

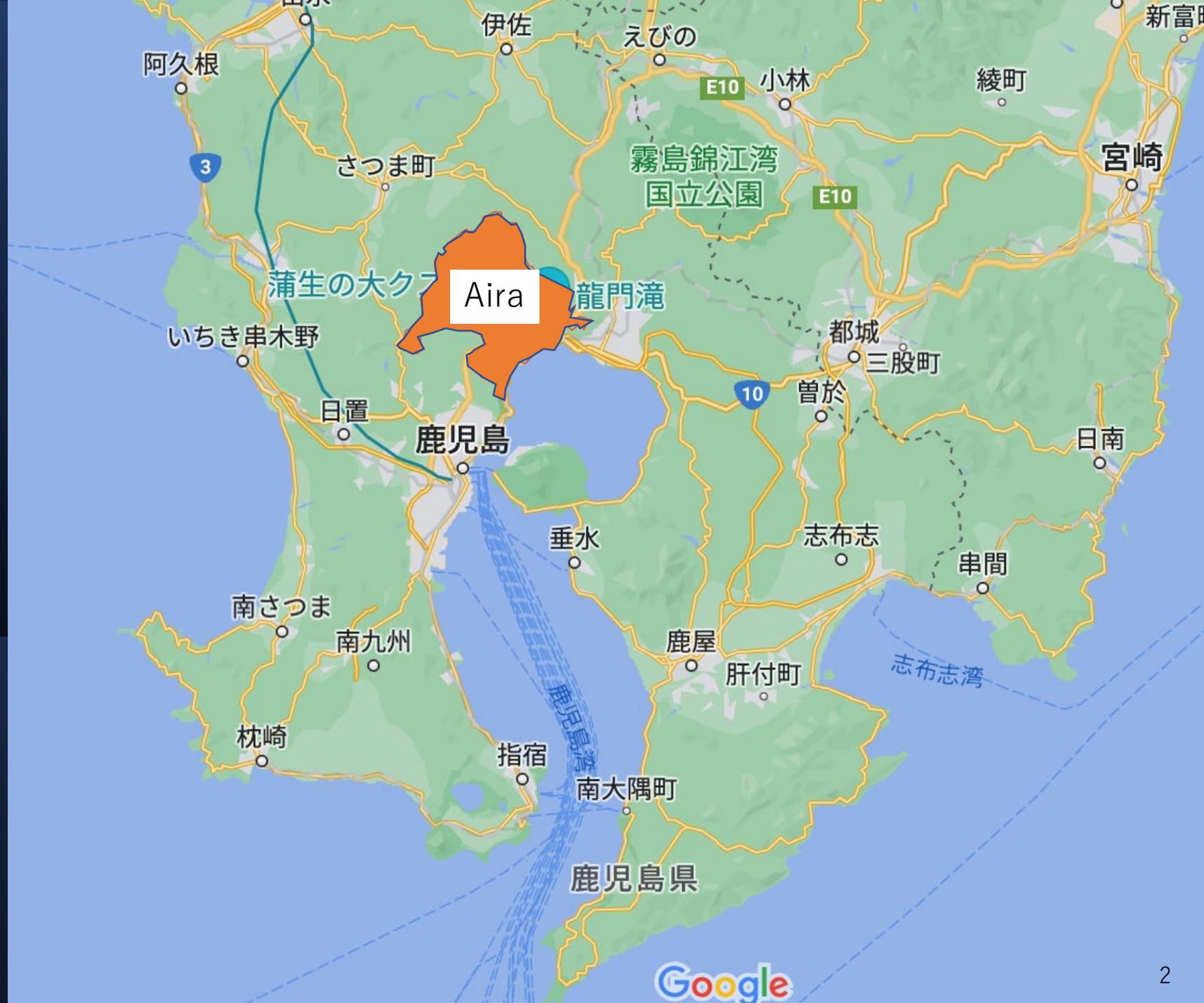
# Improving the water quality of the surrounding water environment by installing the Johkasou

