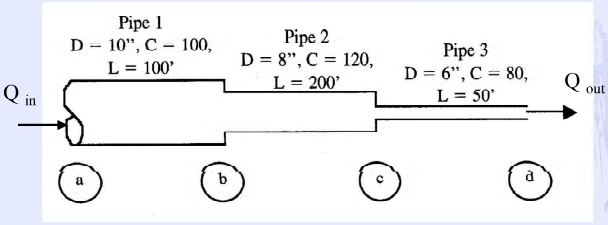
Hydraulic calculation of pipes

•The Hazen – Williams equation is most commonly used in water works engineering.
•The equation in various forms is given below.

- $I=10.666 \times C^{-1.85} \times D^{-4.87} \times Q^{1.85}$
- $D=1.6258 \times C^{-0.38} \times Q^{0.38} \times I^{-0.205}$
- $Q=0.27853 \times C \times D^{2.63} \times I^{0.54}$
- $V=0.35464 \times C \times D^{0.63} \times I^{0.54}$

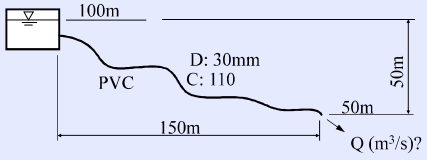
Where,
I: Hydraulic gradient (dimensionless), C: Coefficient of roughness (dimensionless), D: Inner diameter of the pipes (m), Q: Flow rate (m^3/s), V: Velocity of water in the pipes (m/s)

Series Pipe System



•The flow through each pipe is the same.
•Head losses vary between each segment.
•The total head loss from 'a' to 'd' is the sum of the head losses in individual pipes.

Example No.1 on gravity flow



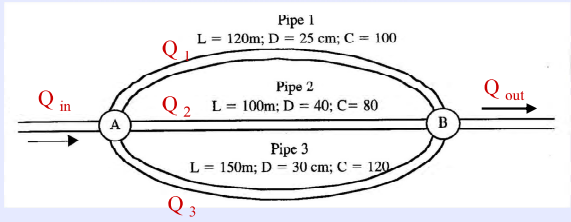
$Q = 0.27853 \times C \times D^{2.63} \times I^{0.54}$

$= 0.27853 \times 110 \times (30/1000)^{2.63} \times (50/150)^{0.54}$

$= 0.00167$ (m3/sec)

$\fallingdotseq 100$ (liter/min)

Parallel Pipe System



•The flow through each will be different.
•The energy loss in each pipe must be the same.
•$Q_{in} = Q_1 + Q_2 + Q_3 = Q_{out}$

Question 1

Estimate the water demand for a community whose population will reach 11,000 persons at the particular target year. The daily per capita water consumption for the community is 120 Lpcd. Calculate the design capacity of water treatment and that of the water distribution system. Water demand for fires is not considered.

Where,
Factor for peak hourly supply: 200 percent of average daily supply.
Factor for maximum daily supply: 110 percent of average daily supply.
NRW: 20 % of average daily demand.
Lpcd: Liter per capita per day

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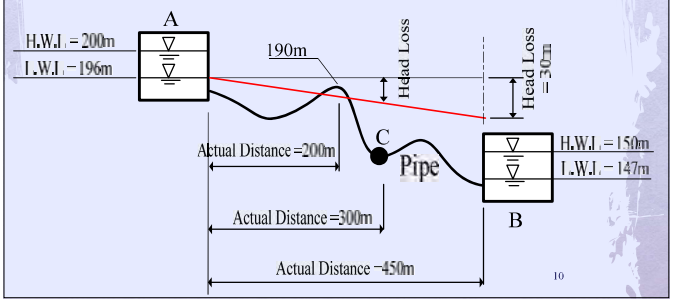
Question 2

Answer the following questions.
Minimum hydraulic gradient:
Average hydraulic gradient:
Head loss at C:
Is the water supplied from A to B?



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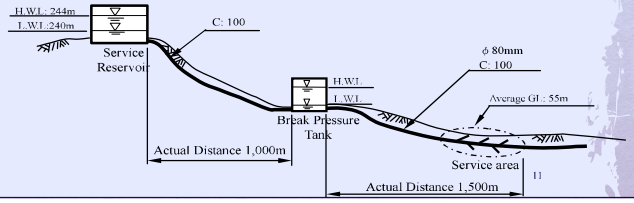
Question 3

The new project of water supply system was launched in Gizo. Water source of spring water was already secured. The plan is to convey the water disinfected by chlorination at water source to a service reservoir and to supply water of 640m³/day to service area. Then SW officer of Gizo negotiated with landowners for land acquisition of the service reservoir. However, some of owners did not approve of the land lease. Eventually, it was impossible to acquire the proposed land for the service reservoir, and SW was forced to acquire alternative land attitude of which is higher than the former proposed land. Therefore, water pressure must be reduced by a break pressure tank or Pressure Reducing Valve (PRV) or break pressure tank.
Answer the following questions.
In order to set maximum static head of 1Mpa in the service area, how much is ground elevation of the land for the break pressure tank proposed?
If the break pressure tank is not planned, how much is maximum static head in the service area?
How much is pipe diameter proposed between the service reservoir and the break pressure tank?
If the diameter of 80mm after the break pressure tank is proposed, how much is effective head in the service area?

