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MEASURES TAKEN AFTER THE 1994 OHTAGAWA RIVER SYSTEM WATER POLLUTION INCIDENT

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Introduction

Before dawn, on the morning of February 18, 1994, there was an oil spill incident at the Utopia Saioto Ski Ground in north-east Geihoku Town, located in the north west of Hiroshima Prefecture, near the border with Shimane Prefecture. This incident resulted in pollution of the Saioto and Takiyama rivers and had a major impact on both the riverside environment and on the lives of the inhabitants of the city of Hiroshima and downstream municipalities.

This report is a summary of the events occurring in the area, especially the actions of the committee set up to deal with the incident, during the 36 days subsequent to the incident and describes a study of the measures taken.

1. Outline of Catchment Area

The Saioto River is a secondary tributary of the Ohtagawa River that joins the Takiyama River and flows into the reservoir of the Odomari Dam about 13 km downstream of where the incident occurred. The water from the dam is used to provide hydroelectric power and the flow discharges into the main steam of the Ohtagawa River. Water is taken from this flow about 45 km downstream of the Odomari Dam at the Ohtagawa Takase Weir and supplied as domestic and industrial water to the 1.6 million residents of Hiroshima and twenty four other municipalities.

2. Cause of the Incident

Saioto Ski Ground was opened to the public in 1988, and in 1990, artificial snow making equipment was installed to enable skiing during the milder part of the winter period.

The incident occurred when frozen snow fell from the roof of the building housing the fuel oil storage tank and ruptured an exposed part of the fuel oil supply pipe that joins the storage tank to the artificial snow making equipment. The rupturing of the pipe automatically activated the supply system and about 10,000 l (estimated) of type A fuel oil was spilled.

3. Initial Phase

3.1 Discovery

The rupture in the pipe leading from the tank that supplies fuel oil to the artificial snow making equipment, and the resulting spillage were discovered by an employee of the Saioto Ski Ground at 6 o'clock on the morning of February 18, 1994.

