

What would happen if there were a Kamenose landslide?

Expected effects

Landslide!

The riverbed of the Yamato River is lifted up, reducing the width of the river.

Formation of a natural dam

The river becomes dammed.

Submerging of upstream areas

Collapse of the natural dam

Flood damage downstream

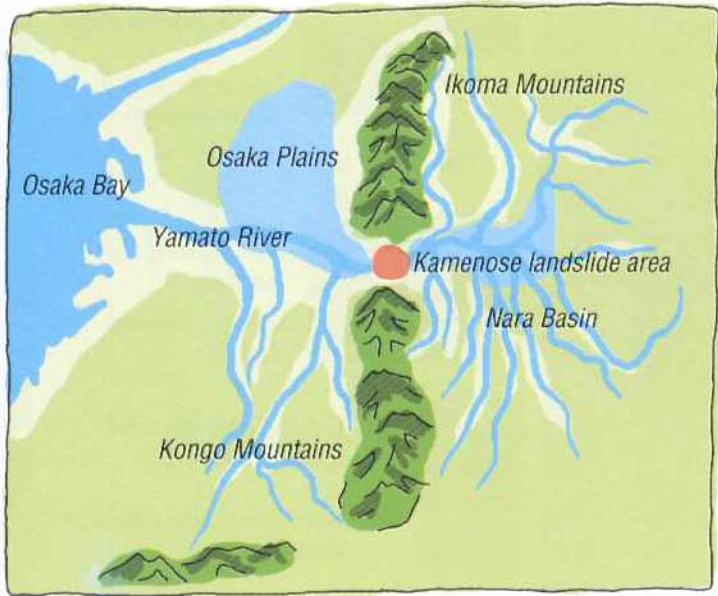


Diagram showing the expected damage areas

Resulting damage

Direct damage resulting from the landslide

(1) Damage to homes, fields, and roads within the landslide area

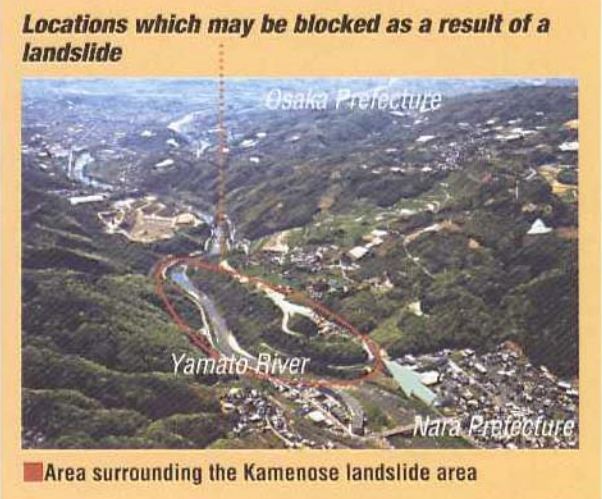
(2) Transportation cut off by damage to Route 25

(3) Danger that the main JR Kansai railway (Yamatoji Line) tunnel near the end of the landslide might collapse

Indirect damage resulting from the landslide

Because a portion of the surface of rupture crosses under the Yamato River, it is expected that the riverbed will be uplifted. This will reduce the width of the river, blocking the channel and forming what is known as a "natural dam," resulting in flood damage.

- (1) Flood damage resulting from flooding of the Nara Basin upstream
- (2) Flood damage downstream in the Osaka Plains resulting from collapse of the natural dam

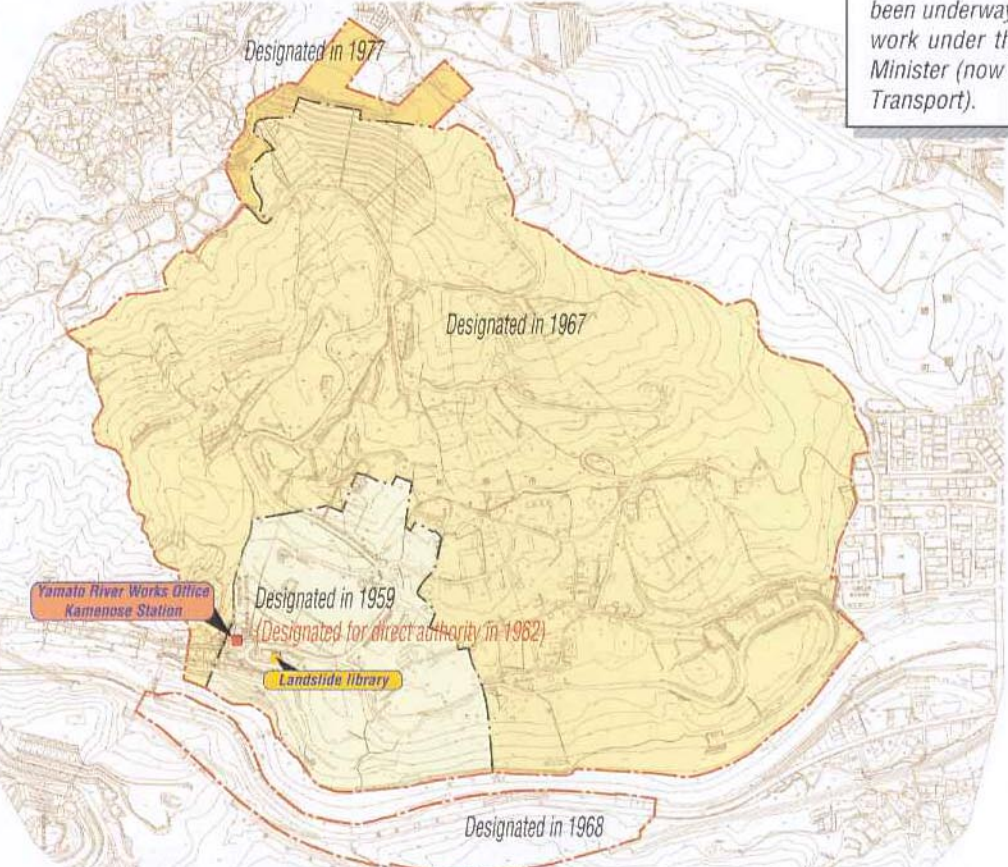


Area surrounding the Kamenose landslide area

Designation of landslide prevention areas and direct-administration areas

Landslide prevention areas		Direct-administration areas		Remarks
Area (ha)	Number and year declared	Area (ha)	Number and year declared	
9.0	October 23, 1959 Ministry of Construction Notification No. 2534	9.0	June 1, 1962 No. 1415	Determined by area of the 1931 - 1932 Okinoshima Direct landslide and including the range of intermittent activity beginning in 1981.
73.54	June 8, 1967 No. 1754	73.54	December 29, 1967 No. 4507	Determined by (1) clarification of the actual area by survey of the neighboring area at the top of the existing direct-administration area, and (2) the 1967 landslide.
	Nara Pref. February 5, 1968 No. 118			Determined by concerns over landslide damage in 1987.
2.7	February 26, 1977 No. 106	2.7	February 26, 1977 No. 106	Determined by permanent measures to unify rear area of slide main scarp to existing landslide area.
Total	85.24 ha	Total	85.24 ha	
Area	85.24 ha	Area	85.24 ha	
Area	85.24 ha	Area	85.24 ha	

In recognition of the fact that the Kamenose landslide area is of particular importance to the maintenance of the national infrastructure, mitigation measures have been underway from 1962, in the form of construction work under the direct authority of the Construction Minister (now the Minister of Land, Infrastructure and Transport).



Kamenose Landslide Area Library

Those persons who would like to learn in more detail about the contents introduced in this pamphlet, should please visit the "Kamenose Landslide Area Library." This facility presents the records of the Kamenose landslide area in an easy-to-understand manner, using panels and model displays. This important facility allows visitors to learn about a broad range of information related to landslides, including the mechanisms of landslides, the conditions of past damages, and the prevention projects that are currently being implemented.

We apologize, however that there is no permanent exhibition of these materials.

Persons who would like to visit this facility are requested to contact the library in advance.

Please contact freely:

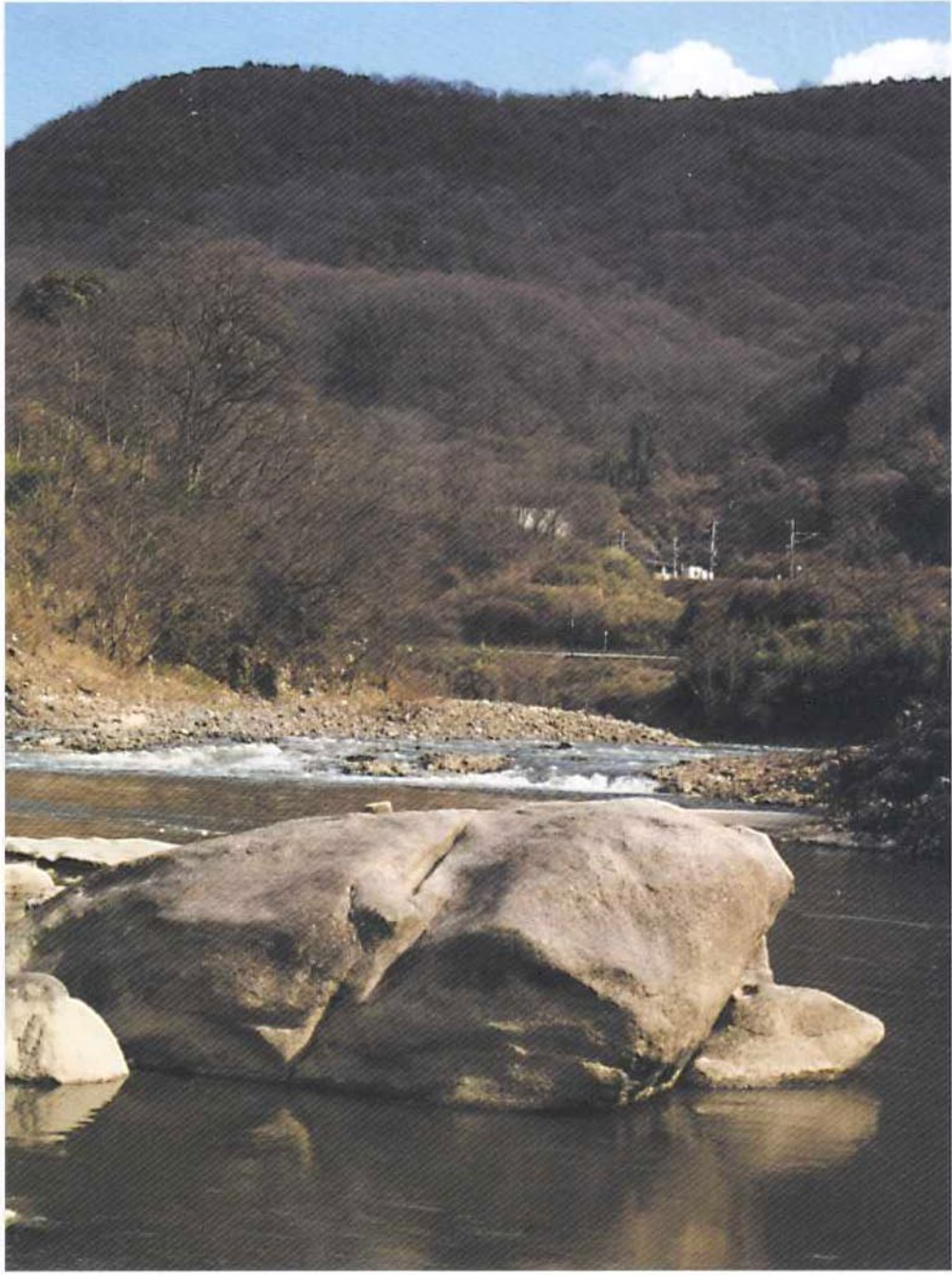
(Yamato River Construction Bureau, Second Engineering Works Department, Number 2 Survey Section)

TEL 0729-71-1381



home page address:
<http://www.yamato.kkr.mlit.go.jp/>

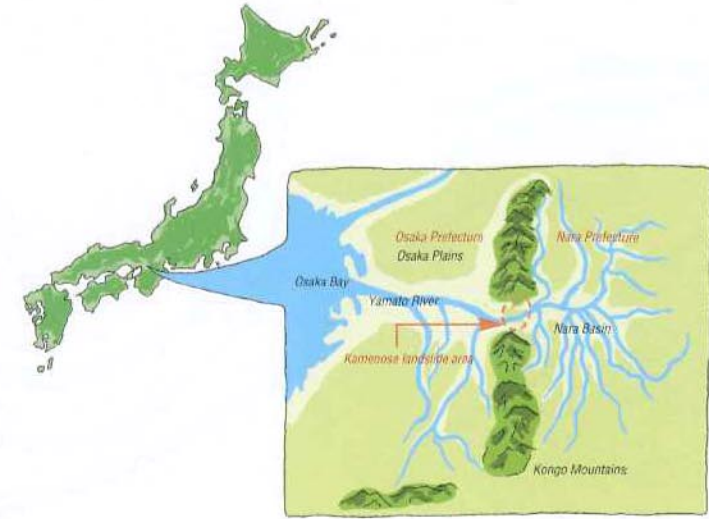
Created November 2002



Yamato River and the Kame-rai (Turtle Rock)

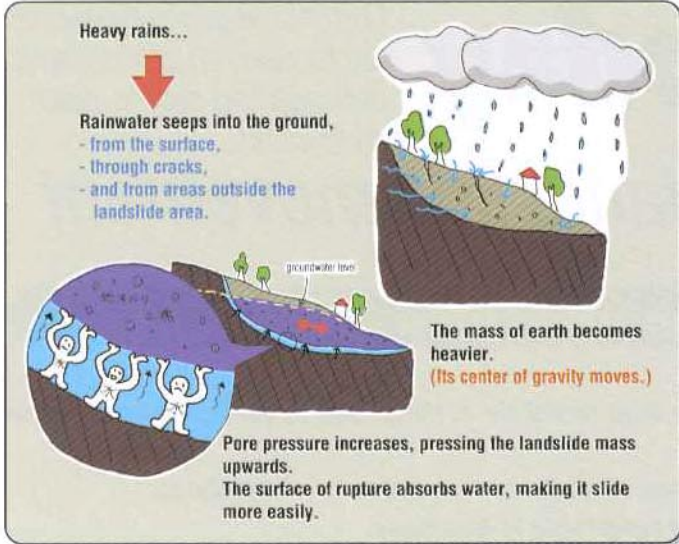
The Kamenose landslide area is located on the right bank of a valley formed by the Yamato River as it flows from the Nara Basin to the Osaka Plains. This river forms the border between Nara and Osaka prefectures.

In the Manyo era (7th century), Kamenose was known as Tatsutagoe, and has since been known as a strategic transportation choke point. In more recent times, Kamenose has fulfilled an important role in transportation, including the transport of farm produce, fertilizer, and other products between Nara and Osaka by ship. Currently, Kamenose remains an important point for transportation between Osaka and Nara, where both Route 25 and the JR Yamatoji line main JR Kansai railway run side-by-side along the left bank of the Yamato River.



Yamato River Works Office, Kinki Regional Development Bureau, Ministry of Land, Infrastructure and Transport

Kamenose Landslide Mitigation Measures



Landslides

A landslide is a phenomenon which occurs when the top part of a layer of clay or other layer which slides easily (surface of rupture) begins to slowly move due to the effects of groundwater and other factors.

Although both are generally referred to as landslides, the table below shows a comparison between this type of landslide (slow landslide) and a slope failure (sudden landslide).

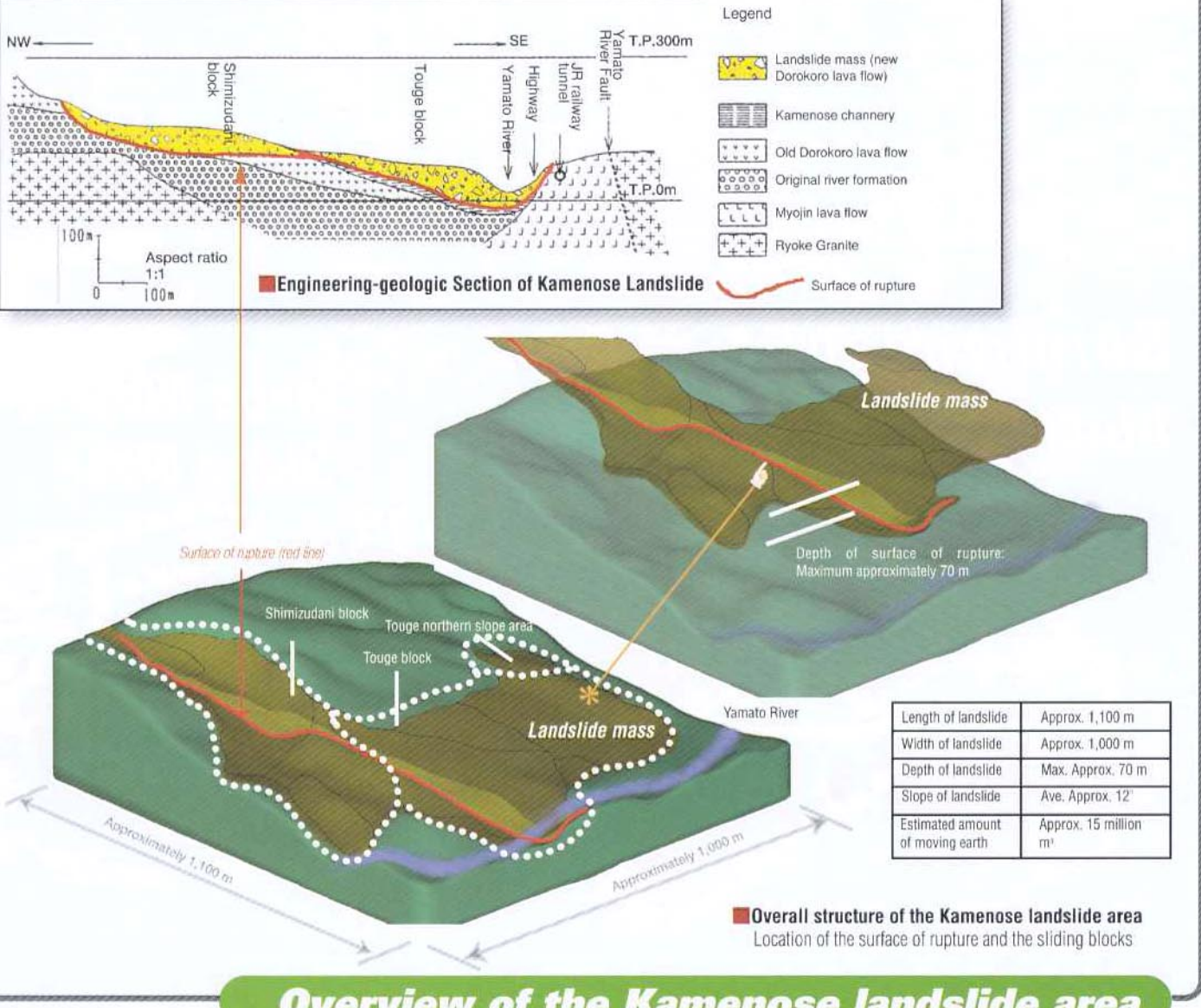
	Landslides	Slope failure
Event	A surface of rupture forms in a particular soil type or location in the soil structure. The ground itself becomes lifted.	Weathering causes the earth near the surface to deteriorate, leading to a collapse.
Geography	Gentle slopes of 30° or less	Steep slopes of 30° or more
Nature of activity	Continuous and recurring	Sudden
Earth conditions	Life disruption. Clods move while retaining their original shapes.	Earth is violently disrupted.
Contributing factors	Affected by groundwater.	Affected by strength of rainfall.
Preliminary signs	Cracking, sinking, upheavals, groundwater fluctuations	No preliminary signs

Geology of The Kamenose area

The Formation in the Kamenose area is composed of Tertiary volcanic rocks and sedimentary rocks, on top of a base of granitic rocks.

One distinguishing characteristic of the Kamenose area is the distribution of volcanic rocks from the Dorekoro volcano north of the Kamenose area. These rocks are the result of lava flows that are estimated to have occurred during two separate eruptions (old and new) several million years ago.

It is thought that the landslide activity is caused by the heavy and thick lava flow riding up onto a weak layer of strata that has altered and become clayey. Crustal movement then results in a slope forming in the direction of the Yamato River. It also appears that other factors, including activity of the Yamato River Fault and erosion of the mountain spurs by the Yamato River, are also involved.



Overview of the Kamenose landslide area

Optical fiber sensors

Diagram showing a conventional measurement system (left), and optical fiber systems (right).

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Kamenose Today

Current mitigation measures are focused on groundwater drainage and cast-in-place shaft works.

Reducing and stopping landslide movement

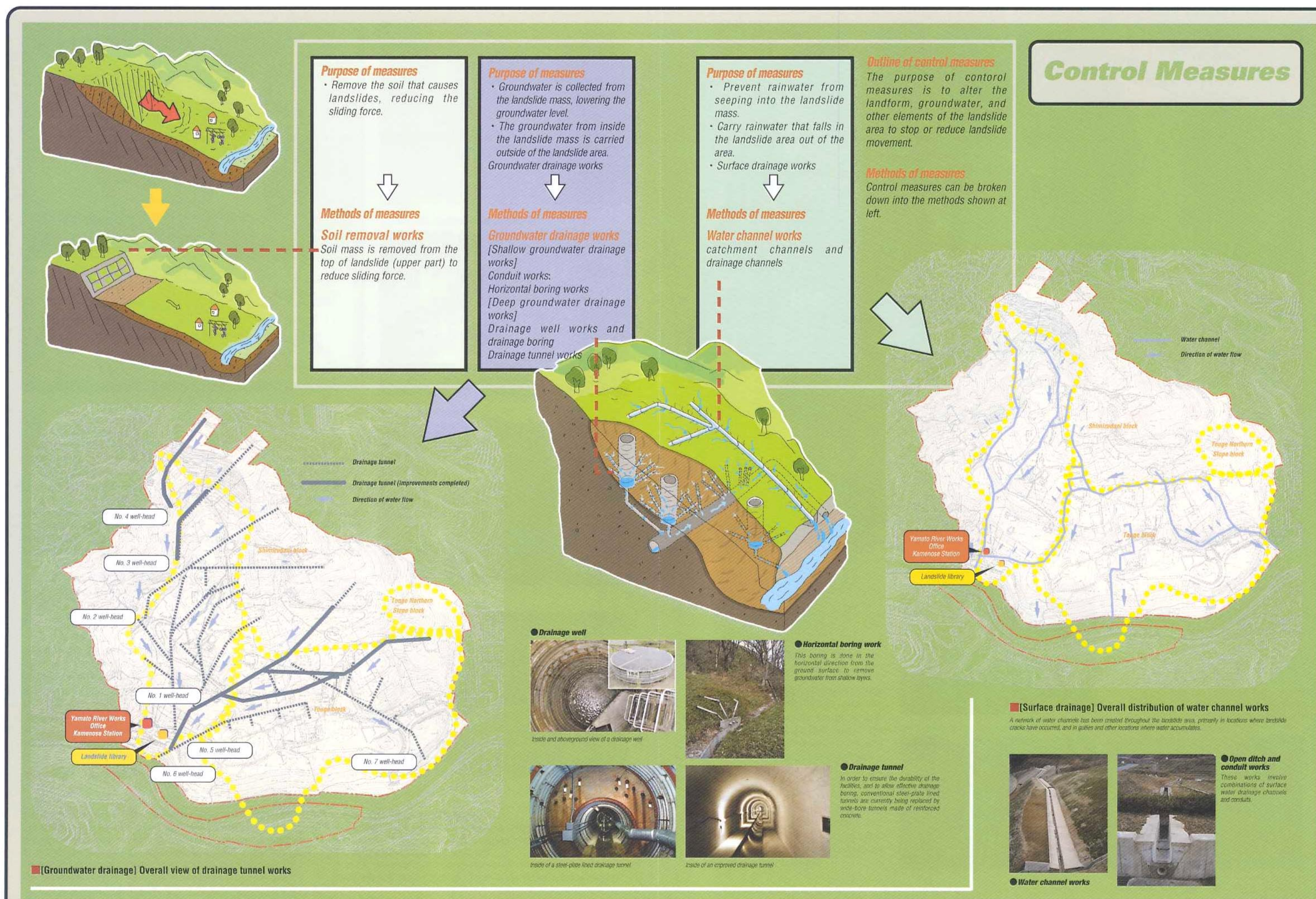
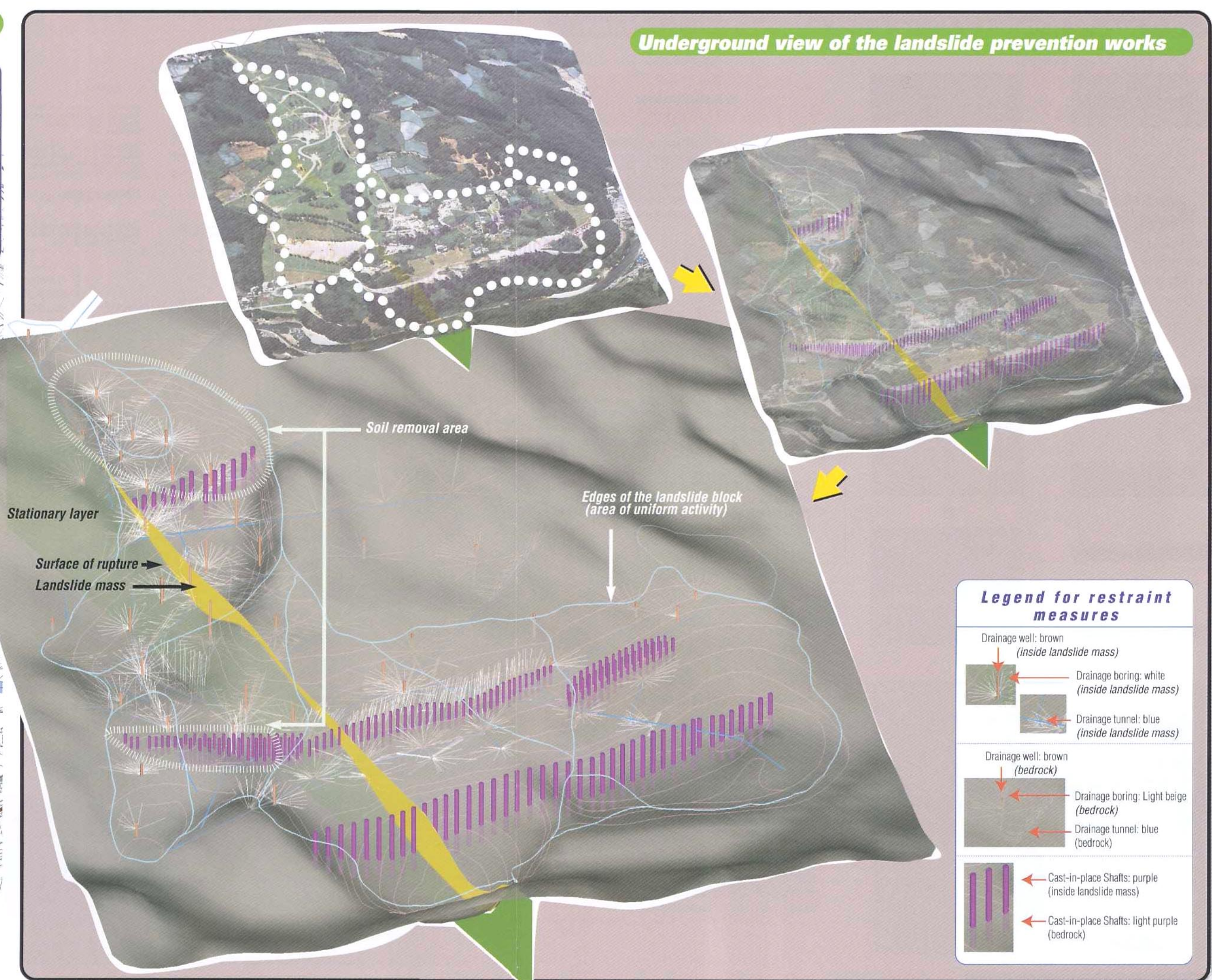
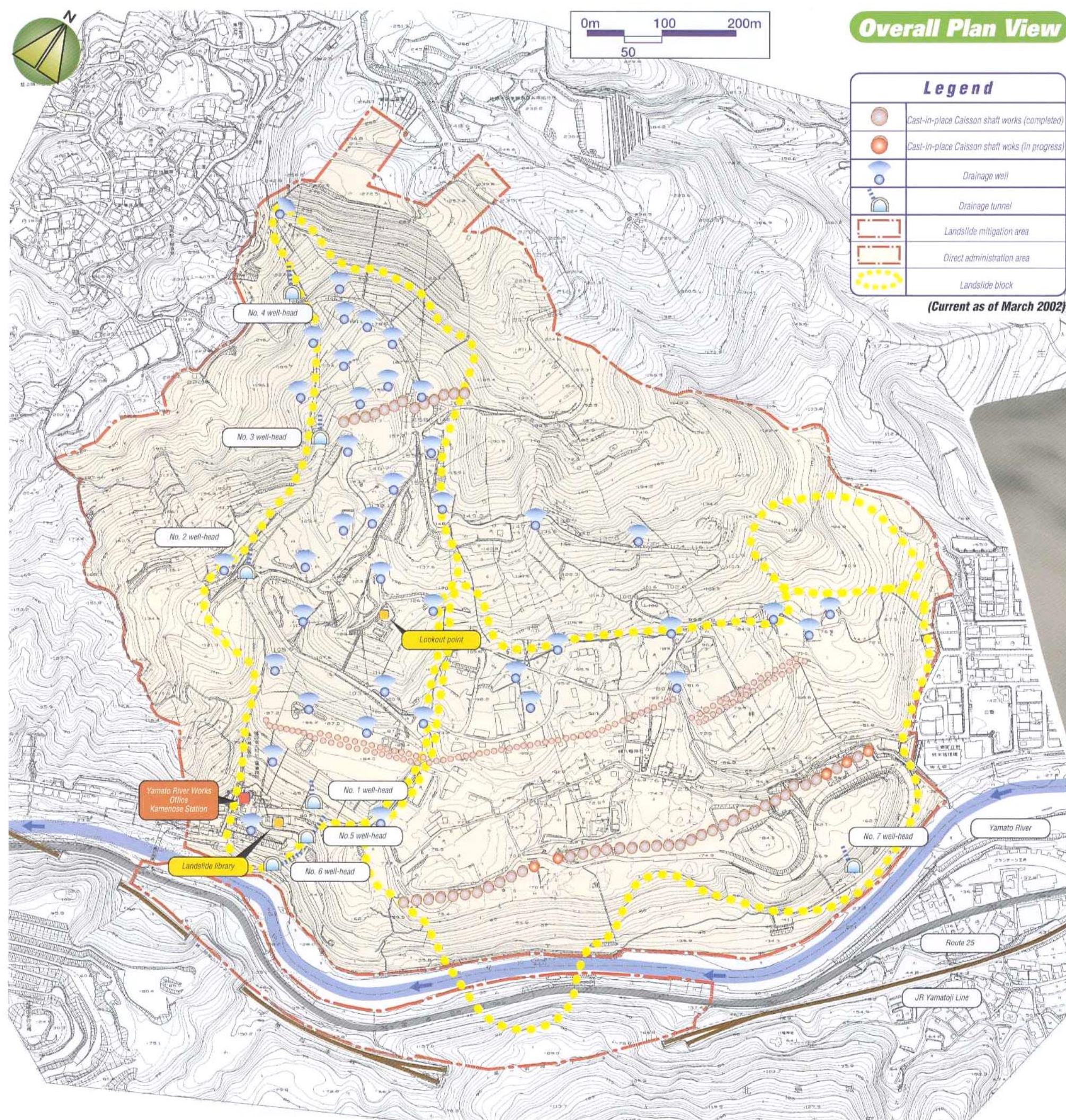
Overview of landslide mitigation measures

"Landslide mitigation measures" are undertaken to reduce or stop landslide activity, and to prevent damage from occurring.

Landslide mitigation measures can be broadly divided into two types of works: **control** and **restraint** measures.

The following constitute the primary mitigation measures that are undertaken at Kamenose.

A broad range of investigations is used to determine the landslide movement block, form and location of the surface of rupture, groundwater distribution, groundwater level, and other factors. Several restraint methods are considered, and these are applied in combination as necessary in the landslide mitigation measures.



Restraint Measures

Outline of restraint measures

Restraint measures utilize the resistance force of physical structures to partially or completely stop landslide movement.

Purpose of measures

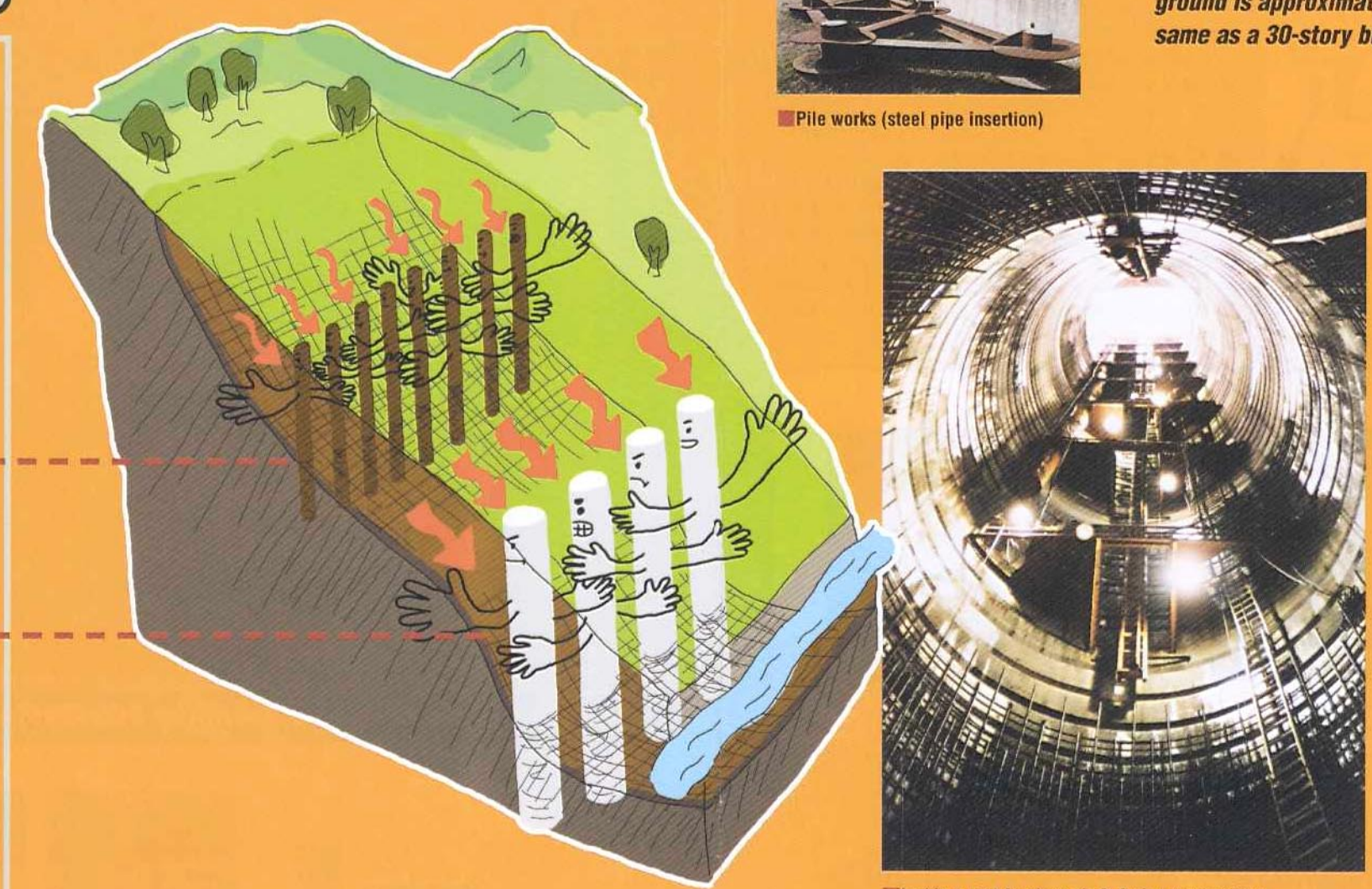
Resists landslide movement to partially or completely stop landslides

Pile works

Piles are inserted between the moving landslide soil mass and the base earth, and the strength of the pile prevents sliding movement. At Kamenose, piles made of steel pipes are used to prevent sliding of small-sized blocks.

Cast-in-place shaft works

At Kamenose, because of the size of the landslide force and the depth of the surface of rupture, ordinary pile works are unable to stop the landslide. Currently, cast-in-place shaft works have become the focus of landslide mitigation measures at Kamenose.



Cast-in-place shaft work process

