RESULTS OF THE MINES AND GEOSCIENCES BUREAU'S (MGB) 1:10,000 SCALE GEOHAZARDS (LANDSLIDE AND FLOOD) ASSESSMENT AND MAPPING OF MONTEVISTA, COMPOSTELA VALLEY PROVINCE

The Mines and Geosciences Bureau (Central Office)-Department of Environment and Natural Resources (MGB-DENR) conducted geohazards (landslide and flood) assessment and mapping (1:10,000 scale) of areas within the municipality of Montevista on March 20 to 27, 2013. Comprising the geohazards assessment team are geologists from the MGB-Central Office (MGB-CO) namely Mr. Salvio B. Laserna, Ms. Christine Jeiselle G. Guarino, Ms. Vanessa Andrea V. Llagas, Mr. Kevin L. Garas, Mr. Mel Anthony A. Casulla and Ms. Princess Danielle B. Matas.

The assessment is in line with the government's efforts aimed at reducing, if not, totally mitigating the destructive effects and impacts of natural hazards on the populace. The assessment is also a follow-up to the geohazards assessment and mapping (1:50,000 scale) previously conducted by geologists from MGB Region XI.

The assessment was only limited to areas covered by the 1:10,000 scale base maps provided to the team The assessed areas were rated as having low, moderate, high or very high (critical) susceptibility to landslide. Similar flood susceptibility rating (i.e., high, moderate or low) was also given to the assessed barangays. **Tables 1** and **2** show the parameters used for the assessment.

When appropriate, the barangay officials were presented with *Landslide and/or Flood Threat Advisories.* These advisories inform them of their area's susceptibility to landslide and flooding and also contain the corresponding recommendations.

Notable results were obtained by the MGB-DENR from the following barangays: Lebanon, San Vicente, San Jose, Linoan, Camansi, Mayaon, New Dalaguete, Prosperidad, Camantangan, Bangkerohan Sur, New Cebulan, Canidkid, Banglasan, Banagbanag, New Visayas, Bankerohan Norte, Dauman, Concepcion, Tapia and New Calape. These results are tabulated in **Tables 3 and 4**.

Table 1. Landslide susceptibility parameters used during the assessment

Landslide Susceptibility Parameters	Low	Moderate	High	Very High
A. Slope Gradient	Low to moderate (<18°)	Moderate to steep (18°-35°)	Steep to very steep (>35°)	Steep to very steep (>35°)
B. Weathering/ Soil Characteristics	Slight to moderate	Moderate	Intense; Soil usually non-cohesive	Intense; Soil usually non-cohesive
C. Rock mass strength	Very good to good	Fair	Poor to very poor	Poor to very poor
D. Ground Stability	Stable with no identified landslide scars, either old, recent or active	Soil creep and other indications for possible landslide occurrence are present.	Inactive landslides evident; tension cracks present	Active landslides evident; tension cracks, bulges, terracets, seepage present.
E. Human Initiated effects				May be an aggravating factor

Table 2. Flood susceptibility parameters used during the assessment

Very high/Critical flood susceptibility	Areas likely to experience flood heights in excess of 2.0 meters and/or flood duration of more than 3 days. These areas are immediately flooded during heavy rains of several hours; include landforms of topographic lows such as active river channels, abandoned river channels and areas along river banks; also prone to flashfloods.
High flood susceptibility	Areas likely to experience flood heights of 1.0 to 2.0 meters and/or flood duration of more than 3 days. These areas are immediately flooded during heavy rains of several hours; include landforms of topographic lows such as active river channels, abandoned river channels and areas along river banks; also prone to flashfloods.
Moderate flood susceptibility	Areas likely to experience flood heights of 0.5 to 1.0 meters and/or flood duration of 1 to 3 days. These areas are subject to widespread inundation during prolonged and extensive heavy rainfall or extreme weather condition. Fluvial terraces, alluvial fans, and in-filled valleys are areas moderately subjected to flooding.
Low flood susceptibility	Areas likely to experience flood heights of less than 0.5 meter and/or flood duration of less than 1 day. These areas include low hills and gentle slopes. They also have sparse to moderate drainage density

Table3. Results of Landslide Assessment

Location	Landslide Susceptibility Rating	Remarks/ Recommendations
Barangay Banglasan		
Purok 2 (GPS reading: N 7° 47' 16.7'' E 125° 57' 36.0'')	Low	The area is characterized by low to moderate slopes with no observed landslides at purok site. Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages). Avoid building of houses along edge of slopes and along footslopes.
Purok 3 (GPS reading: N 7° 47' 10.8'' E 125° 58' 31.0'')	Moderate	Landslides were observed along roadcuts and ridges at the vicinity of the purok site. Rill and gully erosions are prominent. Bulging of slopes were also observed along moderate slopes suggesting creeping movement. Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages). Avoid construction of house along edge of slopes.
Purok 4 (GPS reading: N 7° 47' 55.6'' E 125° 57' 51.4'')	Low	Purok site has low to moderate slopes with no observed active landslide. Saug river drains the area making the purok site prone to flashflood and sheet flooding. Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or

		displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages). Avoid construction of houses along river banks of Saug.
Purok 1 (GPS reading: N 7° 47’ 48.4’’ E 125° 57’ 52.1’’)	Low	The purok site has low to moderate slopes. Rill erosion is common due to surface run-off. Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages).
Barangay Bangkerohan Norte		
Purok 2 (GPS reading: N 7° 44’ 40”/E 125° 59’ 35.4”)	High	Landslides were observed on the northwestern slopes bounding the purok. Avoid settlements along the foot of these slopes. Observe and/or monitor further mass movement (e.g. landslides, tension cracks) in the area and report to MGB/municipal authorities. Observe for saturated ground or seeps and sunken or displaced road surfaces and report to MGB/municipal authorities. Develop early warning system (e.g. signage posts) for critical areas.
Purok 3 (GPS reading: N 7° 45’ 12.0”/E 125° 58’ 56.8”)	High	Numerous landslides pervade the slopes of area. Road widening has also caused several landslides along the road of the purok. Landslide mitigating structures (e.g. retaining walls) may be constructed to prevent further mass movements. Settlements on steep slopes, along edges of ridges and on footslopes are highly discouraged; since mass movements (e.g. tension cracks, terracetes) are most likely to develop on these areas especially when triggered by heavy rains and/or earthquakes. Observe and/or monitor further mass

		movement (e.g. landslides, tension cracks) in the area and report to MGB/municipal authorities. Observe for saturated ground or seeps and sunken or displaced road surfaces and report to MGB/municipal authorities. Develop early warning system (e.g. signage posts) for critical areas.
Purok 5 (GPS reading: N 7° 44’ 34.3”/E 125° 59’ 13.8”)	High	A large rotational landslide was observed affecting the slope along the road. Several earth slides are also present due to road widening. One landslide affects an agricultural land in the area. Avoid settlement on edges of top slopes, along steep ridges and on footslopes; as these areas are prone to develop mass movements (e.g. tension cracks, terracetes). Observe and/or monitor further mass movement (e.g. landslides, tension cracks) in the area and report to MGB/municipal authorities. Observe for saturated ground or seeps and sunken or displaced road surfaces and report to MGB/municipal authorities. Develop early warning system (e.g. signage posts) for critical areas.
Barangay Bangkerohan Sur		
Brgy. Hall (GPS reading: N 7° 43’ 49.0”/E 125° 59’ 23.3”)	Moderate	Western slopes bounding the barangay are steeply cut due to slope modification. Slope stabilization measures (e.g. benching) and landslide mitigating structures (e.g. retaining walls) may be adopted to prevent mass movements in the area.
Proposed barangay site (GPS reading: N 7° 43’ 51.3”/E 125° 59’ 20.5”)	High	The proposed barangay site is located on a moderately sloping hill. Unconsolidated alluvium deposits underlie the area. Weak bedrocks do not make a very good foundation for increased buildup. Settlements in the area should be regulated since overloading may cause slope failure. Steep cuts due to slope modification are critical to landslides. Slope stabilization measures (e.g. benching) coupled with landslide mitigating structures (e.g. riprap, retaining walls) may be done to prevent further mass movements.

		Observe and/or monitor further mass movement (e.g. landslides, tension cracks) in the area and report to MGB/municipal authorities. Observe for saturated ground or seeps and sunken or displaced road surfaces and report to MGB/municipal authorities. Develop early warning system (e.g. signage posts) for critical areas.
Purok 2 (GPS reading: N 7° 43’ 50.2”/E 125° 59’ 26.8”)	High	Several active translational landslides were observed on slopes along the highway. Landslide mitigating structures may be constructed to prevent further mass movements. Observe and/or monitor further mass movement (e.g. landslides, tension cracks) in the area and report to MGB/municipal authorities. Observe for saturated ground or seeps and sunken or displaced road surfaces and report to MGB/municipal authorities. Develop early warning system (e.g. signage posts) for critical areas.
Purok 7 (GPS reading: N 7° 43’ 54.5”/E 125° 59’ 11.9”)	High	Western slopes of the purok are pervaded by active rotational landslides. Settlement at the foot of these slopes should be prohibited. Observe and/or monitor further mass movement (e.g. landslides, tension cracks) in the area and report to MGB/municipal authorities. Observe for saturated ground or seeps and sunken or displaced road surfaces and report to MGB/municipal authorities. Develop early warning system (e.g. signage posts) for critical areas.
Barangay Camansi		
Purok 5 (GPS reading: N 7° 47’ 36.4”/E 125° 56’ 16.9”)	Low	The area has low to moderate slopes. Only small huts were present in the area as temporary shelter for their farming. Residents are living in the barangay proper. Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the

		MGB/municipal authorities. Develop early warning system (e.g. signages). The purok site is deserted only a house is present in the area. Houses completely destroyed by Typhoon Pablo.
Purok 1 (GPS reading: N 7° 46’ 56.9”/E 125° 56’ 55.5”)	Low	The site has low to moderate slopes with no observed landslides and flooding hazards. Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages).
Purok 6 (GPS reading: N 7° 46’ 52.3”/E 125° 56’ 56.9”)	High	Houses along the slopes including purok center hall is highly prone to landslide. Some of the houses constructed along an intermittent gully experience flooding of more than one meter. Flooding was due to the backflow of Saug River. Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages). Houses along the slope including the purok center hall should be placed on lower grounds. Some of the houses below thw slopes should be transferred away from the slopes.
Purok 7 (GPS reading: N 7° 47’ 00’’ E 125° 55’ 50.7’’)	Low	The area is characterized by flat terrain. No landslides were observed. River bank erosion is prominent. Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages). Avoid construction of house along river bank.

Purok 3 (GPS reading: N 7° 47’ 7.7’’ E 125° 57’ 5.1’’)	Low	The area is part of an abandoned river channel/valley. The area experience flash flooding with depth of 1.5 meters.Purok site should be transferred to elevated area Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages). Avoid construction of houses within the river valley.
Barangay Camantangan		
Purok 1 Center N 07°43’59.8” E125^{O}57’39.4”	Very high	The area is bounded by intensely weathered alluvium deposits composed of sandstone, siltstone with steep slope gradient. Families residing at the foot of the slope and at the top edge of the slope are at high risk to landslide including the brgy hall of Camantangan . **Recommendation:** Unless slope stabilization be implemented, relocation is likely the only option. Settlement at the edge of the ridge and foot slope must be discouraged. -Observe for and/or monitor for the presence of mass movement (e.g. landslide, tension cracks). Report situation to MGB office and the municipal/city authorities. -Observe for saturated ground/seeps and sunken or displaced road surfaces. Report situation to MGB office and the municipality/city authorities. -Develop an early warning device (e.g. signage) (for critical areas only) -Constant communication and updates with the barangay officials on geohazard situation.

Purok 2 Center N 07°43'32.2" E 125°58'07.7"	Moderate	Area bounded by moderate to steep slope gradient underlain by weathered siltstone to sandstone components which are inherently weak rocks. **Recommendation:** Settlement at the edge of the ridge and foot slope must be discouraged. -Observe for and/or monitor for the presence of mass movement (e.g. landslide, tension cracks). Report situation to MGB office and the municipal/city authorities. -Observe for saturated ground/seeps and sunken or displaced road surfaces. Report situation to MGB office and the municipality/city authorities. -Develop an early warning device (e.g. signage) (for critical areas only) -Constant communication and updates with the barangay officials on geohazard situation.
Purok 3 Center N 07°44'05.1" E 125°57'46.7"	High	Area bounded by moderate to steep slope gradient underlain by weathered siltstone to sandstone components which are inherently weak rocks. **Recommendation:** Settlement at the edge of the ridge and foot slope must be discouraged. -Observe for and/or monitor for the presence of mass movement (e.g. landslide, tension cracks). Report situation to MGB office and the municipal/city authorities. -Observe for saturated ground/seeps and sunken or displaced road surfaces. Report situation to MGB office and the municipality/city authorities. -Develop an early warning device (e.g. signage) (for critical areas only) -Constant communication and updates with the barangay officials on geohazard situation.
Purok 4 Center N 07°43'59.8"	Very high	Area bounded by moderate to steep slope gradient underlain by weathered siltstone to sandstone components which are

E 125°57’39.7”		inherently weak rocks. Landslide scarps were noted within the vicinities. **Recommendation:** Settlement at the edge of the ridge and foot slope must be discouraged. -Observe for and/or monitor for the presence of mass movement (e.g. landslide, tension cracks). Report situation to MGB office and the municipal/city authorities. -Observe for saturated ground/seeps and sunken or displaced road surfaces. Report situation to MGB office and the municipality/city authorities. -Develop an early warning device (e.g. signage) (for critical areas only) -Constant communication and updates with the barangay officials on geohazard situation.
Purok 5 Center N 07°44’13.3” E 125°58’13”	High	Purok situated at the top ridge bounded by moderate to steep slope gradient. Residences on the top edge are at risk to slope failure. **Recommendation:** Settlement at the edge of the ridge and foot slope must be discouraged. -Observe for and/or monitor for the presence of mass movement (e.g. landslide, tension cracks). Report situation to MGB office and the municipal/city authorities. -Observe for saturated ground/seeps and sunken or displaced road surfaces. Report situation to MGB office and the municipality/city authorities. -Develop an early warning device (e.g. signage) (for critical areas only) -Constant communication and updates with the barangay officials on geohazard situation.
Purok 6 Center N 07°44’46.7” E 125°58’25.3”	High	Purok situated at the top ridge bounded by moderate to steep slope gradient. Houses situated on the top edge of the ridge are at risk to slope failure.

		Recommendation: Settlement at the edge of the ridge and foot slope must be discouraged. -Observe for and/or monitor for the presence of mass movement (e.g. landslide, tension cracks). Report situation to MGB office and the municipal/city authorities. -Observe for saturated ground/seeps and sunken or displaced road surfaces. Report situation to MGB office and the municipality/city authorities. -Develop an early warning device (e.g. signage) (for critical areas only) -Constant communication and updates with the barangay officials on geohazard situation
Barangay Canidkid		
Purok 5 (GPS reading: N 7° 46’ 14.6’’ E 126° 57’ 58.9’)’	Moderate	The site is located edge of slope with moderate to steep slopes. Shallow landslides were observed along roadcuts towards the purok site. Houses were constructed along edge of slopes undergoing erosion. **Recommendations**: Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages).

Purok 1 (GPS reading: N 7° 29’ 29.5’’ E 126° 7’ 8.8’’)	Moderate	The area has low to moderate slopes without observed landslides. Creeping were manifested along some slopes near the purok site. **Recommendations**: Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages).
Purok 2 (GPS reading: N 7° 45’ 30.3’’ E 125° 58’ 4.4’’)	Moderate	The purok center is located along moderately sloping area. Landslides were observed along roadcuts but away from the purok center. Gully and rill erosion were observed along slopes affecting roads. **Recommendations**: Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages). Avoid building of houses along edge of slopes and along footslopes.
Purok 4 (GPS reading: N 7° 45’ 29.6’’ E 125° 57’ 57.5’’)	Very High/Critical	The purok center has been affected by landslides. A number of residents has transferred their houses along the roads. Rows of houses were constructed along edge of slope that is highly prone to landslide. The houses should be transferred to other safe locations. **Recommendations**: Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages). Avoid building of houses along edge of slopes and along footslopes.

Purok 3 (GPS reading: N 7° 46' 17.8'' E 125° 57' 36.9'')	Moderate	The area has moderate slopes. Landslides debris accumulations were observed along footslopes. Shalow landslides were observed along roadcuts affecting the stability of the road. **Recommendations**: Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages). Avoid building of houses along edge of slopes and along footslopes.
Barangay Concepcion		
Purok 5 N 7° 44' 16.4'' E 126° 0' 40.5''	High	Several houses are located in the top of a steep slope along a tributary in Purok 5. Development of gullies has been observed suggesting that the underlying material is saturated with water. The underlying material is mainly composed of soil and unconsolidated rock fragments. Overloading may induce instability to the slope and will result to slope failure or landslide. Local residents and barangay officials should observe and/or monitor for presence of mass movement (e.g. landslides, tension cracks). Any signs (i.e saturated ground or seeps, displaced or sunken road) of incipient landslide should be reported to the MGB office concerned and the municipal authorities. **Relocation** is highly recommended.
Purok 7 N 7° 44' 56.6'' E 126° 0' 38.5''	Very High	Several translational and rotational landslides occurred on very steep to steep slopes parallel with Tapia Creek. The landslide area is wide with 2 – 5 m vertical displacement along slopes with soil and weathered rock material. Portion of these slopes were converted into banana plantation that also affected the stability of slope. Gullies are present indicating that the underlying material is saturated with

		water. Local residents and barangay officials should observe and/or monitor for presence of mass movement (e.g. landslides, tension cracks). Any signs (i.e saturated ground or seeps, displaced or sunken road) of incipient landslide should be reported to the MGB office concerned and the municipal authorities.
Purok 3 N 7° 44’ 3.4’’ E 126° 0’ 38.5’’	High	Steep slope along the incised valley adjacent to the road has high susceptibility to landslide. Houses at the edge of the slope may induce instability due to overloading. A translational landslide occurred on a steep slope in the east with respect to observation point. Local residents and barangay officials should observe and/or monitor for presence of mass movement (e.g. landslides, tension cracks). Any signs (i.e saturated ground or seeps, displaced or sunken road) of incipient landslide should be reported to the MGB office concerned and the municipal authorities. **Relocation** of houses along the edge of the slope is highly recommended.
Purok 2 N 7° 43’ 52.3’’ E 126° 0’ 45.6’’	High	Community of Purok 2 is assessed to be highly susceptible to landslide due to its location along the top of the slope of an incised valley. Tension cracks, southeast with respect to observation point, were observed indicating an incipient landslide. Local residents and barangay officials should observe and/or monitor for presence of mass movement (e.g. landslides, tension cracks). Any signs (i.e saturated ground or seeps, displaced or sunken road) of incipient landslide should be reported to the MGB office concerned and the municipal authorities. **Relocation** of houses along the edge of the slope is highly recommended.
Purok 1 N 7° 43’ 46.2’’ E 126° 0’ 41.3’’	High	A very steep slope along the creek bounding Brgy. Concepcion and Brgy. Dauman is highly susceptible to landslide. Creeping was observed along the slope. An incipient landslide may pose danger of river

		damming that may aggravate flashflooding in the area. Local residents and barangay officials should observe and/or monitor for presence of mass movement (e.g. landslides, tension cracks). Any signs (i.e saturated ground or seeps, displaced or sunken road) of incipient landslide should be reported to the MGB office concerned and the municipal authorities. **Relocation** of houses along the creek is highly recommended. A well engineered mitigating structure (i.e. retaining wall) along the slope should be constructed.
Barangay Dauman		
Purok 1 N 7° 42' 51.8'' E 126° 0' 47.9''	Very High	Several translational and rotational landslides were observed in N-S trending ridge in Brgy. Dauman. The area is underlain by soil and weathered rock material. Presence of gullies suggesting water saturation and cracks along the slopes were observed. Tension cracks are present in a steep slope. These are indicators of an incipient landslide which may pose danger of river damming that will aggravate flashflooding in the area. Local residents and barangay officials should observe and/or monitor for presence of mass movement (e.g. landslides, tension cracks). Any signs (i.e saturated ground or seeps, displaced or sunken road) of incipient landslide should be reported to the MGB office concerned and the municipal authorities.
Purok 3 N 7° 43' 16.0'' E 126° 0' 40.6''	Very High	Several translational and rotational landslides were observed in N-S trending ridge. This area is underlain by soil and weathered rock material. Presence of gullies suggesting water saturation and cracks along the slope. These are indicators of an incipient landslide which may pose danger of river damming that will aggravate flashflooding in the area. Local residents and barangay officials should observe and/or monitor for presence

		of mass movement (e.g. landslides, tension cracks). Any signs (i.e saturated ground or seeps, displaced or sunken road) of incipient landslide should be reported to the MGB office concerned and the municipal authorities.
Purok 5 N 7° 43' 44.5'' E 126° 0' 40.5''	Very High	A 12-13 m wide translational landslide occurred in a road cut in Purok 5. The underlying material is made up of unconsolidated fluvial deposits (mixture of fine sediments and rock fragments) with small lenses of clay layer. Local residents and barangay officials should observe and/or monitor for presence of mass movement (e.g. landslides, tension cracks). Any signs (i.e saturated ground or seeps, displaced or sunken road) of incipient landslide should be reported to the MGB office concerned and the municipal authorities.
Barangay Lebanon		
Purok 1, purok center (GPS reading: N 7° 42' 02.7"/E 125° 57' 05.5")	Very High	This area of the purok where the purok center, barangay hall and the Mayobe Elementary School is located is bounded by unstable steep slopes that are potential landslide spots. A huge U-shaped tension crack has emerged within the grounds of Mayobe Elementary School two weeks after typhoon Pablo. This crack has extended downslope towards the barangay health center and the road where a section has caved in. Settlement at the base of this slope should be discouraged. The lands may be utilized for non-residential purposes (e.g. agricultural). Slope stabilization measures (e.g. retaining walls) may be constructed to prevent further mass movements. Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early

		warning system (e.g. signages).
Purok 4, current settlement area (GPS reading: N 7° 42’ 02.7”/E 125° 57’ 05.5”)	Very High	The periphery where the current settlement site of purok 4 is situated is bounded by steep slopes on the northwestern side. An active translational landslide about 8 to 10 m wide and 2m deep has been noted in this side. Although the settlement area is relatively flat, the slopes bounding it are unstable and are prone to mass movements. Should a new relocation site be identified, this area is not suitable for long time settlement. Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages).
Purok 4, old purok center (GPS reading: N 7° 42’ 03.9”/E 125° 56’ 46.5”)	Very High	Active translational landslides are present on the northwestern slopes bounding the area. A huge rotational slide on northwestern part of the purok occurred during typhoon Pablo which led to the relocation of settlements in the purok. Settlement at the toe of these slides and debris accumulation zones are highly discouraged. Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages).
Northeastern slopes bounding Purok 5, along the road (GPS reading: N 7° 41’ 27.6”/E 125° 56’ 45.3”)	Very High	A massive rotational slide is observed along the road of Purok 5. It is about 10 to 15 m wide having a depth of about 5 to 6 m. It extends downslope the road making it hazardous for residents taking this road. Downslope are huge tension cracks implying a developing mass movement or landslide.