Condition
Effective depth of the break pressure tank: 2 m
L.W.L. of the break pressure tank equals its ground level.
C: Coefficient of pipe roughness.



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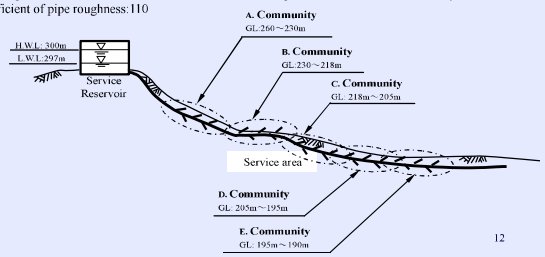
Question 4

When the pipes of PN10 are laid in the following community:
1. Is a break pressure tank required?
2. If required, in which community should the break pressure tank be located?
3. For which community will the break pressure tank be applied?
4. If the break pressure tank is required for above community, how much is approximately effective pressure at the community to be served by using pipes of φ80mm?

Design condition:
- Effective pressure should be at least 0.4Mpa in each village.
- If break pressure tank is required, the following condition will be applied:
  - Effective depth of the break pressure tank: 2 m
  - L.W.L. of the break pressure tank equals its ground level.
  - Pipe length is 200m and flow is 220m³/d between the break pressure tank and the community to be served
- Coefficient of pipe roughness:110



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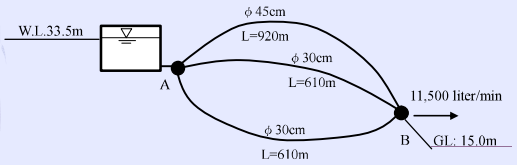
Question 5

Calculate the velocity, head loss and flow in each pipe of the network shown below. What will be the pressure at node B? Use C=100.



Almost everybody understood!
⇒Lecture to be skipped

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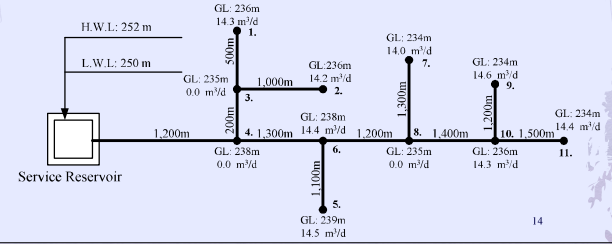
Question 6

the augmentation water supply project started carrying out in this year. The existing service reservoir will be continuously utilized because it has affordable capacity and all the pipelines will be augmented.
Answer the following questions.
1. Determine the pipe diameters and the effective heads (effective pressure) at each node.
2. If booster pumps is required at certain node on the route, which the route and the node are they? And how much should be pressurized by the pump?
3. Draw the hydraulic gradient line from the service reservoir to No. 11 through No.4, No.6, No.8, and No.10.

Condition
Coefficient (C) of pipe roughness for all: 100
0.1Mpa should be required for the minimum effective heads at each node.
Water demands are indicated at the each node.



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S13.3-29 LECTURE ON METER READERS, BILLING TEAM AND CUSTOMER SERVICE

Meter readers, Billing team, Customer service

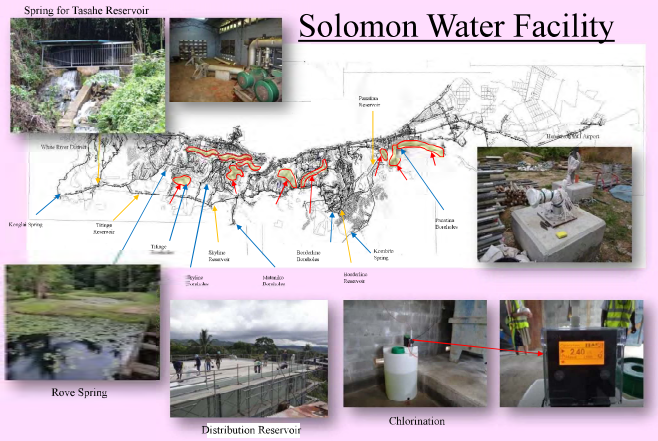
May 5, 2015

Wada

Water source

- For protection water source area
  - ➢Keep forest around water source area clean
  - ➢Avoid discharging waste water directly
- Function of Watershed protection forests
  - ➢Storing water
  - ➢Purifying water
  - ➢Protecting flood

