# Water Utility Information (FY 2014)

<table>
<thead>
<tr>
<th>Name of utility:</th>
<th>Public Enterprises Agency Kanagawa Prefectural Government</th>
<th>Service type:</th>
<th>Water service provider</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administrative population:</td>
<td>3.03 million people</td>
<td>Start of service:</td>
<td>1933</td>
</tr>
<tr>
<td>Population served:</td>
<td>2.8 million people</td>
<td>Service area:</td>
<td>808.59 km²</td>
</tr>
</tbody>
</table>

## Water supply volume

<table>
<thead>
<tr>
<th>Average daily water supply:</th>
<th>880,000 m³/d</th>
<th>Breakdown:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Household use</td>
<td>664,000 m³/d</td>
<td></td>
</tr>
<tr>
<td>Commercial and Industrial use:</td>
<td>152,000 m³/d</td>
<td></td>
</tr>
<tr>
<td>Others:</td>
<td>42,000 m³/d</td>
<td></td>
</tr>
<tr>
<td>From wholesale supplier</td>
<td>25,000 m³/d</td>
<td></td>
</tr>
</tbody>
</table>

| Average daily water supply per capita: | 292.6 L/person/d | Service coverage: | 99.8 % |
| Effectiveness: | 92.7 % | Revenue water: | 88.5 % |
| NRW: | 11.5 % | Water loss: | 6.7 % |

## Water rates

**Calculation condition: The fixed charge is 1,420 yen/two months. The volumetric charge is 128 yen/m³ from 17 to 30 m³ = 1,932 yen x taxes x 1/2**

| Water rate for 10m³/month: | 1,043 yen (including taxes) |
| Water production cost: | 164.14 yen/m³ |
| Water supply cost: | 156.01 yen/m³ |

## Facilities

### Water Treatment Plant and Facilities (including water from wholesale supplier):

<table>
<thead>
<tr>
<th>Name</th>
<th>Capacity</th>
<th>Water source</th>
<th>Treatment process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Samukawa WTP</td>
<td>750,000 m³/d</td>
<td>Surface water</td>
<td>Coagulation/sedimentation + Rapid filtration + Chlorine disinfection</td>
</tr>
<tr>
<td>Tanigahara WTP</td>
<td>242,800 m³/d</td>
<td>Subsoil water Surface water</td>
<td>Sedimentation + Slow filtration + Chlorine disinfection Coagulation/sedimentation + Rapid filtration + Chlorine disinfection</td>
</tr>
<tr>
<td>Kamasawa WTP</td>
<td>720 m³/d</td>
<td>Surface water</td>
<td>Membrane filtration + Chlorine disinfection</td>
</tr>
<tr>
<td>Ochiai WTP</td>
<td>1,620 m³/d</td>
<td>Surface water</td>
<td>Membrane filtration + Chlorine disinfection</td>
</tr>
<tr>
<td>Wada WTP</td>
<td>360 m³/d</td>
<td>Surface water</td>
<td>Membrane filtration + Chlorine disinfection</td>
</tr>
<tr>
<td>Oyama WTP</td>
<td>1,100 m³/d</td>
<td>Surface water</td>
<td>Membrane filtration + Chlorine disinfection</td>
</tr>
<tr>
<td>Sokozawa WTP</td>
<td>470 m³/d</td>
<td>Surface water</td>
<td>Membrane filtration + Chlorine disinfection</td>
</tr>
<tr>
<td>Toya WTP</td>
<td>5,550 m³/d</td>
<td>Subsoil water</td>
<td>Coagulation/sedimentation + Rapid filtration + Chlorine disinfection</td>
</tr>
<tr>
<td>Facility Type</td>
<td>Water Supply (m³/day)</td>
<td>Water Quality</td>
<td>Treatment Process</td>
</tr>
<tr>
<td>------------------</td>
<td>-----------------------</td>
<td>------------------------------</td>
<td>------------------------------------</td>
</tr>
<tr>
<td>Nagano WTP</td>
<td>500</td>
<td>Subsoil water</td>
<td>Membrane filtration + Chlorine disinfection</td>
</tr>
<tr>
<td>Itarih WTP</td>
<td>4,400</td>
<td>Spring water</td>
<td>Membrane filtration + Chlorine disinfection</td>
</tr>
<tr>
<td>Shinanoki WTP</td>
<td>3,300</td>
<td>Spring water</td>
<td>Membrane filtration + Chlorine disinfection</td>
</tr>
<tr>
<td>Midono water source</td>
<td>12,800</td>
<td>Spring water</td>
<td>UV treatment + Chlorine disinfection</td>
</tr>
<tr>
<td>Others (Kissawa etc)</td>
<td>1,700</td>
<td>Ground water</td>
<td>Chlorine disinfection</td>
</tr>
<tr>
<td>Water from wholesale supplier</td>
<td>669,400</td>
<td>Ground water</td>
<td>Chlorine disinfection</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,694,720</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Pipes

- **Pipeline length:** 9,217 km
- **Type of material:**
  - Cast iron: 6,381km
  - Steel: 481km
  - Stainless: 14km
- **Other information:**
  - Number of employees: 623
  - Seismic reinforcement rate of pumping stations: 4.8%
  - Seismic reinforcement rate of distribution reservoirs: 21.6%
  - Maximum daily supply: 1.04 million m³/day
  - Maximum facility utilization rate: 68.5% (Maximum daily supply/treatment capacity)
  - Facility utilization rate: 62.9% (Average daily water supply/treatment capacity)

### Others

- **Remarks:**
  - The information in the Basics, Facilities and Pipes sections (except for the pipeline length, pipe material and ratio of lead service pipe) was cited from the Annual Statistics Report FY2014 of the Kanagawa Prefectural Government.
  - The pipeline length and pipe material is based on the registry of the fixed assets of the Kanagawa Prefectural Government.
  - The seismic reinforcement ratio of primary mains is based on the reference material below.
### Case Study Report (Samukawa Water Treatment Plant)

#### Case #2-1  Samukawa Water Treatment Plant

<table>
<thead>
<tr>
<th>Key word:</th>
<th>Surface water (river), Rapid filtration</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>&lt;Characteristics&gt;</strong></td>
<td></td>
</tr>
<tr>
<td>● Features of the Samukawa Water Treatment Plant</td>
<td></td>
</tr>
<tr>
<td>・Reliable water supply: The Samukawa Water Treatment Plant has a distribution management system to monitor and control reservoirs and pumping stations in the utility's distribution network. On the premises there are two water treatment plants called No. 2 and No. 3 WTPs (No. 1 WTP has been demolished). These two plants are responsible for an efficient and reliable distribution management based on demand forecasts as well as for mutual water transfers with other utilities.</td>
<td></td>
</tr>
<tr>
<td>・Environmental measures: Solar power generation system. Surplus soil from on-site excavations is recycled as raw materials of cement additives.</td>
<td></td>
</tr>
<tr>
<td>・Private sector involvement: A Private Finance Initiative (PFI) has been used for the construction and operation of the drainage facility.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outline:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>・The Samukawa Water Treatment Plant is situated in the Samukawa Town approximately 6.5 km upstream from the estuary of the Sagami River. The Samukawa intake weir located in the town abstracts water from the river. The water treatment process consists of a coagulation/sedimentation, filtration, and disinfection.</td>
<td></td>
</tr>
<tr>
<td>・Service area: 11 Cities and 4 Towns</td>
<td></td>
</tr>
<tr>
<td>・Capacity: 750,000 m³/d (No. 2 WTP: 210,000 m³/d + No. 3 WTP: 540,000 m³/d)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Address:</th>
<th>Miyagawa 4271, Samukawa Town, Kanagawa Prefecture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land area:</td>
<td>487,229 m²</td>
</tr>
<tr>
<td>Water treatment process:</td>
<td>Coagulation/sedimentation + Rapid filtration + Chlorine disinfection</td>
</tr>
<tr>
<td>Capacity:</td>
<td>750,000 m³/d</td>
</tr>
<tr>
<td>Water source:</td>
<td>Surface water (Sagami River)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Raw water quality:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>・Since the raw water is taken from downstream of the Sagami River, it tends to be adversely affected by phytoplankton growth and artificial contaminations in upstream river bodies and lakes.</td>
<td></td>
</tr>
<tr>
<td>&lt;Average raw water quality in FY2014 (maximum)&gt;</td>
<td></td>
</tr>
<tr>
<td>・Turbidity: 9.1 degrees (51 degrees) ・Hardness: 59 mg/L (68 mg/L) ・TOC: 0.8 mg/L (1.3 mg/L) ・pH: 7.8 (7.9) ・Color: 3.4 degrees (12 degrees) ・Geosmin: 0.002 μg/L (0.004 μg/L) ・2-MIB: &lt;0.002 μg/L (0.007 μg/L) ・TON: 8 (17)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chemical dose</th>
<th>Sulfuric acid (pH adjustment), Sodium hydroxide (alkalinity adjustment), Polyaluminum chloride (coagulation), Sodium hypochlorite (disinfection)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start of operation:</td>
<td>Dec-63</td>
</tr>
</tbody>
</table>
Case Study Report (Samukawa Water Treatment Plant)

Pictures:
- Intake point
- Sand settling basin
- Flocculation basin
- Sedimentation basin
- Rapid filtration basin

Water treatment process:
- Solar Power Generation System for CO2 reduction
  Maximum output: 120 kw (daily output varies depending on the weather)
  Installation: Feb 2005
  Location: on the top cover of filtration basins

Other facilities:
- Backup Power Supply System
  The backup power supply system enables the No. 2 and No. 3 water treatment plants to continue operation when a blackout cuts the commercial power supply from the Tokyo Electric Power Company.

Other information:
- The Brochure of the Samukawa Water Treatment Plant (June 2015)
<table>
<thead>
<tr>
<th><strong>Case Study Report (Tanigahara Water Treatment Plant)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Case #2-2  Tanigahara Water Treatment Plant</strong></td>
</tr>
<tr>
<td><strong>Key word:</strong> Surface water (lake), Slow filtration</td>
</tr>
</tbody>
</table>

**Outline:**
- Efficient and Reliable water supply: The Tanigahara Water Treatment Plant has a monitoring and control system for not only on-site facilities but outside reservoirs and pumping stations of the utility's distribution network, providing an efficient and reliable water supply. To improve the treated water quality, automated feeders of activated carbon were installed in 2010.
- Multiple water treatment processes: the plant has two trains of water treatment processes with the one using slow filtration and the other rapid filtration. The latter has three types of sedimentation methods: horizontal, inclined plate, and rapid ones.
- Environmental measures: Surplus soil from on-site excavations is recycled as raw materials of cement additives.

**Address:** Tanigahara 2-6-1, Midori-ku, Sagamihara City, Kanagawa Prefecture

**Land area:** 91,492m²

**Water treatment process:**
1. Slow filtration system: Sedimentation + Slow filtration + Chlorine disinfection
2. Rapid filtration system: Coagulation/sedimentation + Rapid filtration + Chlorine disinfection

**Capacity:** 242,800 m³/d

**Water source:** Surface water, Subsoil water (Sagami River)

**Raw water quality:**
- Mostly abstracted from the Sagami Lake, the raw water tends to contain a range of phytoplanktons including synedra (clogging filtration basin), mycrocystis (affecting filtrate turbidity) and anabaena (musty odor).

**Average raw water quality in FY2014 (maximum):**
- Turbidity: 7.6 degrees (35 degrees)
- Hardness: 53 mg/L (61 mg/L)
- TOC: 0.8 mg/L (1.3 mg/L)
- pH: 7.8 (8.5)
- Color: 6 degrees (22 degrees)
- Geosmin: 0.003µg/L (0.008µg/L)
- 2-MIB: <0.001 µg/L (0.002 µg/L)

**Chemical dose:** Sulfuric acid (pH adjustment), Calcium hydroxide (alkalinity adjustment), Polyaluminum chloride (coagulation), Sodium hypochlorite (disinfection)

**Start of operation:** Mar-40
Case Study Report (Tanigahara Water Treatment Plant)

Water treatment process flow

- Sagami Lake & Wakui Lake
- Receiving well
  - Flocculation
  - Sedimentation
  - Slow filtration (4 m/d)
  - Clear water storage

- Sand Settling Basin
  - Flocculation
  - Sedimentation (inclined plate)

- Rapid filtration type
  - Rapid sedimentation
  - Rapid filtration (140 m/d)
  - Clear water storage

- Sedimentation (horizontal)
  - Sodium hypochlorite
  - PACI
  - Continuous
  - As necessary

- Slow filtration type
  - Sodium hypochlorite
  - PACI
  - Continuous
  - As necessary
### Case Study Report (Tanigahara Water Treatment Plant)

#### Water Treatment Process

- **Intake point**
- **Sedimentation basin (slow filtration system)**
- **Coagulation/sedimentation basin (rapid filtration system - horizontal)**
- **Coagulation/sedimentation basin (rapid filtration system)**
- **Slow filtration basin**
- **Rapid filtration basin**

#### Backup Power Supply System

In the event of a blackout cuts the commercial power supply, a backup power generator enables the operation for up to one fourth of the total plant capacity.

### Other facilities:

#### Other information

- The Brochure of the Tanigahara Water Treatment Plant (March 201)
- The Water Quality of the Kanawaga Prefectural Government's Water Supply Service (Jan 2016)
### Case #2-3  Oyama Water Treatment Plant

<table>
<thead>
<tr>
<th>Key word:</th>
<th>Membrane filtration, surface water (river)</th>
</tr>
</thead>
</table>
| **Outline:** | <Characteristics>  
・Demand fluctuation management: Situated in a tourist zone, the Oyama Water Treatment Plant has relatively broad water demand fluctuations throughout the year but has been producing drinking water in a safe and reliable manner.  
・With a capacity of 740 m³/d, it abstracts water from the Oyama River and supplies about 270 households in the Oyama and Koyasu Districts.  
・Service area: portions of 1 City |
| **Address:** | Sakamoto 671, Oyama, Isehara City, Kanagawa Prefecture |
| **Land area:** | 592 m² |
| **Treatment process:** | Sedimentation + Membrane filtration + Chlorine disinfection |
| **Capacity:** | 1,000 m³/d |
| **Water source:** | Surface water (Oyama River) |
| **Raw water quality:** |  
・Abstracted from a mountainous region, the raw water has a high quality with little artificial contaminations.  
・Average raw water quality in FY2014 (maximum)  
  ・Turbidity: 0.6 degrees (2.3 degrees)  
  ・Hardness: 36 mg/L (38 mg/L)  
  ・TOC: 0.5 mg/L (1.7 mg/L)  
  ・pH: 7.6 (7.7)  
  ・Color: 2.1 degrees (6.4 degrees)  
  ・Geosmin: <0.001 μg/L (-)  
  ・2-MIB: <0.001 μg/L (-)  
  ・TON: 3 (5)  
化学 dose: Sodium hypochlorite (disinfection) |
| **Start of operation:** | April 1986 (membrane filtration since 1998) |
Case Study Report (Oyama Water Treatment Plant)

Outside appearance

Layout

Treatment process flow diagram:

<table>
<thead>
<tr>
<th>Water treatment process</th>
<th>Water flow meter</th>
<th>Turbidity meter</th>
<th>Advanced turbidity meter</th>
<th>Thermometer</th>
<th>Residual chlorine meter</th>
<th>Differential pressure gauge</th>
<th>Water level gauge</th>
</tr>
</thead>
</table>

Oyama River

Sodium hypochlorite

Oyama River Intake Receiving well

Sand settling basin

Intake measuring basin

Sedimentation basin

Dust remover

Raw water tank

Sand washing tank

Receiving well

Junction well

Customer tap

Customer tap

Discharge

Drainage tank

Membrane filtration

Gas water storage

Sodium hypochlorite

Wash water tank

Water flow meter

Turbidity meter

Advanced turbidity meter

Thermometer

Residual chlorine meter

Differential pressure gauge

Water level gauge
### Case Study Report (Oyama Water Treatment Plant)

#### Pictures
- **Intake point**
- **Settling basin, Sedimentation basin (when covered)**
- **Membrane filtration system**
- **Settling basin, Sedimentation basin (when opened)**
- **Membrane filtration system**

#### Other facilities:
- **Membrane module**
  - 12 m³ x 34 modules x 3 trains (102 modules in total)
  - Filtration method: external pressure type dead-end filtration
  - Filtration velocity: 1.0 m³/m²*d (maximum)
  - Module size: φ114×1,078 mm

#### Other information
- The Brochure of the Oyama Water Treatment Plant (June 2010)
# Case #2-4 Midono Water Source

## Key word:
UV treatment system, Spring water

<table>
<thead>
<tr>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental measures: Because of a very high raw water quality throughout the year, a UV treatment system has been adopted, saving energy required for water treatment.</td>
</tr>
<tr>
<td>Service area: portions of 1 Town</td>
</tr>
<tr>
<td>Design capacity: 12,800 m$^3$/d</td>
</tr>
</tbody>
</table>