		Settlement at the base of this slope should be discouraged. The land may be utilized for non-residential purposes (e.g. agricultural). Slope stabilization measures (e.g. retaining walls) may be constructed to prevent further mass movements. Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages).
Purok 6, current settlement site (GPS reading: N 7° 42’ 43.7”/E 125° 56’ 52.7”)	High	This site served as a temporary settlement area for residents of Purok 6. Their previous residences are located in an area bounded by steep slopes cluttered with several translational and rotational landslides which transpired during typhoon Pablo. However, this settlement site is assessed to still be unsuitable for settlements as this too is bounded by steep to very steep slopes. Although no active landslide was noted, teracettes and slight bulges in some slopes bounding the area are indicative of incipient mass movement. A new relocation site for the settlers of Purok 6 must be identified. Settlement at the base of this slope should be discouraged. The land may be utilized for non-residential purposes (e.g. agricultural). Slope stabilization measures (e.g. retaining walls) may be constructed to prevent further mass movements. Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages).
Purok 2, purok center (GPS reading: N 7° 41’ 21.2”/E 125° 56’	Very High	Several translational and rotational landslides were observed along the roads of Purok 2 as well as in slopes bounding the southeastern ridges of the purok. This

58.9”)		makes the area very high susceptibility to landslide. Avoid settlement in areas assessed to be highly susceptible to landslide and other forms of mass movements. Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages).
Purok 3 (GPS reading: N 7° 41’ 50”/E 125° 57’ 37.5”)	Very High	Along the southeastern slopes bounding the purok is a massive active translational slide. It is about 40 to 50 m wide which extends downslope where debris accumulation zones at the foot of the slope can be observed. Settlement at the base of this slope should be discouraged. The land may be utilized for non-residential purposes (e.g. agricultural). Slope stabilization measures (e.g. retaining walls) must be constructed to prevent further mass movements. Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages).
Barangay Linoan		
Western slopes bounding Purok 6, near purok center (GPS reading: N 7° 40’ 34.4”/E 125° 58’ 41.8”)	Very High	Several translational, rotational and wedge landslides surround the slopes bounding the purok center. An active wedge landslide approximately 5 to 6 m wide is found in the southwestern slopes bordering the purok. Towards the southeastern portion is a recent rotational debris slide where a house downslope is situated. Relocation of houses near and along these slopes must be done. Settlements on these areas are highly discouraged.

		The lands may be utilized for non-residential purposes (e.g. agricultural). Slope stabilization measures (e.g. retaining walls) may be constructed to prevent further mass movements. Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages).
Barangay Mayaon		
Purok 10 (GPS reading: N 7° 45' 48.5"/E 125° 54' 02.5")	Very High	The purok center is situated on the edge of steep slope dipping west. The slope height is approximately 100m and the valley width is 130m. Highly fractured sandstone is the lithology in the area making the whole purok highly to critically susceptible to landslide. Several translational and rotational landslides were noted on the southeastern and northeastern sides of purok center. The trail connecting the purok center and the route to purok 9 has active landslides indicating that the area is very critical to mass movement. **Recommendations**: Settlement at the edge of the steep slopes should be discouraged. The purok center must be relocated to area with rolling toporgraphy to the north(N 7° 46' 8"/E 125° 54' 11.5") in order to minimize the risk. Lands may be utilized for non-residential purposes (e.g., agricultural) only. Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. This area should be declared as **danger zone** prohibited for residential settlements.

Purok 9 (GPS reading: N 7° 46’ 44.9”/E 125° 54’ 27.4”)	Very High	The area is underlain by highly weathered and fractured/jointed sandstone that resulted so several translational and wedge landslides to the southern part of purok center. Majority of the area is steep sided making it highly susceptible to mass movement. **Recommendations:** Settlements at the southern part of purok center are highly discouraged. The purok center must be relocated to area with moderate slope gradient to the southern portion of elementary school(N 7° 46’ 50”/E 125° 54’ 34”) in order to minimize the risk. Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities.
Purok 12 (GPS reading: N 7° 47’ 3”/E 125° 54’ 35.9”)	High	The area is situated on a ridge making it not critical to mass movements. Though the purok center is on a moderately sloping terrain, majority of the area is still considered as highly susceptible to landslide. On the northern slopes are several landslides present along trail/road. The vicinity is also underlain by highly fractured and weathered clastic rocks. **Recommendations:** The area must be maintained for agricultural purposes only. Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities.
Purok 13 (GPS reading: N 7° 47’ 43.2”/E 125° 54’ 35.9”)	High	The purok center is bounded by several translational and wedge landslides to the north and south sides. The rocks in the vicinity are identified as highly fractured sandstone dipping due NW. **Recommendations:** Transfer the purok center to the ridge area

		far from the edge of steep slopes. Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities.
Purok 5 (GPS reading: N 7° 47’ 7.4”/E 125° 55’ 40.7”)	Moderate	Generally, Purok 5 is situated on rolling topography which can be considered to have moderate susceptibility to landslide. To the east and north side of the purok center are several landslides adjacent to tributaries draining from the west. **Recommendations:** Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages).
Purok 4 (GPS reading: N 7° 46’ 50”/E 125° 55’ 30.7”)	Moderate	The area is relatively safe to landslide but susceptible to debris flow coming from the western side. The purok center is situated to the north of an active creek draining to the eastern section. **Recommendations:** Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages).
Purok 3 (GPS reading: N 7° 46’ 28.8”/E 125° 55’ 30.1”) Purok 1A (GPS reading: N 7° 46’ 15.4”/E 125° 55’ 57.4”)	Moderate	In general, the Purok 3 and 1A have gentle sloping geomorphology that can be considered relatively safe to mass movement. The area has rolling topography bounded to the north and south by active creeks. The proposed relocation sites of the brgy. are within the area rated as moderate to landslide susceptibility. The relocation sites are situated on good topography but buildings must be constructed away from gullies.

		Recommendations: Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities.
Purok 1 (GPS reading: N 7° 46’ 4.3”/E 125° 55’ 50.1”) Purok 2 (GPS reading: N 7° 46’ 2.9”/E 125° 56’ 2.5”)	Moderate	As a whole, Purok 1 and 2 are located on ridges with rolling topography. They are relatively safe from mass movement during heavy rain/ typhoon making the elevated portions quite suitable for residential purposes. Active creek is sited at the southern and eastern part of the areas which can cause local landslides. **Recommendations:** Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages).
Purok 7 (GPS reading: N 7° 45’ 43.8”/E 125° 55’ 14.1”) Purok 8 (GPS reading: N 7° 45’ 54.8”/E 125° 54’ 42.8”) Purok 6 and Purok11	High	Generally speaking, the lithology in the area is identified to be highly fractured reefal limestone making these zones highly susceptible to mass movements. Purok 7 and 8 are located on a steep gradient topography. More than few of rotational landslides were noted on the northern slopes bounding these areas. To the east of Purok 8 is an active creek that causes wide landslides. On the other hand, to the eastern side of Purok 7 Hall is a tributary adjacent also to landslide zones. **Recommendations:** The area must be maintained for agricultural purposes only. Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal

		authorities. The areas adjacent to zones with noted landslides should be declared as **danger zone** prohibited for residential settlements.
Barangay New Calape		
Brgy Hall/Brgy Site (Purok 1) (GPS reading: N 7° 46’ 18.7”/E 125° 59’ 22.4”)	High	Interbeds of siltstone and mudstone underlay the slopes of the barangay site. Most of these rocks are already weathered and have already turned into soil, thus making the rock materials weak and unsuitable for increased buildup. Overloading of the slope may induce tension cracks, which may result to landslides when triggered by heavy rains and/or earthquakes. Observe and/or monitor further mass movement (e.g. landslides, tension cracks) in the area and report to MGB/municipal authorities. Observe for saturated ground or seeps and sunken or displaced road surfaces and report to MGB/municipal authorities. Develop early warning system (e.g. signage posts) for critical areas. Discourage further settlements in the area, especially along the edges of slopes, where landslide escarpments are most likely to develop. Evacuation of residents living along the edges of the slope is advised during heavy rains. The area of New Calape Elementary School (GPS reading: N 7° 46’ 31.9”/E 125° 59’ 27.4”) is a plausible evacuation site.
Purok 1 (GPS reading: N 7° 46’ 19.8”/E 125° 59’ 19.1”)	Very High	Two active rotational landslides are present on both sides of the ridge where Purok 1 is situated. These landslides may affect 3-4 houses (GPS reading: N 7° 46’ 19.8”/E 125° 59’ 19.1”) and an agricultural land (GPS reading: N 7° 46’ 18.0”/E 125° 59’ 24.4”) once mass movement progresses. Overloading of the slope may aggravate landslides, thus further settlements along the edges of slopes are highly discouraged. However, the area may be continuously used for agricultural purposes. Heavy rains are triggering mechanisms of

		landslides. Thus, evacuation of residents living on the edge of slopes is advised during these times. New Calape Elementary School may be used as an evacuation center. Observe and/or monitor further mass movement (e.g. landslides, tension cracks) in the area. Report to MGB/municipal authorities once landslide reactivates. Observe for saturated ground or seeps and sunken or displaced road surfaces and report to MGB/municipal authorities. Develop early warning system (e.g. signage posts) for critical areas.
Purok 3	High	Several active translational landslides are present on the slopes of Purok 3. Most of the areas are utilized as agricultural lands. Settlements on the edges of slopes should be strictly prohibited as landslide escarpments are most likely to develop on these sites. Evacuation of residents living along the edge of slopes should be done during heavy rains. Observe and/or monitor further mass movement (e.g. landslides, tension cracks) in the area. Report to MGB/municipal authorities once the landslide reactivates. Observe for saturated ground or seeps and sunken or displaced road surfaces and report to MGB/municipal authorities. Develop early warning system (e.g. signage posts) for critical areas.
Purok 4	High	Gully developments and landslides are present in the area. Weak rocks, similar to those found in Purok 1/Brgy Site underlay the area, making it highly susceptible to landslides. Dense/heavy buildup is not advised, especially those along the verges of slopes. Agricultural utilization of the area may be continuously adapted. Observe and/or monitor further mass movement (e.g. landslides, tension cracks) in the area. Report to MGB/municipal authorities once landslide reactivates. Observe for saturated ground or seeps and sunken or displaced road surfaces and report to MGB/municipal authorities.

		Develop early warning system (e.g. signage posts) for critical areas.
Purok 6 (GPS reading: N 7° 46’ 9.8”/E 125° 59’ 14.4”)	High	Several active translational and rotational landslides are present on the slopes of Purok 6. A creep was also observed on a ridge along the rough road towards the purok. Southern downslopes of the area are possible landslide debris accumulations zones. Settlements on edges of slopes and on foot slopes are highly discouraged. Observe and/or monitor further mass movement (e.g. landslides, tension cracks) in the area. Report to MGB/municipal authorities once landslide reactivates. Observe for saturated ground or seeps and sunken or displaced road surfaces and report to MGB/municipal authorities. Develop early warning system (e.g. signage posts) for critical areas.
Purok 2 (GPS reading: N 7° 46’ 36.4”/E 125° 59’ 46.9”)	Very High	Northwest of the area, towards the Olaycon Creek is a huge rotational debris slide. Landslide debris accumulation zones are present along the Olaycon River. Settlement on this slope is highly discouraged. Meanwhile, extensive translational slides are present on the northeastern slopes bounding the purok. Interbeds of siltstone and mudstone underlay the area. These soft and weathered rocks are not suitable for dense/heavy buildup. Heavy rains/and or earthquakes may trigger further mass movements. Stringent monitoring of settlements on these critical areas should be done by barangay authorities. Lands may be utilized for agricultural purposes. Observe and/or monitor further mass movement (e.g. landslides, tension cracks) in the area. Report to MGB/municipal authorities once landslide reactivates. Observe for saturated ground or seeps and sunken or displaced road surfaces and report to MGB/municipal authorities.