Solomon Water Facility



Safe water

- Sodium hypochlorite is used as disinfection.
  - ➢0.1 mg/L at the tap by Waterworks Law

Calcium hypochlorite $Ca(ClO)_2$

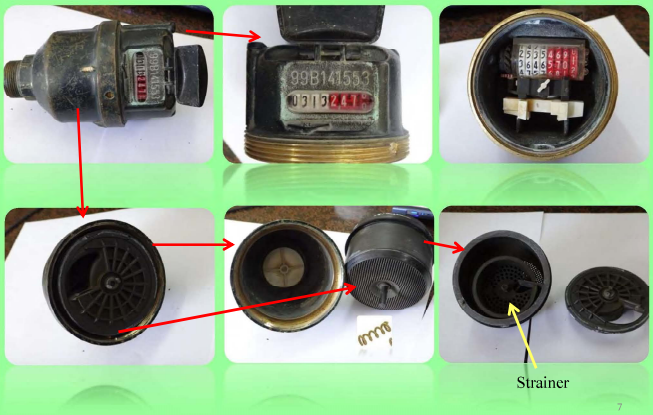
Sodium hypochlorite NaClO

Liquid chlorine

Distribution management

- Function of Distribution reservoir
  - ➢Keep clean water for customers
  - ➢Secure water at the disaster
  - ➢For using fire hydrant 170~180L/d/capita

SW Water meter



Distribution management

- Where to happen leakage?
  - ➢At the connection between distribution pipe and service pipe
  - ➢At a valve beside a water meter

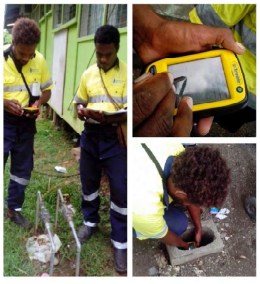
Project; NRW reduction of 30% in each pilot area

How to deduce NRW?

Improvement of meter reading

- ➢ Customers are billed for days
- ➢ New installed meters are
- ➢ Uncover reading discrepancies
- ➢ Reading
- ➢ Water Sales
- ➢ customer complains
- ➢ efficient

- Readings can be accessed (Billings & Customer Care)
- Provides reading
- Communication



Necessary condition of Water meter

- Accurate
- , High , Wide
- Little of the inside parts and a large capacity of
- Hygienically harmless , Weather
- measurement and checks
- structure, handling
- breakdown, repair, interchangeability, price

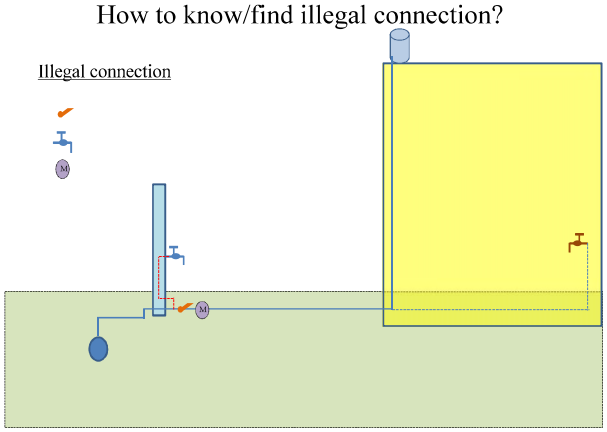
9

Cause and measures for the trouble of the water meter

No	The trouble	A cause	Measures
1	The needle of the water meter doesn't work or the movement is slow		
2	The needle of the meter turns in forward and reverse		
3	The movement of the needle is fast		
4	A needle turns in reverse		
5	The indicator on the meter is unclear of rust		
6	The indicator on the water meter is unclear		

10

How to know/find illegal connection?



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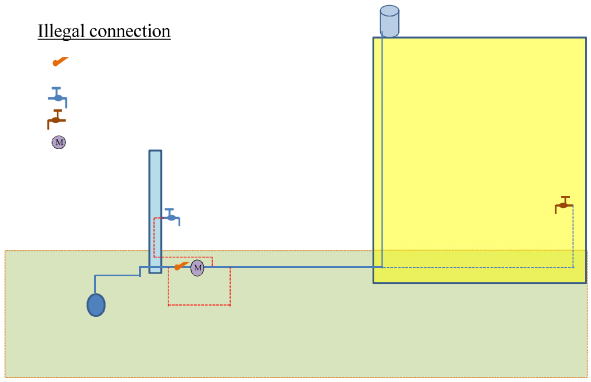
How to know/find illegal connection?



