

Outline of the Tone Canal Project



Water supports wealthy society



Water droplet mascot, Mizuki

Incorporated Administrative Agency Japan Water Agency

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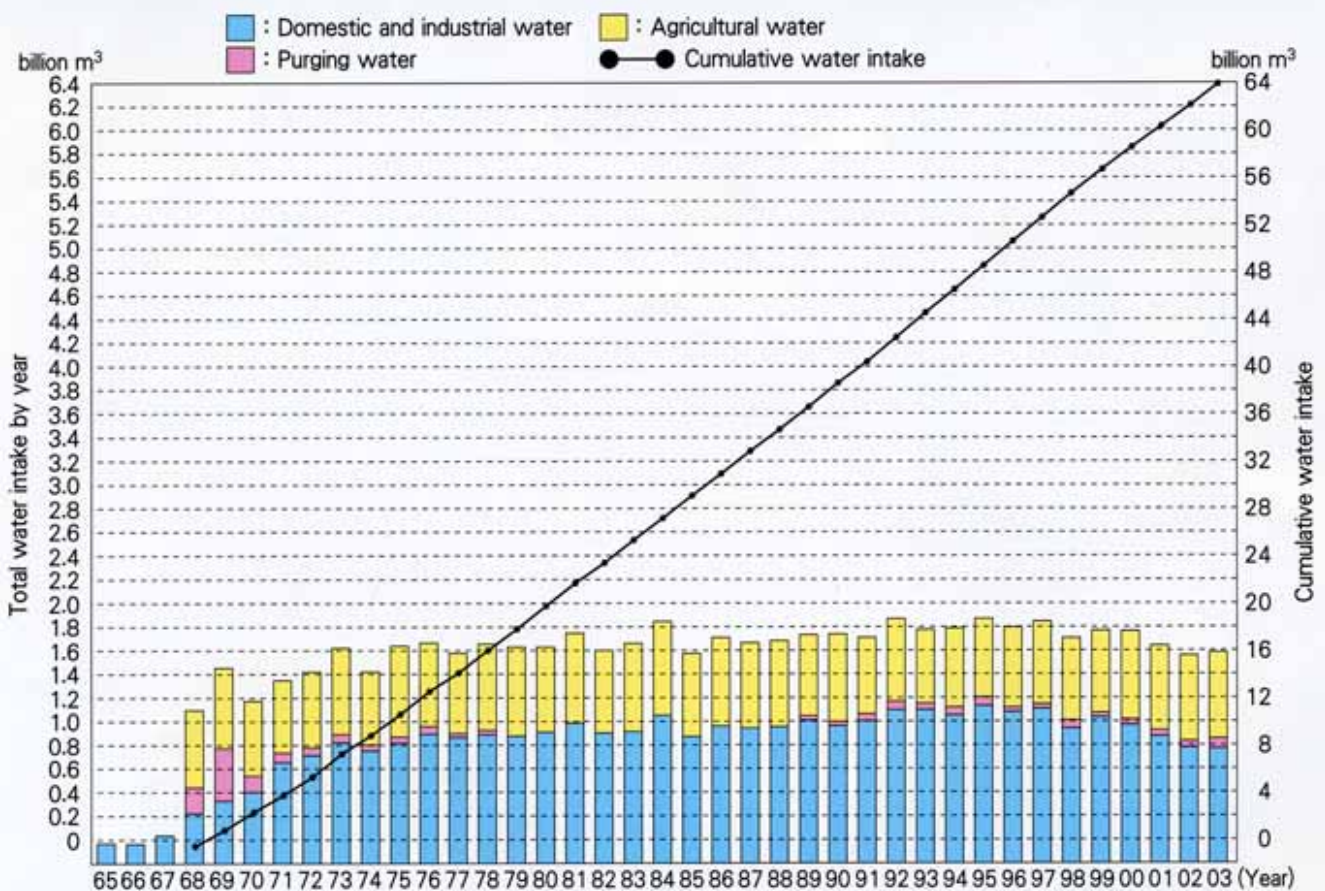
The Tone Canal Project was launched in 1963, just prior to the Tokyo Olympics. It is part of a comprehensive development plan designed to better manage the water resources of the Tone River system in order to meet the quickly growing demand in Tokyo and other parts of the capital region. The three main goals of the plan are listed below.

1. To divert water for domestic and industrial use which developed by dams constructed on the upper reaches of the Tone River and channel it through the Musashi Canal and Ara River for use in Tokyo and Saitama Prefecture.
2. To provide irrigation water stably to 29,000 hectares of land situated in the middle reaches of the Tone River system.
3. To provide surplus water from the Tone River on an emergency and temporary basis for purging the Sumida River.

The first water taken from the Tone River was in the Ara River emergency water diversion operation that was conducted during the Tokyo Olympics in August 1964. Surplus Tone River water was again taken via the Minumadai Canal when the Musashi Canal was completed in March 1965.

The Tone Diversion Weir was constructed in April 1968, enabling full-scale use of water for agricultural, domestic and industrial purposes. As of December 2003, a cumulative total of 66 billion cubic meters of water had been obtained through the Tone Diversion Weir. The Tone Diversion Weir provides the all-important domestic and industrial water for Tokyo and Saitama Prefectures in the capital region and has contributed to supply stable irrigation water and modernize agriculture.

● Volume of Water Intake from the Tone Diversion Weir ●



* Figures for cumulative water intake are based on intake commencing in April 1968.

Historical Overview of the Tone Canal Project

1961, 11, 13	The Water Resources Development Law and the Water Resources Development Public Corporation Law are enacted.
1962, 5, 1	The Water Resources Development Public Corporation is established.
1963, 3, 11	The Tone Canal Project is added to the Tone River Basic Water Resources Development Plan.
1963, 3, 28	The execution directive for the Tone Canal Construction Project is implemented and the Tone Canal Construction Office is set up. (Becomes the Tone Canal Construction Bureau on May 1st.)
1963, 11, 20	The Tone Canal Project Plan is approved and construction commences.
1964, 1, 28	Work begins on the Musashi Canal.
1964, 8, 25	The Asaka Canal is opened in response to a request for emergency supply of domestic water from Metropolitan Tokyo.
1964, 10, 10	The Tokyo Olympics is held.
1965, 3, 1	The Musashi Canal begins supplying water (via the Minumadai Canal) on a temporary basis.
1965, 8, 1	The Akigase Control Station is established and takes over management of the Akigase Diversion Weir.
1965, 10, 30	Construction work begins on the Tone River Diversion Weir.
1966, 4, 11	The cornerstone is officially laid for the Tone River Diversion Weir.
1966, 7, 12	The Crown Prince of Japan (the current Emperor) conducts a tour of the Tone River Canal Project.
1968, 3, 18	A control policy directive concerning management of the Tone River Diversion Weir is issued.
1968, 3, 27	A control policy directive concerning management of the Akigase Diversion Weir is issued.
1968, 3, 30	Control Regulations concerning facility management of the Tone River Diversion Weir and Akigase Diversion Weir are approved.
1968, 4, 1	The Tone Weir Control Center is established and begins water management and system operations.
1968, 4, 12	A ceremony is held to commemorate the opening of the Tone Diversion Weir and its connecting canal.
1968, 8, 1	A Tone River Canal Project completion ceremony is held.
1979, 3, 6	The Saitama Water Use Optimization Second Stage Project is added to the Tone River Basic Water Resources Development Plan.
1979, 8, 29	An execution directive is issued for implementation of the Saitama Water Use Optimization Second Stage Project.
1979, 10, 25	The Saitama Water Use Optimization Second Stage Project is approved and construction commences.
1984, 6, 6	Intake of water for purging the Gyoda Canal commences.
1989, 9, 14	The Saitama Water Use Optimization Second Stage Project enables intake of water for domestic use to begin.
1991, 12, 8	Total water taken from the Akigase Diversion Weir reaches 30 billion cubic meters.
1994, 1, 28	The Tone Weir Emergency Reconstruction Project, Tone Central Canal Reconstruction Project and Musashi Canal Reconstruction Project are added to the Tone River Basic Water Resources Development Plan.
1995, 2, 14	An execution directive is issued for implementation of the Tone Weir Emergency Reconstruction Project and the Tone Central Canal Reconstruction Project.
1995, 3, 15	Approval is granted for implementation of the Tone Weir Emergency Reconstruction Project and the Tone Central Canal Reconstruction Project.
1995, 3, 22	A control policy directive concerning facility management of the Saitama Water Use Optimization Second Stage Project is issued.
1995, 3, 31	Control regulations governing facility management of the Saitama Water Use Optimization Second Stage Project are approved.
1995, 4, 1	The Minuma Control Station is established and commences management operation to coincide with the completion of the Saitama Water Use Optimization Second Stage Project.
1995, 8, 10	Cumulative water intake from the Tone Diversion Weir reaches 50 billion cubic meters.
1998, 3, 23	An official announcement ceremony is held to commemorate completion of the Tone Weir Emergency Reconstruction Project.
2002, 3, 15	A control policy directive concerning management of the Tone Central Canal Reconstruction Project is issued.
2002, 3, 29	Control regulations governing management of the Tone Central Canal Reconstruction Project are approved.
2003, 10, 1	It shifts to An Incorporated Administrative Agency.
2004, 2, 10	Control regulations(water supply diversion) governing management of the Tone Central Canal Reconstruction Project are approved.

Overview of the Facilities

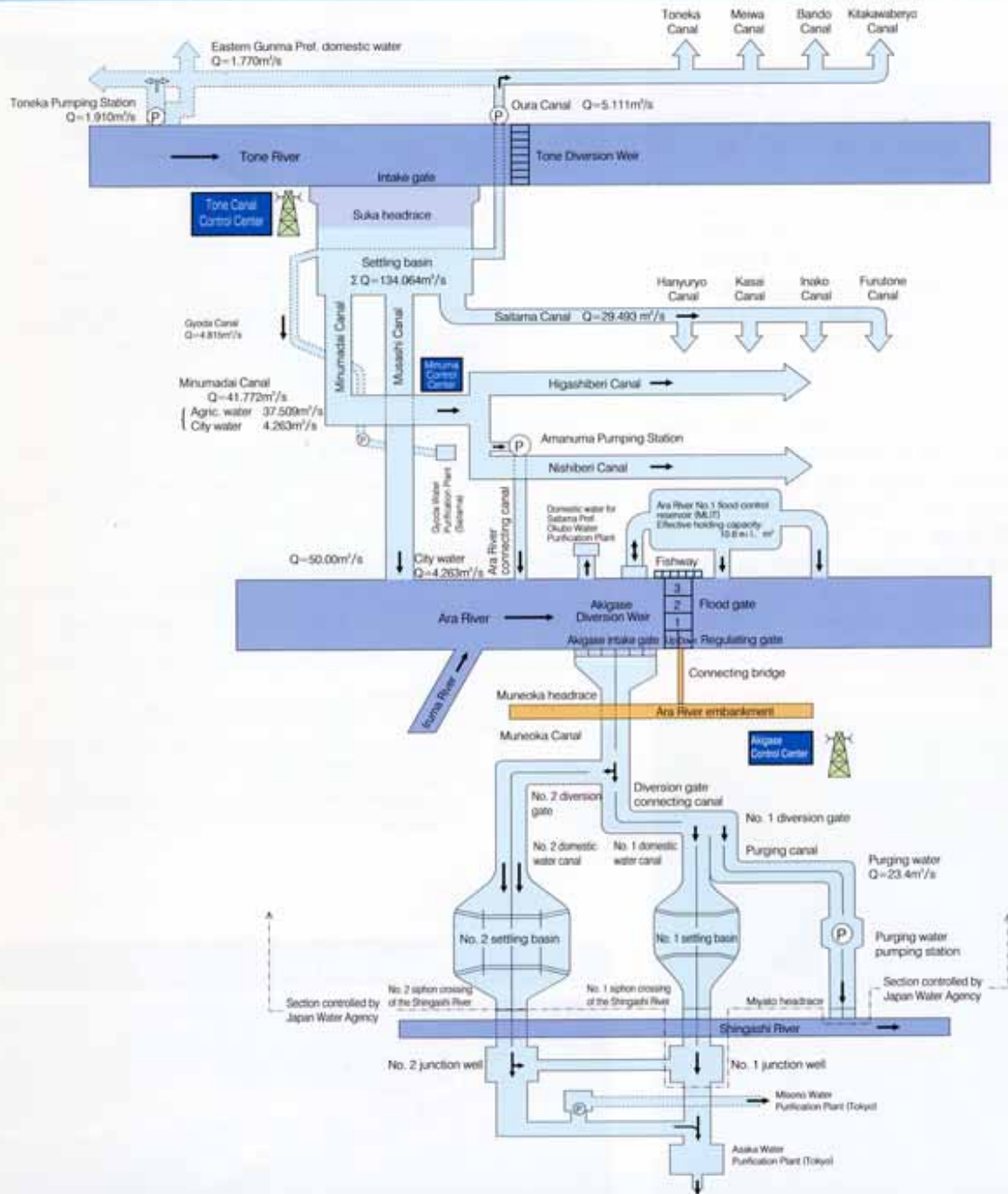
The Tone Canal Control Center manages the following 6 facilities.

1. Tone River Water Intake Facility (Tone Weir, intake gates, settling basin and Oura Pumping Station)
2. Ara River Connecting Canal (Musashi Canal)
3. Irrigation Canal (Minumadai connecting section, Saitama Canal, Oura Canal and Kasai Canal)
4. Ara River Water Intake Facility (Akgase Diversion Weir)
5. Domestic water and purging water canals (Asaka Canal)
6. Minumadai Canal (main canal, Nishiberi Main Canal, Higashiberi Main Canal, Kisairyo Canal, Nakajima Canal, Ara River Connecting Canal, Suedasuka Diversion Weir)

● Detailed List of Tone River Canal Project Facilities ●

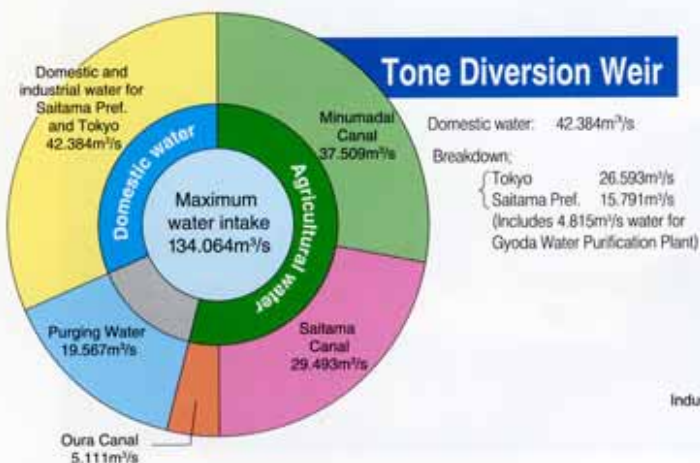
Name of facility	Location	Main specifications	Max. water intake	Project cost	Completion date	Remarks
Tone Diversion Weir	Left bank: Oura Dist., Gunma Pref. Chiyoda Town	Type: Movable weir Weir crest length: 691.7m Movable section: 490.8m No. of gates: 12	134.064m ³ /s	Total project cost Approx. ¥20.4 billion ¥33.5 billion after renovation Approx. ¥6.3 billion	1968	Weir structure: reinforced concrete Gates: steel Upstream ponding area: 2.22 million m ² Fishways: 3 locations (ladder type) Tone Diversion Weir Emergency Renovation Project
	Right bank: Gyoda City, Saitama Pref.	No. of intake gates: 12 Intake crest length: 124.8m (wide) No. of sluiceways: 3 main, 3 sub Settling basin: 12,700m ² No. of pumps: 3 (Oura Pumping Station)				
Saitama Canal	Gyoda, Hanyu, and Kazo Cities in Saitama Pref.	Length: approx. 16,670m	29.493m ³ /s	Approx. ¥3.2 billion Approx. ¥37.4 billion	1968 2002	Canals: Concrete flume Irrigation area: 29,000ha Tone Central Canal Project
Minumadai Canal	Gyoda City, Saitama Pref.	Connecting section: 440m	41.772m ³ /s			
Oura Canal	Chiyoda, Mewa & Itakura Towns, Oura Dist, Gunma Pref. Kitakawabe T., Kitasaitama	Length: approx. 16,620m Water pumps: 2 (Toneka Pumping Station)	5.111m ³ /s (1.910m ³ /s)			
Kasai Canal	Kazo C., Saitama Pref. Otone T., Kitasaitama Dist. Saitama Pref.	Length: approx. 13,500m	21.295m ³ /s			
Musashi Canal	Gyoda C., Konosu C., Fukiage T., Kitaadachi Dist., Saitama Pref.	Length: approx. 14,522m No. of sluiceways: 3 main, 3 sub	50m ³ /s	Approx. ¥5.7 billion	1968	Concrete lining Canal connecting Tone and Ara Rivers
Akgase Diversion Weir	Shiki C., Saitama Pref.	Length: approx. 14,522m Weir crest length: 127m No. of gates: 4	—	Approx. ¥2.0 billion	1965	Weir structure: Reinforced concrete Gates: steel Intake weir upstream ponding area: 155 million m ³ Fishways: 1 (ladder type)
Asaka Canal	Shiki C., Asaka C. Saitama Pref.	Main canal length: 1,667.2m Settling basin: 3,165m ² City water canal: 360.7m Purging canal: 266.2m	28.964m ³ /s (City water) 23.4m ³ /s (Purging canal)	Approx. ¥3.2 billion After renovation approx. ¥13.1 billion	1965	Reinforced concrete box structure Consists of main canal, water supply canal and purging canal. Asaka Canal Renovation Project
					1981	
Saitama Second Stage Project's facility	Saitama Pref. Gyoda C., Hasuda C. Ageo C., Saitama C. Kazo C., Kuki C. Kawasato V. Kisai T. Shobu T. Shiraoka T. Ina T.	Main canal (open): 31.9 km Nishiberi Main Canal (open): 10.7 km Higashiberi Main Canal (open): 6.2 km Kisairyo Canal (open): 9.6 km Nakajima Canal (open): 8.5 km Ara River connecting canal Dedicated canal (pipeline): 9.2 km Amanuma Pumping Station: Pumps x 4	41.772m ³ /s	Approx. ¥72 billion	1995	Saitama Water Use Optimization Second Stage Project Saitama Water Use Optimization Second Stage Project Fishways: 1 (ladder type)
	Iwatsuki C., Saitama Pref.	Suedasuka Weir: moving type			—	

Overview of Tone Canal Water Distribution System



Breakdown of Water Intake

As of April 1, 2004

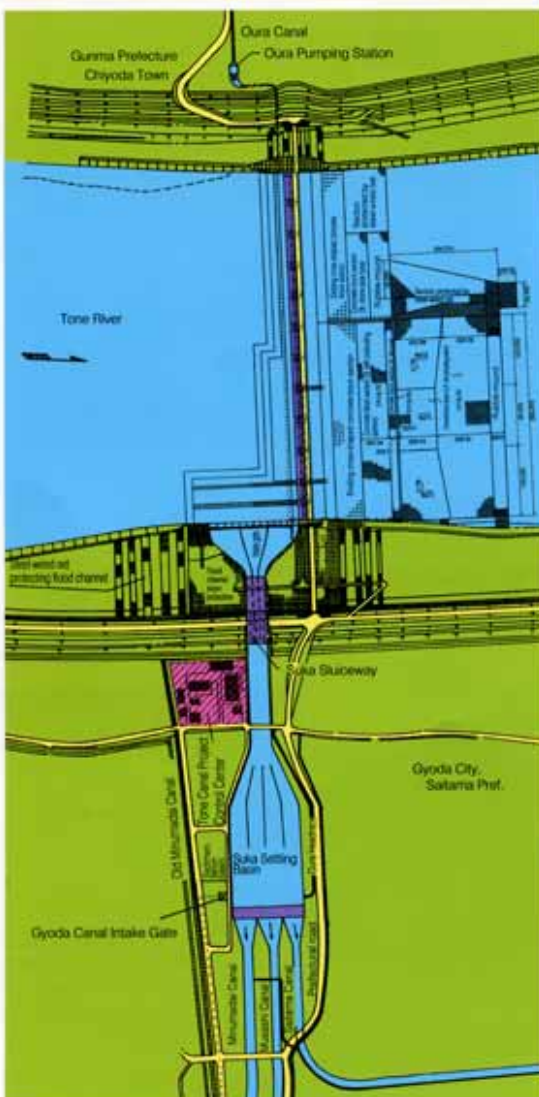


Overview of Facilities

1 Tone Diversion Weir (Tone River Intake Facilities)

The Tone Diversion Weir is located in the middle of the Tone River system, 154 kilometers from the estuary. It is a movable weir that is used to divert water for domestic, industrial and agricultural uses and for purging. The Tone Diversion Weir includes such secondary facilities as intake gates, settling basin and diversion works. Water for the Minumadai Canal, Saitama Canal and Musashi Canal is taken in through the intake gate and passed through the settling basin to the main diversion gate. Water for the Ora Canal passes from the settling basin to the Ora Pumping Station located on the left bank of the Tone Diversion Weir, while water for the Gyoda Canal is diverted directly from the settling basin. Major rehabilitation were carried out on the Tone Diversion Weir between 1992 and 1997. The work involved rebuilding the downstream bed protection works and fishways and moving and rebuilding the Toneka Pumping Station.

Plan of the Tone Diversion Weir Area



Main Structure	Standards, Dimensions, Materials, Water Levels, Etc.
① Diversion weir	<p>Type: Movable weir Weir crest length: River 691.7 m wide, weir 495.4 m wide Weir concrete volume: 15,000 m³ Substructure: Steel-pipe pile ø508 mm, 22 m long, x 1,156</p> <p>Gate: 1. Sediment flushing gate: Double-leaf steel-pipe roller gate x 2, 25 m wide x 3.5 m high 2. Regulating gate: Double-leaf steel-pipe roller gate x 4, 40 m wide, 3.5 m high 3. Flood gate: Single-leaf steel-pipe roller gate x 4, 40 m wide, 3.2 m high x 1, 2.39 m high x 3 4. Flood gate: Reverse gate x 2, 42 m wide, 1.1 m high, gate lifting speed 30 cm/s, gate lowering speed 15cm/s</p> <p>Fishway: x 3, 3.4 m wide, entire difference of elevation 2.2 m Inspection bridge: Steel girder bridge (load category 1), 7 m wide, 687.2 m long Setback levee: Setback distance 90 m, levee 2,155 m long Estimated allowable water intake level: T.P. + 22.7 m Tone River's estimated high water level: T.P. + 27.5 m Tone River's estimated high water discharge: 17,000 m³/s Low-water channel: 490 m wide</p> <p>Channel sections: From the right bank, 231.8 m (T.P. + 19 m), 43.2 m (T.P. + 19.5 m), 129.6 m (T.P. + 20.31 m), 85.4 m (T.P. + 21.4 m) Position of the gate bottom when the gate reaches its maximum hoisting position: T.P. + 30.2 m</p> <p>Note: T.P. means Tokyo Peil or tidal benchmark of Tokyo Bay</p>
② Water intake facility, settling basin, etc.	<p>Water intake facility: 126.8 m wide, composed of three channels; water depth 0.51 m/1.01 m, the facility's capacity 134.064 m³/s</p> <p>No.1 driving channel: 39.9 m long, 30 m wide (internal), 4.61 m high, water 2.57 m deep Sluiceway crossing of the levee: 51 m long, main floodgate on the riverside x 3, sub-flood gate inside the levee x 3</p> <p>No.2 driving channel: 131 m long, 30 m wide (internal), water 2.51 m deep</p> <p>Settling basin: entire length 245 m, effective length 127 m, 100 m wide, water 4.5 m deep, settling 1 m deep, average flow rate 0.4 m³/s</p> <p>Ora Pumping Station (on the left bank): Electric-powered vertical shaft mixed-flow pump x 3, ø900 mm, pumping capacity 5,111 m³/s, entire pump head 5.4 m</p>

Tone Diversion Weir



2 Musashi Canal (Canal Connecting to Ara River)

The Musashi Canal is approximately 14.5 km in length. It was created to divert water from the Tone Diversion Weir to the Ara River. The water use as domestic and industrial water in Tokyo and Saitama Prefectures.

At present, water surplus to requirements for the Tokyo and Saitama Prefecture areas is provided on an emergency and temporary basis to help improve the quality of the water in the Ara River system. This policy will be continued until increased demand from downstream dictates the adoption of new water supply policies.

Land subsidence has affected this area. Renovations to correct the problem have been underway since 1992 and are designed to restore the Musashi Canal's water discharge capacity.

Diversion Works

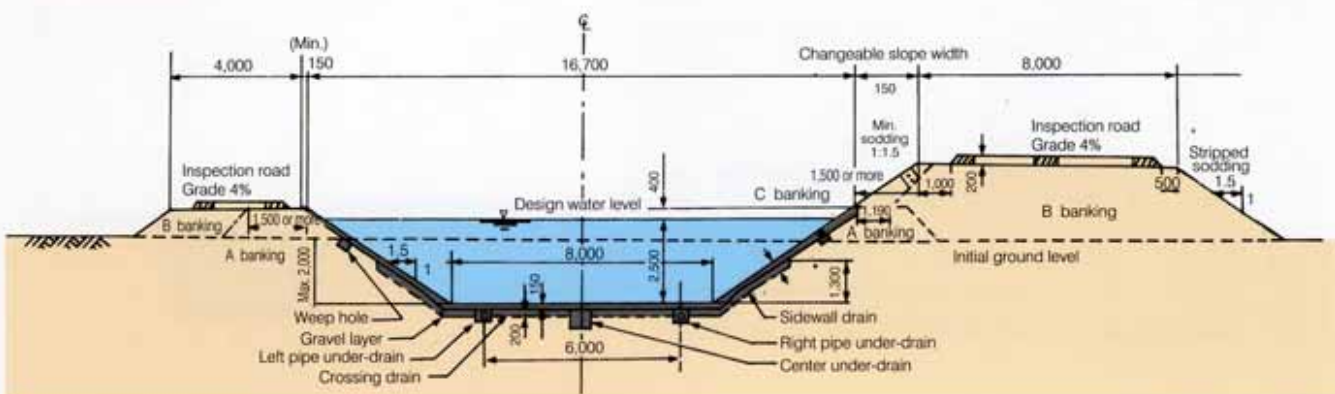


Musashi Canal



Main Structure	Standards, Dimensions, Materials, Water Levels, Etc.
① Main open water channel	Type: Trapezoid water channel lined with concrete on the floor and slopes Length: Total 14,522 m, open section 12,933 m Canal grade: Approx. 1/3,000 Cross-section: Bottom 8 m wide, crest 16.7 m long, depth 2.9 m, slope 1:1.5, concrete 0.15 m thick
② Culvert	Quantity: 50m ³ /s Type: Reinforced concrete siphon Length: 614.5 m (including the joint section) Cross-section: 3.5 m x 3.5 m (inside) x 2 channels, concrete 0.5 m thick (top plate & sidewalls), 0.6 m (bottom plate) Number of locations: 6 Araki 148.5 m, Kamihoshikawa 89 m Shiratorida 81 m, Nagano 61 m Motoarakawa 89 m, Mida 146 m
③ Regulating weir	Type: Hinged steel gate Span length: Gate cross-section 6 m x 2 m (2 gates) Effective height: 2 m Number of locations: 4, 83 m long
④ Levee's sluiceway and gate	Type: Reinforced concrete box culvert Length: 105 m (including the joint section) Cross-section: 3.5 m x 3 m (x 3 channels), concrete 0.6 m thick (top plate x sidewalls), 0.7 m (bottom plate) Gate: Steel roller gate, 3 main (3.2 m x 3 m) on the riverside, 3 sub (3.5 m x 3 m) inside the levee
⑤ Water filling works	Type: Concrete block lined Length: 100 m (including the 20-meter stilling basin) Cross-section: bottom 8 - 12.5 m wide, 4 m high, slope 1:1.5 - 1:2
⑥ Nukata Drain Pumping Station	Type: Horizontal shaft mixed-flow pump Aperture: 700 mm (2 pumps) and 1,200 mm (1) Pumping capacity: Total 5 m ³ /s (1 m ³ /s x 2 & 3 m ³ /s x 1) Facility: Two-story reinforced building with a floor area of 434 m ²
⑦ Inspection road	Asphalt-paved road, 6.5 m wide, 15,000 m long 4.5 m wide, 14,500 m long
⑧ Collateral facilities	Total of 71 bridges: National road bridge x 1, prefectural road bridge x 6, municipal bridge x 55, railway bridge x 1, inspection bridge x 8

Standard Cross-Sectional View of Musashi Canal



3 Connecting Canals and Kasai Canal

〈Connecting Canals〉

The connecting canal developed under the project that takes irrigation water from the Tone Diversion Weir is actually comprised of three connecting canals. The canal that connects to the Minumadai Canal provides water for agricultural use that irrigates a 15,400-hectare land area and water for domestic and industrial use in Metropolitan Tokyo and Saitama Prefecture. The other two canals developed under the project supply water to four canals each in Saitama and Gunma Prefectures to facilitate irrigation of 13,300 hectares of agricultural land. As part of the Tone Central Canal Reconstruction Project, renovation work was conducted from 1992 to 2001 on the Saitama and Oura Canals.

(1) Section Connecting to Minumadai Canal

This canal measures approximately 0.4 km in length. It serves as a connecting link between the Tone Diversion Weir and the Minumadai Canal that supplies irrigation water to a 15,400 hectare area of agricultural land and Domestic and Industrial water to the Tokyo Metropolitan Area and Saitama Prefecture.

(2) Saitama Canal (right bank connecting canal)

The 16.7 km long existing canal passes through the cities of Gyoda, Hanyu, and Kazo in Saitama Prefecture as it links to canals in the four water districts of Hanyuryo, Kasai, Inago, and Furutone. Extending from the right bank (Saitama side) of the Tone River, this canal provides water from the Tone Diversion Weir for use in irrigating 11,300 hectares of land.

(3) Oura Canal (left bank connecting canal)

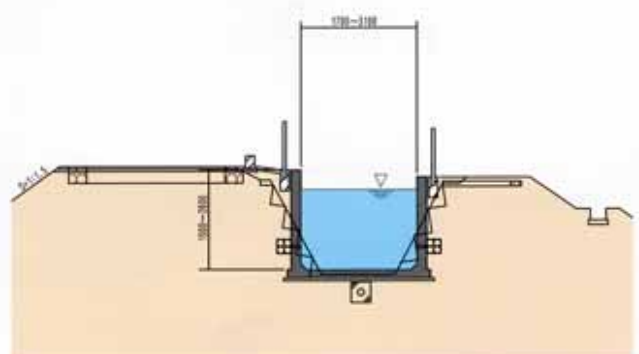
This 16.6 km long canal passes through the towns of Chiyoda, Meiwa, and Itakura, Kitakawabe in Gunma Prefecture as it links existing canals in the four water districts of Toneka, Meiwa, Bando, and Kitakawaberyo. Extending from the left bank (Gunma side) of the Tone River, this canal provides water from the Tone Diversion Weir for irrigating a 2,000-hectare area of land. The Toneka Pumping Station is located in the upper reaches of the canal (Chiyoda Town in Gunma).

Main Structure	Standards, Dimensions, Materials, Water Levels, Etc.
① Minumadai Canal connecting section	Flow rate: 41.772 m ³ /s Irrigation coverage: Approx. 15,400 ha
② Saitama Canal (right bank connecting canal)	Type: Concrete flume Length: 16.67 m Canal grade: 1/2,000 – 1/6,000 Canal height: 2.1 m – 2.9 m Canal bottom width: 2.9 m – 8.2 m Flow rate: 29.493 m ³ /s Irrigation coverage: Approx. 11,300 ha Main diversion works: Reverse gate x 1, gate cross-section 25.5 m x 1.1 m Kasai Diversion Works: Radial gate x 1, gate cross-section 2.5 m x 4.5 m, radial gate x 1, 2.5 m x 2.5 m Regulating weir: Aluminum gate x 8 Spillway: 7 Number of diversions works: 31
③ Oura Canal (left bank connecting canal)	Type: Concrete flume Length: 16.618 m Canal grade: 1/1,000 – 1/4,000 Canal height: 1.5 m – 2.6 m Canal width: 1.7 m – 3.1 m Flow rate: 5.111 m ³ /s Irrigation coverage: Approx. 2,000 ha Regulating weir: Amiru gate x 10, watchman's gate x 1 Spillway and gate: gate x 8 Diversion works: 27 Toneka Pumping Station: Pumping capacity 1.91 m ³ /s, electric-powered vertical shaft mix-flowed pump (ø700) x 2

Oura Canal



Standard Cross-sectional View of Oura Canal



〈Kasai Canal〉

The Kasai Canal carries water from the Kasai Diversion Works located on the Saitama Canal to an 7,900 hectare-area of agricultural land for use in irrigation. The canal measures 25.7 km in length. A 13.5 km section of the upstream section including the cities of Hanyu and Kazo and the town of Otone was reconstructed under the Public Corporation's Tone River Central Canal Project.

The Kasai Canal is comprised of two channels on the section downstream of the Higashiya Diversion Works, which is located approx. 2.5 km downstream of the Kasai Diversion Works. The water from the smaller cross-section (subchannel) is diverted to a land area of 1,200 hectares, which is covered by the Public Corporation's service. The water from the large cross-section (main channel) is diverted to a land area located downstream of the area covered by the Public Corporation's service.

Saitama Canal



Main Structure	Standards, Dimensions, Materials, Water Levels, Etc.	
Kasai Canal	Type:	Concrete flume
	Length:	13,500 m, double-channel section 11,092 m
	Canal grade:	1/2,800 - 1/5,000
	Height:	2.4 m - 2.6 m
	Bottom width:	8.1 m - 9.2 m
	Diversion channel:	1.9 m - 2.2 m
	Main channel:	5.84 m - 6.9 m
	Slope:	1:0 - 1:03
	Flow rate:	21,295 m ³ /s
	Higashidani Diversion Works:	Radial gate (main channel) x 1, gate cross-section 6 m x 2.1 m, reverse gate (diversion gate) x 1, gate cross-section 1.4 m x 2.2 m
	Regulating weir:	Radial gate x 5 (No. 1 - 5 regulating weirs), gate cross-section 1.9 m x 2.1 m, hook-type two-stage sliding gate x 1 (No. 6 regulating weir)
	Kainokawa Combining Works:	Sliding gate x 1, gate cross-section 6.6 m x 2.7 m

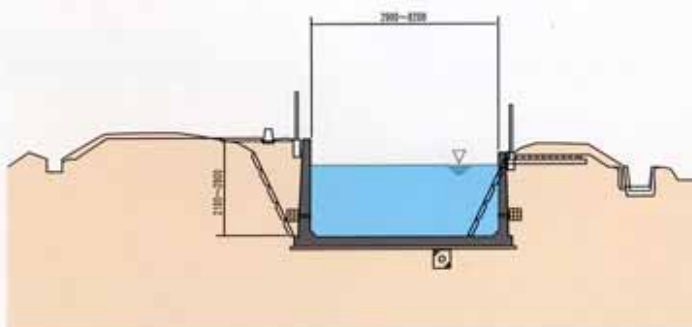
Kasai Canal



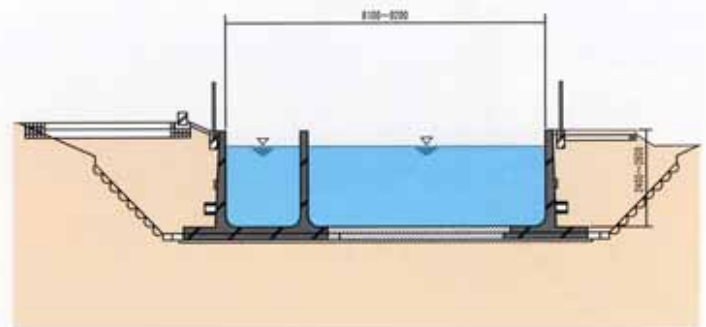
Kasai Canal



Standard Cross-sectional View of Saitama Canal



Standard Cross-sectional View of Kasai Canal



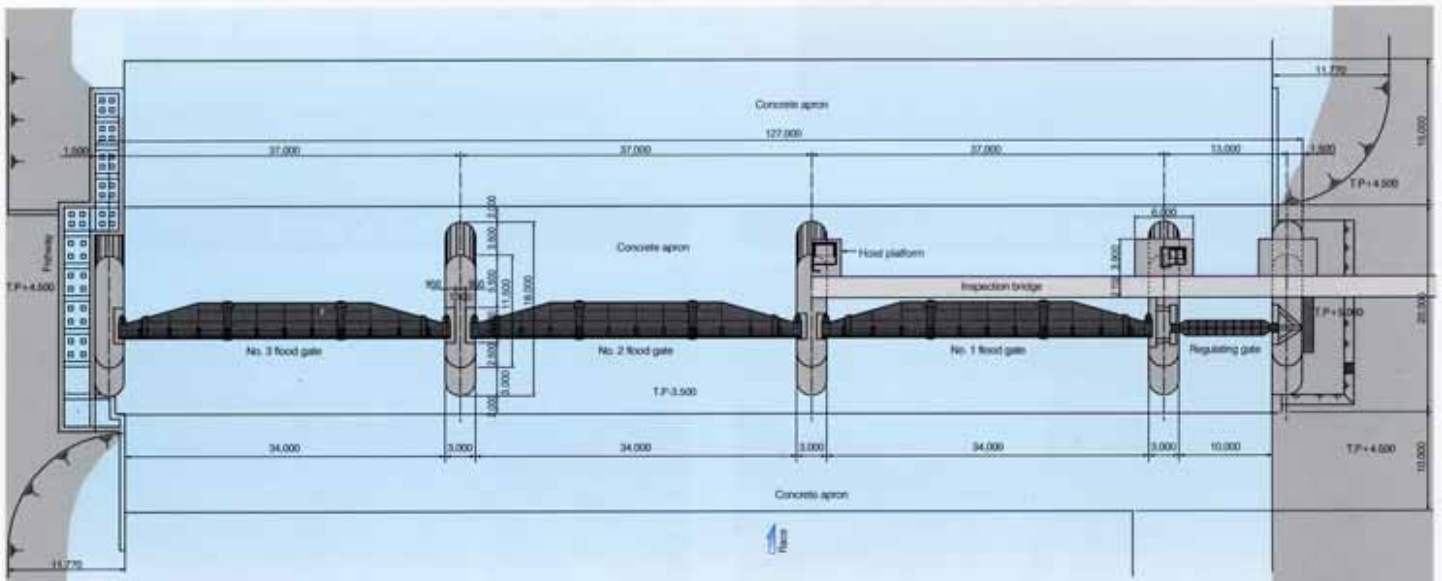
4 Akigase Diversion Weir (Ara River water intake facility)

Located approximately 35 kilometers from the estuary of the Ara River in Shiki City of Saitama Prefecture, the Akigase Diversion Weir was built at a strategic natural bend in the river to create an opening for a new waterway. The principal role of this movable weir is to channel water from the Musashi Canal through the Ara River to a point 30 kilometers downstream. From there it is diverted for use as Metropolitan Tokyo domestic and industrial water and Saitama Prefecture domestic water. In addition, the water created by the agricultural water use optimization scheme of the Saitama Second Stage Project is diverted to Metropolitan Tokyo and Saitama Prefecture for domestic and industrial water use.

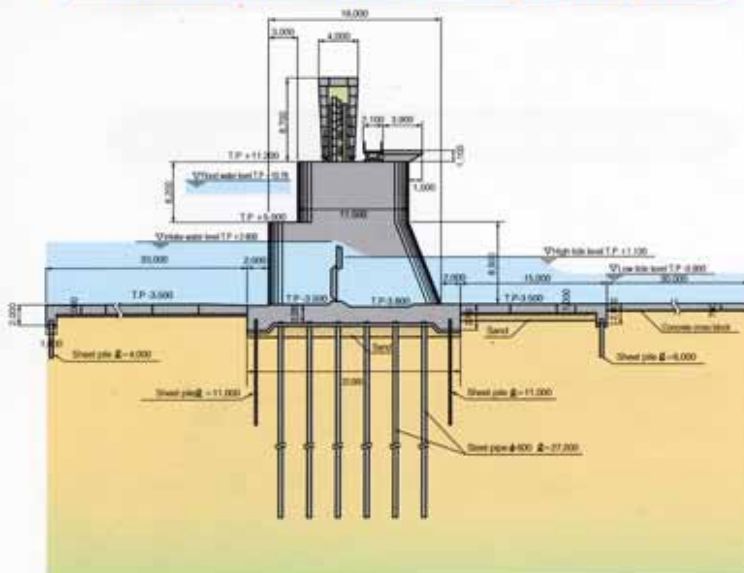


Main Structure	Standards, Dimensions, Materials, Water Levels, Etc.	
Akigase Diversion Weir	Type:	Movable weir
	Weir height & crest length:	22 m high, movable weir 127 m
	Weir concrete volume:	15,000 m ³
	Substructure:	
		Steel-pipe pile ø400 mm, 27.5 m long, x 193
		Steel-pipe pile ø600 mm, 27 m long, x 185
	Gate:	
	1. Regulating gate:	Two-stage overflow-type steel roller gate x 1, 10 m wide, 6.1 m long
	2. Flood gate:	Shell-type steel roller gate x 3, 34 m wide x 6.4 m high
	Ara River's estimated high water level:	T.P. +10.79 m
	Ara River's estimated high water discharge:	7,000 m ³ /s
	Water level upstream of the weir:	T.P. +2.6 m
	Low-water channel's width:	121 m
	Low-water channel's height:	T.P. -3.5 m
	Concrete pier's crest height:	T.P. +11.2 m
	Steel tower's height:	T.P. +19.9 m
	Position of the gate bottom when the gate reaches its maximum hoisting position:	T.P. +11.2 m

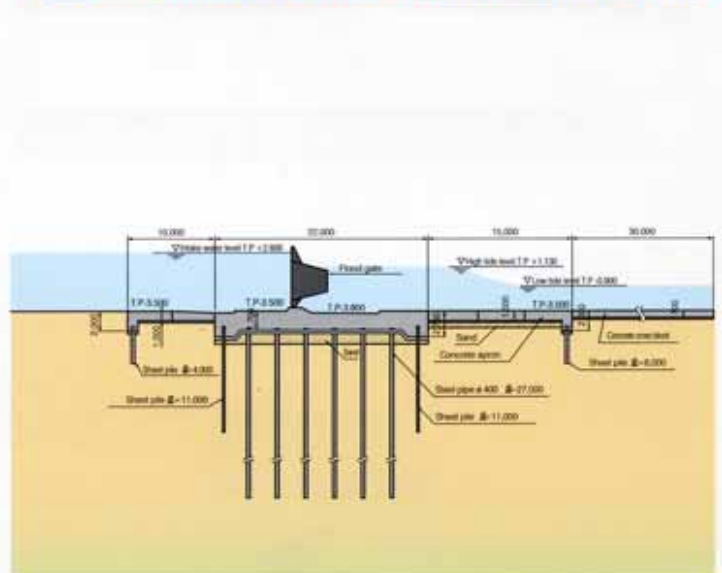
Overview of the Akigase Diversion Weir



Cross-sectional View of Regulating Gate



Cross-sectional View of Intermediate Slab



5 Asaka Channel (Carrying domestic and purging water)

The Asaka Canal is used to carry Metropolitan Tokyo domestic water to the Asaka Water Purification Plant and the Misono Water Purification Plant. The Asaka Canal serves to carry water from a water intake gate installed just upstream from the Akigase Diversion Weir through under-drain, settling basin and junction well to the water purification plants.

As the Asaka Canal serves to deliver purging water as well, the water for the two different applications is separated into two channels at the diversion works. The water destined for use as Metropolitan Tokyo domestic water passes through under-drain, settling basin and junction well to the water purification plants, while the water intended for purging flows from the No. 1 diversion works through an under-drain to the Shingashi and Sumida Rivers.

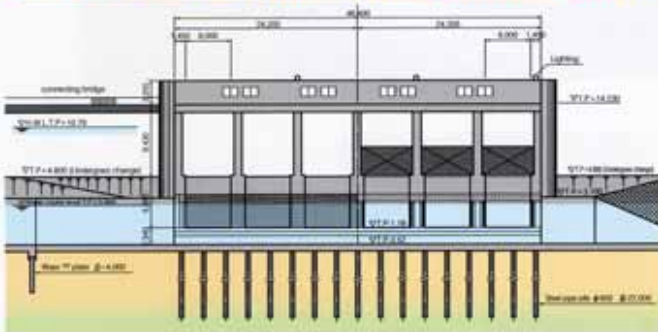
The canal was significantly damaged by the land subsidence that significantly affects the southern part of Saitama Prefecture. As a result, it was decided to construct a new canal as part of the Asaka Canal Improvement Project. Construction began in October 1977 and was completed in October 1981. The new canal began service in November 1981.

Main Structure	Standards, Dimensions, Materials, Water Levels, Etc.
1. Main canal	Entire length: 1,667.23 m Muneoka Intake Gate: Reinforced concrete, max. 48.4 m wide, intake gate 3.68 m high, 52.6 m long Muneoka Channel outside the levee: Reinforced concrete box culvert, 4.5 m wide x 4.5 m high x 2 channels, 383.58 m long Muneoka Sluiceway: Reinforced concrete box culvert, 4.5 m wide x 4.5 m high x 2 channels, 125.00 m long Muneoka Sluiceway inside the levee: Reinforced concrete box culvert, 4.5 m wide x 4.5 m high x 2 channels, 1019.69 m long No. 1 diversion inlet: Reinforced concrete, max. 17 m wide, 18.3 m long No. 2 diversion inlet: Reinforced concrete, max. 10.4 m wide, 25 m long Connecting channel to the diversion inlet: Reinforced concrete box culvert, 4.5 m wide x 4.5 m high x 2 channels, 43.07 m long Gate: Steel roller gate x 16
2. No. 1 channel carrying domestic water	Entire length: 360.49 m Upstream-side channel: Reinforced concrete box culvert, 4.5 m wide x 4.5 m high x 2 channels, 56.4 m long No. 1 settling basin: Reinforced concrete, max. 43.2 m wide, water max. 7.88 deep, 118.1 m long, effective holding capacity 11,000 m ³ No. 1 siphon crossing of Shinkashi River: Reinforced concrete box culvert, 3 m wide x 3.1 m high x 2 channels, 116.17 m long, spillway x 1, electromagnetic flow-meter x 2 No. 1 junction well: Reinforced concrete, 9 m wide x 15 m long x 12.7 m high Gate: Steel roller gate x 21
3. No. 2 channel carrying domestic water	Entire length: 228.02 m No. 1 connecting culvert: Reinforced concrete box culvert, 3.5 m wide x 3.5 m high x 2 channels, 40.27 m long No. 2 settling basin: Reinforced concrete, max. 67 m wide, water max. 8 m deep, 160 m long, effective holding capacity 16,000 m ³ Gate: Steel roller gate x 22, flow-meter x 4
4. Channel carrying purging water	Entire length: 266.17 m Pumping station for purging water: Facility: 3-story reinforced concrete building with a floor area of 671.07 m ² Pump: Vertical shaft mixed-flow floor pump x 2, aperture 2,000 mm, pumping capacity 7.8m ³ /s Culvert section: Reinforced concrete culvert, 3.4 m wide x 3.7 m high x 2 channels, 171.67 m long, flow-meter x 2, decorative steel pipe x 2 Miyato Sluiceway: Reinforced concrete culvert, 3.4 m wide x 3.7 m high x 2 channels, 25.5 m long Open culvert section: Reinforced concrete culvert, max. 16.6 m wide, water max. 35 m deep Concrete block, max. 15.6 m wide x 34 m long Gate: Steel roller gate x 4

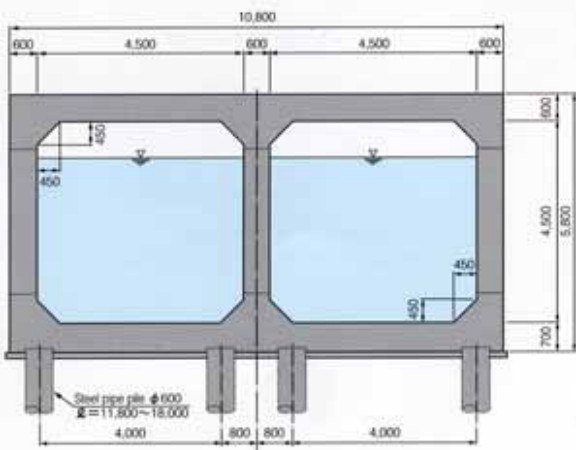
Muneoka Intake Gate



Front View of Muneoka Intake Gate



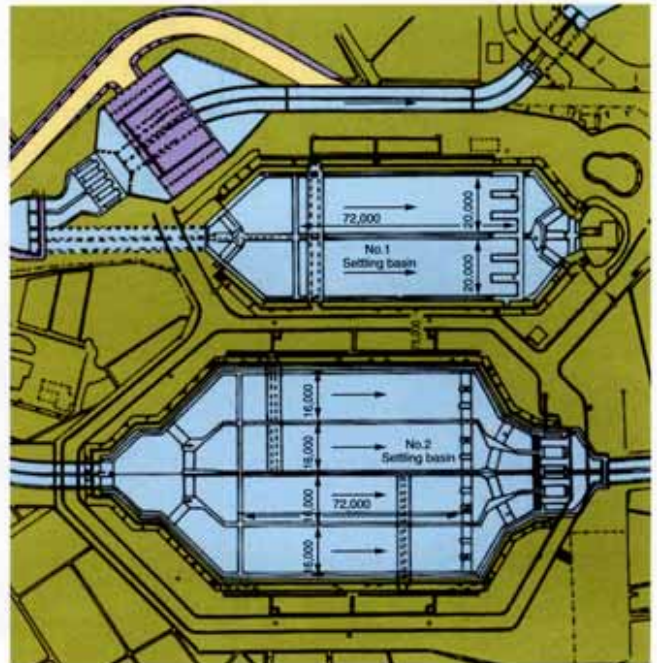
Standard Cross-sectional View of Muneoka Channel



Settling Basin



Top View of Settling Basin



6 Minumadai Canal (Carrying agricultural, domestic and industrial use water)

When the Minumadai Canal took over the job of supplying agricultural water from the Minuma Irrigation Pond in the Kyoho era (1716-1744), it marked an important turning point by sourcing agricultural water from the Tone River system.

At present, the Minumadai Canal supplies agricultural water to a 15,400 hectare area ranging from Gyoda in Southeastern Saitama Prefecture to Adachi Ward in Tokyo. The Minumadai Canal now also delivers water made available by the successful rationalization efforts of the Saitama Water Use Optimization Second Stage Project to areas in Saitama and Tokyo.

The Minumadai Canal system is comprised of the main canal, Nishiberi Canal, Higashiberi Canal, Kisairyo Canal, Nakajima Canal and the Ara River Connecting Canal. Canal water levels are controlled using a remote monitoring system at the Control Center.

Efforts have been coordinated with the local governments whose territory the canal passes through in order to develop a green environment. The result has been the creation of "Healthy Green Roads," "Discovering Nature Roads" and "Water Discovery Parks."

Main Structure	Standards, Dimensions, Materials, Water Levels, Etc.		
① Main canal	Type:	Flume	Concrete lined channel
	Length:	Approx. 14,310 m	Approx. 16,650 m
	Channel grade:	Approx. 1/8,000 - 1/3,000	Approx. 1/3,000
	Cross-section:	7.1 m - 17.4 m wide	Bottom 14.85 m wide, crest 24 m long
Flow rate:	2.4 m - 3.65 m high	3.05 m high	
	43.467 m ³ /s	43.467 m ³ /s	
② Nishiberi Main Canal	Type:	Flume (Nishiberi)	Flume (Higashiberi)
③ Higashiberi Main Canal	Length:	Approx. 10,130 m	Approx. 6,090 m
	Channel grade:	Approx. 1/6,000	Approx. 1/7,500
Cross-section:	5.5 m wide	5.5 m - 6.9 m wide	
	1.5 m - 2.85 m high	2.1 m high	
Flow rate:	7.517 m ³ /s	11.500 m ³ /s	
④ Kisairyo Canal	Type:	Flume (Kisairyo)	Flume (Nakajima)
	Length:	Approx. 9,490 m	Approx. 8,270 m
⑤ Nakajima Canal	Bottom grade:	Approx. 1/4,000	Approx. 1/4,000
	Cross-section:	3.3 m x 5.8 m wide	3.2 m x 4.9 m wide
Flow rate:	1.7 m - 1.8 m deep	1.2 m - 1.5 m deep	
	6.569 m ³ /s	5.007 m ³ /s	
⑥ Canal dedicated to connecting to Ara River	Type:	Pipeline	
	Length:	Approx. 9,080 m	
	Cross-section:	external diameter 3,950 mm, internal diameter 2,000 mm	
	Flow rate:	4.263 m ³ /s	

Main Canal (B Type)

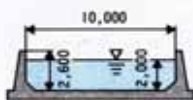


Nishiberi Canal

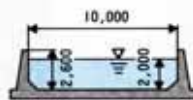


Standard Cross-Sectional Diagrams of Canals

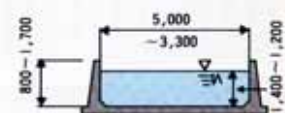
Main Canal (Type A)



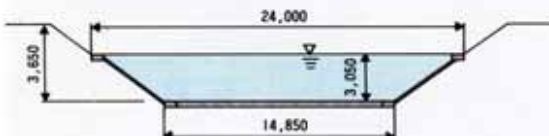
Main Canal (Type D)



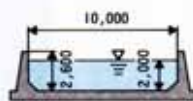
Kisairyo Canal



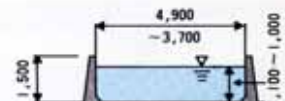
Main Canal (Type B)



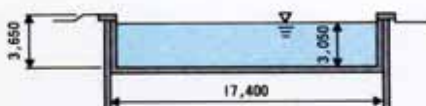
Nishiberi Canal



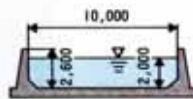
Nakajima Canal



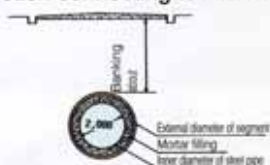
Main Canal (Type C)



Higashiberi Canal



Shielded water channel section connecting to Ara River



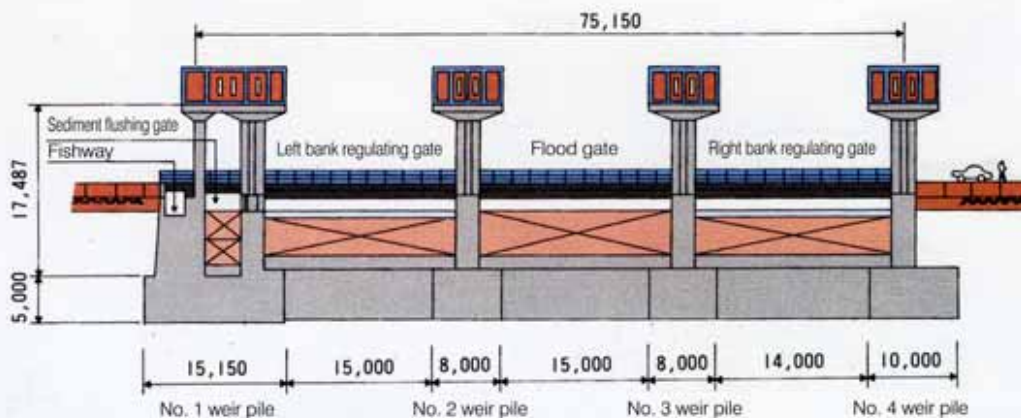
Suedasuka Diversion Weir (Maintaining agricultural water levels)

Located in the middle of the Motoara River, the Suedasuka Diversion Weir serves to maintain water levels upstream of the weir at 7.96 m above A.P. (Ara River Peil, or tidal benchmark of Ara River) in order to supply the agricultural water needed for a 2,900 hectare area of land.

The water from the Motoara River alone is not sufficient to meet the demand for agricultural use, so water is also taken from the Minumadai Canal via the Juurokkenseki Diversion Weir. Therefore, the Suedasuka Diversion Weir is managed as part of the Minumadai canal system.

Main Structure	Standards, Dimensions, Materials, Water Levels, Etc
Suedasue Weir	Type: Movable weir Weir crest length: 75 m Substructure: ø600 mm steel-pipe pile (weir post), PHC pile (floorboard, apron, and retaining wall). Gate: Regulating roller gate with a hinged gate x 2, 20.7 m wide, 4.56 m high Flood gate (roller type) x 1, 20.7 m wide, 4.56 m high Sediment flushing gate (2-stage roller gate) x 1 Fishway (ladder-type) x 1

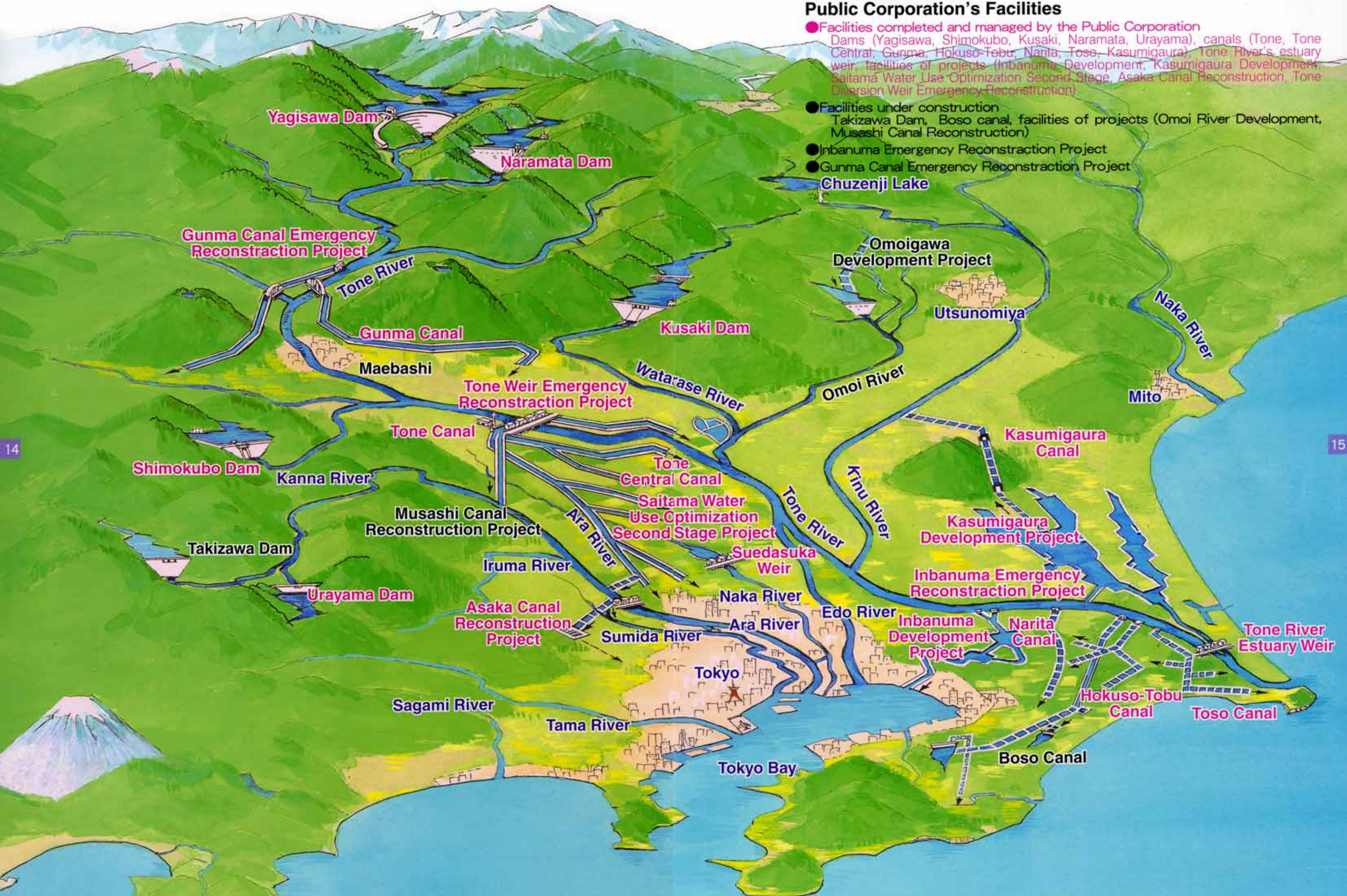
Suedasuka Diversion Weir



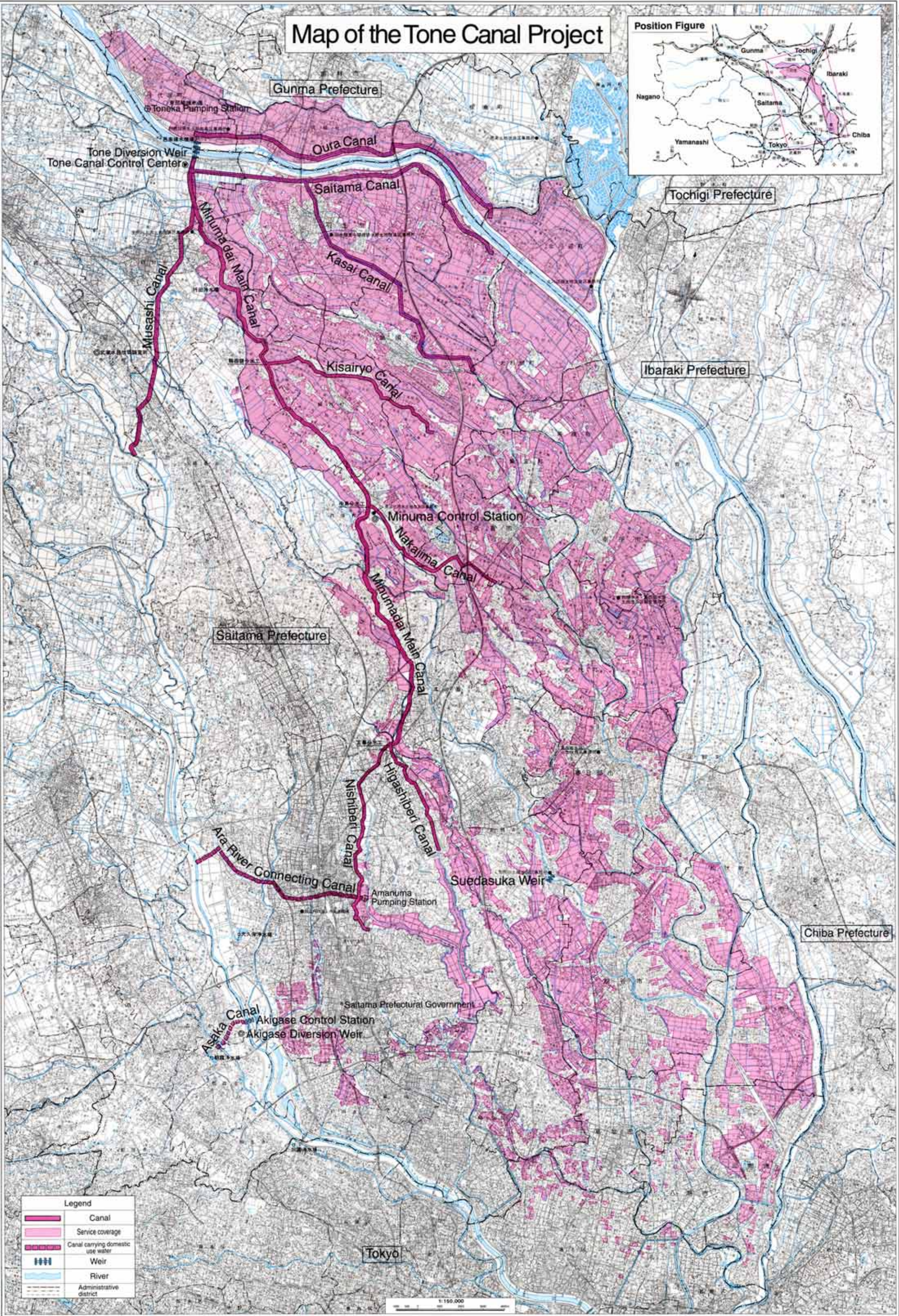
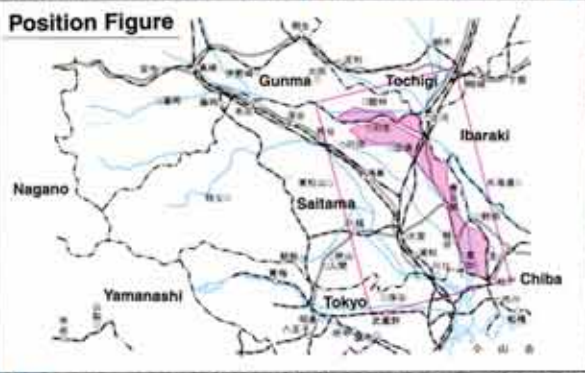
Outline of Development

Public Corporation's Facilities

- Facilities completed and managed by the Public Corporation
Dams (Yagisawa, Shimokubo, Kusaki, Naramata, Urayama), canals (Tone, Tone Central, Gunma, Hokuso-Tobu, Narita, Toso, Kasumigaura), Tone River's estuary weir, facilities of projects (Inbanuma Development, Kasumigaura Development, Saitama Water Use Optimization Second Stage, Asaka Canal Reconstruction, Tone Diversion Weir Emergency Reconstruction)
- Facilities under construction
Takizawa Dam, Boso canal, facilities of projects (Omoi River Development, Musashi Canal Reconstruction)
- Inbanuma Emergency Reconstruction Project
- Gunma Canal Emergency Reconstruction Project



Map of the Tone Canal Project



Legend	
	Canal
	Service coverage
	Canal carrying domestic use water
	Weir
	River
	Administrative district

Scale: 1:150,000

Management of Facilities

1 Tone Canal Control Center

The staff in the Control Center's operation room ensures everything is safe before operating the Tone Canal Diversion Weir's gates. Graphic panels in the control room help the operators monitor the water distribution of the canals. The computer system captures, stores, processes, and displays a large amount of data, which are gathered at and transmitted from observations points, such as water levels, gate status, and flow volume.

The computer system takes over various kinds of duties, for instance, printing of daily reports; automatic control of Tone Diversion Weir and water levels at main diversion works; full-time monitoring of water levels and flow volume at fixed points of the canals; and optimization of water distribution. If trouble occurs at observation points or unordinary data is found, the system alerts operators so they can resolve the problem quickly and properly.

The automatic measuring system installed in the water quality observation laboratory keeps track of water quality on a full time basis to ensure the supply of safe water. Fish in a tank are also used to monitor the water quality and to ensure quick detection of harmful substances.

Control Center



Operation Room



Toneka Water Intake Facility



Oura Pumping Station



Display of Diversion Weir's Natural World



Water Quality Observation Laboratory



2 Akigase Control Station

Akigase Control Station



Operation Room



Miyato Sluiceway



Settling Basin



3 Minuma Control Station

Minuma Control Station



Suedasuka Weir



Minumadai Canal

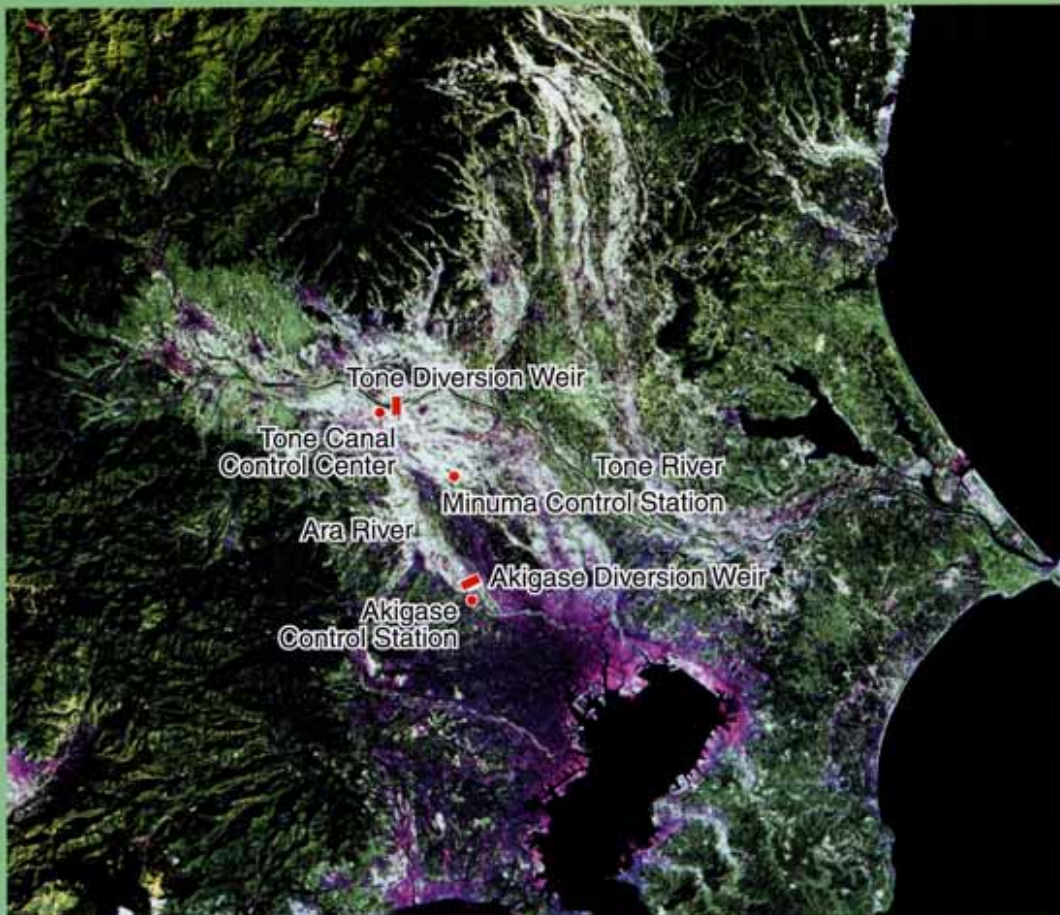


Amanuma Pumping Station



Explanation of Terms

1. City water means domestic and industrial use water.
2. Multi-purpose dam means a dam, which has two or more purposes such as flood control, waterpower generation, and water distribution (agricultural, industrial, domestic use water).
3. Graphic panel means a panel displaying pattern diagrams (see photo of the operation room where rivers, canals, etc., are displayed).



Courtesy of Japan Broadcast Publishing Co., Ltd.

Tone Canal Control Center

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Akigase Control Station

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Minuma Control Station

760 Oaza Kamiosaki, Shobu-cho, Minamisaitama-gun, Saitama-ken 346-0111
Phone: 0480 (85) 1300