		Develop early warning system (e.g. signage posts) for critical areas.
Purok 5 (GPS reading: N 7° 46’ 59.7”/E 125° 59’ 55.7”)	High	Road widening might have caused a huge rotational slide observed along the rough road in Purok 5. Relocation of the house situated at the toe of the slide should be immediately done unless slope stabilization measures (e.g. retaining walls) are accomplished. Further settlement in the area affected by the slide is highly discouraged. Along the slopes beside Olaycon River (GPS reading: N 7° 47’ 1.5”/E 125° 59’ 52.7”) are several active translational slides. Though no houses are affected. Landslides may dam water and cause flashfloods in the downstream portion of the barangay. Observe and/or monitor further mass movement (e.g. landslides, tension cracks) in the area. Report to MGB/municipal authorities once landslide reactivates. Observe for saturated ground or seeps and sunken or displaced road surfaces and report to MGB/municipal authorities. Develop early warning system (e.g. signage posts) for critical areas. Residents on the downstream portion of Olaycon River should be wary of flashfloods and debris flows during heavy rains. Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content).
Barangay New Cebulan		
Purok 7 (GPS reading: N 7° 44’ 44.1”/E 125° 57’ 44.6”)	High	The purok center is situated adjacent to a mountain peak with 310m elevation. Majority of the lithology in the area is identified be fractured sandstone with some patches of limestone. The area’s lithology and topography made it highly susceptible to landslide. 350m to the west of the purok center is an active wide landslide bordering

		to the trail to Purok 4 area. **Recommendations**: Settlement at the edge of the steep slopes should be discouraged. Lands must be utilized for non-residential purposes (e.g., agricultural) only. Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. This area should be declared as **danger zone** prohibited for residential settlements.
Purok 4 (GPS reading: N 7° 44' 39.3"/E 125° 50' 49.7") Purok 5 (GPS reading: N 7° 44' 43.7"/E 125° 56' 39.1")	Moderate	Purok 4 and 5 are underlain by highly weathered limestone manifested by some sinkholes in the area. The karst topography presents low slope gradient making the area moderate in landslide susceptibility but prone to subsidence. **Recommendations:** Observe for and/or monitor for presence of mass movement and report to the municipal authorities (e.g., landslides, cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the municipal authorities.
Purok 1 (GPS reading: N 7° 45' 12.6"/E 125° 57' 09.4")	Moderate	The area is situated on a ridge to the south of a creek. Though the purok center is on a moderately sloping terrain, the northern and eastern portions are still considered to be high in landslide susceptibly. The vicinity is also underlain by highly weathered limestone. **Recommendations:** The area must be maintained for agricultural purposes only. Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities.

Purok 2 (GPS reading: N 7° 45' 28.4"/E 125° 57' 14.6")	Moderate	The purok center is located on a moderately sloping ridge classifying it as relatively safe to landslides. The whole Purok 2 is bounded by creeks to its north, south and western side. The rocks in the area are also identified to be limestone. **Recommendations:** Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities.
Purok 3 (GPS reading: N 7° 45' 56.7"/E 125° 56' 46.9")	High	Purok center is located on a steep slope topography which can be considered to have high susceptibility to landslide. To the eastern and western side of the purok are several active landslides. **Recommendations:** Transfer the purok center to the southern portion of the ridge with moderate slope gradient. The area must be maintained for agricultural purposes only. Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities.
Purok 6 (GPS reading: N 7° 45' 27.8"/E 125° 56'46.9.7")	Moderate	The purok center is adjacent to the eastern side of the brgy. hall. The majority of the area is underlain by highly weathered limestone with moderate slope gradient. To the northeastern portion of purok are several active landslides bordered by creeks. The southern side of the purok center has a steep slope which is **highly** susceptible to landslide. **Recommendations:** For safely precaution, if heavy rain/ typhoon occurs, the residents from the edge of steep sided slope must be evacuated to the ridge areas with gently sloping topography. Observe for and/or monitor for presence of mass movement

		and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages).
Barangay New Dalaguete		
Purok 1 Center N 07°43'57.1" E 125°56'58.8"	High	Area bounded by steep slopes making it highly susceptible to landslide. Houses residing at the top edge of slopes are at risk. Slope failure may likely to occur due to the weak underlying soil material where most of the houses were built. **Recommendation:** Settlement at the edge of the ridge and foot slope must be discouraged. -Observe for and/or monitor for the presence of mass movement (e.g. landslide, tension cracks). Report situation to MGB office and the municipal/city authorities. -Observe for saturated ground/seeps and sunken or displaced road surfaces. Report situation to MGB office and the municipality/city authorities. -Develop an early warning device (e.g. signage) (for critical areas only) -Constant communication and updates with the barangay officials on geohazard situation.
Purok 2 Center N 07°43'44.4" E 125°56'48.0"	Very High	Purok 2 is situated at the top of the ridge with gently rolling terrain. Houses residing at the top edge of slopes are at risk to slope failure. Tension cracks in an old "sari-sari" store had been developed, manifestations of the lack of the underlying support caused by unstable and weak rocks making it very susceptible to landslide. **Recommendation:** Settlement at the edge of the ridge and foot

		slope must be discouraged thus relocation must be done. -Observe for and/or monitor for the presence of mass movement (e.g. landslide, tension cracks). Report situation to MGB office and the municipal/city authorities. -Observe for saturated ground/seeps and sunken or displaced road surfaces. Report situation to MGB office and the municipality/city authorities. -Develop an early warning device (e.g. signage) (for critical areas only) -Constant communication and updates with the barangay officials on geohazard situation.
Purok 3 (old) Center N 07°43'40" E 125°56'00"	Very High	Residents in Purok 3 merged into the Barangay site area. Landslide scarps were noted within the vicinities. **Recommendation:** Settlement at the edge of the ridge and foot slope must be discouraged. -Observe for and/or monitor for the presence of mass movement (e.g. landslide, tension cracks). Report situation to MGB office and the municipal/city authorities. -Observe for saturated ground/seeps and sunken or displaced road surfaces. Report situation to MGB office and the municipality/city authorities. -Develop an early warning device (e.g. signage) (for critical areas only) -Constant communication and updates with the barangay officials on geohazard situation.
Purok 4 Center N 07°43'40.5" E 125°56'19.1"	Very high	Area bounded by inherently weak and steep slopes makes it highly susceptible to landslide. Houses residing at the top edge of slopes are at risk to slope failure. **Recommendation:** Settlement at the edge of the ridge and foot slope must be discouraged.

		-Observe for and/or monitor for the presence of mass movement (e.g. landslide, tension cracks). Report situation to MGB office and the municipal/city authorities. -Observe for saturated ground/seeps and sunken or displaced road surfaces. Report situation to MGB office and the municipality/city authorities. -Develop an early warning device (e.g. signage) (for critical areas only) -Constant communication and updates with the barangay officials on geohazard situation.
Purok 5 Center N 07° 43’34” E 125°55’45”	Very High	Purok 5 is characterized by flat terrain bounded by inherently weak and steep slopes making it highly susceptible to landslide. **Recommendation:** Settlement at the edge of the ridge and foot slope must be discouraged. -Observe for and/or monitor for the presence of mass movement (e.g. landslide, tension cracks). Report situation to MGB office and the municipal/city authorities. -Observe for saturated ground/seeps and sunken or displaced road surfaces. Report situation to MGB office and the municipality/city authorities. -Develop an early warning device (e.g. signage) (for critical areas only) -Constant communication and updates with the barangay officials on geohazard situation.
Purok 6 Center N 07° 43’42” E 125°56’48.8”	High	Houses in Purok were built inherently in weak rocks manifested by tension cracks ad displaced surfaces. Many reside at the top edge of steep gradient slope. **Recommendation:** Settlement at the edge of the ridge and foot slope must be discouraged. -Observe for and/or monitor for the presence of mass movement (e.g. landslide, tension cracks). Report situation

		to MGB office and the municipal/city authorities. -Observe for saturated ground/seeps and sunken or displaced road surfaces. Report situation to MGB office and the municipality/city authorities. -Develop an early warning device (e.g. signage) (for critical areas only) -Constant communication and updates with the barangay officials on geohazard situation.
Barangay New Visayas		
Purok 3 N 7° 42' 13.1'' E 126° 1' 13.6''	Very High	Several translational and rotational slides are present along the mountainous portion of Brgy. New Visayas. The underlying materials are bedded siltstone (0.5m) covered with thick weathered zone (mixture of rock fragments and loose sediments). Siltstone in the area is highly porous, friable and bioturbated. Joints in the siltstone bed are also present. Landslide often occur along road cut and steep to very steep slopes. Local residents and barangay officials should observe and/or monitor for presence of mass movement (e.g. landslides, tension cracks). Any signs (i.e saturated ground or seeps, displaced or sunken road) of incipient landslide should be reported to the MGB office concerned and the municipal authorities.
Purok 6 N 7° 41' 19.4'' E 126° 1' 35.9''	Moderate	Portion of this purok is characterized by rolling to moderately sloping terrain. This is mostly planted with bananas and some settlements. Overloading and modification (agricultural use) of the slope might aggravate the present condition and stability of underlying material. Local residents and barangay officials should observe and/or monitor for presence of mass movement (e.g. landslides, tension cracks). Any signs (i.e saturated ground or seeps, displaced or sunken road) of incipient landslide should be reported to the MGB office concerned and the municipal authorities.

Purok 8 N 7° 41’ 24.8’’ E 126° 1’ 43.4’’	High	A steep slope along a road cut going to Compostela is assessed to be highly susceptible to slope failure. This is mainly due to overloading of houses that weakens the stability of the slope. Local residents and barangay officials should observe and/or monitor for presence of mass movement (e.g. landslides, tension cracks). Any signs (i.e saturated ground or seeps, displaced or sunken road) of incipient landslide should be reported to the MGB office concerned and the municipal authorities.
Barangay Prosperidad		
Purok 6 (GPS reading: N 7° 49’ 41.7”/E 126° 56’ 44.2”)	High	The area is undergoing creeping movement towards an unknown creek. Five terracetts were developing with vertical displacement of 0.5 meters and horizontal displacement of 0.3 meter. A temporary relocation was established by the purok but upon inspection, the area is also prone to landsliding. A possible relocation site was located at 7° 50’ 27.4” at 126° 56’ 37.7”, located along a ridge owned by Guillermo Pagalan. **Recommendations:** Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g., landslides, tension cracks).Observe for saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities.Develop an early warning system (e.g., signages).
Purok 4 (GPS reading: N 7° 48’ 53.4”/E 125° 53’ 35.8”)	Moderate	The purok should be transferred to another site since it is located on a meander curved of the river. Although the site has been evacuated, the area should not be allowed for settlement purposes. Houses to be constructed should be located on higher grounds. Depth of flooding reaches to more than 2 meters. The area has been evacuated due to the flash flooding incidence during the onslaught of Typhoon Pablo. Portions of the purok has moderate slopes with traces of landslide.

		Recommendations: Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages). Avoid construction of house along edge of slopes.
Purok 2 (GPS reading: N 7° 49’ 28.8”/E 125° 57’ 38.6”)	Low to Moderate	Several landslide were observed along the roads towards purok 2. **Recommendations:** Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages).
Purok 5 (GPS reading: N 7° 49’ 02.1”/E 125 56’ 38.5”)	Moderate	Most of the landslide occur along road due to cutslopes. **Recommendations:** Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages). Avoid building of along edge of slopes and along foot slopes.
Purok 9 (GPS reading: N 7° 48’ 40”/E 125° 56’ 57.0”)	Low	**Recommendations:** Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages). Avoid building of house along riverbanks and edge of slopes.

Barangay San Jose		
Purok 2 N 7° 42’ 15.1’’ E 125° 59’ 2.7’’	High	A massive outcrop of siltstone which belongs to Kabagtican Formation (Casasola, 1956) has high susceptibility to rock fall and rockslide. Settlements along the slope are critical due to the possible occurrence of the hazard. Several conjugate shear joints oriented NW and NE were observed. Another outcrop in the area exposes residents to rockslide hazard. The outcrop is characterized by interlayering of thinly bedded siltstone and weathered rock. Daylighting beds are prone to rockslide. Some of the houses are laid on the bedding plane which is the point of weakness of the rock. Location of the newly constructed church is prone to landslide. Retaining wall was built to reduce the movement of soil material but it was proven to be ineffective. Cracks and bulges on the retaining wall are indicators of an unstable ground. Several rotational and translational landslides were also observed in the area. Local residents and barangay officials should observe and/or monitor for presence of mass movement (e.g. landslides, tension cracks). Any signs (i.e saturated ground or seeps, displaced or sunken road) of incipient landslide should be reported to the MGB office concerned and the municipal authorities. Habitation adjacent to the steep slopes mentioned above is highly discouraged. The location of the church is not favorable for such structures due to its slope instability and indications of impending slide.
Purok 4	Very High	Sitio Tibungco, composed of 70 household, is located in a very steep slope that is

N 7° 43’ 4.8’’ E 125° 58’ 18.9’’		assessed to be highly susceptible to landslide. Several translational and rotational landslides occurred in the area. Several landslide, rockslide and rock fall were observed along the road going to Brgy. Prosperidad. This area is made up of varying sedimentary rocks such as porous siltstone, indurated mudstone and weathered pebbly sandstone. Most of these rocks exhibit bedding and/or laminations. Thin sandstone beds are oriented N 60^{0} W and dipping 70^{0} NW. Rock slide along weak joints formed wedges. Threat of rock fall in the area is very high due to the presence large rock boulders along the road.
N 7° 42’ 35.7’’ E 125° 58’ 28.8’’	High	Overloading of houses on moderate to steep slope increases the instability for slope failure. This area is prone to landslide due to congestion of settlements in the area. Local residents and barangay officials should observe and/or monitor for presence of mass movement (e.g. landslides, tension cracks). Any signs (i.e saturated ground or seeps, displaced or sunken road) of incipient landslide should be reported to the MGB office concerned and the municipal authorities. Habitation in the steep slope in Sitio Tibungco and foot slope of the ridge is highly discouraged. Relocation should be prioritized by the government. Signages indicating rock fall and rockslide along the road should be put up in the area.
Barangay San Vicente		
Northeastern slopes bounding Purok 6 (GPS reading: N 7° 40’ 40”/E 125° 56’ 04.9”)	Very High	Several rotational and translational slides were observed in the northwestern and northeastern slopes bounding the purok. Noted in the northwestern side near the purok center is an active rotational slide of debris and earth which was reported to be triggered by rains of typhoon Pablo.

		Settlement at these regions should be discouraged. The lands may be utilized for non-residential purposes (e.g. agricultural). Slope stabilization measures (e.g. retaining walls) may be constructed to prevent further mass movements. Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages).
Southwestern slopes bounding purok 2 (GPS reading: N 7° 40' 45.5"/E 125° 56' 57")-sited from Purok 8	Very High	Several translational and rotational slides were observed in Purok 8 on the southwestern slopes bounding Purok 2. The purok in general is surrounded by steep to very steep convex and concave slopes which manifests its high susceptibility to landslide and other forms of mass movements. Settlement at these regions should be discouraged. The lands may be utilized for non-residential purposes (e.g. agricultural). Slope stabilization measures (e.g. retaining walls) may be constructed to prevent further mass movements. Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages).
Purok 7, purok center (GPS reading: N 7° 41' 30.1"/E 125° 55' 32.5")	Very High	The purok center is bounded from its northwestern to southwestern sides by steeply sloping hills where several translational slides were observed. On its southeastern portion is a recent rotational slide along the road bound to Purok 5. A debris accumulation zone was identified at the foot of the slide along the road. Settlement at the base of this slope should

		be discouraged. The lands may be utilized for non-residential purposes (e.g. agricultural). Slope stabilization measures (e.g. retaining walls) may be constructed to prevent further mass movements. Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages).
Purok 9 (GPS reading: N 7° 40' 47.1"/E 125° 55' 16.9"); Purok 5 (GPS reading: N 7° 39' 00"/E 125° 56' 55.4"); and Purok 3 (GPS reading: N 7° 39' 25.7"/E 125° 57' 36.2")	Very High	These puroks have relatively similar topography. They are all situated and bounded by steep to very steep slopes making them highly susceptible to landslide and other mass movements. Terracetes indicative of incipient differential settlements were observed in these puroks. Slope stabilization measures (e.g. retaining walls) may be constructed to prevent further mass movements. Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages).
Purok 4, purok center (GPS reading: N 7°39' 25.7"/E 125° 57' 09.5")	Very High	The purok center is situated on the northwest-sloping hills of the purok. It is positioned on a generally steep to very steeply sloping topography thus making it highly susceptible to landslide and other type of mass movements. Several active rotational landslides were noted along the road bound to Purok 1. Settlement at the base of this slope should be discouraged. The lands may be utilized for non-residential purposes (e.g. agricultural). Slope stabilization measures (e.g. retaining walls) may be constructed to prevent further mass movements.

		Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages).
Eastern slopes bounding Purok 1 (GPS reading: N 7°39' 31.3"/E 125° 57' 10.7")	Very High	A large tension crack along highly weathered material/non-cohesive soil in Purok 1 was observed on the eastern slopes bounding the purok. The cracks apparently show a 5m displacement from its wall. These tension cracks indicate an incipient landslide.. Settlement at the base of this slope should be discouraged. The lands may be utilized for non-residential purposes (e.g. agricultural). Slope stabilization measures (e.g. retaining walls) may be constructed to prevent further mass movements. Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages).
Barangay Tapia		
Brgy Hall (GPS reading: N 7° 45' 56.5"/E 126° 0' 34.5")	Low	The barangay hall is located on low-lying and gently sloping hills.
Purok 4 (GPS reading: N 7° 46' 59.5"/E 126° 1' 3.9")	Very High	Steep to moderately sloping hills characterize the topography of the area. Bedrocks are composed of interbedded mudstone and siltstone. The degree of weathering is high to the extent that most of the rock exposures in the area have already turned into soil. The very poor rock mass class characteristic of the bedrock is not suitable for dense/heavy buildup. Numerous landslides are already present in the area. Ridges on both sides of the

		Olaycon Creek are pervaded by several active translational and rotational landslides. Earth and debris slides are also present on slopes along the highway. These are possibly due to slope modifications and road widening. Further mass movements may be prevented by the construction of landslide mitigating structures (e.g. retaining walls). Slope stabilization measures may also be observed (e.g. benching) besides the construction of mitigating structures. However, settlements on steep slopes, along edges of ridges, on footslopes, and near gully developments are highly discouraged; since mass movements (e.g. tension cracks, terracetes) are most likely to develop on these areas especially when triggered by heavy rains and/or earthquakes. They may be utilized as agricultural lands, instead. Observe and/or monitor further mass movement (e.g. landslides, tension cracks) in the area. Report to MGB/municipal authorities once landslide reactivates. Observe for saturated ground or seeps and sunken or displaced road surfaces and report to MGB/municipal authorities. Develop early warning system (e.g. signage posts) for critical areas.
Purok 7 (GPS reading: N 7° 46’ 21.8”/E 126° 0’ 52.2”)	High	Eastern slopes (towards Monkayo) bounding the barangay are pervaded by numerous active landslides. Settlements on steep slopes, along edges of ridges and on footslopes are highly discouraged; since mass movements (e.g. tension cracks, terracetes) are most likely to develop on these areas especially when triggered by heavy rains and/or earthquakes. Rather, they may be utilized as agricultural lands. Observe and/or monitor further mass movement (e.g. landslides, tension cracks) in the area. Report to MGB/municipal authorities once landslide reactivates. Observe for saturated ground or seeps and sunken or displaced road surfaces and report to MGB/municipal authorities.

		Develop early warning system (e.g. signage posts) for critical areas.
Purok 2 (GPS reading: N 7° 45’ 39.7”/E 126° 0’ 29.7”)	High	The area is underlain by weak and weathered rocks of interbedded siltstone and mudstone. Unconsolidated alluvium deposits cover most of the area. These rock materials have very poor rock mass class and is therefore, not suitable for heavy/dense buildups. Landslides are present on the northern to northeastern slopes bounding the area. Slides are also present on the slopes along the highway. One house along the road was even observed sitting on a landslide scarp that has already progressed. Relocation is advised unless landslide mitigating measures are observed. Further mass movements may be prevented by construction of landslide mitigating structures (e.g. retaining walls), coupled with slope stabilization measures (e.g. benching). Discourage settlements on areas where evidences of slope instability (e.g. tension cracks, terracetes) are observed. Observe and/or monitor further mass movement (e.g. landslides, tension cracks) in the area. Report to MGB/municipal authorities once landslide reactivates. Observe for saturated ground or seeps and sunken or displaced road surfaces and report to MGB/municipal authorities. Develop early warning system (e.g. signage posts) for critical areas.
Purok 1 (GPS reading: N 7° 45’ 31.8”/E 126° 0’ 20.6”)	High	Active rotational landslides were observed on the slopes northeast of the observation point, across the Ilogdan Creek. Settlements on the edges of the topslope and along footslopes are highly discouraged. Observe and/or monitor further mass movement (e.g. landslides, tension cracks) in the area. Report to MGB/municipal authorities once landslide reactivates. Observe for saturated ground or seeps and sunken or displaced road surfaces and

		report to MGB/municipal authorities. Develop early warning system (e.g. signage posts) for critical areas.
Purok 6 (GPS reading: N 7° 45’ 39.7”/E 125° 59’ 57.0”)	High	The northeastern slopes of the purok are pervaded by several rotational landslides. Weak and weathered rocks underlie the area. These are covered with unconsolidated alluvial deposits. Buildups in the area are discouraged unless foundations are anchored deep on more solid bedrock. Observe and/or monitor further mass movement (e.g. landslides, tension cracks) in the area. Report to MGB/municipal authorities once landslide reactivates. Observe for saturated ground or seeps and sunken or displaced road surfaces and report to MGB/municipal authorities. Develop early warning system (e.g. signage posts) for critical areas.
Purok 3, proposed relocation site (GPS reading: N 7° 46’ 1.7”/E 126° 0’ 33.0”)	Moderate	The two hectares proposed relocation site of the barangay is located northwest of the barangay proper/barangay site. Low and gently sloping characterize the terrain of the area. Bedrocks are composed of interbedded siltstone and mudstone overlain by alluvium deposits. The friable and highly weathered rock materials make an unsuitable foundation for heavy/dense buildup of houses. Settlements in the area should be regulated as slopes may fail due to overloading. Few, small, shallow earth slides were observed on the southeastern slope of the area. Slope stabilization measures (e.g. benching) coupled with landslide mitigating structures (e.g. retaining walls) may be adopted to prevent further mass movements. Observe and/or monitor further mass movement (e.g. landslides, tension cracks) in the area and report to MGB/municipal authorities. Observe for saturated ground or seeps and sunken or displaced road surfaces and report to MGB/municipal

		authorities. Develop early warning system (e.g. signage posts) for critical areas.

Table 4. Results of Flood Hazard Assessment

Location	Flood Susceptibility Rating	Remarks/ Recommendations
Barangay Banagbanag		
Purok 4, purok center (GPS reading: N 7° 40’ 28.3”/E 126° 01’ 25.6”)	Very High	Accumulation of floodwater from the overflow of Batutu River joined by water emanating from rivers transecting New Bataan and Maragusan critically floods the purok during extreme heavy rains and typhoons. Also, a portion of the riprap along the Batutu River’s bank has gave way permitting larger volume of water to flood the entire purok. The purok being positioned in the natural floodplains of Batutu River is not suitable for human settlements. Avoid settlement on the banks of river. Organize emergency evacuation protocols in the community together with municipal authorities. Develop early warning device/system. Repair the damaged portion of the river’s riprap to lessen flooding within the purok and consider elevating the bank protection so as to accommodate larger volume of water during heavy rains.
Purok 6, purok center (GPS reading: N 7° 39’ 19.4”/E 126° 01’ 00.5”)	High	The purok is drain by water from the north-flowing Batutu River which transects most of the puroks in the barangay. The purok center and its immediate vicinity being situated in the natural floodplains of Batutu River are highly prone to sheet floods during typhoons and heavy rainfall. Organize emergency evacuation protocols in the community together with municipal authorities. Develop early warning device/system.
Regions bounded	Very High	Some regions in the purok are critically

by Manat and Batutu River (GPS reading: N 7° 39' 47.2"/E 126° 00' 53.4")		susceptible to flooding. These areas are relatively nearer to Manat and Batutu River which create floods of about 3-4 m depth. These areas where some 40 households were affected during typhoon Pablo are still submerged in water. Agricultural lands can no longer be used due to such floods. Organize emergency evacuation protocols in the community together with municipal authorities. Develop early warning device/system. Identify relocation sites for residences that are highly susceptible to flooding. Activate Barangay Disaster Risk Reduction Management Council for rescue operations during flooding event in the barangay.
Purok 7, purok center (GPS reading: N 7° 39' 55.9"/E 126° 00' 51.3")	Very High	The entire purok has very high susceptibility to flooding during intense rainfall and typhoons. This is due to the area being a natural floodplain of Batutu River as well as Manat River. A major portion of the purok encompasses rice plantations which were all flooded during typhoon Pablo and is still submerged at present and consequently unproductive. Organize emergency evacuation protocols in the community together with municipal authorities. Develop early warning device/system. Activate Barangay Disaster Risk Reduction Management Council for rescue operations during flooding event in the barangay. The LGU's must consider finding alternative land use for these inundated areas.
Purok 2, purok center (GPS reading: N 7° 38' 58.4"/E 126° 01' 05.8") bordering Manat River (GPS reading: N 7° 38' 50.9"/E 126° 00' 40")	Moderate Very High	The purok center and its immediate vicinity have moderate susceptibility to flooding during excessive rainfall and typhoons. Water emanating from Manat River floods this area of the purok. About 11 households situated near the north-flowing Manat River were critically affected by flooding during typhoon Pablo in the purok. Settlement in these areas must be evaded. Organize emergency evacuation protocols in the community together with municipal

		authorities. Develop early warning device/system. Activate Barangay Disaster Risk Reduction Management Council for rescue operations during flooding event in the barangay. The LGU's must consider finding alternative land use for these inundated areas.
Purok 1, purok center (GPS reading: N 7° 39' 01.3"/E 126° 01' 20.7")	Low	The purok experiences low floods of about 0.2m to 0.5m during typhoons and excessive downpours. Water is usually derived from surface runoff which recedes a few hours after continuous downpours. Improve and maintain drainage canals in the purok. Regular declogging of canals and waterways is recommended.
Purok 3, purok center (GPS reading: N 7° 39' 07.0"/E 126° 01' 44.3")	Moderate	The purok center and its surrounding regions may experience moderate floods of about 0.5m to 1m depth during extreme heavy rainfall and typhoons. Improve and maintain drainage canals in the purok. Regular declogging of canals and waterways is recommended.
Low-lying areas in the purok (GPS reading: N 7° 39' 26.9"/E 126° 01' 39.3")	High	Certain portions in the purok are highly susceptible to flooding. During excessive rainfall and typhoons, these sections are submerged to ~1.5m high floodwater. Improve and maintain drainage canals in the purok. Regular declogging of canals and waterways is recommended.
Purok 5, purok center (GPS reading: N 7° 39' 22.0"/E 126° 01' 20.2")	Low	The purok center and closer regions have low susceptibility to flooding. Water is generally an accumulation from surface runoff. Improve and maintain drainage canals in the purok. Regular declogging of canals and waterways is recommended.
Along NIA drainage	High	In the lower portions of the purok northeast of the purok center, floodwater reaches a level of about 1.5 m.
Barangay Bangkerohan Norte		

Brgy Hall/ Purok 1 (GPS reading: N 7° 44’ 23.0”/E 125° 59’ 47.9”)	Low	Declogging of canals may help ensure efficient flow of water during heavy rains.
Purok 1 (along banks of Manat River)	High	The immediate banks of Manat River and other low-lying areas of the purok are affected when the river overflows during heavy rains. Settlements along the banks of the river are strongly discouraged. The land area may be utilized for agricultural purposes. Organize emergency evacuation protocols in the community in coordination with the municipal authorities. Develop early warning device/system. Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content). Identify nearest evacuation site for affected residents.
Purok 1 (fringes of high flood zones) (GPS reading: N 7° 44’ 29.5”/E 125° 59’ 50.9”)	Moderate	A creek passes through the area, inundating some of the portions along its banks. Flood heights range from 0.5 to 1 meter. Avoid settlement on these areas unless floodplain building codes (e.g. non-occupancy of basement/first floors, elevation of houses) are adopted. Dredging of the creek and declogging of canals may help ensure efficient flow of receding floodwaters.
Purok 2 (GPS reading: N 7° 44’ 34.2”/E 125° 59’ 54.3”)	Very High	Banks of Purok 2 along the Manat River experience flood heights exceeding two meters during heavy rains. Settlement along the banks of the river is highly discouraged. These may be utilized as agricultural lands, instead. Scouring of banks may be remedied by installing flood protection walls (e.g. riprap). Organize emergency evacuation protocols in the community in coordination with the municipal authorities. Develop early warning device/system. Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content). Identify nearest evacuation site for affected

		residents.
Purok 6 (GPS reading: N 7° 44’ 58.9”/E 126° 0’ 5.5”)	Very High	Similar to Purok 6, Manat River passes through the area causing inundation of more than 2 meters along the river’s immediate banks. Elevation of houses may be done to prevent floodwaters from inundating residences. However, further buildup along floodplains is highly discouraged. Organize emergency evacuation protocols in the community in coordination with the municipal authorities. Develop early warning device/system. Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content). Identify nearest evacuation site for affected residents.
Purok 4 (GPS reading: N 7° 44’ 15.9”/E 125° 59’ 41.4”)	High	A creek is present in the area. It drains east into the Manat River. During heavy rains, when the heavily silted Manat River overflows, floodwaters in the creek also backflow causing inundation in the surrounding areas. Dredging of the creek and the Manat River may be done to increase their capacity. Flood protection walls (e.g. riprap, dikes) may be built to protect scouring of banks. Organize emergency evacuation protocols in the community in coordination with the municipal authorities. Develop early warning device/system. Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content).
Barangay Bangkerohan Sur		
Purok 1 (GPS reading: N 7° 43’ 57.1”/E 125° 59’ 28.2”)	High	The nearby Guyon Creek and Manat River contribute to floods in the area. Flood heights reach more than a meter in the low-lying portions of the purok. Settlements on banks of creeks and rivers are highly

		discouraged. Organize emergency evacuation protocols in the community in coordination with the municipal authorities. Develop early warning device/system. Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content).
Bangkerohan Elementary School (part of Purok 5) (GPS reading: N 7° 44’ 3.3”/E 125° 59’ 31.1”)	High	The area is situated on the floodplains of Manat River. The backflow of floodwaters from nearby Guyon Creek also augment flood heights in the area. Floodplain zoning (e.g. non-residential utilization of flood prone areas) is advised. Organize emergency evacuation protocols in the community in coordination with the municipal authorities. Develop early warning device/system.
Purok 5, near Guyon Bridge (GPS reading: N 7° 43’ 59.9”/E 125° 59’ 28.2”)	High	Guyon Creek passes through the area before draining east into Manat River. River bank erosion is present. Settlement along the banks of creek is discouraged. Flood protection structures (e.g. riprap/dikes) may be built to protect further scouring of banks. Declogging of canals and creeks may help ensure efficient flow of receding floodwaters.
Purok 4 (GPS reading: N 7° 43’ 57.4”/E 125° 59’ 25.4”)	High	Flood heights in the area exceed one meter. The overflow of Guyon Creek primarily contributes to flooding along the banks and on the low-lying portions of the purok. Additional canals may be installed to easily channel the receding floodwaters into Manat River. Regular declogging of creeks and canals may also alleviate floods.
Purok 6 (GPS reading: N 7° 43’ 26.6”/E 125° 59’ 27.8”)	High	The backflow of floodwaters from Manat River into irrigation canals cause floods in rice fields. Frequent dredging of irrigation canals may be done to ensure efficient flow of receding floodwaters.
Purok 7 (banks of Guyon Creek)	Moderate	Guyon Creek passes through the area. Affected areas are mostly coconut plantations. Settlement along the banks of

		the creek is discouraged. Organize emergency evacuation protocols in the community in coordination with the municipal authorities. Develop early warning device/system.
Barangay Camansi		
Purok 2 (GPS reading: N 7° 46' 58.7'' E 126° 57' 10.0")	Very High	The purok is located adjacent to Saug River which is approximately 15 to 20 meters wide and depth of 7 meters. Low lying areas are situated along areas near the river bank which were occupied by settlements.. The area has very high susceptibility to flooding. **Recommendations**: Develop an early warning device/system. Observe for rapid increase/decrease in creek/river water levels, possibly accompanied by increased turbidity (soil content). Avoid construction of houses along river banks.
Barangay Concepcion		
Purok 5 Along the lower banks of the local creek N 7° 44' 17.9'' E 126° 0' 38.6	Very High	A NW flowing creek drains waters from the eastern mountainous ridge towards Manat River. This creek has an approximate 6 – 8 m wide and 2 – 3 m from the stream bed up to its banks. High volume of waters, debris (uprooted trees) and fine sediments (sand, silt and clay) were deposited during the onslaught of Typhoon Pablo. An average of 2.5 m flood was reported along the banks and old meander bend of the creek which lasted for around 1 hour. Active river erosion during recent flashflood event weakened the foundation of the steel bridge resulted to its collapse. Damages on houses were observed during the field assessment. Local government should establish an early warning device (i.e siren). Monitor for murky discoloration of water in the creek accompanied by rapid increase or decrease of water levels. Settlements along

Upper banks of the local creek Purok Center: N 7° 44' 16.4'' E 126° 0' 40.5''	High	its banks should be prohibited and declared as critical areas for flashflood. Evacuation protocol should be established and exercised by the community when the alert warning for typhoon or heavy rainfall will be given to the area. Relocation of present residents should be prioritized. Overflowing of creek also affected the upper banks where the barangay hall and majority of the purok are settled. A 1.5 m flood was experienced during Typhoon Pablo. One (1) meter of sand deposits was dumped in the area. Floodwaters flow NE towards the creek. Local government should establish an early warning device (i.e signages). Monitor for murky discoloration of water in the creek accompanied by rapid increase or decrease of water levels. Evacuation protocol should be established and exercised by the community when the alert warning for typhoon or heavy rainfall will be given to the area. Relocation of the community should be considered.
Purok 7 N 7° 44' 59.0'' E 126° 0' 41.3''	Very High	Tapia Creek is a north-northwest flowing tributary of Manat River separating Barangay Concepcion and Tapia. It has high channel capacity and sediment load competence. It can channel large amount of waters and carry fine to coarse sediments (clay, silt, sand, pebble and cobble) during typhoon. Banks of the creek experienced 3 – 4 m flood height. Banana plantation beside the creek was also inundated by flood. Unstable fluvial deposits in the banks were easily eroded by high energy floodwaters. Banks of the river is not suitable for residential use. Flood will be a regular event specifically during heavy rainfall and typhoon. River bank erosion will weaken foundations of houses. Mitigating structures such as dike wall will reduce the effect of river bank erosion but still, it is costly to implement. Local residents should monitor

		murky discoloration of water in the creek accompanied by rapid increase or decrease of water levels. Relocation of present residents in the banks is a must.
Purok 1 Center: N 7° 43’ 47.7’’ E 126° 0’ 41.0’’	Very High	A flashflood occurred in the area on December 2012 when Typhoon Pablo hit the province. Large volume of water rushed the area dumping fine grained sediments over the floodplain. Floodwaters were channeled in a nearby creek flowing towards west. The peak of the flood has 2.0 m height which lasted for 6 hours. This area is highly susceptible to flooding because this was part of the old channel that shifted southward. River bank erosion is an active process in the stream channel. Approximately, 15 – 20 m^2 of the bank was eroded. Impending landslide in the adjacent steep slope might cause river damming that will aggravate flashflooding in the area. Residential settlement along the banks is highly discouraged. Mitigating structures such as dike wall will reduce the effect of river bank erosion but still, it is costly to implement. Local residents should monitor murky discoloration of water in the creek accompanied by rapid increase or decrease of water levels. Local government should impose effective evacuation protocol during typhoon season.
Purok 6 Center: N 7° 44’ 22.2’’ E 126° 0’ 38.9’’	Moderate	A NW trending incised valley is located in the vicinity of Purok 6. Houses are located along this geomorphologic feature. This was formed by continuous incision of a tributary or creek leaving a V-shaped valley which is moderately susceptible to flooding. Local government should limit the settlement along incised valley. If there’s an active creek flowing parallel to it, local residents should monitor murky discoloration of water in the creek accompanied by rapid increase or decrease of water levels. Proper

		evacuation protocol must be followed during disaster.
Barangay Dauman		
Purok 5 N 7° 43’ 46.2’’ E 126° 0’ 41.0’’	Very High	A flashflood occurred in the area on December 2012 when Typhoon Pablo hit the province. Large volume of water rushed the area dumping fine grained sediments over the floodplain. Floodwaters were channeled in a nearby creek flowing towards west. The peak of the flood has 2.0 m height which lasted for 6 hours. This area is highly susceptible to flooding because this was part of the old channel that shifted southward. River bank erosion is an active process in the stream channel. Residential settlement along the banks is highly discouraged. Mitigating structures such as dike wall will reduce the effect of river bank erosion but still, it is costly to implement. Local residents should monitor murky discoloration of water in the creek accompanied by rapid increase or decrease of water levels. Local government should impose effective evacuation protocol during typhoon season.
Center: N 7° 43’ 43.0’’ E 126° 0’ 27.6’’	High	Rice fields and residential areas in Purok 5 were flooded during recent typhoon events. Overflowing of the adjacent creek is responsible for this phenomenon. Local government should establish an early warning device (i.e signages). Monitor for murky discoloration of water in the creek accompanied by rapid increase or decrease of water levels. Evacuation protocol should be established and exercised by the community when the alert warning for typhoon or heavy rainfall will be given to the area. Relocation of the community should be considered.
Purok 4 N 7° 43’ 59.6’’ E 126° 0’ 2.7’’	Very High	The area is located near the confluence of a local creek and Manat River, thus its susceptibility to flooding is very high. This

Center: N 7° 43’ 49.5’’ E 126° 0’ 3.3’’	High	NW flowing creek drains from its headwaters in a ridge in Brgy. Dauman towards Manat River. Flood in this area could reach up to 2.0 m. River bank erosion along the creek has been observed. Residential settlements in the area are highly discouraged. Instead, it should be used as agricultural lands. Early warning system (i.e. sirens) regarding flood hazard in the area should be put up. Local residents should monitor murky discoloration of water in the creek accompanied by rapid increase or decrease of water levels. Local government should impose effective evacuation protocol during typhoon season. Relocation of the community should be considered. Due to the presence of river systems in the area, flooding during heavy and prolonged rains affects the community of Purok 4. An average of 1.4 m flood could inundate the area. Install an early warning system like sirens and an emergency evacuation protocol in coordination with the Municipal and Barangay Disaster Risk Reduction & Management Committees. Restrict settlements in the area.
Purok 3 Center: N 7° 43’ 18.4’’ E 126° 0’ 35.6’’	High	This west flowing creek is highly susceptible to flashflooding due to the abrupt change of energy from its constricted upper section towards the lower section. Several houses are located along the creek which experienced flashflood on December 2012 during Typhoon Pablo. Fine sediments (i.e. sand, silt, clay) were deposited in the floodplain. Early warning system (i.e. sirens) regarding flood hazard in the area should be put up. Local residents should monitor murky discoloration of water in the creek accompanied by rapid increase or decrease of water levels. Local government should impose effective evacuation protocol during typhoon season. Relocation

		of the community should be considered.
Purok 2 Center: N 7° 42’ 55.9’’ E 126° 0’ 18.0’’	Very High High	Agricultural areas near the Manat River experienced >2.0 m flooding during typhoon. Susceptibility to flood of Purok 2 and Gawad Kalinga Village is high due to its location in the floodplain of the Manat River. Early warning system (i.e. sirens) regarding flood hazard in the area should be put up. Local government should impose effective evacuation protocol during typhoon season. Relocation of the community should be considered. Areas along Manat River should be utilized as agricultural lands rather than residential areas.
Barangay Lebanon		
Along Topasan Creek, Purok 6 (GPS reading: N 7° 42’ 35.0”/E 125° 56’ 48.8”)	Very High	The southwest-flowing Topasan Creek which forms part of the headwaters of Manat River serves as flashflood exit point during excessive downpours uphill and during typhoons. Settlements near and along the banks of the creek are highly discouraged. Widening and frequent dredging of river channels may be done to increase the capacity of the creek and ensure efficient flow of floodwaters during strong typhoons/heavy rains. Develop early warning device/system. Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content). Organize emergency evacuation protocols in the community together with municipal authorities.
Barangay Linoan		

Purok 1, Pag-asa (GPS reading: N 7° 39’ 52.0”/E 125° 58’ 58.5”) Adjacent to Casangay Creek (GPS reading: N 7° 39’ 39.1”/E 125° 58’ 56.1”)	Low Very High	The purok center being relatively elevated than its surrounding regions has low susceptibility to flooding. It experiences up to ~0.5m high floods during excessive rainfall and typhoons. Frequent declogging of canals may be done to ensure efficient flow of water. East-flowing Casangay Creek run across the purok inundating the southeastern portion of the purok encompassing residences and rice plantations. Approximately 10 households were critically flooded during typhoon Pablo experiencing flood heights of about 1.5 to >2m. Settlement in areas near and along rhe Casanagay Creek is sicouraged. Widening and frequent dredging of creek channels may be done to increase the capacity of the creek and ensure efficient flow of floodwaters during strong typhoons/heavy rains. Develop early warning device/system. Organize emergency evacuation protocols in the community together with municipal authorities.
Purok 6, purok center (GPS reading: N 7° 40’ 34.4”/E 125° 58’ 41.8”)	High	This section of the purok is being traversed by an east flowing tributary creek of Casangay River. It may possibly serve as a flashflood exit point during extremely heavy downpours thus making it highly susceptible to floods. Scouring of river banks is present. Flood protection structures (e.g. dikes riprap) are advised to prevent riverbank erosion and lessen overflow during extreme heavy rains. However, settlement along the banks of river is still discouraged. Widening and frequent dredging of river channels may be done to increase the capacity of the creek and ensure efficient flow of floodwaters during strong typhoons/heavy rains. Develop early warning device/system.

		Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content). Organize emergency evacuation protocols in the community together with municipal authorities.
Purok 7, purok center (GPS reading: N 7° 40' 31.8"/E 125° 59' 07.9") Regions adjacent to Linoan River	Low High	The purok center and its surrounding regions experience low floods of about 0.2m during extensive rainfall and typhoons. Water is usually derived from surface runoff which cannot be accommodated by drainages and waterways. Frequent declogging of canals may be done to ensure efficient flow of water. The eastern portion of the purok proximal to Linoan River is highly susceptible to flooding during typhoons and heavy downpours. Roughly eight households in the purok experience 1 to 1.5 m high floods. Flood protection structures (e.g. dikes riprap) are advised to prevent riverbank erosion and lessen overflow during extreme heavy rains. However, settlement along the banks of river is still discouraged. Widening and frequent dredging of river channels may be done to increase the capacity of the creek and ensure efficient flow of floodwaters during strong typhoons/heavy rains. Develop early warning device/system. Organize emergency evacuation protocols in the community together with municipal authorities.
Purok 5, purok center (GPS reading: N 7° 40' 06.7"/E 125° 59' 05.3")	Moderate	The purok is by and large composed of rice plantations which received 0.5-0.8m water from surface runoff coupled with discharges from Pantod Creek transecting Purok 4. Drainages and water pathways cannot lodge enough water during excessive rains. Frequent declogging of canals must be done to ensure efficient flow of water.

		Supplementary canals may also be built so that there will be more passages for the receding floodwaters.
Purok 4, Purok Center (GPS reading: N 7° 39' 52.9"/E 125° 59' 53.5")	Very High	The purok center used to stand proximal to the northeast flowing Pantod Creek. The creek has critically inundated the whole of Purok 4 wiping out all residences including the purok center. Sediments carried along with the flood has settled and covered a vast part of the rice plantations in the purok thus making it unsuitable for crop growing. Some areas are still submerged to floodwater. Flood protection structures (e.g. dikes riprap) are advised lessen overflow during extreme heavy rains. However, settlement along the banks of river is still discouraged. Widening and frequent dredging of river channels may be done to increase the capacity of the creek and ensure efficient flow of floodwaters during strong typhoons/heavy rains. Develop early warning device/system. Organize emergency evacuation protocols in the community together with municipal authorities.
Purok 2, Barangay Multipurpose Hall, near Linoan Creek (GPS reading: N 7° 40' 27.8"/E 125° 59' 02.6")	High Very High	The purok center being situated proximal to Linoan Creek is highly susceptible to flooding during heavy downpours and typhoons. The lower northwest portions of Purok 2 received critical level floods during typhoon Pablo with flood heights of 2-3 m in regions nearest the Linoan River.
Purok 7, purok center (GPS reading: N 7° 40' 31.8"/E 125° 59' 07.9") Portion of the Purok adjacent the Manat River	Low High	Water derived from surface runoff and surfeit from Manat River floods the purok center and neighboring regions. Flood heights reach 0.1 to 0.2m in these areas. Areas in the purok which are relatively closer to Manat River are prone to high flood levels of about 1 to 1.5m. About eight households in the purok have reportedly experienced such flood levels.

		Flood protection structures (e.g. dikes riprap) are advised lessen overflow during extreme heavy rains. However, settlement along the banks of river is still discouraged. Widening and frequent dredging of river channels may be done to increase the capacity of the creek and ensure efficient flow of floodwaters during strong typhoons/heavy rains.
Barangay Mayaon		
Mayaon Brgy. Hall (GPS reading: N 7° 46' 3.4"/E 125° 55' 49.3")	Low	The brgy. hall is on topographic high located to the north of an active creek. Only runoffs from the northern elevated portion affected the area during Typhoon Pablo. All in all, majority of the brgy zones are not devastated by flood except for the lowlands of Purok 1 and Purok 2. **Recommendations:** Households adjacent to the creek must be relocated/ evacuated to the Purok 1A area during heavy rain or typhoon. Develop early warning device/system. Organize emergency evacuation protocols in the community together with municipal authorities.
Purok 2 (GPS reading: N 7° 46' 2.9"/E 125° 56' 2.5")	High to Critical	Saog River is the primary tributary causing the destruction of Saog Bridge connecting the Brgy. New Cebulan and Mayaon. The average width of the stream is 100m and depth of 8m. The recorded flood height in the area during Typhoon Pablo is greater that 2m draining due south. **Recommendations:** Households adjacent to the creek must be relocated/ evacuated to the area northern/near the elevated purok center during heavy rain or typhoon. Avoid settlement on the banks of creeks. Develop early warning device/system. Organize emergency evacuation protocols in the community together with municipal authorities.
Purok 1 (GPS reading: N 7° 46' 4.3"/E 125° 55' 50.1")	High	To the south of purok center are two merging creeks draining from the western mountainous area. As the two creeks intersect, the inundation of the lowlands become critical. The Mayaon Elementary

		School near the merging creeks was highly inundated during Typhoon Pablo with recorded flood height of about 1.2m. **Recommendations:** The school and residents adjacent to the merging creeks must be relocated to safer areas in Purok 1A to prevent flashflood or debrisflow coming from the western mountain of Purok 7 and 8. Organize emergency evacuation protocols in the community together with municipal authorities. Develop early warning device/system.
Barangay New Calape		
Purok 5 (GPS reading: N 7° 47’ 1.5”/E 125° 59’ 52.7”)	High	Olaycon River passes through the area. Landslide debris accumulation zones are already present in the upstream portion (Purok 2) of the barangay. These deposits may dam waters and cause flashfloods in the area. Though no houses are situated along the upstream portion of the river, a road may be affected once flashflood occurs. The lower portions/downstream residents of Olaycon River are critical to flashfloods. Evacuation of residents should be immediately done during extreme heavy rains. Settlements along the banks of this river are highly discouraged. Organize emergency evacuation protocols in the community in coordination with the municipal authorities. Develop early warning device/system. Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content). Identify nearest evacuation site for affected residents.
Barangay New Visayas		
Purok 3 Center: N 7° 41’ 48.8’’ E 126° 0’ 43.1’’	Low	Purok 3 has gentle to rolling terrain where susceptibility of flooding is low.

