
CHAPTER 2

PHYSICAL ENVIRONMENT

2.1 Topography

The general topography of the area is essentially a hilly terrain with lots of tributaries meandering throughout the landscape of the Spanish Lookout Area. The higher altitudes of the terrain are found more northwards of the Spanish Lookout Area with elevations reaching the 280 meters above mean sea level (MSL). This area is also known as the Yalbac Hills. This ridge extends in a semicircular direction towards the northwestern portion of the Spanish Lookout area. The lower areas of Spanish Lookout are formed by the creeks and its tributaries that have carved the mountainous terrain as a result of surface runoffs. The Belize River, which meanders in the area, captures the surface water runoffs.

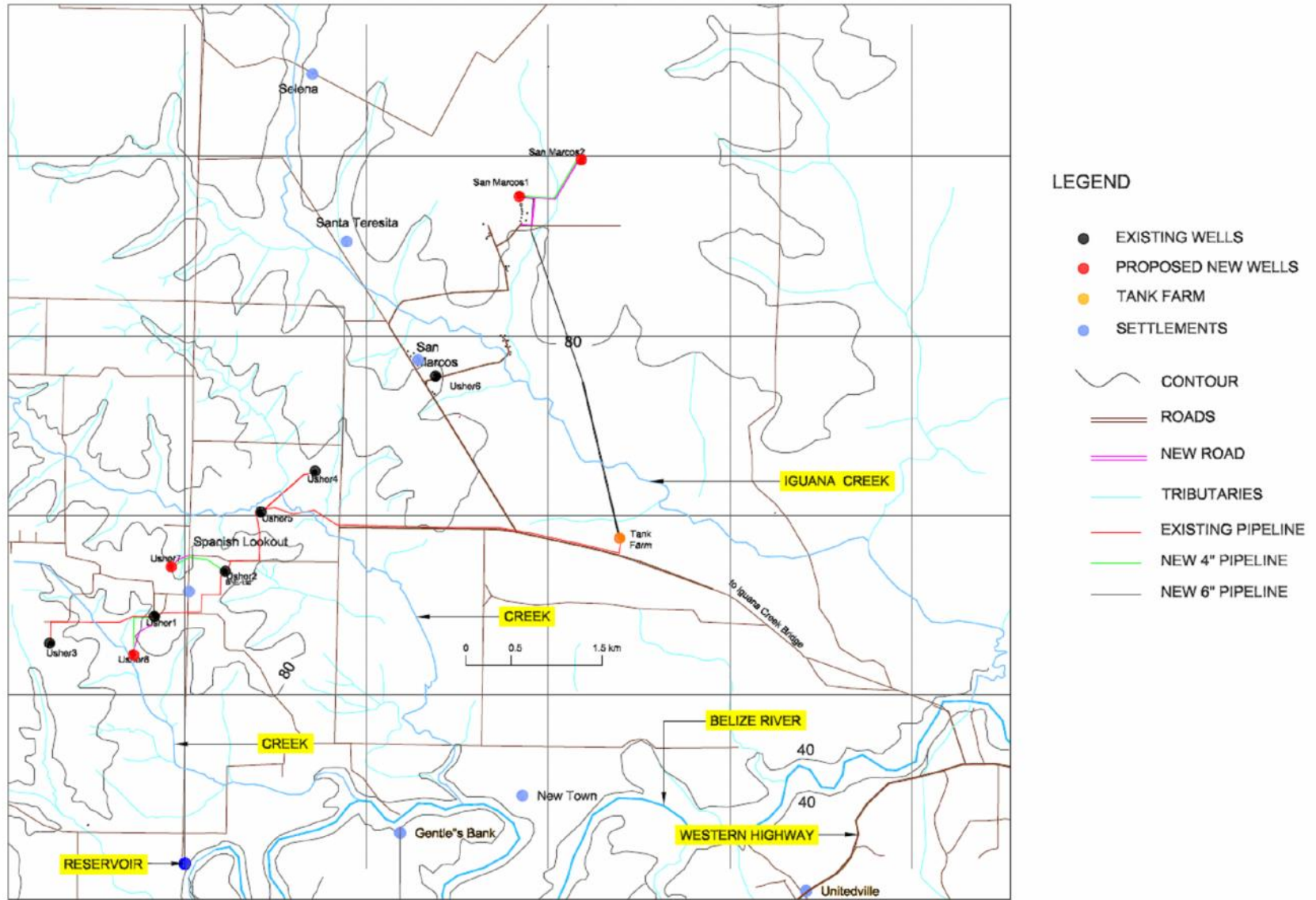
The proposed San Marcos development wells will be located on a hilly ridge formed by the undulating landscape. These rolling ridges undulate right through the country side and decreases towards the Iguana Creek's tributaries. The higher elevation of the area is found just north of the proposed site and this ridge gradually decreases towards the northeast. The topographical contour of the area is about 80 meters above mean sea level (MSL), see figure 2.1.

As for the proposed Spanish Lookout wells, they are also located on an elevated ridge carved out by the numerous tributaries of the area. The proposed sites are on a hilly crest that extends northwards and gently slopes downwards towards the south eventually extending to the river. The contouring of the area is about 80 meters above mean sea level (MSL). The gradual cultivation of the land, loss of vegetation and community development has slowly eroded the topography of the Spanish Lookout area.

2.2 Hydrology

The proposed project site or well locations will be located in the Belize River Watershed. This watershed is the largest watershed in the country and is traversed by the Belize River, Mopan River and Macal River along with their respective tributaries and creeks. The watershed is also bordered by a labyrinth of smaller watersheds to the north and east of the proposed sites. All these watersheds, as can be seen in figure 2.2, are responsible for draining the Yalbac Hills and Maya Mountains during heavy rains. It is expected that the proposed development have no negative impact on this watershed.

Directly, the proposed sites are bordered by creeks (Iguana Creek) and the Belize River. These water courses are responsible for the draining of the hilly range near the project sites. These are eminent by the dry tributaries found throughout the landscape.



Creek & Tributaries near Project Site
 Scale= 1":1.53 km

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Fig. 2.1 Contour and Hydrology Map of the Project Well Sites

These tributaries are extremely active during the rainy season and can often overflow their banks causing erosions, environmental and developmental impacts (See annex III and figure 2.2) Underground hydrology is unknown and uncertain in the Spanish Lookout area and are limited to a few wells perforated by the community. Reports of both confined and unconfined aquifers have been recorded in the area. Belize Natural Energy is cognizant of the fact that their activities can significantly impact any well, aquifer or spring in the area. In this regard, BNE will take the appropriate mitigation measures to protect these valuable resources from any anthropogenic contamination.

2.3 Climatology

Belize has a tropical to subtropical climate with pronounced wet and dry seasons, although there are significant variations in weather patterns by region. Figure 2.3 illustrates the different rainfall isopleths of Belize around the proposed project sites.

Average rainfall varies considerably, ranging from 1,350 millimeters in the north and west to over 4,500 millimeters in the extreme south. The proposed sites are expected to fall within this range with seasonal averages of 1,500 mm. The dry season is shorter in the south, normally only lasting from February to April. A shorter, less rainy period, known locally as the "little dry," usually occurs in late July or August, after the initial onset of the rainy season.

The coast of Belize is subjected to southeasterly trade winds that average 10-17 knots. The greatest trade winds are experienced in July. The coastal regions of the country get the majority of the winds. The general wind patterns of the proposed sites are that of east-south-easterly winds during the dry season, easterly winds in the rainy season and occasional northerly winds during the cooler months. In the period March-June the average wind speed is highest but the average wind-speed inland is considerable lower than along coastal areas.

Temperatures vary according to elevation, proximity to the coast, and the moderating effects of the northeast trade winds off the Caribbean. Average temperatures in the coastal regions range from 24° C in January to 27° C in July. Temperatures are slightly higher inland, except for the southern highland plateaus, such as the Mountain Pine Ridge, where it is noticeably cooler year round. Overall, the seasons are marked more by differences in humidity and rainfall than in temperature.

An important factor in Belize is the frequency of hurricanes. On average, a hurricane affects central Belize every 16 years. Not all of these hurricanes will do extensive damage but there is at least an appreciable amount of wind-throw and breakage of tree crowns. Most impact comes from rainfall which can be substantial and lead to widespread flooding. This flooding is of particular importance for the project on low lying sites such as the Iguana Creek Bridge near Spanish Lookout.

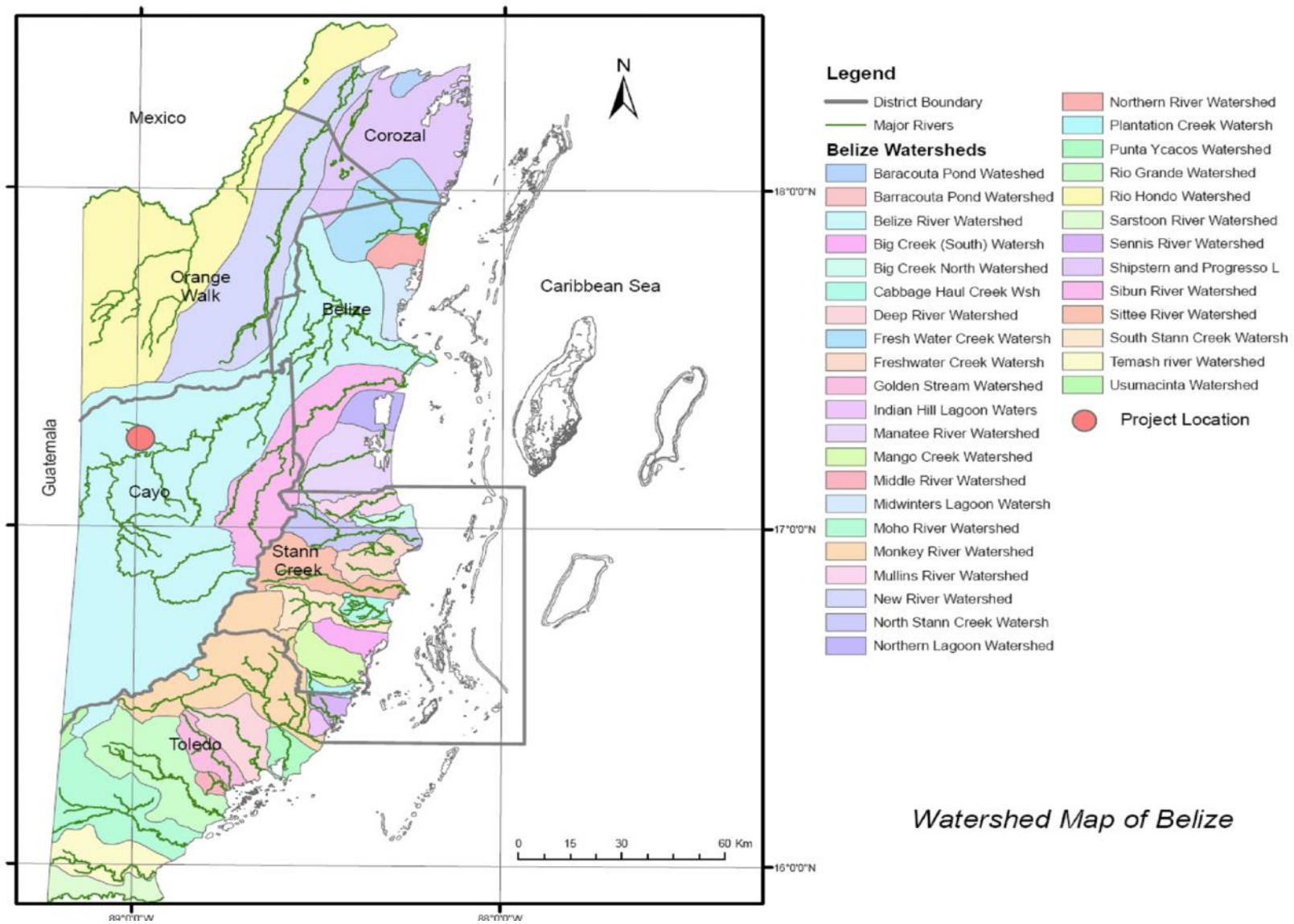
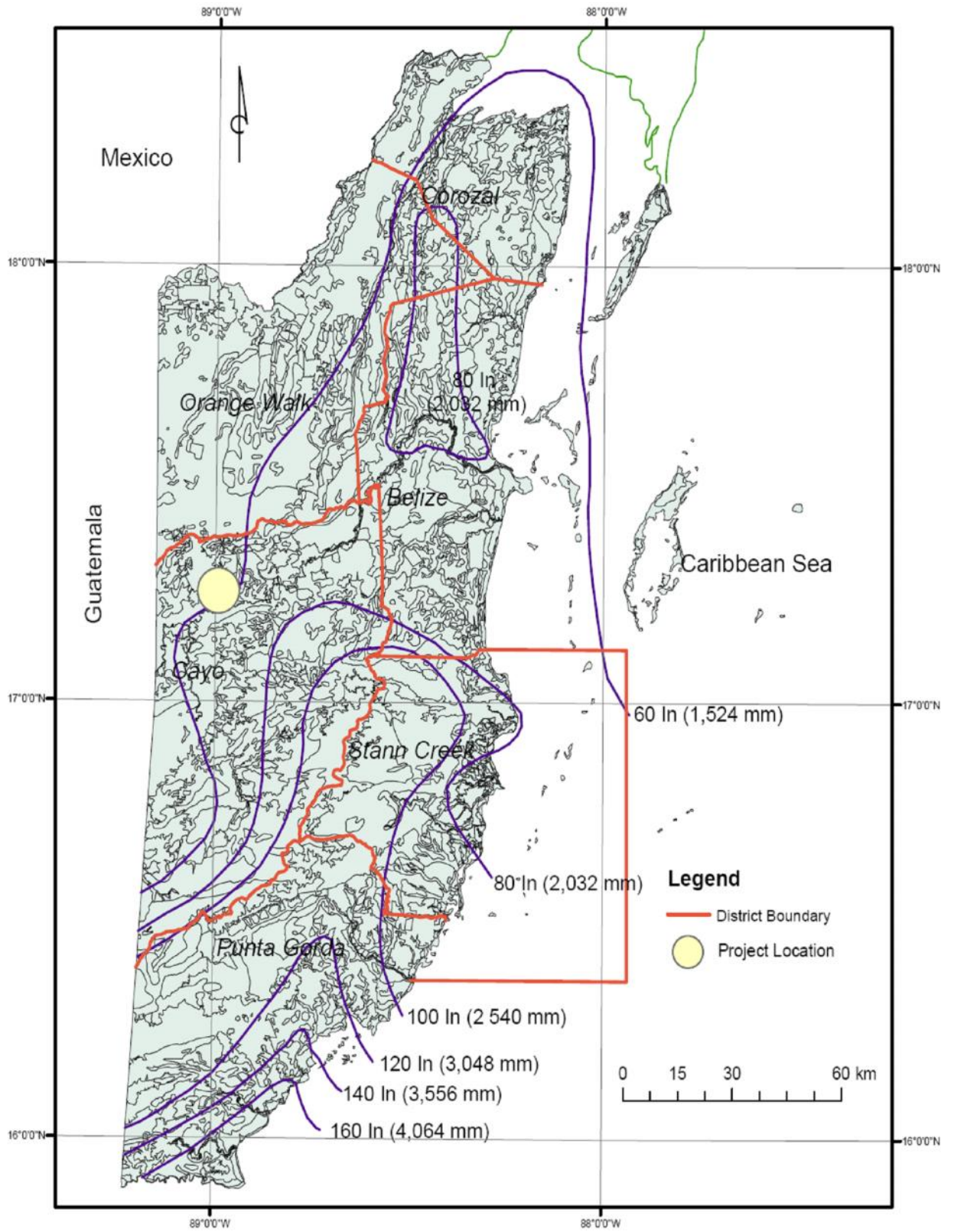


Fig. 2.2 Watershed Map of Belize



Isopleth Map of Belize

Fig. 2.3 Isopleth Map of Belize

2.4 Ecosystem and Vegetation

As can be seen in figure 2.4, the general ecosystem of the area consists of agricultural lands bordered by some lowland broad leaf forests to the north and lowland savannah in the Iguana Creek area (See Chapter 4). The general vegetation is consistent with grassland pastures characteristic of the agricultural practices of the area. The San Marcos sites are fringed by the lowland broadleaf forests as opposed to the Spanish Lookout sites which are on agricultural land.

In the Spanish Lookout area almost all of the original vegetation has been removed to make way for agricultural uses. Only remnants of the original vegetation cover are left along the fringes of the villages and along some of the creeks (although there has been a tendency to clear the forest all the way up to seasonal) and waterways. Most of the area is now under an artificial vegetation cover largely consisting of (introduced) grasses.

The area is dissected by a number of waterways draining towards the Belize River just south of the project area. All of this project area falls within the Belize River watershed, the largest in the country.

In general, the ecosystem of the area is wide and varied as previously described. There for four types of vegetation were identified inclusive of the agricultural grasslands. These are:

- Tropical evergreen seasonal broad leaved lowland forest on calcareous soils
- Tropical evergreen seasonal broadleaf lowland forest over rolling calcareous hills
- Broad-leaved lowland shrub land: Leguminous variant
- Lowland savannah

2.4.1 Protected Areas

The development drilling of the wells or installation of the pipeline does not pass within any ecologically sensitive or protected areas. The land has been intensively altered in characteristic due to the development of agriculture and other industries in the area.

2.4.2 Fire Risk

The proposed project sites are mostly located in the low risk classification of the fire risk map as illustrated in figure 2.5. This is due to the agricultural lands in which the wells will be located. Also, from the figure, it can be noted that the San Marcos wells lie in a portion classified as low risk bordered by the extreme risk classification, in undertaking precaution, BNE will take appropriate measures in the form of site preparation. On the whole, it is anticipated that this risk, due to vegetation cover, does not affect BNE's operation.

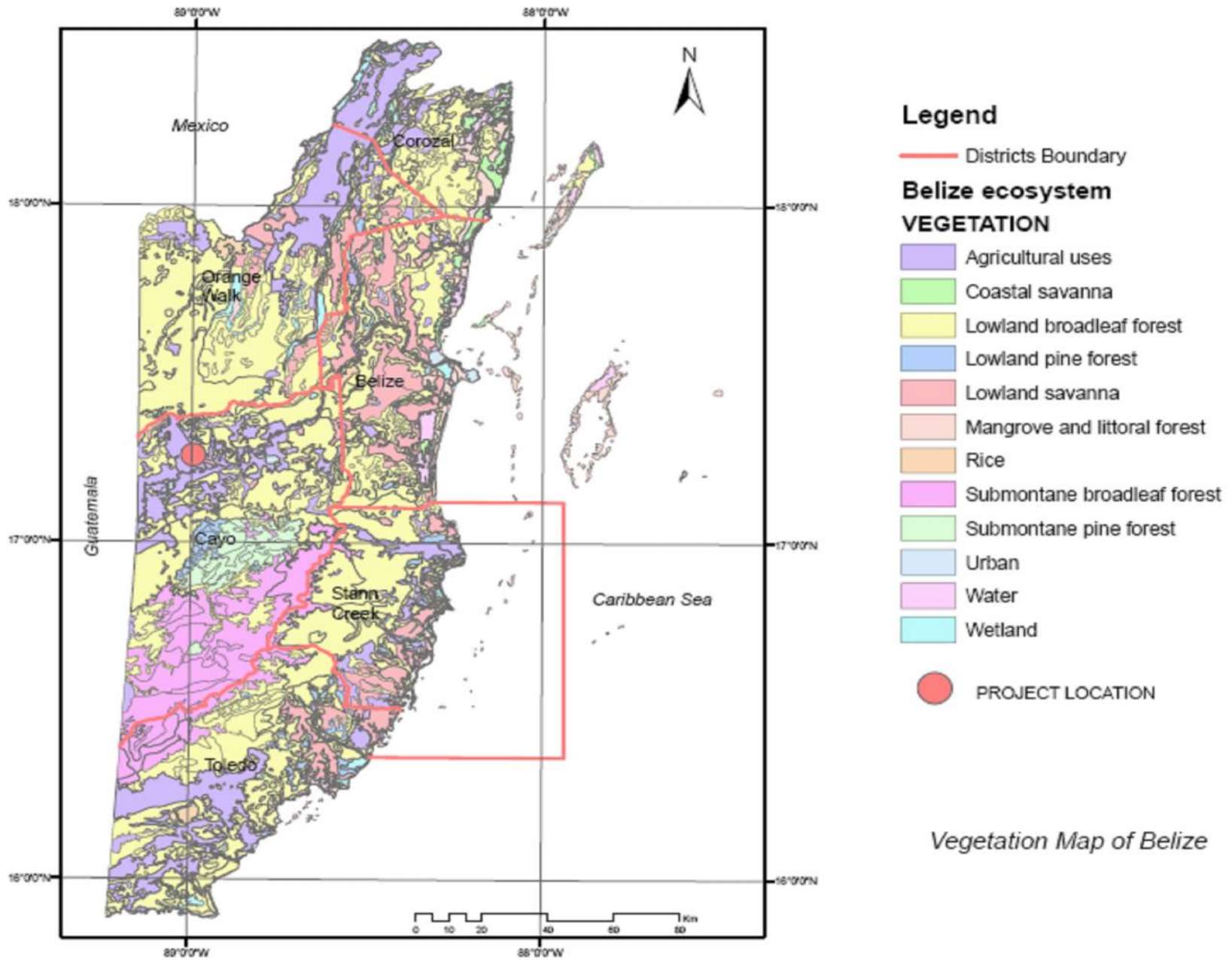


Fig. 2.4 Vegetation Map of Belize

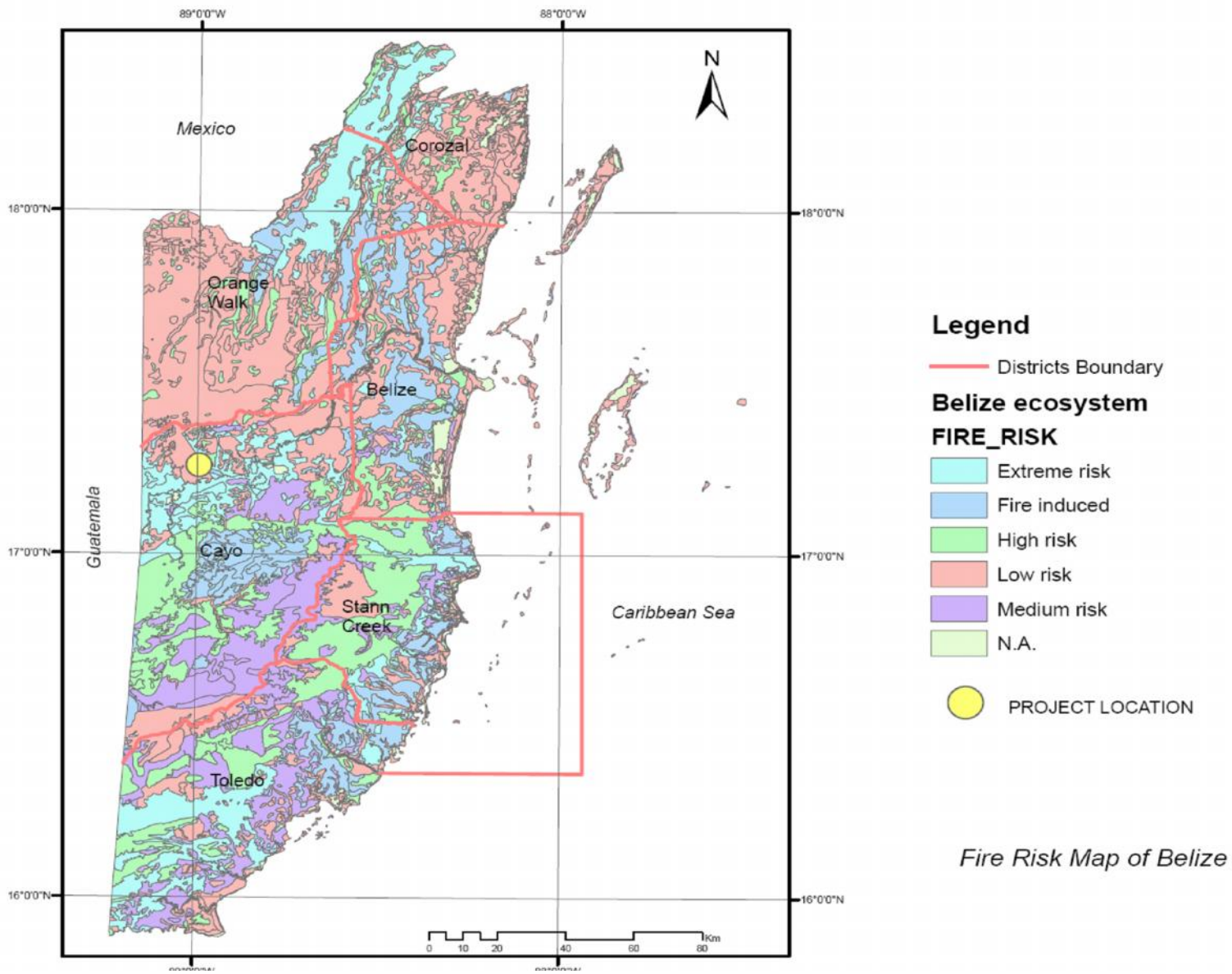


Fig. 2.5 Belize Ecosystem Fire Risk Map

2.5 Seismology

The proposed project sites are located on the Cayo Wrench System, which is a series of medium sized fault lines that run across horizontally across the northern portion of the Maya Mountains and the southern part of the Yalbac Hills. The project sites, however, are not located on any fault or thrust lines but are north of the Coama Calm fault line and south of an unnamed fault line as can be seen in figure 2.6. The Coama Calm Fault intersects the Wrench System and gradually convexes downwards towards the western border line. The project sites or well locations (San Marcos and Spanish Lookout) are not enclosed by any epicenters, but are surrounded by a series of past oil exploration sites.

For Belize, earthquake hazard increases steadily from the north of the country to the south as can be observed in the Maximum Seismic Intensity in Belize (See figure 2.7). Earthquakes that affect the country of Belize occur in the Gulf of Honduras which is the plate boundary zone between North America and the Caribbean. Belize, on occasion would experience mild tremors as a result. The US Geological Survey's National Earthquake Information Center (NEIC) is responsible for the tracking of all these epicenters and according to the NEIC, Belize would experience a 6.0 magnitude on the Richter scale subterranean earthquake in the ocean approximately every 8 years in the fault located between Hunting Caye and Puerto Cortez.

The geological faults near the project site are presented in the geological fault location map for Belize (see figure 2.5). Also, the proposed project sites are located in the < 5.0 magnitude scale (Riechter Scale) and just north of the 5.0 magnitude range (see figure 2.7). With this said, the project sites are prone to only mild seismic activity, if any. Nevertheless, construction works should be carried out in accordance with the regulated building code of Belize.

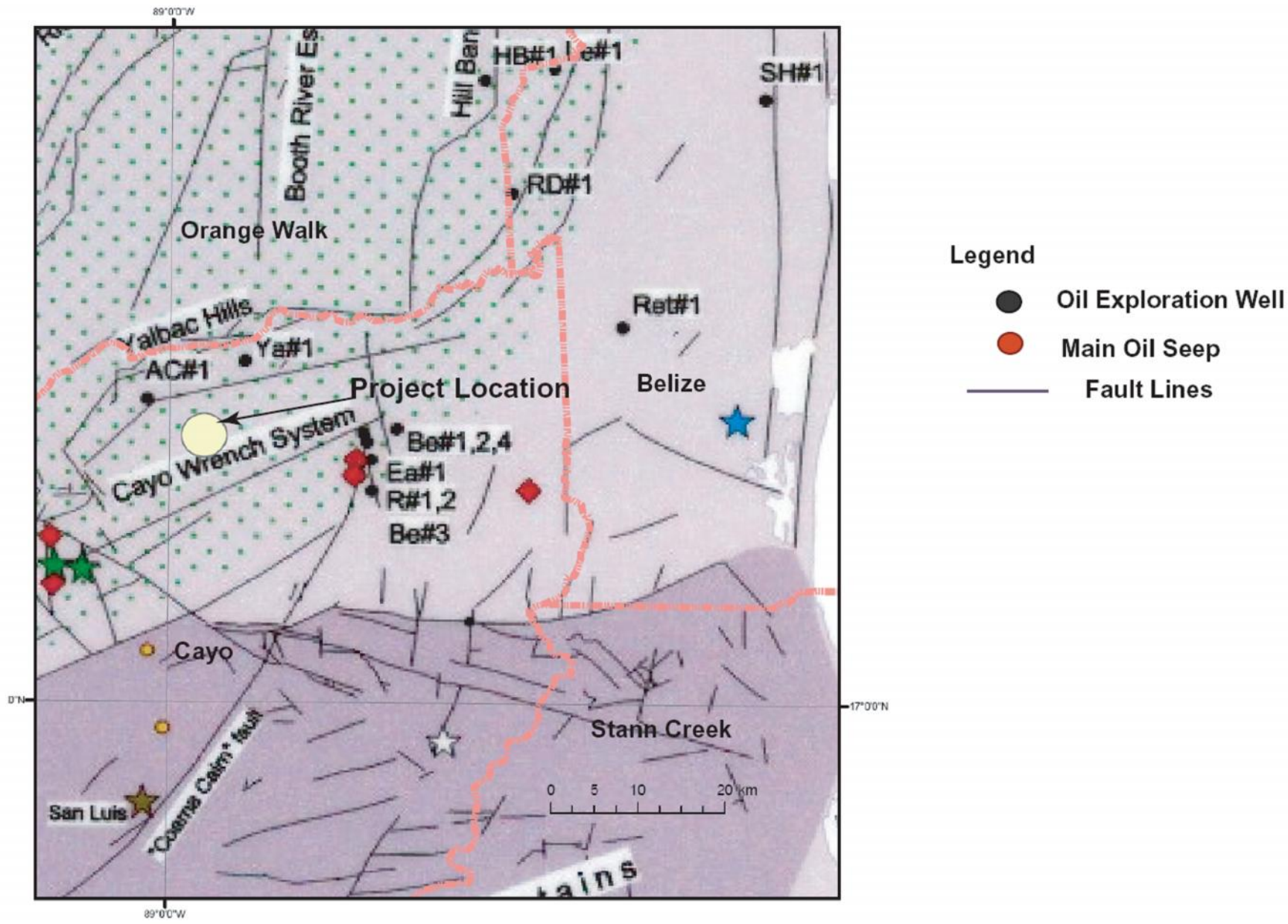


Fig. 2.6 Geological Fault Lines of the Proposed Sites

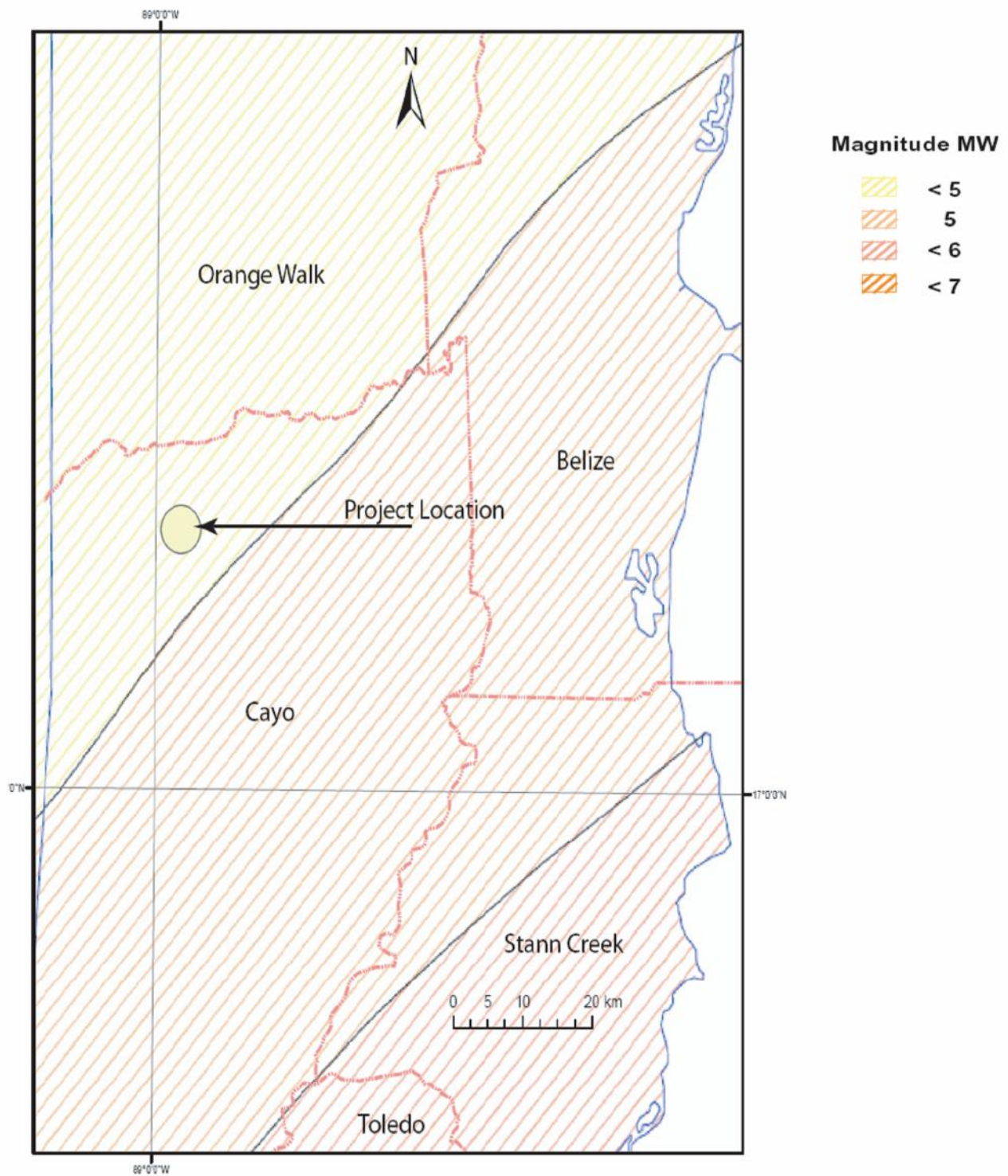


Fig. 2.7 Seismic Intensity Map of the project site