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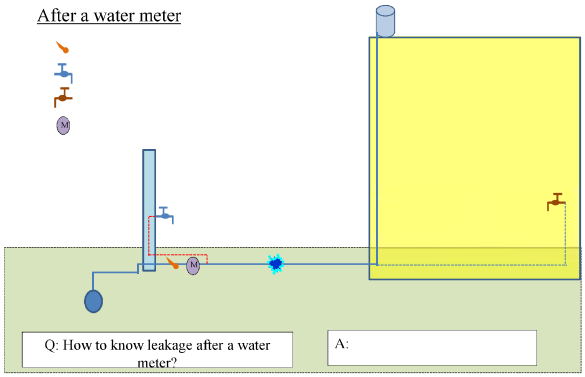
How to know/find leakage?



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Saving water

Case	How to save water	Water-saving amount
Bathing		90L / d 36L / d
Shower		35L / d
Cooking		80L / d
Face-wash Dentifrice		15L / d 20L / d
Toilet		20L / d
Laundry		45L / d 40L / d
Sweeping/ watering		20L / d

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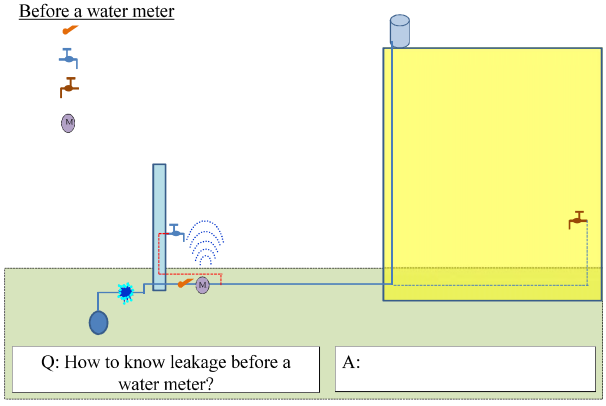
How to know/find leakage?



Water meter error

Customer ID			101	102	103	104	105	106	107	108	109	110
Installed Date			03/2014	11/2013	01/2007	01/2007	02/2007	03/2012	01/2006	01/2006	01/2005	01/2008
Passage Year			0.3	0.7	7.6	7.5	7.4	2.3	8.6	8.5	9.5	6.5
Meter DN (mm)			13	13	13	13	13	13	13	13	13	13
Meter Count (800×120×60×30)	L/h	L	L	L	L	L	L	L	L	L	L	L
	30	10	670.5	361.4	865.1	1011.0	990.9	186.3	526.7	340.8	1153.6	1053.9
	60	20	660.6	351.7	858.7	1011.0	981.0	176.5	518.1	330.3	1145.3	1044.7
	120	40	640.6	331.8	840.3	1011.0	960.8	156.3	499.9	310.5	1125.8	1024.7
	800	100	600.6	291.8	800.9	973.4	920.4	115.8	459.0	271.8	1084.9	983.9
	Initial		500.6	192.1	701.0	867.3	819.9	15.4	359.1	171.6	983.4	883.4
Meter Error	L/h	Ave.%	%	%	%	%	%	%	%	%	%	%
	30	-17.7	-1.0	-3.0	-36.0	-100.0	-1.0	-2.0	-14.0	5.0	-17.0	-8.0
	60	-11.9	0.0	-0.5	-8.0	-100.0	1.0	1.0	-9.0	-1.0	-2.5	0.0
	120	-0.2	0.0	0.0	-1.5	-6.0	1.0	1.3	2.2	-3.3	2.2	2.0
	800	0.9	0.0	-0.3	-0.1	6.1	0.5	0.4	-0.1	0.2	1.5	0.5

Calculating formula

((865.1-858.7)÷10×100-1) ×100 = -36.0
((858.7-840.3) ÷10×100-1) ×100 = -8.0
((840.3-800.9) ÷10×100-1) ×100 = -1.5
((800.9-701.0) ÷10×100-1) ×100 = -0.1

Consideration

1. Billing
Q: How to calculate water charge collection rate?
A:

Q: Solution to reduce non-payment of water charge?
A:

Q: Importance of relation between meter reading team and billing team?
A:

Q: Water charge is enough to cover the cost?
A:

Q: How to treat low-income payers who are difficult to pay water charge?
A:

Consideration

2. PR activity
Q: Necessity of PR activity?
A:

Q: Necessity of Awareness Meeting?
A:

Q: Necessity of School education?
A:

Q: Issues of Water Supply Service?
A:

Consideration

3. Customer Service
Q: How to treat customer's complaint?
C1: Judging from water consumption, water charge is high.
A1:

C2: Water pressure is low.
A2:

C3: Not receiving a billing.
A3:

C4: Continuing water supply cut?
A4:

C5: I want to know water quality?
A5:

C6: I cannot pay water charge because I have no job.
A6:

C7: Disconnection due to non-payment of water charge.
A7:

Consideration

4. NRW Activity
Q: How to calculate NRW ratio?
A:

Q: Necessity of NRW Activity?
A: