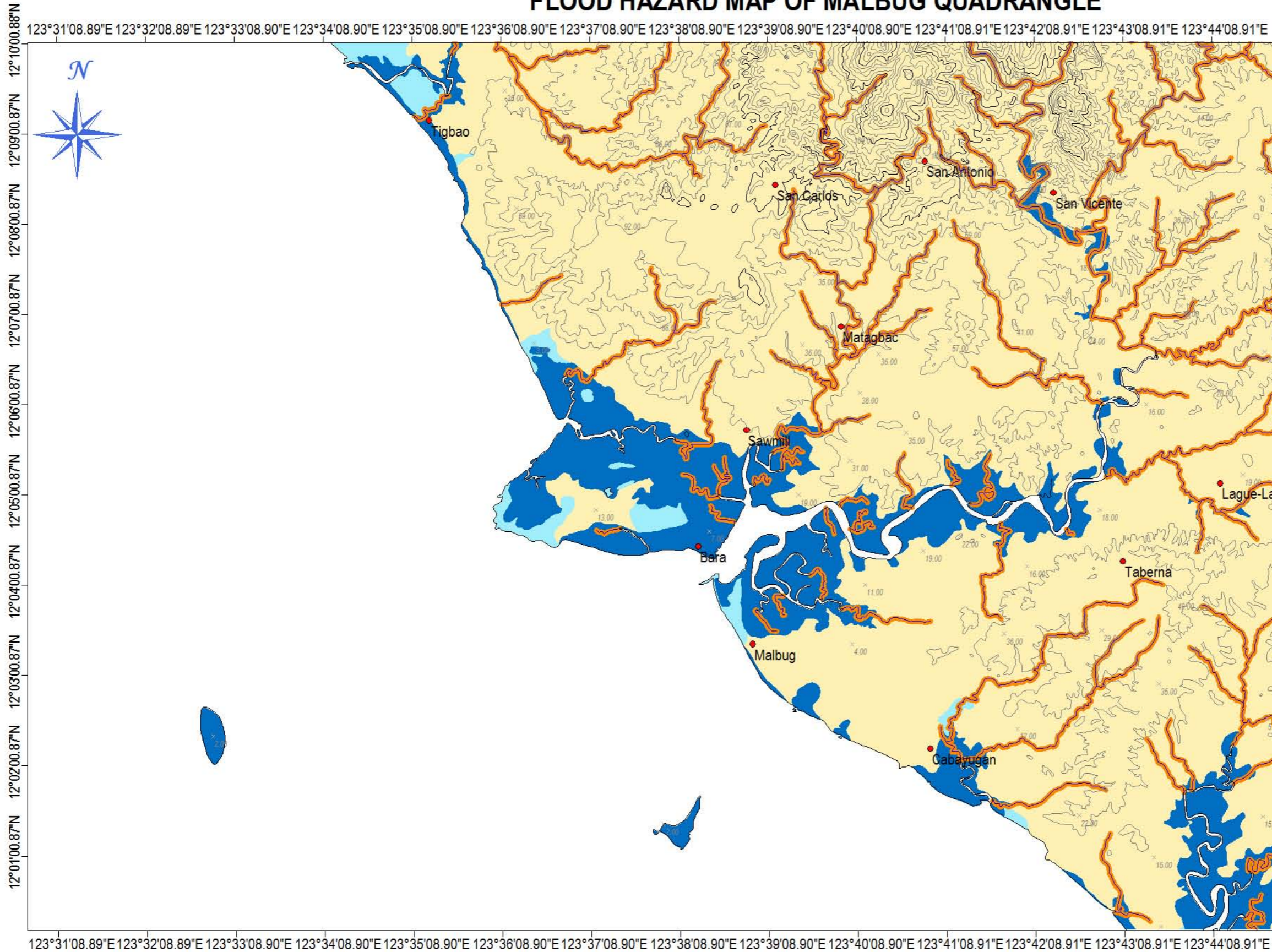


# FLOOD HAZARD MAP OF MALBUG QUADRANGLE



**MAP LEGEND**

**Flood Hazard Zones:**

- areas prone to riverbank erosion
- non-flood prone areas
- occasionally to rarely flooded areas
- regularly to frequently flooded areas

— fault  
— river

contour

**EXPLANATIONS:**

Flood hazard susceptibility zones were derived based on the geomorphological analysis of landforms and the fluvial system. Information on flood occurrences, flood depths, duration of inundation as well as topographic information supported the geomorphologically-based flood hazard mapping.

**Regularly to Frequently Flooded Areas:**  
Areas that are frequently flooded. Mere heavy rains of 1-2 days could bring about flooding in these areas. Moderate to strong typhoons could submerge these areas 0.5 to 3.0 m. in flood waters for a few days to a few weeks. Housing development in these areas is not recommended.

**Occasionally to Rarely Flooded Areas:**  
Areas become inundated during moderate to strong typhoons. Flood depths vary from a few centimeters to 1 m. Floods last from a few hours to a few days.

**Non Flood Prone Areas:**  
Areas with no reported flood occurrences except along low lying areas adjoining rivers or creeks.

**Areas Prone to Riverbank Erosion:**  
Areas 0 to 50 m. from river banks that are prone to scouring and erosion.

Field data collection by: A. E. Dayao, JM. S. Laud, E.T. Avila, E. G. Basilan, MN. L. Miraballes, J. N. Malto  
 Geomorphological interpretation by: A. E. Dayao, E. G. Basilan  
 Digital cartographic processing by: E. G. Basilan, D. G. Zepeda  
 GIS processing by: A. E. Dayao, E. G. Basilan  
 Checked by: R.A. Juan  
 Approved by: R.A. Juan

Other sources of information:  
 1:50,000 NAMRIA Topographic Map

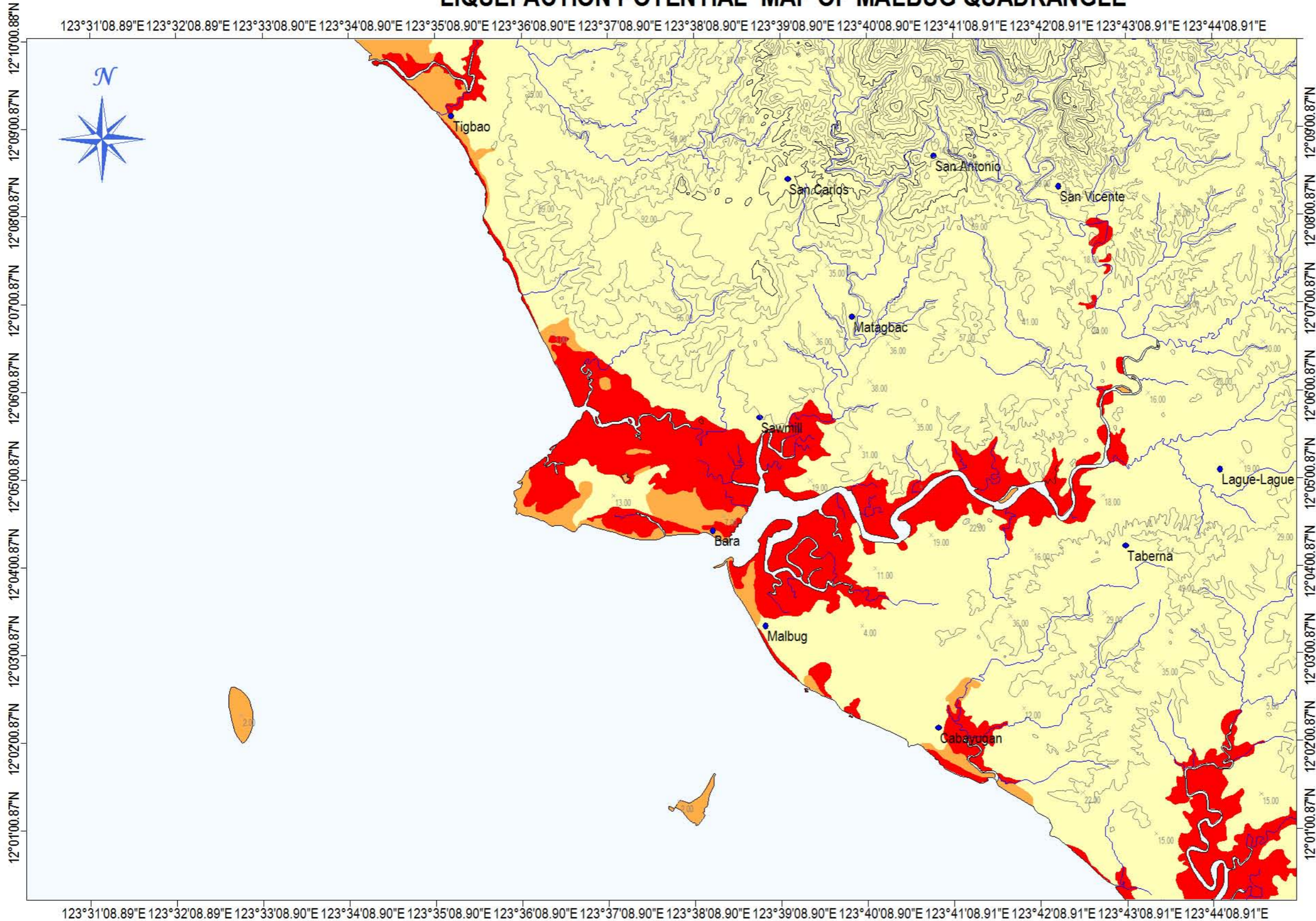
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 Rawis, Legazpi City, Albay  
 2009





