8.0 ROAD FILL PERFORMANCE

The GEER field reconnaissance included documentation and evaluation of several areas of road cracking/failure that occurred along the coastal Route 2 west of Carrefour, and a site of a road fill slump/settlement over a box culvert on Route 2 between Leogane and Dufort (Figure 8.1).

The investigated road fill failures represent the most notable or dramatic failures in the investigated reaches of the roadways, however many additional, typically smaller, road failures occurred in these areas, and presumably occurred in roadways that were not investigated by the GEER team. The investigated failures are believed, however, to provide a reasonable representation of the failure modes and road performance typical through the earthquake epicentral area.

The road failures documented included the following features:

- Large, continuous pavement cracks over about 1 to 5 cm in width, greater than 30-m in length, and causing adverse settlement or reduction of vehicle safety;
- Road crack/deformation features, or geometric characteristics suggestive of lateral spread or slumping of the road fill or of underlying natural foundation soils; and,
- Road failures that have been reported as possible examples of lateral spread or fault surface displacement.

In general, the investigated reaches of Route 2 follow relatively flat coastal benches or cross alluvial delta fan complexes near Carrefour and Leogane. Cut and fill grading has been used to raise road grade above small alluvial valleys and marshy areas, and to pass through small bedrock ridges. In cut/fill areas, fills typically are on the order of about 1 to 3 m thick with sideslopes ranging from about 1.5:1 to 2:1 (horizontal to vertical), occasionally with masonry or concrete walls at the toe of road fill slopes.

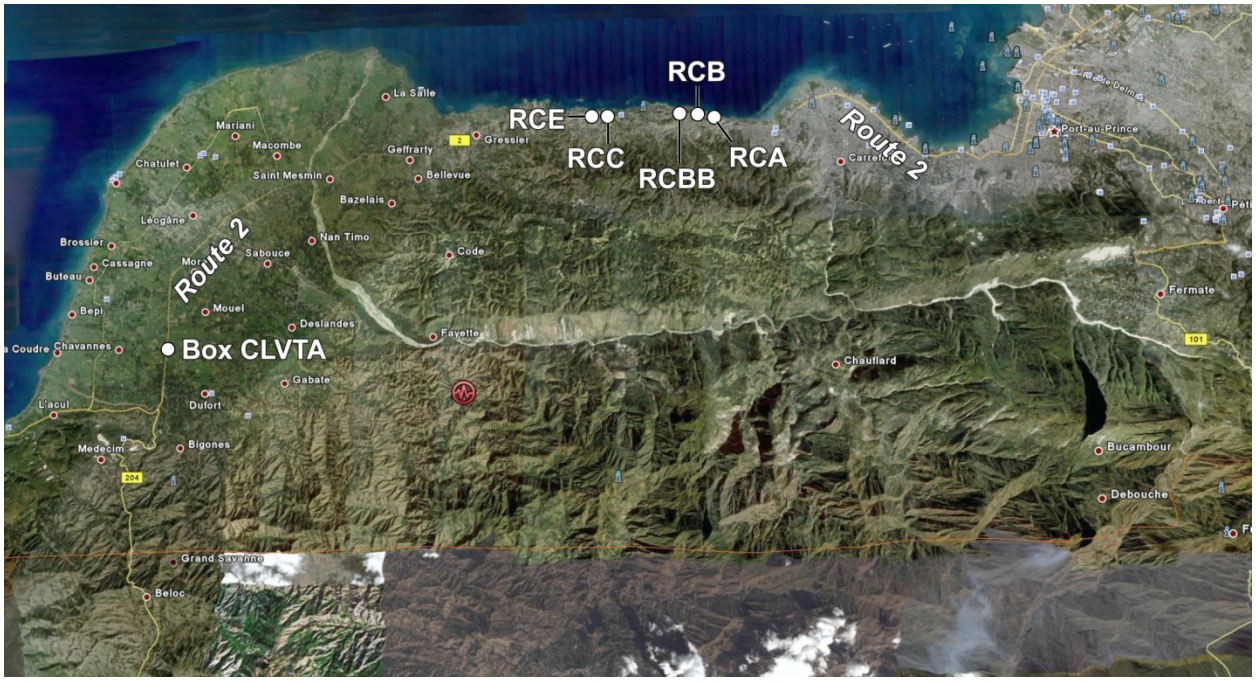

Figure 8.1. Index map of evaluated road fill failures by GEER team.

Five locations of poor road fill performance were investigated along Route 2 (Figure 8.1). Figures 8.2 and 8.3 are sketch maps of the crack patterns and fill failures for the investigated sites (note that RCD in Figure 8.2 represents RCC in Figure 8.1). These sketches will be improved in the next version of this report. At each location cracks and deformation extended completely through the asphalt pavement, which is typically 3 to 5 cm thick (Figure 8.4), and apparently through the compacted fill subbase and fill. Many of the road cracks exhibit an arcuate pattern typically associated with lateral spread or slump failures. Our team inspected the natural ground adjacent to the road/fill, and found no extension of cracks, liquefaction features, or cracks/deformation indicating global lateral spreading, deep-seated slumping, or major liquefaction Rather, cracking appeared restricted to the road bed and adjacent fills, and reflects localized settlement and differential cracking/movement of the road fill and underlying subgrade soil. Most of the failures occur in areas where the road crosses small alluvial drainages/valleys and/or marshy areas. In some cases, the road is underlain by thick fill with steep fill slopes that underwent a degree of creep and possible discrete slumping. Based on observed conditions, the road failures appear to be the result of deformation of soft, organic and saturated alluvial and marsh soils. The magnitude of damage will require extensive regrading and paving to restore a stable and safe roadway.

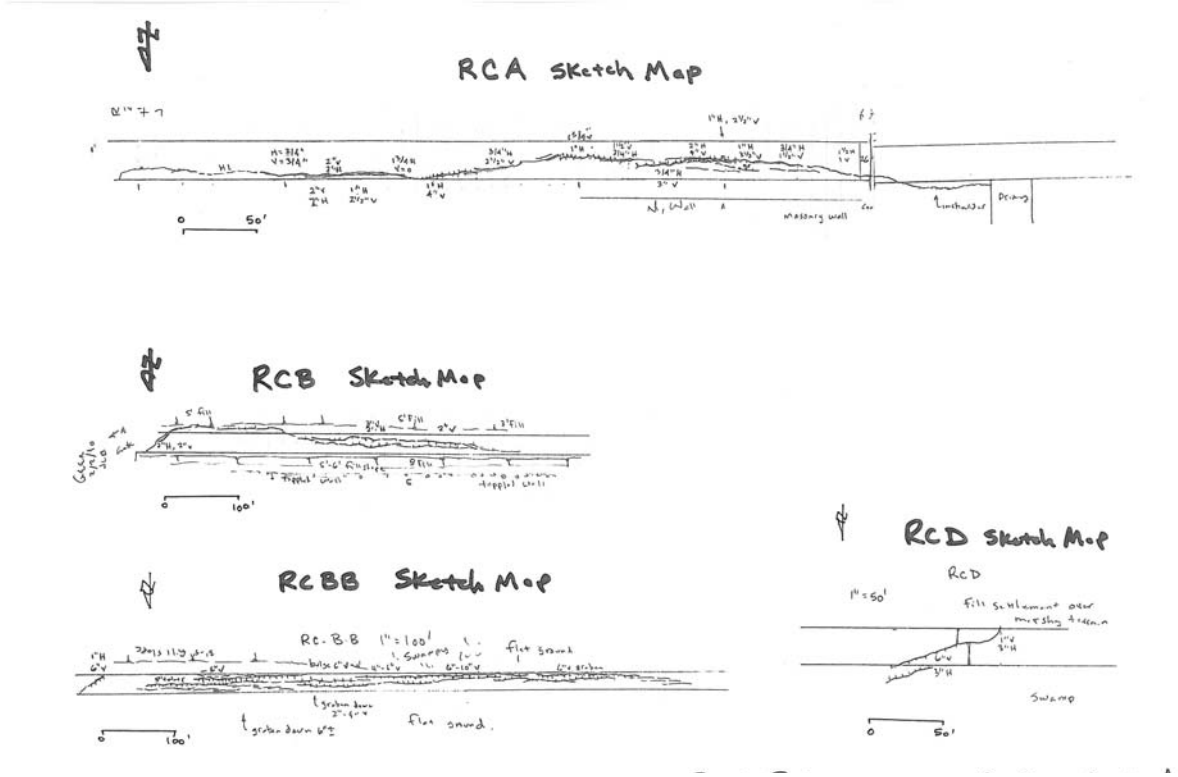

Figure 8.2. Road fill failure sketch maps for sites RCA through RCD.

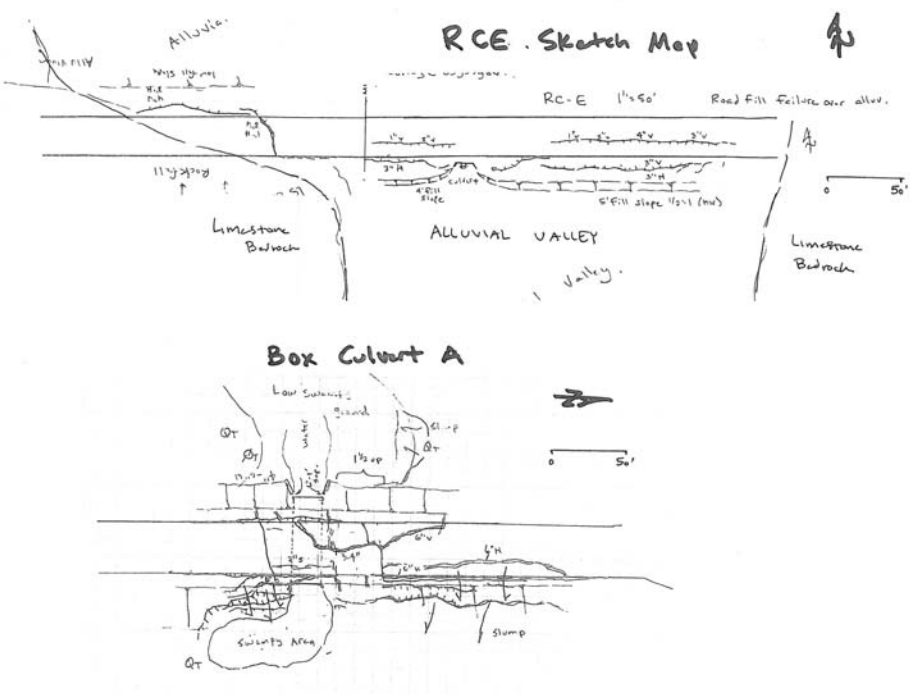

Figure 8.3. Road fill failure sketch maps for site RCE and BOXCLVTA.

Figure 8.4 Typical arcuate road cracks at road failure site RCA west of Carrefour.

One notable site (BOXCLVT A) of road damage occurred between Leogane and Dufort, where a masonry box culvert passes under the roadway along a swampy area. The portion of the road bed over the culvert did not settle notably, but the prisms of fill against the culvert settled up to 30 cm. Discrete slumping of the road fills north and south of the culvert (Figure 8.5) damaged the outboard edges of the fill, contributing to the road failure. Fill exposed in large cracks (up to 30 cm wide) and slump headscarps consisted of well-compacted granular fill (Figure 8.6), and appeared to be suitably compacted. The settlement appears to have been caused by deformation in the soft, organic subgrade soils of the swampy zone, and slumping failure of the steep 1:1 to 1.5 :1 (horizontal to vertical) fill slopes that range from about 3 to 4.5 m high. This particular failure was previously reported to possibly represent surface fault rupture, as it occurs westward of the general trend of the Enriquillo-Plantain Garden fault trace. However, the reconnaissance team found no evidence of surface fault rupture west or east of the site, or along the fault trace in this area.

We did observe possible liquefaction features in a stream channel about 150 to 300 m south of the box culvert damage site. It is possible that liquefaction-induced soil failure or deformation contributed to the failure of the road subgrade, but liquefaction features were not observed at the box culvert site that instead were underlain by fine-grained organic soil.

Figure 8.5 Cracks induced by fill slope slumping at road damage site BOXCLVTA.

Figure 8.6 Well-compacted granular fill at road damage site BOXCLVTA.