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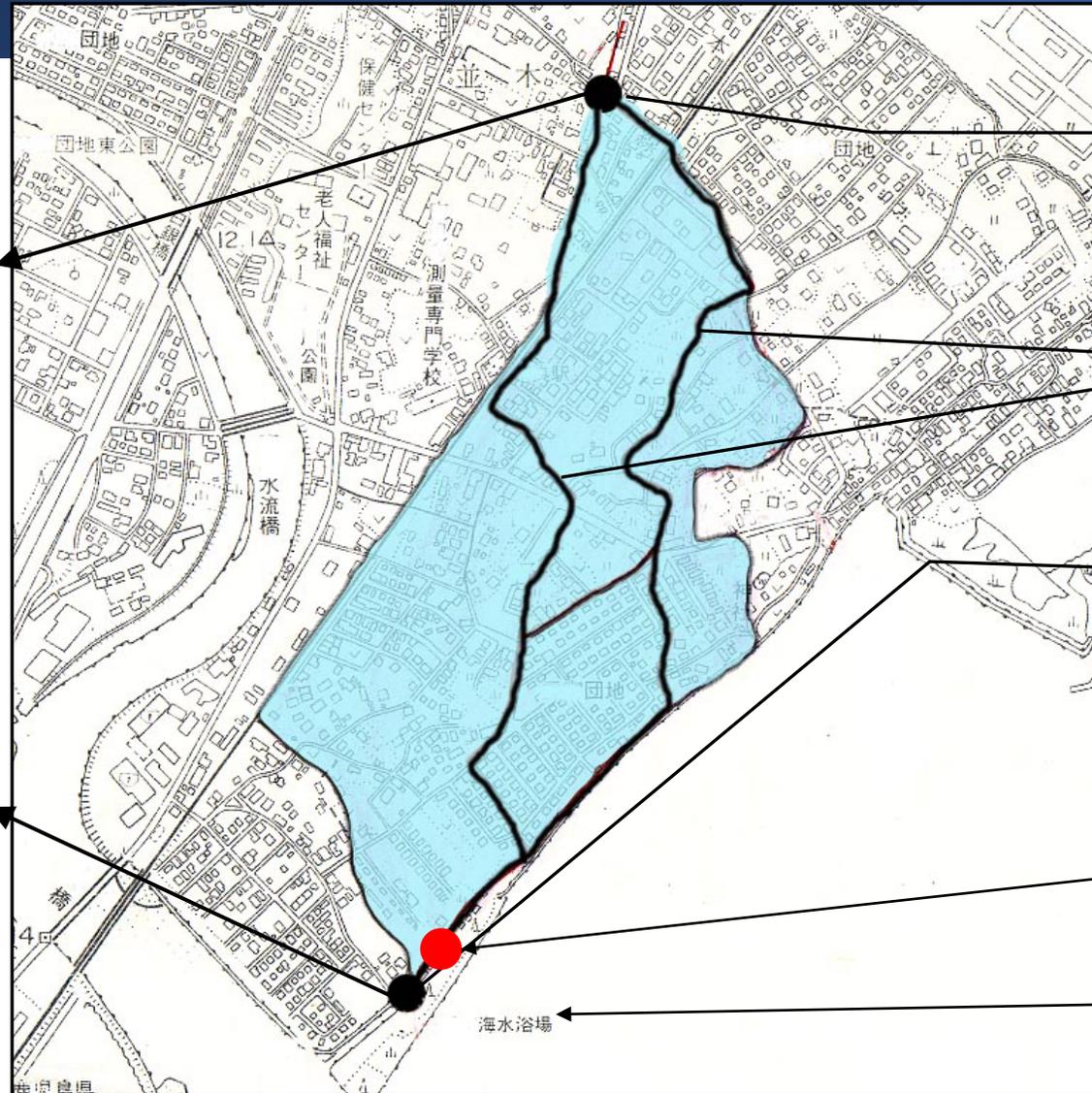
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Environmental Conservation Association

# Location of Aira City and Background of this study

How the water quality of the small water channel in the area has changed between 2003 and 2022 by promoting Johkasou?



# Survey area



Water sampling point :  
water channel  
(**upstream**)

Water  
channels

Water sampling point :  
water channel  
(**downstream**)

Area with Old type  
Johkasou

Shigetomi Beach

# Features of survey area

1. Since there is no other inflow between upstream and downstream survey points except domestic wastewater, analysis is easy.
2. Aira city actively promotes the Johkasou installation and maintenance project. In Aira city, the wastewater treatment population penetration ratio has been increased due to the development of the Johkasou.
3. However, every year, the water quality at the downstream point is particularly remarkably polluted.
4. And, Shigetomi Beach is located downstream of the downstream sampling point, however the rating of water bathing has been level B judgment for the past few years, and the interest of residents is very high. There is a high need for countermeasures against domestic wastewater.

Comparison of the situation in the surveyed areas	FY 2003	FY 2022
Number of Johkasou installed annually	400~500 units/year	200 units/year
Inflow other than domestic wastewater between upstream and downstream sampling points of the water channel	None	None

# Method of survey

- Population by type of domestic wastewater treatment in the basin

The number of households, the number of installed Johkasou, the number of installed Old type Johkasou, and the number of vault toilets in the survey area were investigated from the data, and the population served by each treatment was calculated.

- Water volume

The flow velocity at the survey point was measured using an electromagnetic current meter and calculated the flow rate of the water channel.

- Water quality

8 items of water quality were analyzed ; pH, DO, BOD, COD, SS, T-N, T-P, and Fecal coliform count

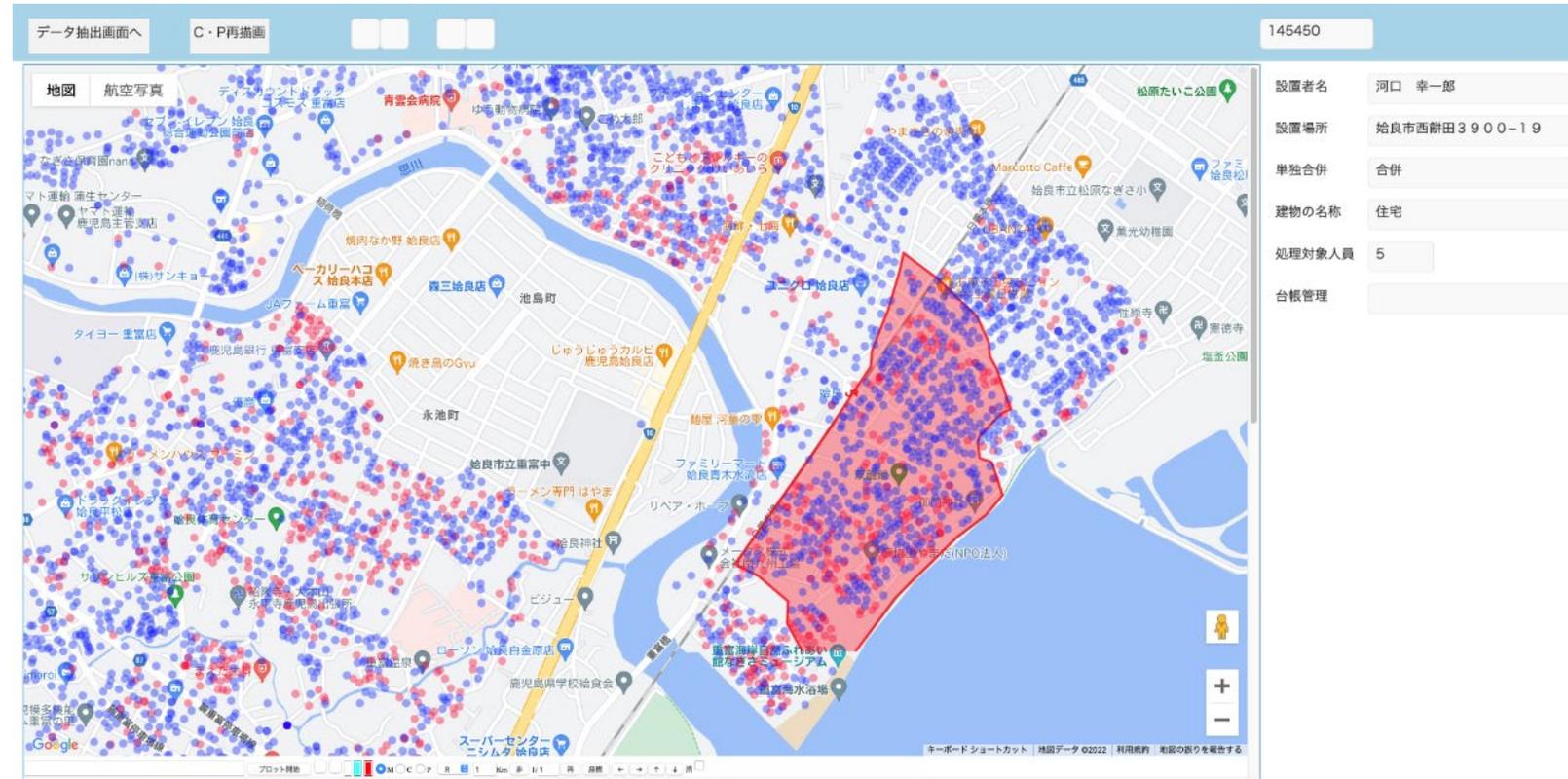
- The actual pollutant load (kg/day) = { water quality of downstream (mg/L) – water quality of upstream (mg/L) } × water volume (m<sup>3</sup>/day)

Based on the results of water quality analysis and water volume, the actual pollutant load discharged from the survey area into the water channel was calculated.

# Get Position Coordinates and plot the Coordinate



Mobile phone screen when acquiring coordinates (location information) during legal inspection.



● :Johkasou

● :Old type Johkasou

Coordinates plotted on the map. (survey area is marked red.)



# Result: Wastewater treatment population coverage ratio by type of treatment facilities (FY2003 vs FY2022)

Due to the promotion of Johkasou, the wastewater treatment population coverage ratio has been increased from 23.5% to 68.8%.

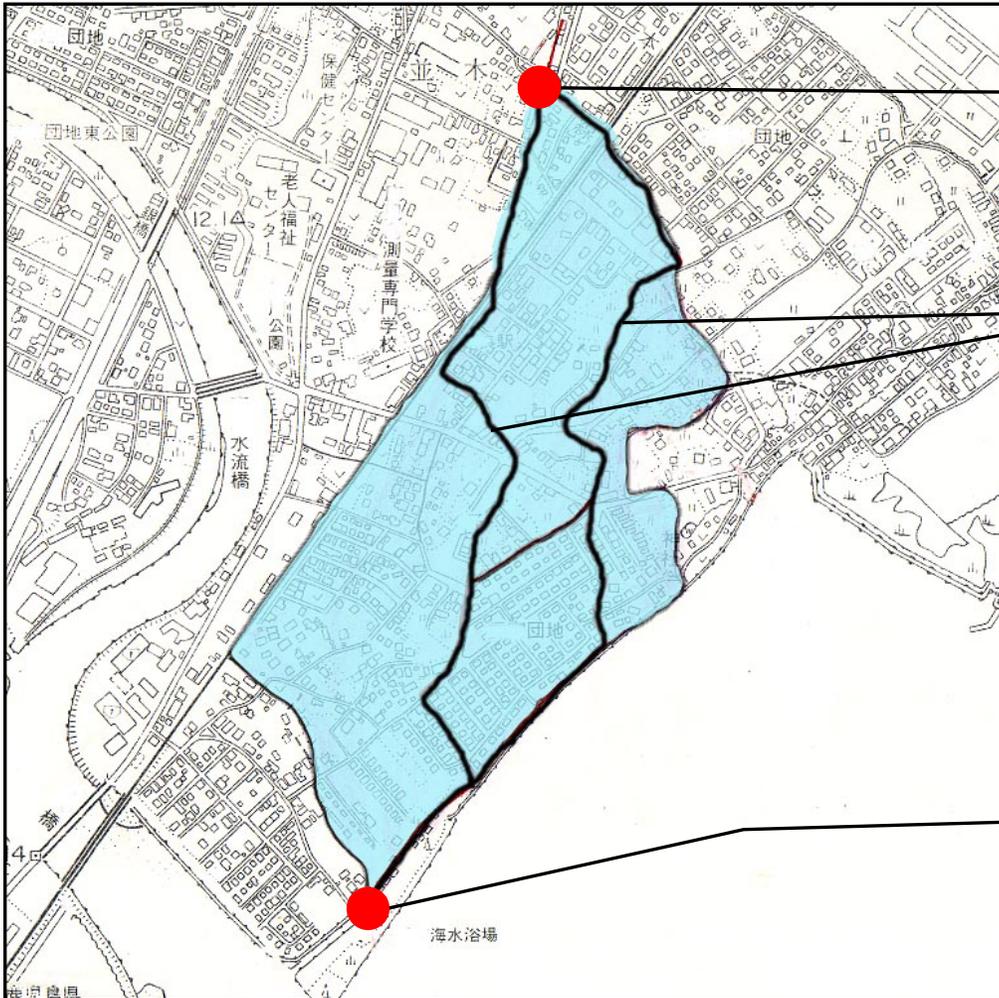
FY	Item by type of domestic wastewater treatment facilities	PE/ household	Households with Johkasou	Households with Old type Johkasou	Households with vault toilet	Total
2003	Number of households		176	376	196	748
	PE	2.5	440	940	490	1,870
2022	Number of households		593	204	65	862
	PE	2.14	1,269	437	139	1,845

FY2003  
23.5%

FY2022  
68.8%

The wastewater treatment population coverage ratio in whole Aira City is 82.2% as of 2020.

# Result: Water volume of the water channel (FY2003 vs FY2022)



Water sampling point :  
water channel  
(**upstream**)

Water  
channels

The amount of domestic wastewater discharged from the survey area is estimated to be approximately **600 m<sup>3</sup>/day in FY 2003** and approximately **480 m<sup>3</sup>/day in FY 2022**.

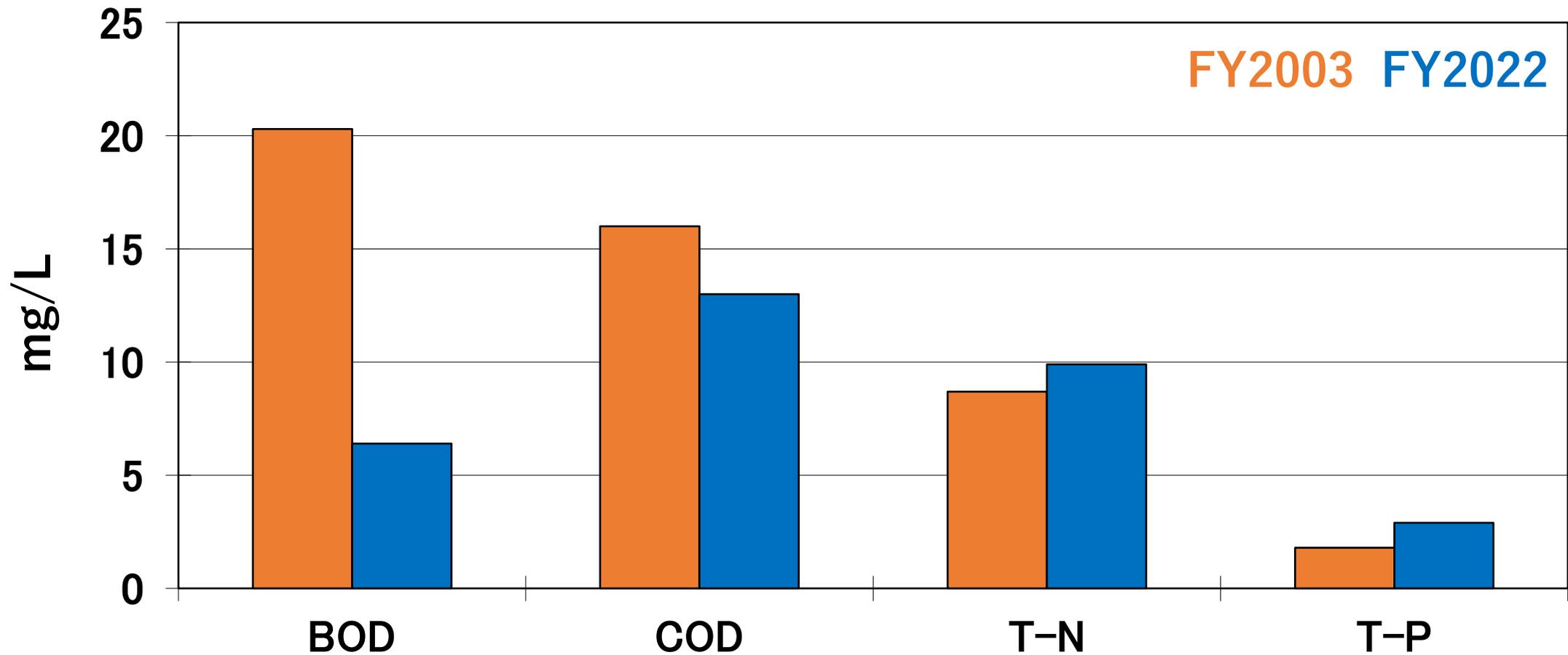
Water sampling point :  
water channel  
(**downstream**)

# Result: Water quality of the water channel (FY2003 vs FY2022)

FY		item	pH	DO	BOD	COD	SS	T-N	T-P	Fecal coliform count
		unit	—	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	count/100mL
		Environmental standard ※	6.5 ~8.5	More than 7.5 mg/L	Less than 2 mg/L		Less than 25 mg/L			Less than 1,000/100mL
2003	Upstream	2003/9/19	7.4	7.9	1.9	3.1	5.7	0.87	0.16	1900
		2003/11/26	7.8	5.7	27	22	29	12	2.6	2,500
		2003/12/18	7.6	8.2	6.5	8	4.3	5.8	1.4	110
	<b>Ave. of upstream</b>		<b>7.6</b>	<b>7.3</b>	<b>11.8</b>	<b>11.0</b>	<b>13.0</b>	<b>6.2</b>	<b>1.4</b>	<b>1,503</b>
	Downstream	2003/9/19	7.4	2.1	11	11	6.1	3.9	0.81	27,000
		2003/11/26	7.7	4.0	23	19	14	9.1	2.4	25,000
		2003/12/18	7.6	5.3	27	18	11	13	2.1	18,000
<b>Ave. of downstream</b>		<b>7.6</b>	<b>3.8</b>	<b>20.3</b>	<b>16.0</b>	<b>10.4</b>	<b>8.7</b>	<b>1.8</b>	<b>22,500</b>	
2022	Upstream	<b>2022/7/28</b>	<b>7.6</b>	<b>7.0</b>	<b>11</b>	<b>17</b>	<b>5.8</b>	<b>16</b>	<b>3.2</b>	<b>160</b>
	Downstream	<b>2022/7/28</b>	<b>7.7</b>	<b>2.0</b>	<b>6.4</b>	<b>13</b>	<b>3.9</b>	<b>9.9</b>	<b>2.9</b>	<b>450</b>

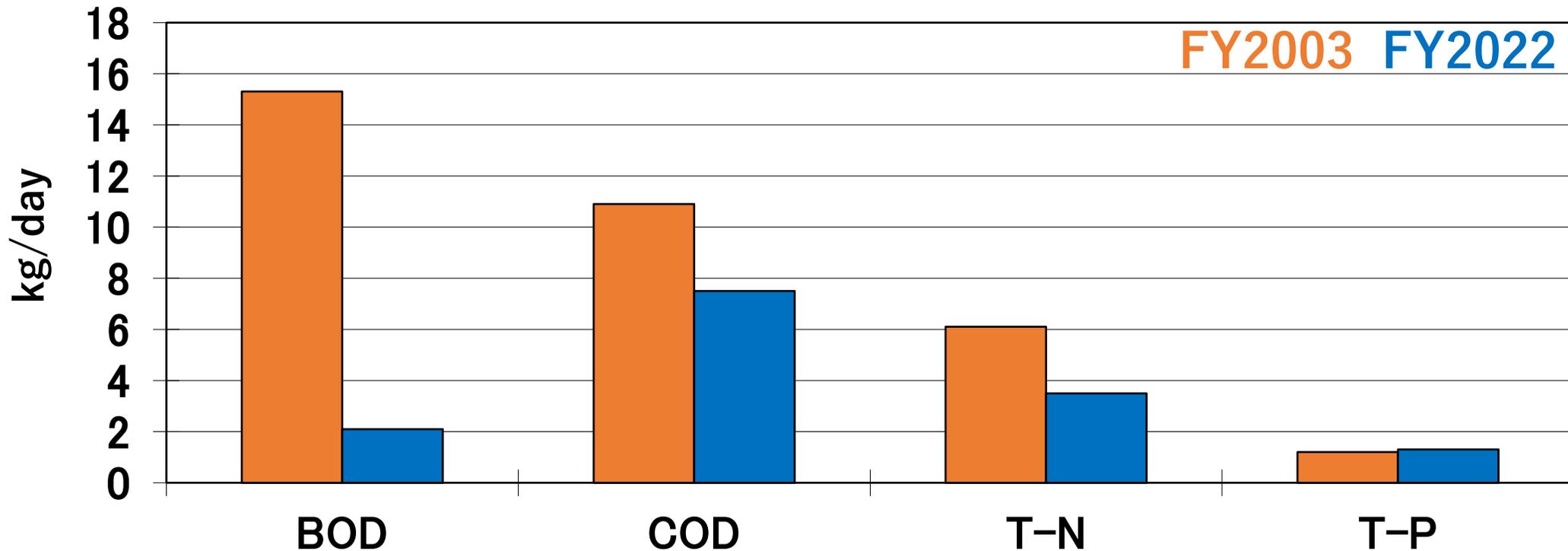
※ Environmental standard values for Class 2 rivers (Type A) of Aira city

# Comparison of water quality at downstream (FY2003 vs FY2022)



# The actual pollutant load (FY2003 vs FY2022)

The actual pollutant load discharged from the survey area into the water channel decreased, except for T-P.



The actual pollutant load (kg/day)

$$= \{ \text{water quality of downstream (mg/L)} - \text{water quality of upstream (mg/L)} \} \times \text{water volume (m}^3\text{/day)}$$

# Changes in effluent BOD and effluent volume (FY2003 vs FY2022)

- The effluent quality of the Johkasou was investigated through legal inspections and wastewater surveys.
- The effluent volume was obtained from the change in the tap water meter.
- Both the BOD concentration in the effluent and the effluent water volume from the Johkasou decreased compared with FY2003.

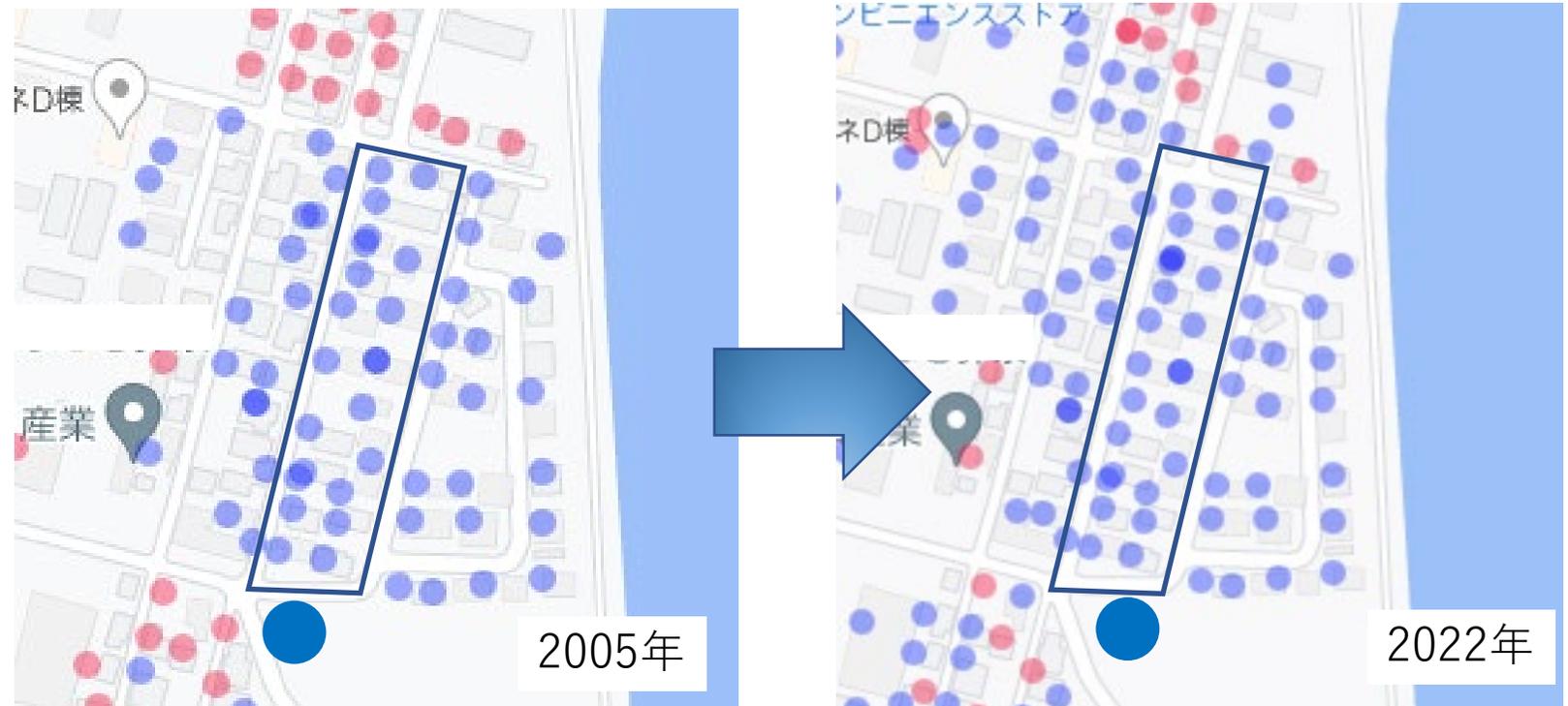
	Effluent BOD (mg/L)	Effluent volume (L/day · PE)	Effluent BOD Unit (g/day · PE)	Reference data
FY 2003	9.6	267	2.6	Estimated from the survey results of approximately 57,000 Johkasous conducted from 1994 to 2002.
FY 2022	7.3	258	1.9	Estimated from the survey results of approximately 300,000 Johkasous conducted from 2018 to 2021.