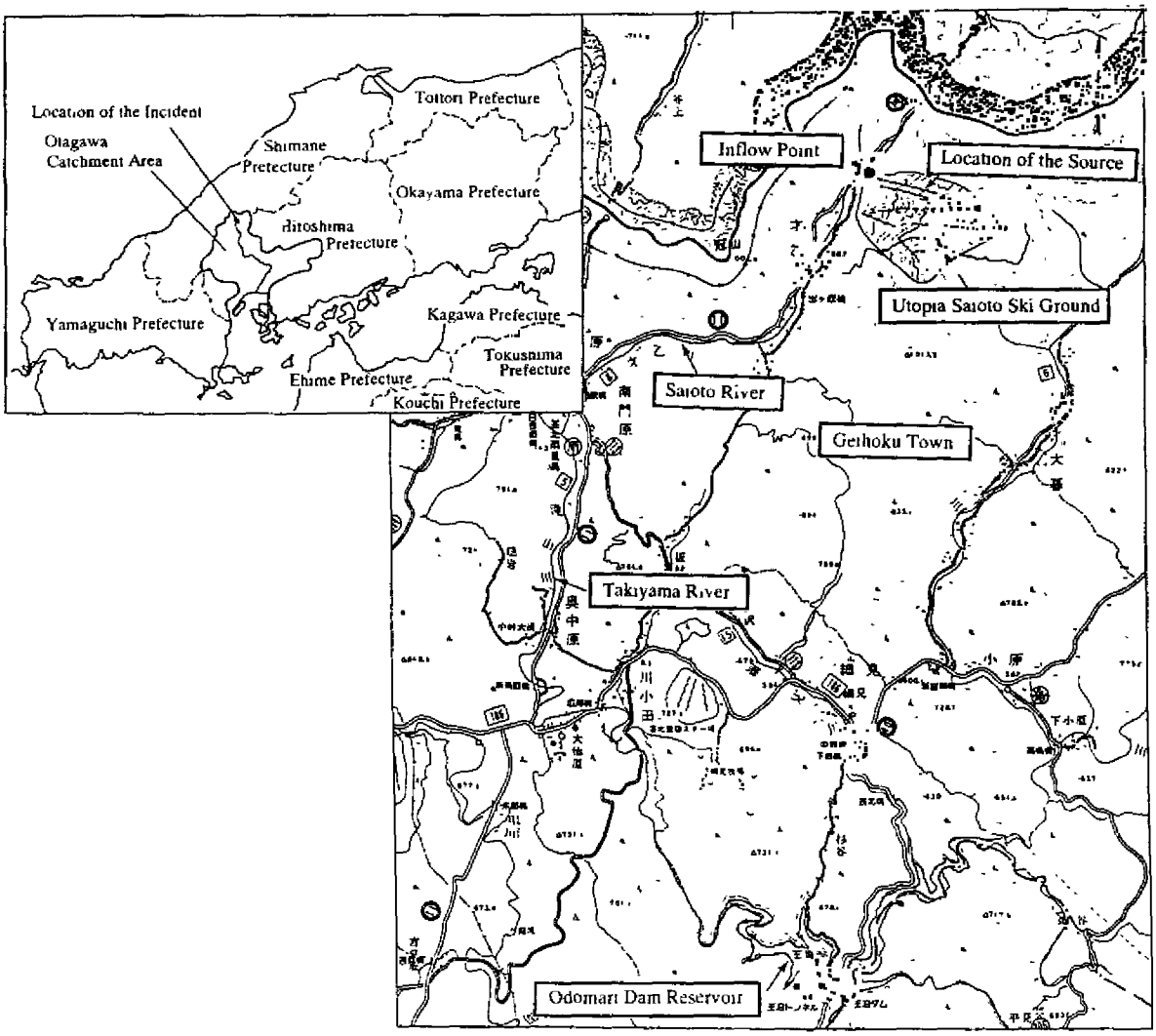

Fig .1 Location Map

The employee immediately tried to report the incident to the Hiroshima Prefectural Community Health Center-Kabe Bureau, but as there was no one at the office at that time of the morning, it was 8:30 a.m. before telephone contact was finally made. The Kabe Community Health Center instructed the manager of the ski ground to contact the Hiroshima Prefectural Public Works Office-Kake Bureau Engineering Office, and a call was made at 8:35 a.m. in which it was stated, "An oil supply pipe at the ski ground has been ruptured and 10,000 l of type A fuel oil has been spilled, and some of this oil is flowing into the Saioto River."

Having received this report, the Kake Public Works Office maintenance and management divisions had, by 9.00 a.m., informed: the Geihoku Town Office, Yamagata Seibu Fire Department, the Kake Branch Office, the Ohtagawa River Works Office of the Ministry of Construction, Hiroshima Prefectural River Maintenance and Control Division, Hiroshima Prefectural Community Health Center-Kabe Bureau Asakita Ward Office of the city of Hiroshima, Kake Police Station, and Kake Town Office.

The occurrences on the morning of February 18 following the discovery of the oil spillage can be summarized as follows:

6:00 The fuel oil spillage was discovered by the Saioto Ski Ground Employee who tried unsuccessfully to contact the Hiroshima Prefectural Health Center-Kabe Bureau.

8:30 The Saioto Ski Ground Employee finally managed to report the incident to the Hiroshima Prefectural Community Health Center-Kabe Bureau.

8:35 The manager of the ski ground reported the incident to the Hiroshima Prefectural Public Works Office-Kake Bureau as instructed by the Kabe Health Center.

8:50 Staff were dispatched from the Kake Public Works Office to the scene of the incident.

9:00 The Kake Public Works Office informed the Geihoku Town Office, Yamagata Seibu Fire Department, the Kake Branch Office of the Ohtagawa River Works Office of the Ministry of Construction, Hiroshima Prefectural River Maintenance and Control Division, Kabe Health Center, Asakita Ward Office of the City of Hiroshima, Kake Police Station, and Kake Town Office.

9:30 A subcommittee to deal with the oil spillage incident was set up within the Ohtagawa River Anti-pollution Committee. (At the Ohtagawa River Works Office of the Ministry of Construction)

9:35 Fuel oil was confirmed flowing about 9.5 km downstream of the point where the spillage incident occurred.

9:40 Staff from the Ohtagawa River Works Office of the Ministry of Construction set out toward the site of the incident. A survey of the scene was made by Kabe Health Center and Geihoku Town.

9:41 The oil flow stopped at the Odomari Dam (about 13 km downstream of the point where the spillage incident occurred).

10:00 Work started at one location on the setting up of an oil fence (Kake Public Works Office).

10:50 Oil fences were completed at two locations (Chugoku Electric Power Company).

13:30 A meeting of the Hiroshima Prefecture Water Pollution Prevention Committee Meeting was held (first meeting).

15:00 Ohtagawa River System Saioto River Fuel Oil Incident Information Exchange Meeting was held (first meeting).

White pollution was confirmed about 3 km upstream of the inlet end of the Odomari Dam.

21:00 A total of 18 oil fences were set up at 10 locations by various organizations.

22:00 Patrol Report

A thick oil slick covered the entire width of the upstream region of the Saioto River.

An offensive odor was present in the vicinity of Hirose Bridge (about 10.5 km downstream of the spillage).

An oil slick was observed over almost all regions of the Saioto and Takiyama rivers.

3.2 Setting Up of the Committee

In the afternoon of February 18, the Kake Public Works Office decided to set up an on-site committee and requested the participation of the various organizations involved. On February 19, at 10:00, at the Geihoku Town Office, the "Saioto River Fuel Oil Spillage Incident On-site Committee" was established.

The head of the Kake Public Works Office was made chairman, and the committee was defined as the on-site committee for the "Ohtagawa River Anti-pollution Committee's Oil Spillage Incident Sub-committee", and activities began in regard to the following three basic policies:

i) The main priority should be to stop the flow of fuel oil from the ski ground.

ii) The greatest possible efforts should be made to prevent flow of the oil into the reservoir of the Odomari Dam.

iii) The recovery of the remaining fuel oil should be carried out through the cooperation of the organizations involved.

The various organizations are:

Hiroshima Prefectural Public Works Office-Kake Bureau, Geihoku Town,
Ohtagawa River Works Office of the Ministry of Construction, Kake Police Station,
Hiroshima Prefectural Community Health Center, Yamagata Seibu Fire Department,
Hiroshima Prefectural Waterworks Management Office-Hiroshima Bureau,
Chugoku Electric Power Company

4. Development Phase

4.1 Countermeasures

To minimize the pollution caused by the fuel oil spillage, the on-site committee divided the countermeasures to be taken into three blocks. The details are shown in the following diagram.

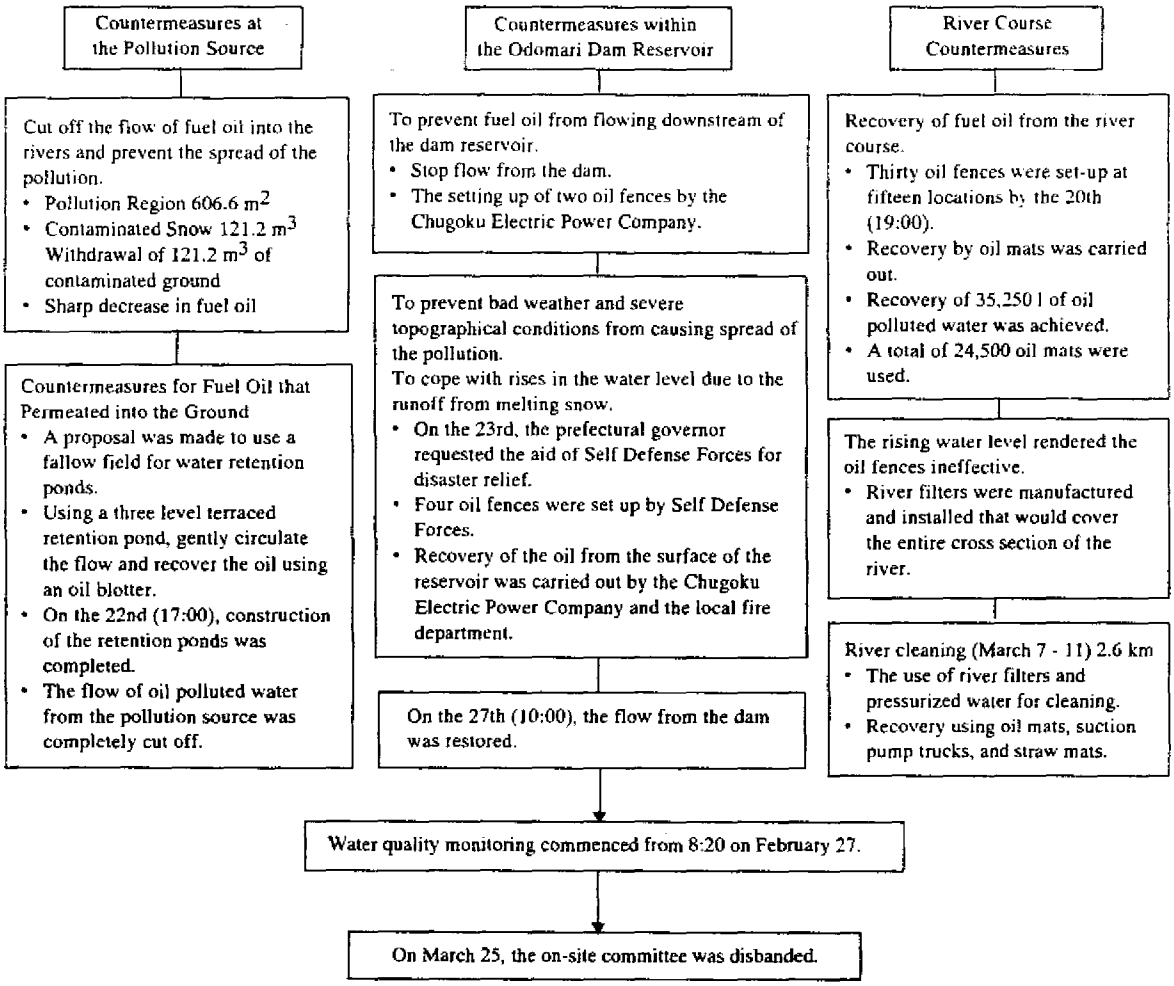

Fig.2 Countermeasures

4.2 Pollution Source Countermeasures

It took time to prevent discharge from the pollution source due to the fact that snow made it impossible to immediately determine the extent of the pollution. Immediately after the spillage incident, ski ground employees dug a hole about 2 m x 2 m and 1.5 m deep in the snow at the location and attempted oil recovery by pumping. However, as of 10:00 on the morning of the 19th, the fuel oil discharge continued. At a meeting of the on-site committee (17:00, 19th), treatment of the pollution source was made the responsibility of the Kake Public Works Office and Geihoku Town. Recovery operations began from about 20:00 on the 19th.

Isolated holes were dug to determine the extent of the pollution, and then a back hoe was used for excavation and withdrawal. The pollution was found to extend southwest of the pump house in a trapezoidal shape having an area of 606.6 m^2, and 121.2 m^3 of contaminated snow and 121.2 m^3 of contaminated soil were withdrawn. The fuel oil discharging into the river was sharply reduced as a result but the oil was permeating through the soil and walls of the watercourse and some way had to be found to completely stop the flow.

Melting snow at the site was starting to increase the amount of polluted water flowing into Saioto River As an emergency measure, thorough cleaning of drainage water channels was carried out to separate the oil polluted water and water from melting snow.

At the third on-site committee meeting (15:00, 20th), a plan was presented from Geihoku Town in which a fallow field would be used for the construction of retention ponds in which the flow would be gently circulated and the oil recovered using an oil blotter This plan was immediately initiated, and from 17:00 on the 22nd, all the contaminated water from the pollution source was made to flow into the retention ponds where the oil was recovered thus completely cutting off the flow of fuel oil into the river. The Kabe Health Center continued to direct and lead the operations day by day.

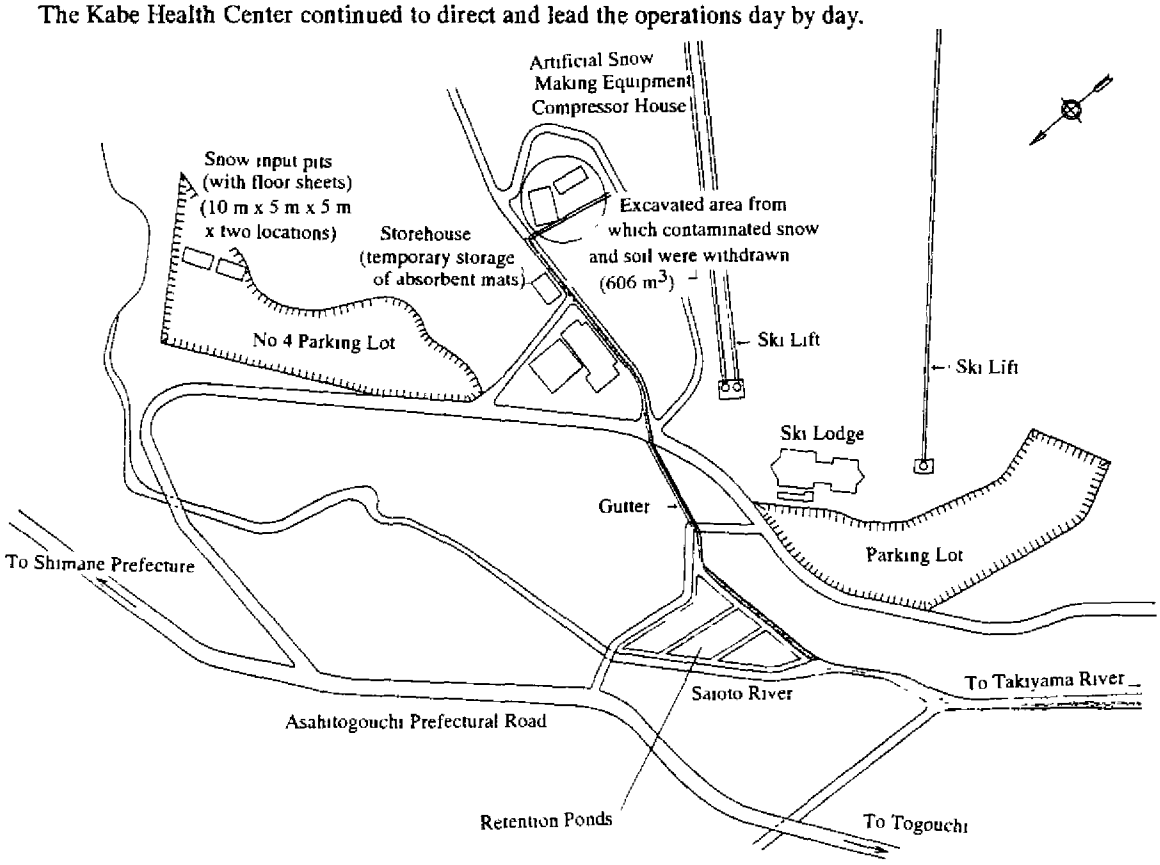

Fig.3 Plan of the Retention Ponds Region

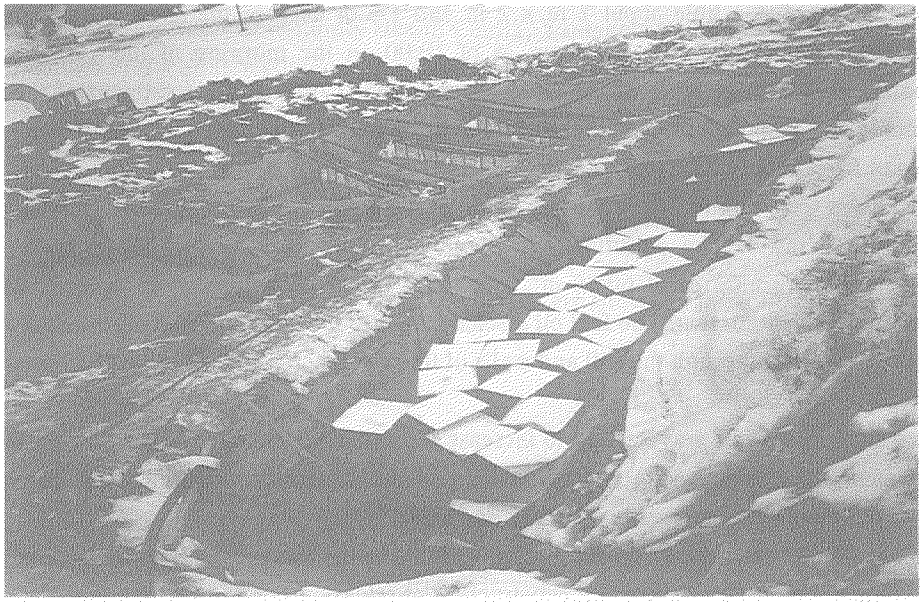

Photo.1 Retention Ponds:
Sheeting was laid in each area, the oil led in and recovered with absorbent mats and filters (March 7).

4.3 Countermeasures within the Odomari Dam Reservoir

The countermeasures within the Odomari Dam Reservoir were carried out mainly by the Chugoku Electric Power Company (hereinafter Chugoku Electric). Two oil fences were set up within the reservoir on the 22nd; however, bad weather and snow made it difficult and dangerous to proceed with further countermeasures. The possibility of discharge occurring due to the rising water level had to be studied, and time was tight. The head of Geihoku Town held discussions with Chugoku Electric and the prefectural governor was asked to request the aid of the Self Defense Forces. At 12:30 on the 23rd, the governor requested the assignment of Self Defense Forces to assist in the disaster operations.

In this way a total of six oil fences were set up within the dam reservoir, two by Chugoku Electric and the other four by the Self Defense Force. These oil fences prevented the oil from proceeding downstream, and at the same time, Chugoku Electric and the local fire department commenced recovery operations to clear the oil slick from the surface of the reservoir.

On February 25 (10:30), the second meeting of the Ohtagawa River Anti-pollution Committee was held at which it was agreed to start discharging water from the Odomari Dam at 10:00 a.m. on February 27. As the discharge from the Odomari Dam affects the downstream water supply intake and river ecosystem, it was decided to discharge from the lowest outlet tunnels to avoid the water near the crest of the dam.

The first meeting of the Ohtagawa River System Saioto River Fuel Oil Spillage Incident Countermeasures Committee was held at 15:30 on the 25th, and water quality monitoring commenced from the 27th.

Main Events:

February

21st	23:15	• Head of Geihoku Town studied the possibility of requesting Self Defense Forces (SDF).
		• The Head of the Kake Public Works Office was requested to clear the forest road (for transportation of men and equipment).
22nd	10:30	• Work began removing snow and rocks from the road.
	11:10	• An oil fence was set up (Chugoku Electric).
	14:10	• Snow clearing of 900 m of forest road was completed.
	15:30	• An oil fence was set up (Chugoku Electric).
	17:00	• Head of Geihoku Town asked the prefectural governor for the assistance of the SDF.
23rd	12:30	• The prefectural governor requested the assistance of the SDF
		• The SDF set out for the area (83 personnel, 21 vehicles).
24th	11:00	• Oil fences were set up by the SDF (Line Nos.32-35).
	11:20	• Oil fence was set up by the SDF (Line No.40).
	14:40	• The prefectural governor visited the site.
	15.20	• Oil fence was set up by the SDF (Line No.29).
25th	9:15	• Oil fence was set up by the SDF (Line No.44).
	11:00	• The governor requested the withdrawal of the SDF from the area.
	13:00	• SDF withdrew.

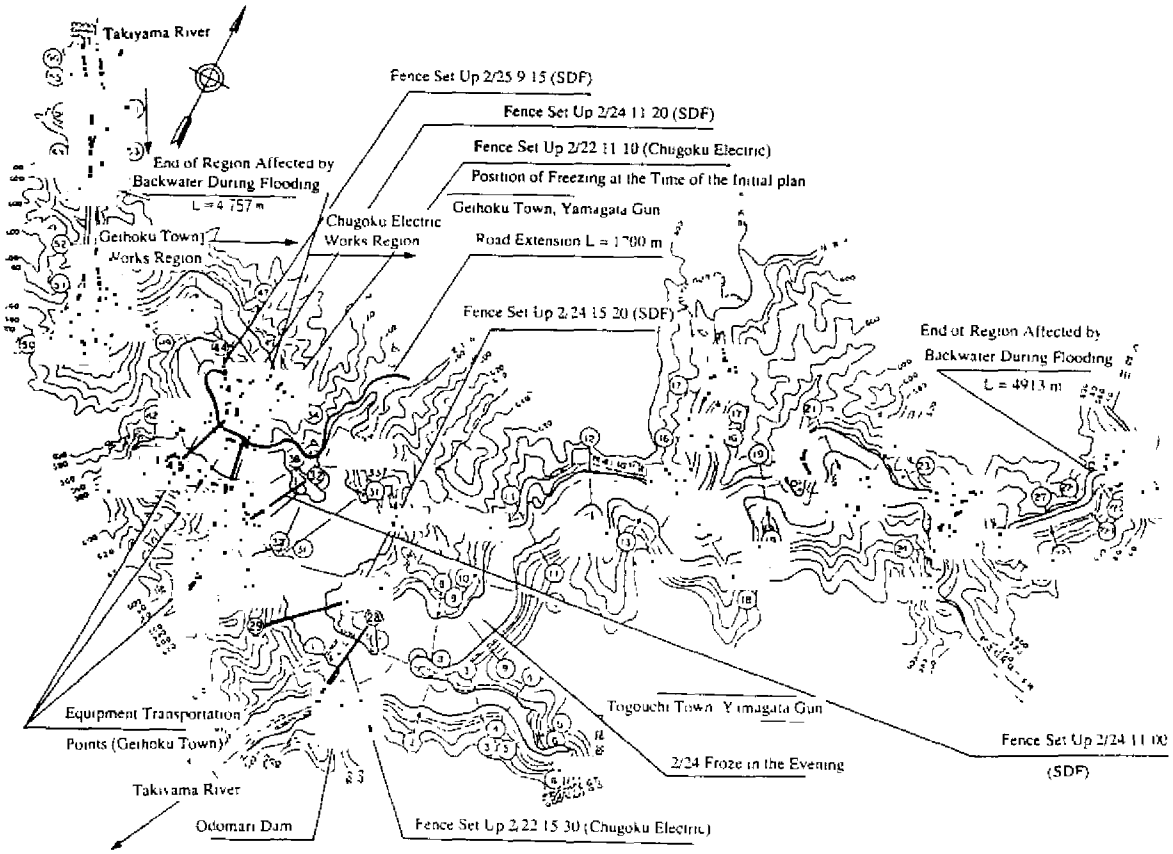

Fig.4 Plan of the Oil Fences Set Up Within the Odomari Dam Reservoir

1. Water Quality Monitoring Points

