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Differences in geological hazards from liquefaction–fluidization and ground waves in the areas facing Tokyo Bay and San Francisco Bay

Nirei Hisashi¹⁻¹, Shlemon Roy¹⁻², Jonas Satkunas¹⁻³, Osamu Kazaoka² and Kunio Furuno¹⁻⁴

¹ International Union of Geological Sciences (IUGS), Commission on Geoscience for Environmental Management (GEM):¹⁻¹nireihisashi@msn.com, ¹⁻²rshlemon@jps.net,

¹⁻³Jonas.Satkunas@lgt.lt, ¹⁻⁴kuniofurunojp@gmail.com ²Research Institute of Environmental Geology, Chiba [.o.kzok@pref.chiba.lg.jp](mailto:o.kzok@pref.chiba.lg.jp)

The overall topography of San Francisco Bay has changed little in recent centuries compared with Tokyo Bay. However in parts of San Francisco Bay some reclamation has taken place and can be compared with Tokyo Bay. The latter has been considerably modified since the 1800s by the reclamation of land which is now distributed widely from the former low tide area to former offshore zone. Man-made strata now rest unconformably on natural strata in reclaimed areas of both Bays.

Both, Foster City, facing San Francisco Bay, and Urayasu City, facing Tokyo Bay, were constructed on land reclaimed from delta and estuarine environments. Foster City was developed on an estuarine salt marsh, with large to small meandering channels, on a delta facing the bay. The delta top, channels, and estuary sediments were covered by anthropogenic deposits in an area that is still shaped like the delta fan. In contrast, at Urayasu City the seabed was partitioned by bunds into rectangular cells. These were reclaimed by pumping sand from offshore into the cells directly onto channel and estuarine sediments.

Both areas are subject to strong earthquakes that can give rise to liquefaction-fluidization of sediments. It has been observed that:

(1) Areas of man-made strata (e.g. land areas reclaimed from the sea, lakes etc.) in rectangular cells by hydraulic filling, as at Urayasu City, suffer serious damage due to fluidization.

(2) In the reclaimed areas where delta, channel, and estuary deposits were surcharged with anthropogenic deposits, as at Foster City, damage from fluidization was less severe; and

(3) Ground waves caused by fluidization caused the more extensive serious damage in Urasayu City.