## Address:
Sengokuhara Daigatake 1277-2, Hakone Town, Kanagawa Prefecture (location of the UV treatment system)

## Land area:
16,127 m$^2$

## Water treatment process:
UV treatment + Chlorine disinfection

## Capacity:
12,800 m$^3$/d

## Water source:
Spring water

## Raw water quality:
- Turbidity: <0.1 degrees (<0.1 degrees)
- Hardness: 110 mg/L (110 mg/L)
- TOC: <0.1 mg/L
- pH: 7.2 (7.2)
- Geosmin: <0.001 μg/L (-)
- 2-MIB: <0.001 μg/L (-)
- TON: <1 (<1)

## Chemical dose:
Sodium hypochlorite (disinfection)

## Start of operation:
Mar-68
## Case Study Report (Midono Water Source)

### Layout

<table>
<thead>
<tr>
<th>Midono Water Source</th>
</tr>
</thead>
</table>

### Treatment process flow diagram:

- **Midono water source**
- **Pumping station**
- **Strainer**
- **No. 2 UV treatment system**
- **No. 1 UV treatment system**
- **Motor operated valve**
- **Emergency stop valve**
- **No. 2 Receiving well**
- **Sodium hypochlorite**
- **Motor operated valve**
- **No. 1 Receiving well**
- **Emergency stop valve**
- **Sodium hypochlorite**
- **Distribution**
- **Reservoir**
- **To another pumping station**
## Case Study Report (Midono Water Source)

### Water treatment process

<table>
<thead>
<tr>
<th>Intake facility</th>
<th>Intake facility</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Intake facility" /></td>
<td><img src="image2" alt="Intake facility" /></td>
</tr>
</tbody>
</table>

- **Spring water**
  - (inside the intake facility)

- **UV system**
  - (outside)

- **UV system**
  - structure

### Other facilities:

- UV treatment system
  - Irradiation dose: over 10mJ/cm²
  - Size of irradiation tank: φ500 mm x 2400 mm
  - Number of UV lamps: 6 lamps/unit
  - Size of a UV lamp: φ19 mm x 1500 mm

### Other information

- [The Brochure of the Kanagawa Prefectural Government's Water Service in the Hakone Town (Apr 2014)](#)
## Case Study Report (Kissawa Water Source)

### Case #2-5  Kissawa Water Source

<table>
<thead>
<tr>
<th>Key word:</th>
<th>Ground water, Chlorine disinfection only</th>
</tr>
</thead>
</table>

- **<Characteristics>**
  - Safe and refreshing drinking water: the ground water has a very good quality throughout the year.

- **Outline**
  - Service area: the ground water is used to supplement reservoirs of other water treatment plants.
  - Maximum capacity: 1,100 m³/d
    1st well: φ75×60m
    2nd well: φ125 x 12 m, φ100 x 48 m

<table>
<thead>
<tr>
<th>Address:</th>
<th>Tsuchiya 1760, Hiratsuka City, Kanagawa Prefecture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land area:</td>
<td>322m²</td>
</tr>
</tbody>
</table>

- **Water treatment process:** Chlorine disinfection
- **Capacity:** 1,100 m³/d
- **Water source:** Ground water

#### Water treatment process

- **Raw water quality:**
  - Turbidity: <0.1 degrees (<0.1 degrees)
  - Hardness: 140 mg/L (140 mg/L)
  - TOC: 0.2 mg/L (0.3 mg/L)
  - pH: 7.6 (7.9)
  - Geosmin: <0.001μg/L (-)
  - 2-MIB: <0.001 μg/L (-)

- **Chemical dose:** Sodium hypochlorite (disinfection)

| Start of operation: | Unknown |
Case Study Report (Kissawa Water Source)

Layout:

Treatment process flow diagram:

- Well
- Well
- Pump
- Water meter
- Residual chlorine meter
- Sodium hypochlorite
- Reservoir
- Reservoir
- Customer tap
- Reservoir
- Receiving tank
- Customer tap
- Customer tap
- Customer tap
# Case Study Report (Kissawa Water Source)

## Water Treatment Process

<table>
<thead>
<tr>
<th>Pictures</th>
<th>Other facilities:</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Well (outside) Image" /> <img src="image2.png" alt="Intake facility Image" /> <img src="image3.png" alt="Pumping facility Image" /></td>
<td><img src="image4.png" alt="Well (inside) Image" /></td>
</tr>
</tbody>
</table>

- Well (outside)
- Well (inside)
- Intake facility
- Pumping facility

### Other information: