

ASSESSMENT REPORT OF THE SOASOA DRAINAGE SCHEME
FOLLOWING TC YASA AND TC ANA



FEBRUARY 2021

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1.0 Introduction

The Soasoa drainage scheme in Labasa, Vanua Levu was established in the 1970s and consists of a 2,050m levee running along the landward margin of the Qawa river with water discharge outflow structures namely a flap-gate, a four-barrel floodgate and a spillway (Fig.2). To the south the levee continues for a further 1,250m, and there are two flap gates. Over time and compounded by climate change and sea level rise the drainage infrastructure has become inefficient and obsolete. High intensity rainfall events, generated by cyclones and low pressure systems, result in flooding within the lower Soasoa watershed. This adversely affects communities and causes damage to agriculture and especially sugarcane farms, homes, villages and businesses. During flooding events the Wainikoro road is flooded preventing road access and transportation to Labasa. Sea-level rise and inefficient floodgate systems result in saltwater intrusion into sugar cane farms.

The GCCA+ SUPA project is scaling up the Soasoa drainage system. This includes the building of two new floodgates and a new trash rack structure, raising of the levee and upgrade of the spillway, (Fig 3). The measures are intended to reduce the flooding in the Soasoa watershed during high rainfall events. Designs were completed in December 2020.

Late in December 2020, and in January 2021, two cyclones impacted the Northern Division. The first cyclone was a category 5 system, TC Yasa, that tracked over Fiji from 16th – 18th December, 2020 and the second cyclone, TC Ana, a category 2 system tracked across Fiji from 31st January 2021 to 1st February 2021 (Fig.1).

Following these events, SPC together with MoW conducted a damage assessment of the Soasoa drainage scheme from 10th – 12th February 2021. This report documents the results of the assessment and presents recommendations.

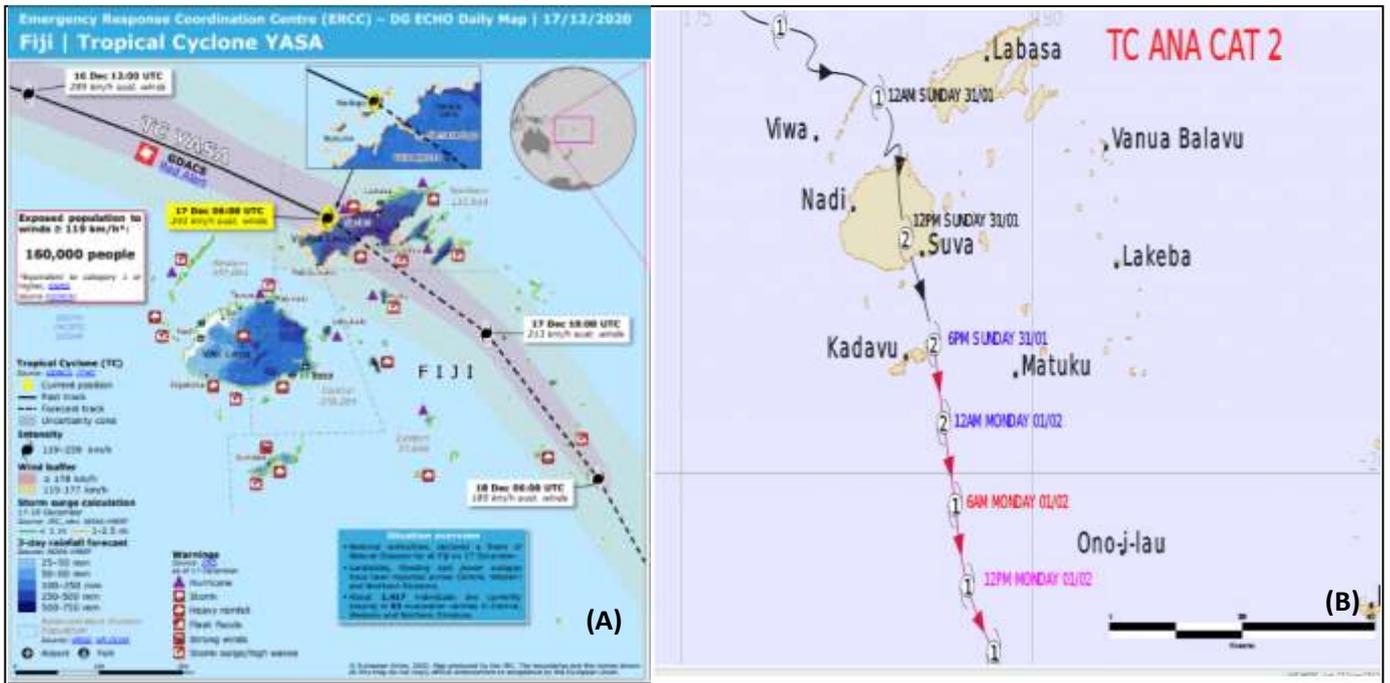


Figure 1 (A): Tropical Cyclone Yasa track, source: GDACS; (B) Tropical Cyclone Ana track, source: Fiji Meteorological Service.



Figure 2: Soosoa drainage scheme satellite view from Google Earth. showing damage assessment locations including levee (yellow line), flap-gate, floodgate and spillway (red circle). Top white lines delineate segments of the levee into 3 segments



Figure 3: Soasoa drainage scheme, zoomed in view from Google Earth, showing proposed sites for scaling up of drainage systems. (Note the widening of the man-made channel will be completed by MoW as part of their maintenance work).

2.0 Damage assessment

The damage assessment was carried along the existing drainage infrastructure namely:

- (i) 4-Barrel floodgate
- (ii) Spillway
- (iii) Culvert and flap-gate
- (iv) Soasoa and Qawa levee – Soasoa levee (from chainage 0 to 2,050m). Qawa levee (from chainage 0 to 1,250m)

An assessment was also carried out of the proposed sites for new drainage structures, namely the trash rack structure and the two double-barrel flood gate structures as shown in Fig. 3 above.

2.1 Existing 4-barrel floodgate

Minor scouring of the banks on both sides of the existing 4-barrel floodgate structure was observed. The minor damages will not affect the construction of the proposed double-barrel flood gate as the section of the levee adjacent to this site is still intact and structurally stable as shown in Figure 4 a-d.



Photo a. Landside of the levee where the existing four-barrel floodgate structure is located.



Photo b. Seaside of the levee where the existing four-barrel floodgate structure is located.

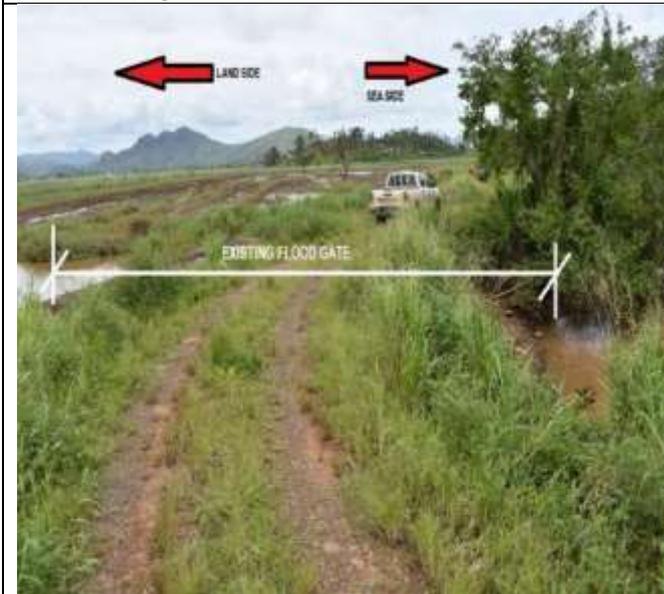


Photo c. Full width of the levee by the existing four-barrel floodgate



Photo d. Top view of the existing four-barrel floodgate

Figure 4 a-d, Photographs of the old 4-barrel Floodgate structure with informative captions.

2.2 Existing spillway

There is a small accumulation of sediment along the landward side of the spillway (Fig. 5b). No signs of damages was observed on the concrete structure including the top, landward side and seaward side of the spillway as seen in figure 5 a, b and c respectively.



Photo a. Spillway structure



Photo b. Small accumulation of sediment along the landside of the spillway structure



Photo c. Seaside of the spillway structure

Figure 5 a-c, Photographs of the existing spillway structure with informative captions.

2.3 Flap gate

The steel trash rack attached to the flap gate structure did not ascertain any damages and continues to function as normal (Fig.6a), however on the opposite end, the flap gate door has been dislodged and is currently held in place by a rope (Fig. 6b).

The MoW team is currently fabricating a new flap gate for this site as well as another site further down the Qawa levee. MoW plan to install the new flap gates as soon as possible and will provide confirmation to the SPC team. Figure 6c shows the man-made channel on the landward side of the flap gate structure, while Figure 6d shows the man-made channel on the seaward side of the existing flap gate. The seaward channel connects to the main Qawa river. The proposed location along the levee for the double-barrel flood gate has not been disturbed.



Photo a. Steel trash rack landward of the existing flap gate



Photo b. Broken flapgate at the exit of the culvert and on the seaward side of the levee.



Photo c. Manmade channel at landward side of the existing levee and the culvert flap gate



Photo d. Manmade channel at the seaward side of the existing levee and culvert flap gate

Figure 6 a-d, Photographs of the existing culvert flap gate structure with informative captions.

2.4 Soasoa and Qawa levee

Inspection of the seawall commenced along the Soasoa levee, from chainage 2,050m to chainage 0, then continued along the Qawa levee, from chainage 0 to chainage 1,250m. The full length of the levee to be raised is $(1,250 + 2,050)$ 3,300m. The Soasoa levee was divided into three segments as shown in figure 2. For each segment, the observed damages are shown in figure 6, 7 and 8 in the subsequent pages.

2.4.1 Soasoa levee segment 1

There was no major physical damage to this first segment. Small depressions containing water were observed on the crest as shown in Fig. 6a. Minor scouring extending for a distance of 10m and a lowering of 0.6m was observed on the seaward side (Fig 6b) and the landward side (Fig. 6c) of the levee.



Figure 6: Photographs of damages observed along levee along segment 1 of levee, with (a) showing depressions on the crest of levee, (b) minor erosion scars on the seaward side of levee and (c) minor erosion scars on the landward side of levee

2.4.2 Soasoa and Qawa levee segment 2

Small, waterlogged depressions were observed at certain sections along the crest of the levee as seen in figure 7b. In addition, certain areas along the landward side of levee had visible erosions (Fig. 7a). a notable erosion was encountered along segment 2 with dimensions of approximately 1.2m in depth and 50m in length as seen in figure 7c.



Figure 7: Photographs of damages observed along segment 2 of levee, with (a) showing minor erosion scars on the landward side of levee, (b) minor depressions on the crest and (c) intermediate level of erosion on the landward side of levee

2.4.3 Qawa levee segment 3

The last segment of the levee was mainly intact with only minor depressions along the crest (Fig. 8c) and superficial scouring on levee banks (Fig 8a). this segment had also several areas of accumulated or deposited sediments along the crest as seen in figure 8b that may have been brought in by moving flood waters during TC Yasa and TC Ana.



Figure 8: Photographs of damages observed along segment 3 of levee, with (a) showing minor erosion scars on the landward side of levee, (b) minor sediment deposits on the crest and (c) depressions on the crest of levee.

2.5 Trash rack site

The location of the proposed trash rack structure along the banks of the Nasuva Creek is intact and stable enough for the trash rack (Fig. 9a, b & c).

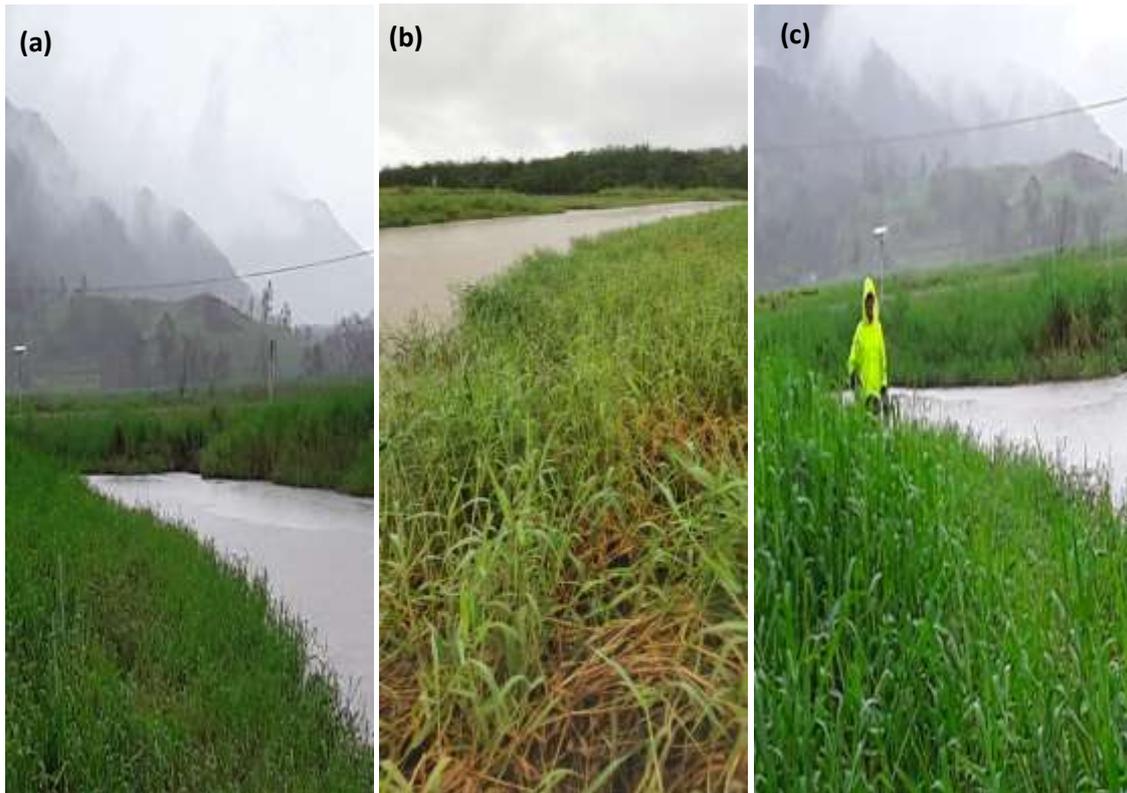


Figure 9: Photographs trash rack site with (a) & (c) showing actual location of proposed trash rack and (b) showing the access area to the trash rack site.

3.0 Conclusions and Recommendation

The findings showed the following damage to the Soasoa drainage scheme:

- Dislodged steel flap gate
- Small scale scouring along sections of the levee including areas adjacent to the Qawa riverbank
- Small accumulation of silt on the landward side of the spillway.

MoW have advised they are in the process of replacing the dislodged flap gate. Furthermore, that the scouring and erosion along the banks of the Qawa River will be addressed by installing boulders, and the scouring along the landward and seaward sides of the levee will be remedied by earth filling as part of MoW's routine maintenance works.

The proposed measures to be implemented by the GCCA+ SUPA project, listed below, have not been compromised:

- i. New 2-barrel floodgate at the site of the old four-barrel floodgate
- ii. New trash rack structure upstream of the old four-barrel floodgate
- iii. Upgrade of the spillway
- iv. New 2-barrel floodgate by the existing culvert flap gate
- v. Raising of the levee

Investigating the possibility of installing more 1.5m culverts with flap gates was also explored during the site assessment. This would help drain floodwater away from the Soasoa flood plain during heavy rainfall events.

A potential site for an additional culvert with flap gate, or a new 2-barrel floodgate, was identified on the north side of the existing culvert with the broken flap gate.

A potential site for an additional trash rack much further upstream was identified and explored.

Based on the findings of this assessment, it is recommended that the request for proposals for the five measures listed above be advertised as soon as possible.