Monitoring Location	Sampling Frequency	Inspection Organization
Odomari Dam (Below Shinodomari Bridge, Discharge Outlet)	4 Times Daily	Hiroshima City Water Bureau
Takiyama Hydroelectric Power Station Discharge Outlet	24 Times Daily	Hiroshima Prefecture
Tsubuse Weir	24 Times Daily	Hiroshima Bureau of Health
Upstream of Otagawa Bridge	12 Times Daily	Hiroshima City Water Bureau
Otagawa Hydroelectric Power Station Discharge Outlet	12 Times Daily	Hiroshima City Water Bureau
Koyo Water Intake	12 Times Daily	Hiroshima City Water Bureau
Yagi Water Intake	12 Times Daily	Hiroshima City Water Bureau
Hesaka Water Intake	12 Times Daily	Hiroshima Prefecture Planning Bureau

2. Outline of Monitoring Results

Monitoring Location	2/27			
	10:00	12:00	15:00	19:00
Odomari Dam	B	B	B	B
Takiyama Hydroelectric Power Station Discharge Outlet	A	B	B	B
Tsubuse Weir	A	A	B	B
Otagawa Hydroelectric Power Station Discharge Outlet	A	A	A	A
Water Intakes (Koyo, Yagi Hesaka)	A	A	A	A

*A Odorless.
*B Some smell but can be diluted or treated by water purification facilities.
*C Discharge must be regulated so that the water can be diluted.

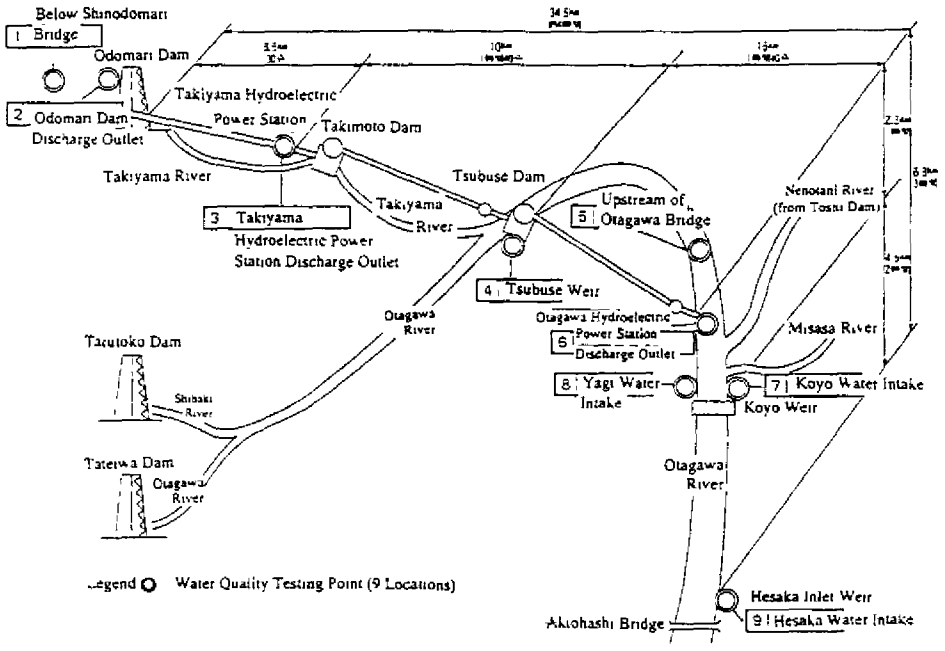

Fig.5 Outline Schematic of the Water Quality Monitoring