Measures to make Horikawa River Limpid

Implementation by Nagoya City Feb.29th 2020

Greenification & PublicWorks Bureau River Planning Div.

Waterworks and Sewerage Bureau Sewerage Planning Div.

Environment Bureau Local environmental measures Div. Implementation by Greenification & PublicWorks Bureau



Construction of Shallows and Depths

Setting wooden piles and ripraps generates variable stream on the river for enforcing river's self-purification function and creating habitats with growth of plants.

.fish spawning and plants' seed ashore

... change of stream

Construction in 2016 (Downstream of Meoto Bridge)

◆Construction of Shallows and Depths Construction Plan in Downstream of Shin-Hori-Bridge in Kita Ward, 2020



Construction of Shallows and Depths



Some of the creatures seen in the upstream of Horikawa River





Japanese mitten crab





◆ Improvement

- Variety and amount of fish have increased. (example pale chub)
- Benthos have increased. (example shrimp)
- Plants have grow up more.

Use of shallow groundwater

New pumping groundwater facility is now under construction in upstream of Kurokawa No.1 Bridge.





Removal of inflow of pollutants

◆Garbage catcher (Near Johoku Bridge) since 2006



Removal of pollutants

Cooperation with Cleaning group of ports (Sei-ko-kai)



Collection of pollutants



Examination for water environment improving (2020)

OBasic Examination for water environment improving

Verify the effects of various water cleaning measures

<Examples>

Securing water source (underground water)



Environment Affairs Bureau

(Ex.) Spring water in TsurumaiLibrary Separating sewer systems, "Hybrid sewerage"



OSecuring water source (convey Horikawa River water)



OHearing with Experts etc.

Examine the effective water cleaning measures and future utilization of waterfront area

Experts : Experts in river, water quality, city planning, etc.Contents : • effective water cleaning measure and scale

future role of waterfront

Cooperation with Nagoya Chamber of Commerce and Industry (2020 plan)

OTo make prosperity of Shin-Horikawa River together with companies on the river

- •Experience event of boarding (know the present)
- •Exchanging opinions about the future (talk about the future)

Implementation by Waterworks and Sewerage Bureau

Initiatives for clarification of Horikawa river

Initiatives for clarihication of *Horikawa* river



Advanced water treatment Meijo water treatment center (disk filter)

Advanced facilities of simple treatment *Meijo* water treatment center

Rain Water reservoir for pollution control *Ozone* Rain-water reservoir *Horikawa*-river right bank Rain-Water reservoir *Horikawa*-river left bank Rain-Water reservoir

Set of Garbage removel facilities

Shrinkage of Rainwater screen slit Shiratoribashi pumping station Nakajima pumping station Chitose water treatment center

Reclaimed wastewater supply *Moriyama* water treatment center

Garbage Catcher (Corporation with Greenification & PublicWorks Bureau)

Advence water treatment

Meijo water treatment center

(treatment capacity : 50,000m3/day)



Minute Suspended Solids(SS) in treated water are removed more by the filtration devices (disk filter)



Advanced Facilities of simple treatment (Improvement of combined sewer system)

We changed the simple treatment of rain water from Settling treatment to Filtration treatment, remodeled the part of existing first settling basin and installed advanced facilities of simple treatment in the water treatment centers.

Meijo Water Treatment Center (simple treatment capacity 99,400m3/day)

Started operation in 2019





Special filteration materilal

XLeft figure is Tenma Water Treatment Center



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Rain-water Reservior for pollution controll (Improvement of combined sewer system)

We construct rainwater storage facilities to reduce pollution load for *Horikawa* River in rainy weather by storing high polluted first flush rainwater temporarily.

Ozone rain water Reservoir for pollution control Horikawa-river right bank Rainwater Reservoir for pollution control Horikawa-river left bank Rainwater Reservoir for pollution control







Started operation in 2006 (12,000m³)

Started operation in 2010 (13,000m³) Started operation in 2019 (14,000m³) ¹⁸

Removal and Reduction of inflow of pollutants

Improvement of combined sewer system (Installation of Garbage Removal Device)

The number of installation of Garbage Removal Device (end of 2018)



Shrinkage of Rainwater screen slit (Improvement of combined sewer system)

Rainwater screens are the facility to remove comparatively big garbage, and installed in water treatment centers and pumping station. More garbage is removed by shrinkage of rainwater screen.