# Johkasou area vs Old type Johkasou area

Aira, FY2005 vs FY2022

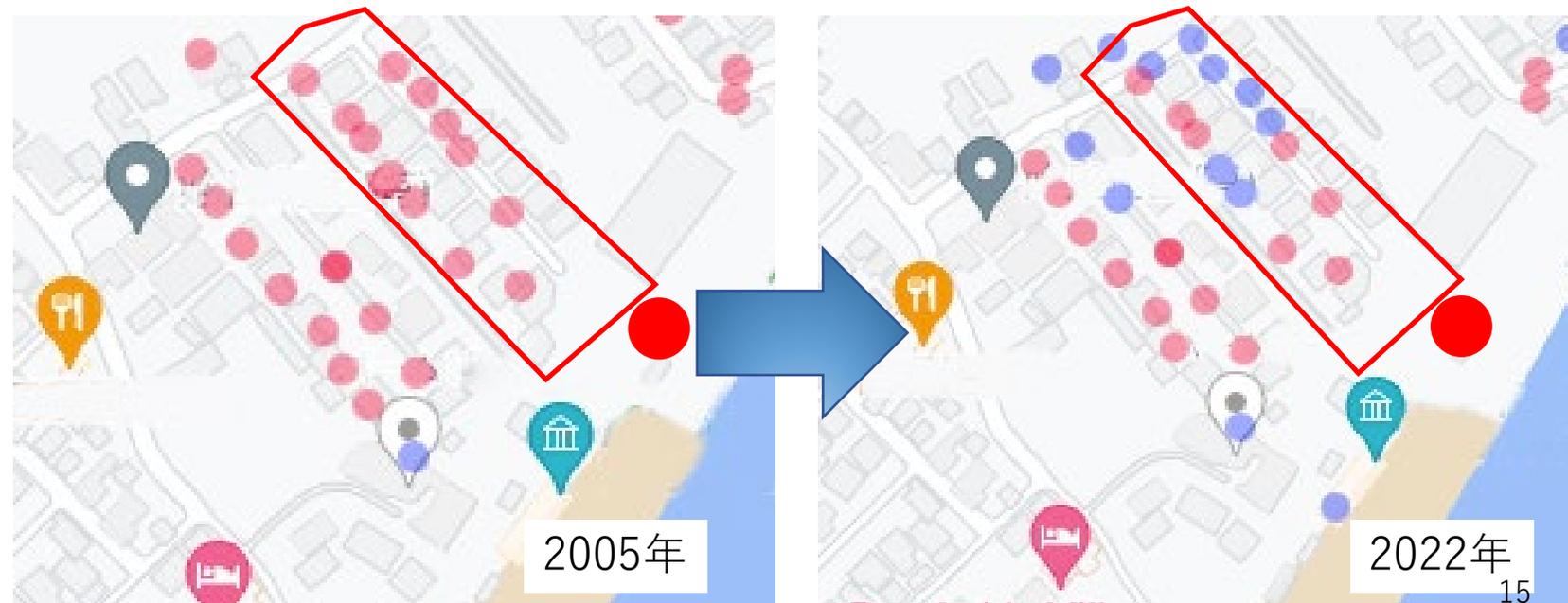
# Johkasou area

● : sampling spot



# Old type Johkasou area

● : sampling spot



# Appearance at the sampling spot (FY 2005)



## Johkasou area

- There is no sludge or biofilm in the gutter and the water channel where the effluent is discharged.



## Old type Johkasou area

- The biofilm is attached to the bottom of the gutter, and sludge is also flowing out. Sanitary pests such as mosquito larvae are occurring.

# Appearance at the sampling spot (FY 2022)



## Johkasou area

- Continuously, there is no sludge or biofilm in the gutter and the water channel where the effluent is discharged.



## Old type Johkasou area

- The biofilm attached to the bottom of the gutter was completely absent. The sanitary pests that were seen before are not observed.

# Water quality of each area

Items	unit	Johkasou area		Old type Johkasou area	
		FY 2005	FY 2022	FY 2005	FY 2022
BOD	mg/L	7.6	5.3	81	31
COD	mg/L	19.1	16	55.0	22
Fecal coliform count	count/cm <sup>3</sup>	0	0	118,000	980
T-N	mg/L	13.9	17	17.2	4.7
T-P	mg/L	2.9	4.2	3.0	3.8

Survey period of FY2005 : June-2005~May-2006, Kagoshima Environmental Inspection Center (n=8)

Survey period of FY2022: July -2022, Kagoshima Prefecture Environmental Conservation Association (n=1)

# Summary (FY2003 vs FY2022)

- Although the population of the survey area remained almost constant, the wastewater treatment population coverage ratio increased from 23.5% (FY 2003) to 68.8% (FY 2022) due to the promotion of Johkasou installation. Only one time survey (water quality and water volume) has been conducted in 2022, however there was an improvement trend in the water quality of the small water channel.
- Concentrations of T-N and T-P were higher than in 2003 at the downstream water quality of the small water channel. However, in 2022, except for dissolved oxygen and fecal coliform counts, downstream water quality was better than upstream water quality.
- From the changes in the actual pollutant load, it is considered that the pollutant load of BOD, COD, and T-N discharged from the survey area into the small water channel has decreased due to the installation of the Johkasou. It is thought that the improvement of effluent water quality from Johkasou and the decrease in the amount of effluent water volume have also affected.
- The appearance of the water channel in the Johkasou area has not changed between 2005 and 2022, and the water quality is maintained in good condition. Half of the old type Johkasou in the Old type Johkasou area have been converted to Johkasou, resulting in improvements in appearance and water quality.
- Regarding the Shigetomi Beach, although the fecal coliforms count meets the standards, the COD exceeds the standards and rating of water bathing remains level B judgment as of 2022.



# Shigetomi Beach

Thank you for your attention!