Purok 4 Center: N 7° 41’ 41.9’’ E 126° 0’ 44.3’’	Moderate Low	Open vegetated area of the purok is susceptible to 0.8 – 1.0 m flooding. Residential areas of Purok which reside along the road are elevated making them less susceptible to flooding.
Purok 5 N 7° 40’ 44.3’’ E 126° 0’ 35.2’’ N 7° 41’ 12.5’’ E 126° 0’ 45.1’’ Center: N 7° 41’ 15.1’’ E 126° 0’ 51.9’’	Very High High Moderate to Low	The area is at the confluence of a creek and Manat River which carry large amount of water during typhoon and heavy rainfall. Manat River is large meandering stream system which flows northward. Majority of area of Purok 5 along the river is agricultural area with minor settlements. Residential areas were also inundated by flood for 1 week. Flood height along Manat River is 3 – 4 m. The area is not suitable for residential purposes. It must be permanently declared as critical area. Monitor for murky discoloration of water in the creek accompanied by rapid increase or decrease of water levels. Present residents must be immediately relocated to a safer site. Purok center is quite distant from the river but still, susceptible to flooding due to its flat topography.
Purok 7 N 7° 40’ 48.9’’ E 126° 1’ 18.2’’ N 7° 40’ 55.1’’ E 126° 1’ 16.5’’	Very High High	Overflowing of a west flowing creek causes severe flooding that inundated the low-lying area of Purok 7. Flood could reach up to > 2.0 m at the banks of the creek. Most of the affected areas are covered by rice fields. Residential areas experienced 1.5 – 2.0 m flood height during recent typhoon events. Flooded areas should be used as agricultural lands. These are not suitable for habitation. Monitor for murky

Center: N 7° 41’ 14.2’’ E 126° 1’ 11.8’’	Moderate to Low	discoloration of water in the creek accompanied by rapid increase or decrease of water levels. Present residents must be immediately relocated to a safer site. This portion of Purok 7 has gentle to rolling terrain which less susceptible to flooding.
Purok 8 Center: N 7° 41’ 24.8’’ E 126° 1’ 43.4’’	Moderate to Low	Purok 8 has gentle to rolling terrain which less susceptible to flooding.
Purok 2 Center: N 7° 42’ 2.1’’ E 126° 0’ 37.3’’	High Moderate to Low	Open vegetated areas and agricultural areas are susceptible to 1.0 – 2.0 m flooding due to its relatively flat topography. This should be used as agricultural areas. These are not suitable for habitation. Populated areas of Purok 2 has gentle to rolling terrain which relatively less susceptible to flooding.
Purok 1 Center: N 7° 42’ 35.2’’ E 126° 0’ 32.2’’	High	Overflowing of NW flowing creek that transects the area causes flooding. Estimated flood height in the area is 1.2 m. Local government should establish an early warning device (i.e siren). Monitor for murky discoloration of water in the creek accompanied by rapid increase or decrease of water levels. Evacuation protocol should be established and exercised by the community when the alert warning for typhoon or heavy rainfall will be given to the area.
Barangay San Jose		

Purok 7 N 7° 42’ 18.7’’ E 125° 59’ 46.6’’	High	Sheet flooding is the only observable hazard in Purok 7 characterized by flat terrain. Most of the affected areas are residential and agricultural areas covered by rice fields. Flood height can reach up to 1.3 m. Local government should establish an early warning device (i.e siren). Minimize residential settlements in the area; instead, this should be utilized as agricultural lands. Evacuation of residents should be done during heavy and prolonged rainfall.
Purok 8 N 7° 42’ 18.4’’ E 125° 59’ 27.4’’	Moderate	Due to its flat terrain and settlement congestion, the area is susceptible to moderate flooding. Flood height ranges from 0.5 m -1.0 m.
Purok 3 N 7° 42’ 19.4’’ E 125° 59’ 20.1’’	Low	This is a built-up area that has low susceptibility to flooding. Maximum flood height is 0.5 m. Localized flooding due to clogged canals can be the source of flooding.
Purok 1C N 7° 41’ 20.2’’ E 125° 59’ 42.1’’	Very High High Low	These areas are characterized by flat terrain. Cause of flooding in the area is the Manat River. Most of the affected areas of more than 2.0 m flood are agricultural areas. Residential areas near the vicinity of rice fields. Vicinity of the purok center has low susceptibility to flooding. Local government should establish an early warning device (i.e siren). Restrict human settlements in areas with susceptibility rating of high to very high. Evacuation of

		residents should be done during heavy and prolonged rainfall.
Purok 1B N 7° 41’ 42.4’’ E 125° 59’ 14.4’’	Very High High Low	These areas are characterized by flat terrain. Cause of flooding in the area is the Manat River. Most of the affected areas of more than 2.0 m flood are agricultural areas. Residential areas near the vicinity of rice fields. Vicinity of the purok center has low susceptibility to flooding. Local government should establish an early warning device (i.e siren). Restrict human settlements in areas with susceptibility rating of high to very high. Evacuation of residents should be done during heavy and prolonged rainfall.
Purok 1A N 7° 41’ 54.8’’ E 125° 59’ 16.1’’	Very High High Low	These areas are characterized by flat terrain. Cause of flooding in the area is the Manat River. Most of the affected areas of more than 2.0 m flood are agricultural areas. Residential areas near the vicinity of rice fields. Vicinity of the purok center has low susceptibility to flooding. Local government should establish an early warning device (i.e siren). Restrict human settlements in areas with susceptibility rating of high to very high. Evacuation of residents should be done during heavy and prolonged rainfall.
Purok 6B N 7° 42’ 27.7’’	Moderate	Built-up areas of Purok 6B have moderate susceptibility to flooding. Flood can reach

E 125° 59’ 46.5’’		up to 1.0 m.
Purok 6A N 7° 42’ 29.8’’ E 125° 59’ 59.4’’	Very High High	Manat River is a large meandering stream which drains water from the mountainous areas of Nabunturan towards its confluence with Agusan River in Montevista. Banks are prone to very high flooding and erosion. Rice fields and houses along the road going to Compostela were flooded during these recent typhoon events. Flood height could reach up to 1.8 m. An early warning device (i.e siren) should be devised that will be used for monitoring and warning during typhoon. Restrict human settlements in areas with susceptibility rating of high to very high specifically those areas along the banks of Manat River. Evacuation of residents should be done during heavy and prolonged rainfall.
Purok 5 N 7° 42’ 23.8’’ E 125° 59’ 21.8’’	High	Tigbawan Creek is a northeast flowing creek towards Manat River. Constructed riprap wall along its banks were partially damaged during the onslaught of Typhoon Pablo. Houses at the banks experienced more than 1.0 m flooding. More effective and well-engineered mitigating structure should be constructed along the banks of Tigbawan Creek. Residents along the creek should be evacuated during typhoon.
Purok 4B N 7° 43’ 15.3’’ E 125° 59’ 24.3’’	Very High	Manat River is a large meandering stream which drains water from the mountainous areas of Nabunturan towards its confluence with Agusan River in Montevista. Banks are prone to very high flooding and erosion.

	Moderate	Those areas near the road going to Monkayo are prone to moderate flooding up to 1.0 m. An early warning device (i.e siren) should be devised that will be used for monitoring and warning during typhoon. Restrict human settlements in areas along the banks of Manat River. Flood prone areas should be further utilized as agricultural lands. Evacuation of residents should be done during heavy and prolonged rainfall.
Barangay Tapia		
Purok 4, near banks of Manat River (GPS reading: N 7° 46' 36.2"/E 126° 1' 0.5")	Very High	The heavily silted Manat River frequently overflows during continuous heavy rains. Flood heights exceed two meters from its immediate banks. Most of the areas affected are banana plantations. However, houses are also located farther away from the banks, where floods still extend. Settlement on the banks of the river is highly discouraged. Further buildups along on fringes low-lying areas should be regulated by municipal authorities. Houses may be elevated to prevent inundation of residences. Desilting and dredging of the Manat River may be accomplished to increase its capacity and also to prevent the scouring of banks. In addition, flood protection structures (e.g. riprap, dikes) may be also be built.
Purok 7, near banks of Manat River (GPS reading: N 7° 46' 31.8"/E 126° 0' 59.2")	Very High	Floods are due to the overflow of Manat River during heavy rains. Flood heights reach more than two meters from the immediate banks of the river. Floodplain zoning (e.g. utilization of area for agricultural/recreational purposes/non-residential purposes) may be adopted. Desilting and dredging of the Manat River are advised so the water channel may be able to accommodate larger volumes of floodwaters during increased precipitation.

		Construction of additional canals may also help channel the receding floodwaters towards Manat River. Flood protection structures (e.g. riprap, dikes) may be built to protect the banks from being scoured.
Purok 2, back of Tapia Elementary School (GPS reading: N 7° 45’ 33.6”/E 126° 0’ 29.6”)	High	The back of Tapia Elementary School is located on the immediate banks of Manat River. Scouring of riverbanks is present, affecting the land area of the school. During continuous heavy rains, Manat River overflows, inundating its banks with flood heights of more than a meter. Duration of inundation lasts for 3 days. Settlement on these areas should be regulated. Flood protection structures (e.g. riprap) may be constructed to prevent further bank erosion. Additional canals may also be installed to easily channel receding floodwaters.
Purok 1, near Ilogdan Creek (GPS reading: N 7° 45’ 34.2”/E 126° 0’ 26.6”)	Moderate	Ilogdan Creek passes through the purok draining east towards Manat River. The channel is narrow and shallow, thus waters scour its banks affecting the southern banks of Tapia Elementary School. Dredging of the creek may be donw to increase its capacity for larger volumes of floodwaters during increased precipitation. Flood protection structures (e.g. riprap) may be constructed to prevent further bank erosion.
Purok 1, fringes of moderately susceptible areas	Low	Flood heights wane as distance increases from the banks of Ilogdan Creek and Manat River. Frequent declogging of canals may help ensure efficient flow of receding floodwaters.
Purok 5, near Manat River (GPS reading: N 7° 45’ 6.0”/E 126° 0’ 10.4”)	High	The immediate banks of Purok 5 along the Manat River are highly prone to sheet floods. Land areas may be utilized for agricultural purposes (e.g. banana plantations) instead of residential. Installation of additional canals may be done to rapidly channel the floodwaters back into the river.

It should be noted that these susceptibility ratings were arrived at as of this field assessment. However, the rating could advance (e.g., from low to moderate, moderate to high). Hence, the MGB constantly recommends strict and continuous monitoring by the barangays.

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