Shiratoribashi pumping station Nakajima pumping station Chitose water treatment center

Rainwater screen slit

40mm $\rightarrow 25$ mm

Prevention of inflow of pollutants



Supply of reclaimed wastewater

Moriyama water treatment center supply reclaimed water treated by membrane filtration to *Horikawa* river.

Water supply :Up to 4,000m3/day(0.046m3/s)



Flat membrane unit aerobic tank



Flat membrane unit



Watering period is almost irrigation period(April~October) (Except the period for Shonai irrigation channel(November~March))



Initiatives for clarification of Shin-Horikawa river

Initiatives for clarification of Shin-Horikawa river

Improvement facilities of combined sewer system in *Wakamiya* avenue Rainwater reservo

Horidome water treatment center

Shin-Horikawa river

Takakura pumping station

Atsuta water treatment center

Fukue Rain-water reservoir

Takatuji Rain-water reservoir

Ushimaki pumping station

Tenmacho water treatment center



Advanced water treatment

Atsuta water treatment center (AO method)

Advanced facilities of simple treatment Horidome water treatment center Tenmacho water treatment center

Rain-water reservoir for pollution control Wakamiya avenue Rain-water reservoir Fukue Rain-water reservoir Takatuji Rain-water reservoir

Set of Garbage removel facilities

<u>Shrinkage of Rainwater screen slit</u> Takakura pumping station Ushimaki pumping station Tenmacho water treatment center (under installing)



The process can remove nitrogen and phosphorus which causes eutrophication more than normal conventional activated sludge process.



Advanced Facilities of simple treatment (Improvement of combined sewer system)

We changed the simple treatment of rain water from Settling treatment to Filtration treatment, remodeled the part of existing first settling basin and installed advanced facilities of simple treatment in the water treatment centers.

Tenmacho Water Treatment Center (treatment capacity 168,000m3/day)

• Started operation in 2011

Horidome Water Treatment Center (treatment capacity 277,200m3/day)

Started operation in 2018





Special filteration materilal

Left figure is Tenma Water Treatment Center
Removal Rate of BOD 20%-30%

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⇒50%-60% Improvement!

Rain-water Reservior for pollution controll (Improvement of combined sewer system)

We construct rainwater storage facilities to reduce pollution load for *Shin-Horikawa* River in rainy weather by storing high polluted first flush rainwater temporarily.

Takatuji Rain-water reservoir



Started operation in 1987 (**30**, **000m**³)

Fukue Rain-water reservoir



Started operation in 1999 (26, 000m³)

Improvement facilities of combined sewer system

in Wakamiya avenue Rain-water reservoir



Started operation in 2002 (19, 000m³)



Removal and Reduction of inflow of pollutants

Improvement of combined sewer system (Installation of Garbage Removal Device)

The number of installation of Garbage Removal Device (end of 2018)



Shrinkage of Rainwater screen slit (Improvement of combined sewer system)

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Takakura pumping station
 Ushimaki pumping station
 Tenmacho water treatment center
 (under installing)

Rainwater screen slit

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Prevention of inflow of pollutants



Additional initiatives for clarification

Further water cleaning in upper-middle area of Horikawa and upper area of Shin-Horikawa

Problem

ONeed to implement the measures for water cleaning in near future and examine future separating sewer system to contribute to development of downtown area utilizing waterfront.

Measures

OConstruction of rainwater main sewer trunk and closure of rainwater discharge chamber of combined sewer along Horikawa River and Shin-Horikawa River, anticipating future sewer separation.

OExamination of rainwater reservoir connecting to rainwater main sewer trunk for integral pollution control as well as continuous treatment of rainwater in wastewater treatment center.



Implementation by Environment Bureau

Examination of ground water use for river clarification





Examination of ground water use in Shin-Horikawa

◆Survey for visualization of
water cycle of Yamazaki River

We will be conducted to promote river clarification by effective use of ground water.

Examination of using ground water in Shin-Horikawa River

Examination will be conducted how to convey groundwater into river in upper Shin-Horikawa area where ground water is abundant

2019

□ Basic Survey

Some model cases are constructed and considered for clarification of Shin-Horikawa River with information of ground water.

•Conveyance of spring water, rainwater.

and underground water leakage •Boring well and flowing well etc.

2020

source

□ Preparation for the plan of conveying ground water into Shin-Horikawa River, which is judged possible to utilize in basic survey

- •Route
- Quantity
- Creation of waterfront area etc.

□ Comparative examination of water quality improving effect etc

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