

# **Kanda River/ Loop Road No.7 Underground Regulating Reservoir**



**Bureau of Construction  
Tokyo Metropolitan Government**



# Outline of the Kanda River System

The Kanda River is a class A river, 24.6 km in length. The river begins in Inogashira Pond in Mitaka City and is joined by the Zempukuji River and the Myoshoji River along the way, flowing east across the borders of Shinjuku-ku, Toshima-ku, and Bunkyo-ku, and branching off the minor stream as the Nihonbashi River in the vicinity of Suidobashi Station before flowing in the Sumida River. The Kanda River basin stretches into two cities and 13 districts ("ku" in Japanese), including Suginami-ku, Nakano-ku, and Shinjuku-ku, and has a river basin of 105 km<sup>2</sup>, which is the largest among the river basins of the small- and medium-size rivers in Tokyo.

The Zempukuji River, a tributary stream 10.5 km in length, begins in Zempukuji Pond in Suginami-ku, winds through the district, and meets the Kanda River near the border of Nakano-ku. The Myoshoji River is also a class A river of 9.7 km in length, beginning in Myoshoji Pond in Suginami-ku. The river flows through the eastern part of Nakano-ku, meets the Ekoda River in the vicinity of Ekoda Park before running into Shinjuku-ku, and flows into the Takadanobaba diversion canal in the vicinity of Shimo-Ochiai Station.

In the Kanda River system, small and medium river improvement projects are underway in the upper stream from the fork in the Nihonbashi River, while storm-surge control projects are underway downstream from the fork. Small and medium river improvement projects focus on such things as improvements of bank protection, division canals, and underground regulating reservoirs, that can handle a rainfall of 75 mm per hour.

## Location of Kanda River/Loop Road No. 7 Underground Regulating Reservoir



## Major Flood Damage in the Kanda River System

Date	Flood name	Area Flooded (ha)	Houses (buildings) flooded
Sep. 26, 1958	Kanogawa Typhoon	1194.0	38,356
Aug. 31, 1963	Local heavy rainfall	363.0	9,456
Jun. 28, 1966	Typhoon No. 4	403.2	9,175
Apr. 6, 1978	Local heavy rainfall	120.6	2,743
May. 15, 1979	Local heavy rainfall	62.4	1,544
Jul. 22, 1981	Local heavy rainfall	188.7	5,697
Oct. 22, 1981	Typhoon No. 24	214.5	4,939
Sep. 12, 1982	Typhoon No. 18	285.5	5,856
Jul. 14, 1985	Local heavy rainfall	70.7	1,458
Aug. 1, 1989	Local heavy rainfall	51.8	2,669
Sep. 19, 1991	Typhoon No. 18	28.5	1,067
Aug. 27, 1993	Typhoon No. 11	117.1	4,706
Aug. 15, 2005	Local heavy rainfall	3.7	296
Sep. 4, 2005	Local heavy rainfall	125.9	3,591

Note: Area flooded and the number of houses flooded include cases caused by local runoff (overflows other than those from rivers).



Flood pictures (Kanda River hit by Typhoon No. 11 on August 27, 1993)



# History of the Project

The Kanda River/ Loop Road No. 7 Underground Regulating Reservoir project aims to quickly improve safety against floods that often occur in the middle basin of the Kanda River.

The project involves the construction of a 4.5 km-long underground tunnel with a 12.5-meter inner diameter beneath the area of Loop Road No. 7 that can store approximately 540,000 m<sup>3</sup> of flood water from the Kanda River and Zempukuji River. Since the project deals with a huge regulating reservoir facility and will take a considerable amount of time to complete, the project has been divided into first and second stages in order to make the greatest benefit as quickly as possible.

## Procedures for Urban Planning

	Stage 1	Stage 2
Urban Plan Decision	Tokyo Metropolitan Government Notice No. 1354, issued on December 22, 1986	Tokyo Metropolitan Government Notice No. 86, issued on January 26, 1990
Project Permitted	Ministry of Construction Notice No. 290, issued on March 6, 1987	Ministry of Construction Notice No. 1382, issued on July 26, 1990 (intake facility on Zempukuji River only)
		Ministry of Construction Notice No. 1507, issued on July 5, 1993 (not including the intake facility on Zempukuji River)

## Stage 1 Project

A 2.0 km-long underground tunnel that can store approx. 240,000 m<sup>3</sup> of flood water and the "Kanda River Intake Facility" that undertakes flood water from the Kanda River have been completed. The construction project started in 1988 and was completed in fiscal 1998, when the control building, etc. were completed. In this connection, since April 1997, river water intake has started, contributing greatly to reducing flood damage in the downstream basins.



Stage 1 Tunnel

## Stage 2 Project



Myoshoji River Intake Facility and Intakes

The Tokyo Metropolitan Government has constructed a "2.5 km-long tunnel that can store approximately 300,000 m<sup>3</sup> of reserve volume" that connects the Stage 1 tunnel with an intake facility that takes flood water from the Zempukuji River and the Myoshoji River. The construction project started in 1995. The Zempukuji River intake facility started flood water intake from September 2005. The intake facilities, including the control building and electrical and other facilities, were entirely completed in March 2007. A civil engineering facility was also completed in the Myoshoji intake facility in March 2007 and has started water intake. The intake facility, including the electrical and other facilities, was completed in March 2008.

### Stage 1

September 6, 1985	The Tokyo Metropolitan Government Underground River Plan Study Meeting (consultative meeting for Tokyo Governor) was set up
October 16, 1986	Interim report by the Tokyo Metropolitan Government Underground River Plan Study Meeting
December 22, 1986	Urban plan decided
March 6, 1987	Project approved
October 30, 1988	Official report by the Tokyo Metropolitan Government Underground River Plan Study Meeting
October 1988 to December 1991	Umesato starting shaft works
June 1989 to January 1995	Shield Works (machine making, assembling, and tunneling)
September 1991 to March 1997	Kanda River intake facility works (civil engineering facility)
October 1995 to March 1999	Kanda River intake facility works (electrical and mechanical facilities)
April 1997	Operation started (intake started)
December 1997 to March 1999	Kanda River intake facility works (control building constructed)

### Stage 2

January 26, 1990	Urban plan decided
July 26, 1990	Project approved (Zempukuji River intake facility)
July 5, 1993	Project approved (tunnel, Myoshoji River intake facility)
July 1993 to March 1997	Land acquired for Myoshoji River starting shaft
November 1995 to September 2005	Zempukuji River intake facility works (civil engineering facility)
October 1997 to August 2002	Myoshoji River starting shaft works
June 2001 to December 2006	Shielding works (machine making, assembling, tunneling)
June 2005 to March 2007	Zempukuji River intake facility works (control building constructed)
August 2005 to March 2007	Zempukuji River intake facility works (electrical and mechanical facilities)
September 2005	Zempukuji River intake facility dual use started (intake started)
March 2007	Zempukuji River intake facility completed
March 2008	Myoshoji River intake facility dual use started (intake started)
	Myoshoji River intake facility completed



# Outline of Facilities

The Kanda River/ Loop Road No. 7 Underground Regulating Reservoir is comprised of the following facilities.

- ◇ Intake facilities : Facilities that take in flood water from rivers and guide it into the underground tunnel. They include a side overflow weir along the bank, shaft that drops flood water underground, connecting ducts that lead water into the tunnel, discharge pumps, ventilation facilities, etc.
- ◇ Regulating reservoir tunnel : A facility that reserves inflowing water from intake facilities
- ◇ Control building : A facility that operates, controls, and monitors water inflow and discharge facilities

## Outline of Facilities

	Total	Stage 1 Project	Stage 2 Project
Storage volume	540,000 m <sup>3</sup>	240,000 m <sup>3</sup>	300,000 m <sup>3</sup>
Tunnel length	4.5 km	2.0 km	2.5 km
Tunnel inner diameter	12.5 m		
Intake facilities	Three points	Kanda River	Zenpukuji River Myoshoji River

Reverse circulation type shield machine  
(Stage 2 project)



Zenpukuji River intake facility connecting duct joint points of the Stage 1 tunnel



Central monitor and control board of Zenpukuji River intake facility



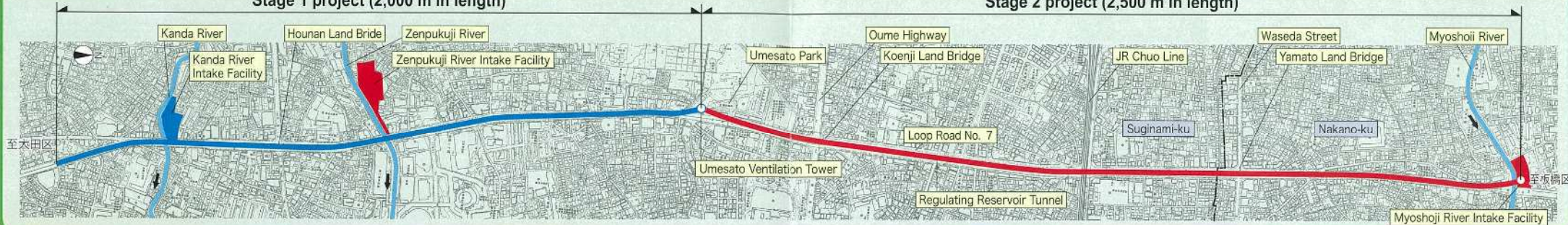
Main discharge pump of Zenpukuji River intake facility



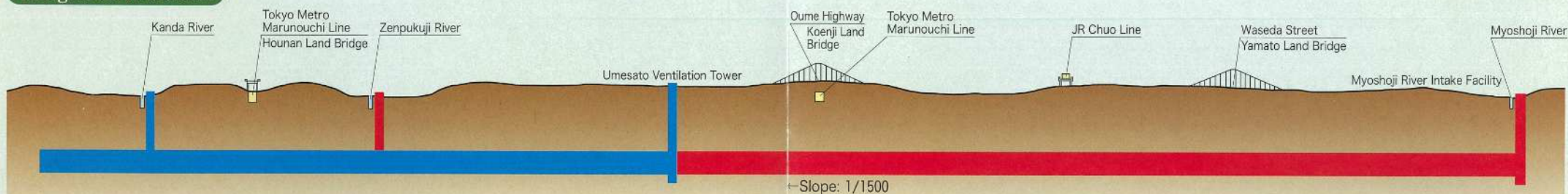
## Plane Figure

Stage 1 project (2,000 m in length)

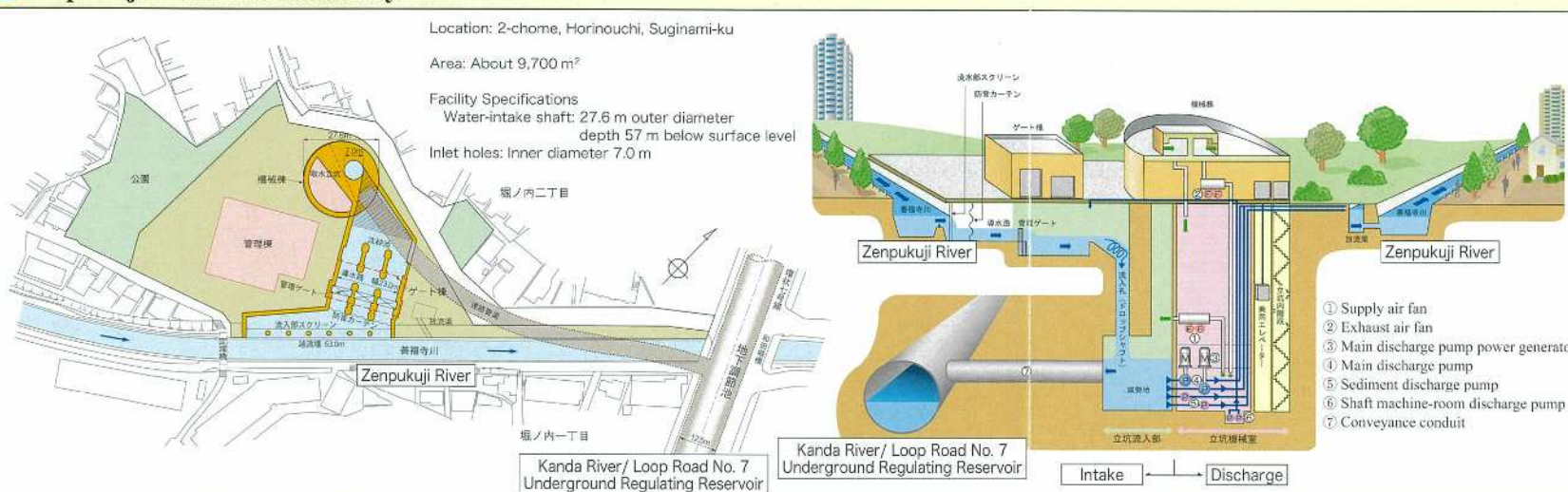
Stage 2 project (2,500 m in length)



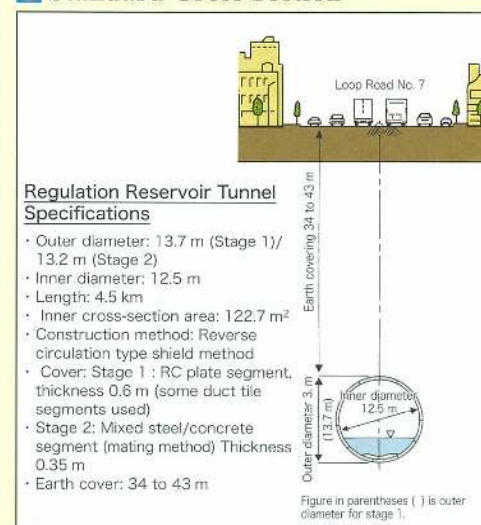
## Longitudinal Section



## Zenpukuji River Intake Facility



## Standard Cross Section





# Project Benefits

The Kanda River/ Loop Road No. 7 Underground Regulating Reservoir has started use of the first stage project site since April 1997, and has started use of the second stage project site since September 2005.

There were forty-two inflows by the end of January 2019, and the regulating reservoir played a great role in reducing flood damage in the downstream basins.



Inflows to Kanda River Intake Facility

Typhoon No. 11 in 1993 caused significant flood damage in the middle basin of the Kanda River. Typhoon No. 22 in October 2004 also brought rainfall whose volume was almost the same as of the abovementioned typhoon; however, flood damage was greatly reduced due to the improved river bank protection implemented by river disaster control special emergency projects\* and the Loop Road No. 7 underground regulating reservoir that stored flood water.

## Comparison of Typhoon No. 11 (1993) with Typhoon No. 22 (2004)

	Typhoon No. 11 (August 27, 1993)	Typhoon No. 22 (October 9, 2004)
Total Rainfall (rainfall per hour)	288 mm (47 mm)	284 mm (57 mm)
Area Flooded	85 ha	4 ha
Houses Flooded (above and below floor)	3,117 houses	46 houses

## Inflows

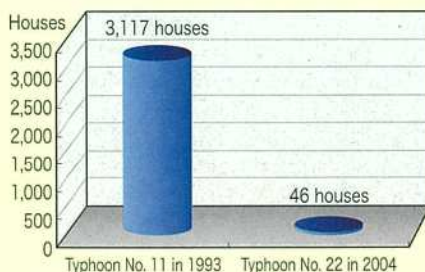
As of the end of January 2019

Number	Date	Meteorological Title	Inflow Volume (m³)	Rainfall record		Observation Station
				Max. Per Hour (mm)	Total Rainfall (mm)	
1	Jun. 20, 1997	Typhoon No. 7	40,800	22	97	Izumi
2	Aug. 23, 1997	Local heavy rainfall	37,000	55	93	Izumi
3	Sep. 3, 1997	Local heavy rainfall	20,000	43	45	Kugayama
4	Sep. 8, 1997	Local heavy rainfall	8,000	35	43	Kugayama
5	Aug. 6, 1998	Local heavy rainfall	14,000	45	51	Takaido
6	Sep. 15, 1998	Typhoon No. 5	151,700	33	175	Izumi
7	Jul. 21, 1999	Local heavy rainfall	70,000	65	71	Takaido
8	Aug. 14, 1999	Tropical depression	52,000	38	208	Kugayama
9	Aug. 29, 1999	Local heavy rainfall	24,000	46	62	Wadamibashi
10	Sep. 4, 1999	Local heavy rainfall	9,500	58	89	Izumi
11	Jul. 8, 2000	Typhoon No. 3	214,000	29	197	Izumi
12	Sep. 12, 2000	Local heavy rainfall	61,000	53	146	Narita Higashi
13	Sep. 11, 2001	Typhoon No. 15	120,000	38	172	Takaido
14	Jun. 25, 2003	Local heavy rainfall	38,000	45	66	Musashino
15	Oct. 13, 2003	Local heavy rainfall	148,000	68	69	Wadamibashi
16	Oct. 9, 2004	Typhoon No. 22	215,000	58	284	Yayoicho
17	Oct. 20, 2004	Typhoon No. 23	52,000	42	228	Yayoicho
18	Aug. 15, 2005	Local heavy rainfall	35,000	38	39	Izumi
19	Sep. 4, 2005	Local heavy rainfall	*1 420,000	101	238	Kugayamabashi
20	Jun. 16, 2006	Local heavy rainfall	128,900	31	103	Kugayama
21	Jul. 29, 2007	Local heavy rainfall	76,000	28	58	Kugayama
22	May. 20, 2008	Local heavy rainfall	79,000	26	131	Kugayama
23	Aug. 10, 2008	Local heavy rainfall	1,000	43	44	Saginomiya
24	May. 24, 2009	Local heavy rainfall	1,900	26	36	Shimoigusa
25	Oct. 8, 2009	Typhoon No. 18	505,000	45	152	Wadamibashi
26	Sep. 28, 2010	Local heavy rainfall	95,700	44	155	Shimoigusa
27	Dec. 3, 2010	Local heavy rainfall	113,800	38	91	Aioibashi
28	Aug. 26, 2011	Local heavy rainfall	92,700	86	99	Nakano
29	May. 3, 2012	Local heavy rainfall	81,000	26	173	Musashino
30	Apr. 7, 2013	Local heavy rainfall	210,000	45	104	Wadamibashi
31	Aug. 12, 2013	Local heavy rainfall	110,000	59	59	Suginami
32	Sep. 5, 2013	Local heavy rainfall	79,600	40	69	Banyabashi
33	Sep. 15, 2013	Typhoon No. 18	540,000	45	152	Aioibashi
34	Oct. 16, 2013	Typhoon No. 26	431,100	36	244	Kugayamabashi
35	Jul. 24, 2014	Local heavy rainfall	378,400	75	121	Musashino
36	Sep. 10, 2014	Local heavy rainfall	132,600	70	85	Kugayamabashi
37	May. 12, 2015	Typhoon No. 6	176,800	41	65	Aioibashi
38	Aug. 17, 2015	Local heavy rainfall	145,200	54	103	Ikebukurobashi
39	Aug. 22, 2016	Typhoon No. 9	213,400	41	129	Musashino
40	Oct. 23, 2017	Typhoon No. 21	92,000	39	259	Musashino
41	Mar. 9, 2016	Local heavy rainfall	286,400	54	161	haraterabubashi
42	Aug. 27, 2018	Local heavy rainfall	123,400	79	83	Aioibashi

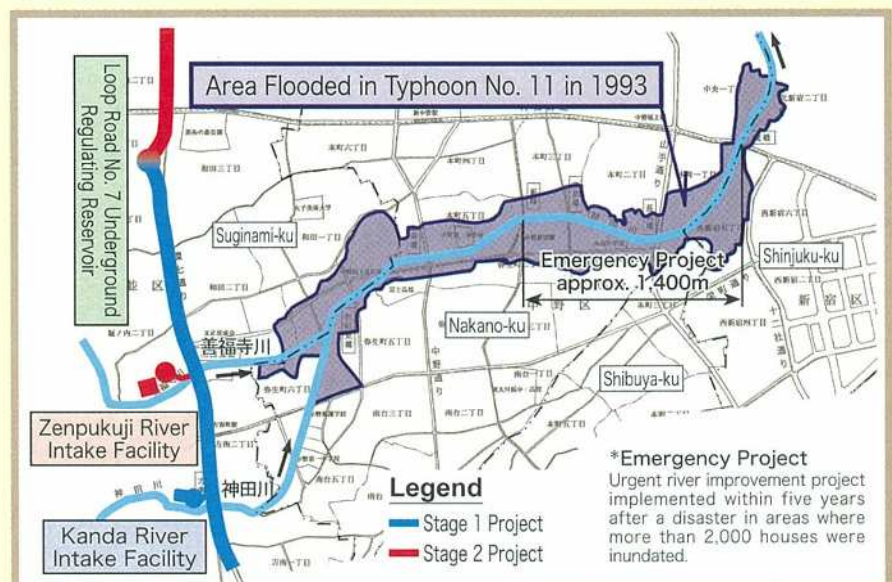
Note : Capacity of Regulating Reservoir : 240,000m³ (since Sep. 2005 : 540,000m³)

Rainfall record is maximal value of the Observation Stations around the Kanda River intake facility

\*1 Had an urgent water intake into the Stage 2 tunnel, Which was under construction



Yayoicho  
in Nakano-ku



\*Emergency Project  
Urgent river improvement project implemented within five years after a disaster in areas where more than 2,000 houses were inundated.





Zenpukuji River intake facility in full view

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**R70**  
※R70は、環境省が定める環境性能評価基準に基づいて算出された数値です。

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