# LIQUEFACTION POTENTIAL MAP OF MALBUG QUADRANGLE

123°31'08.89"E 123°32'08.89"E 123°33'08.90"E 123°34'08.90"E 123°35'08.90"E 123°36'08.90"E 123°37'08.90"E 123°38'08.90"E 123°39'08.90"E 123°40'08.90"E 123°41'08.91"E 123°42'08.91"E 123°43'08.91"E 123°44'08.91"E



**MAP LEGEND:**  
**Liquefaction Potential Zones:**

- areas where liquefaction is likely
- areas where liquefaction is not likely
- areas where liquefaction is possible

— fault  
 — river  
 ○ contour

**EXPLANATIONS:**

There are no reported liquefaction occurrences in the mapped area based on several field interviews. However, zones of different liquefaction potential were derived based on the geomorphological analysis of the study area following previous studies made by Iwasaki and Yasuda.

**Areas where Liquefaction is Likely:**  
 Areas where liquefaction is likely include active/young tidal flats with nipa and mangrove, beach ridge and swale complex and spit. These areas are unsuitable for urban development. Multi-storey building should be required of geotechnical studies addressing or mitigating the effects of liquefaction.

**Areas Where Liquefaction is Possible:**  
 Coastal plains and the alluvial plains are areas where liquefaction is possible. Buildings having 5 storeys or more should be required a full geotechnical study.

**Areas where Liquefaction is not Likely:**  
 Areas where the likelihood of liquefaction is unlikely.

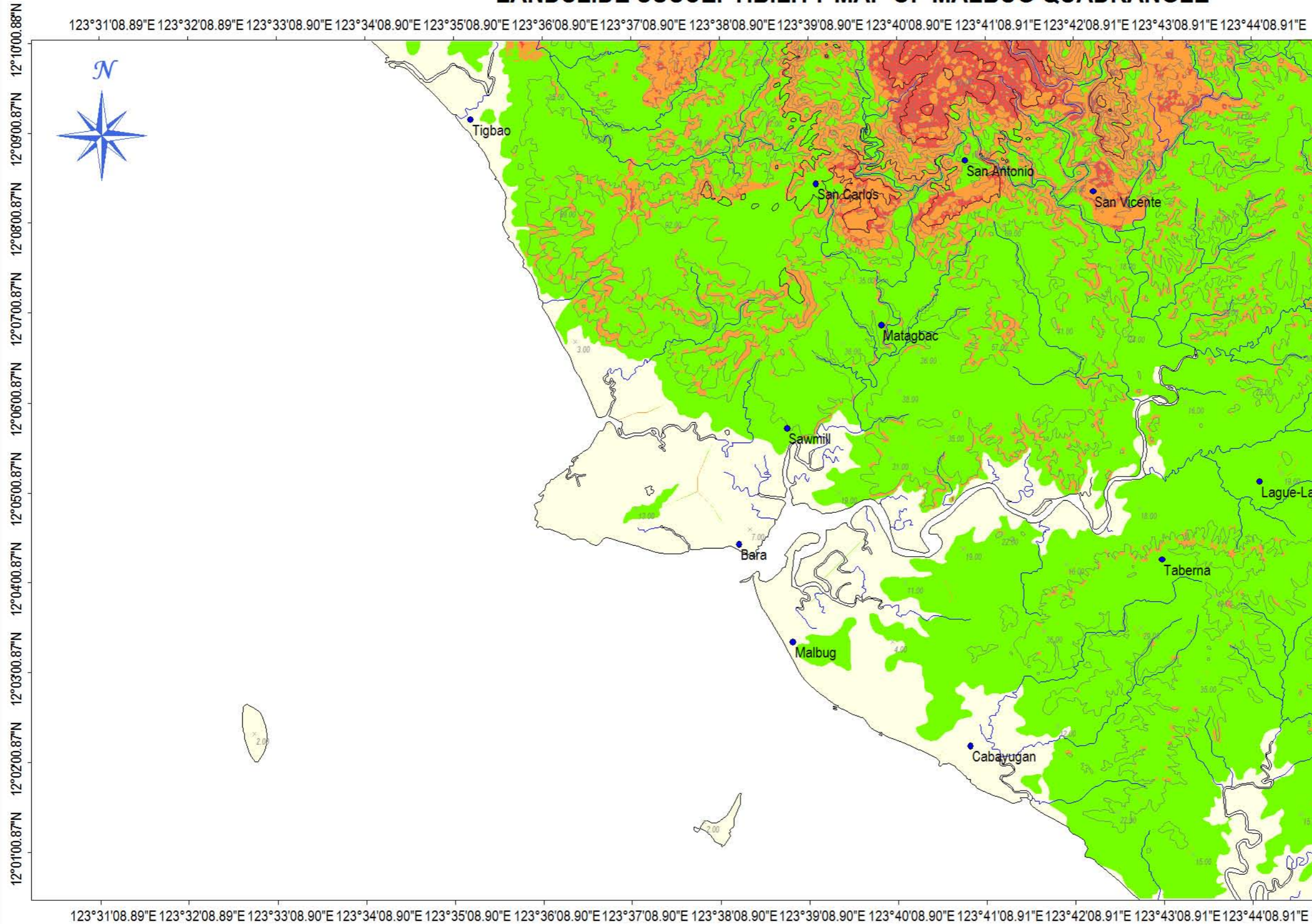
Field data collection by: A.E. Dayao, J.M.S. Laud, E.T. Avila, E.G. Basilan, M.N.L. Miraballes, J.N. Malto  
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Other sources of information:  
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 1951 B/W Aerial photos

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# LANDSLIDE SUSCEPTIBILITY MAP OF MALBUG QUADRANGLE



**MAP LEGEND:**

**Landslide Susceptibility Zones:**

- Absent
- Low Susceptibility to Landslides
- Moderate Susceptibility to Landslides
- High Susceptibility to Landslides

— fault  
— river  
— contour

**EXPLANATIONS:**

Landslide hazard susceptibility zones were derived through qualitative map combination using lithology, geomorphology, slope gradient, road distance and fault distance as input parameters. GIS was used in the map combination and subjective weights were assigned to each unit in the parameter map.

**Areas with High Susceptibility to Landslides:**  
Areas having high probability of occurrence of mass movements particularly rock slides, debris slides and slumps. Very steep to nearly vertical slopes and areas along fault lines are rated high susceptibility areas and are unsuitable for housing development and human settlement.

**Areas with Moderate Susceptibility to Landslides:**  
Areas having moderate likelihood of occurrence of landslides and are recommended for more detailed engineering geological and geohazard assessment prior to housing development.

**Areas with Absent or Low Susceptibility to Landslides:**  
Areas where the likelihood of landslide occurrence is either absent or low.

Field data collection by: A.E. Dayao, J.M.S. Laud, E.T. Avila, E.G. Basilan, M.N.L. Miraballes, J.N. Malto  
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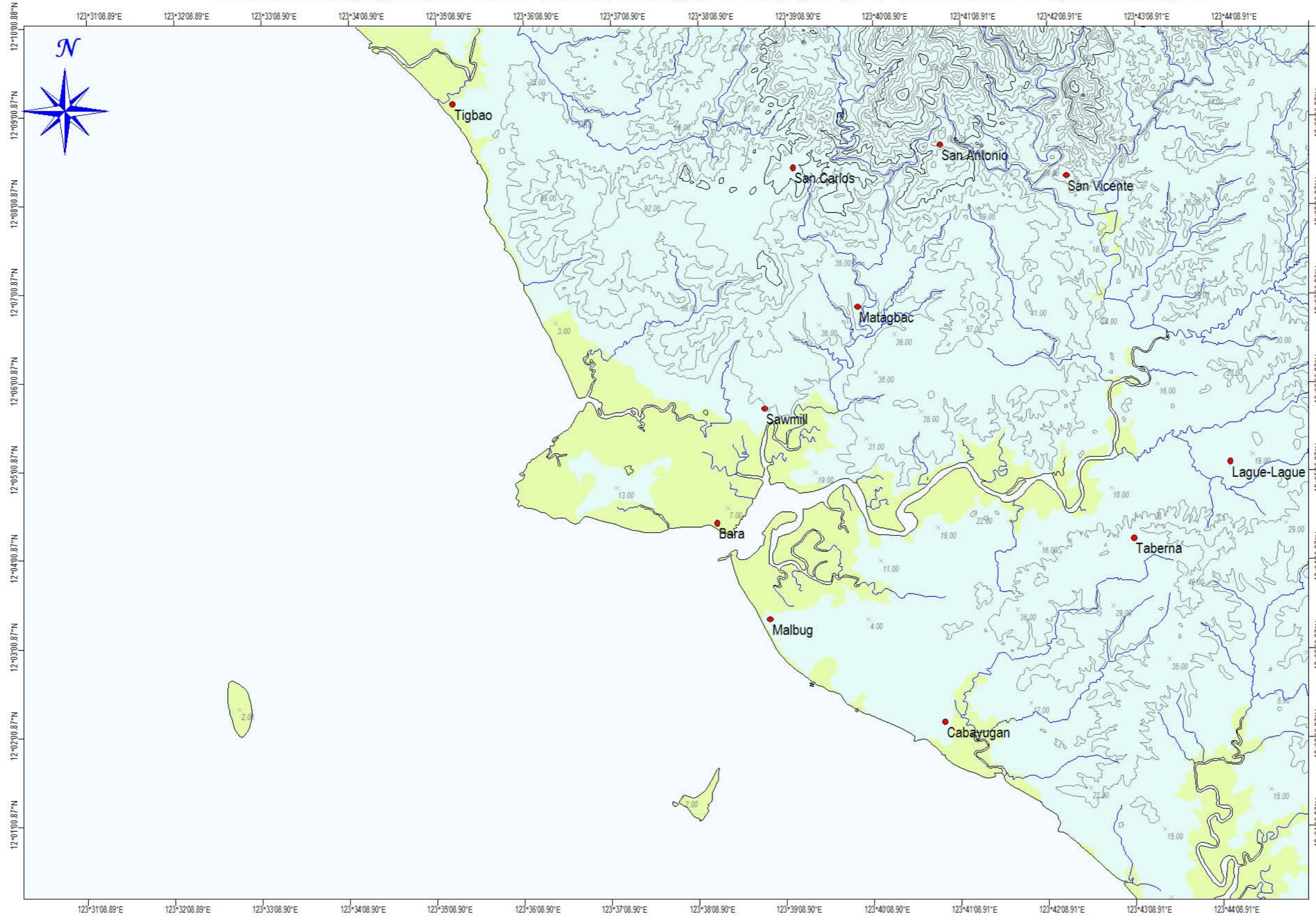
Other sources of information:  
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 1951 B/W Aerial photos

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 2008





# GROUND SUBSIDENCE AND GROUND SUSCEPTIBILITY MAP OF MALBUG QUADRANGLE



**MAP LEGEND:**  
**Ground Subsidence and Ground Susceptibility Map**

- Areas Not Susceptible to Ground Settlement
- Areas Susceptible to Ground Settlement
- fault
- river
- contour

**EXPLANATIONS:**

Susceptibility map for ground subsidence due to karst or solution processes was primarily derived from the lithologic map of the study area. Field observations on sinkholes and ground subsidence observed on concrete roads and damaged houses supported the mapping. Areas of possible ground settlement were delineated through the analysis of the geomorphological lay of the study area, the sub-surface soils and the ground water levels.

**Areas Susceptible to Ground Subsidence:**  
 Areas that are prone to ground cavitation, sinkhole formation and ground subsidence in areas underlain by limestone and calcareous siltsones and shales.

**Areas Susceptible to Ground Settlement:**  
 Areas where fluvialite sands, silts and clays coupled with shallow ground water tables are site of possible ground settlement. Ground settlement may be reduced through appropriate foundation design. Buildings having 3 storeys or more should be tested for settlement and/or consolidation. Buildings having 5 storeys or more should undergo detailed geotechnical studies.

**Areas not Prone to Ground Settlement/Subsidence:**  
 Areas where the possibility of ground settlement or

Field data collection by: A.E. Dayao, J.M.S. Laud, E.T. Avila, E.G. Basilan, M.N.L. Miraballes, J.N. Malto  
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 GIS processing by: A.E. Dayao, E.G. Basilan  
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 Approved by: R.A. Juan

Other sources of information:  
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 1054 RAM Aerial photos



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