CARITAS Schweiz Suisse Svizzera Svizra

‘Oftobak’

Sanitation facilities

(Caritas Switzerland)

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Contents

1. Executive Summary

This is a brief assessment of the sanitation facilities constructed by Caritas, Switzerland at Oftobak, Khoroson District, Tajikistan.

After an initial site visit and discussion with a local community volunteer it was discovered that the Caritas sanitation facilities were well built, using a brick and concrete construction. The pit for all the latrines was dug to depth of over 2m and in one case this had been flooded with ground water at a depth of 1.70m The evidence suggest that the ground water seeped from underneath the latrine pit and not through the concrete lining.

The contamination potential in its present state is low due to the low seepage rates of loess materials; however, if this issue is to be corrected then the base of the pit needs to be lined and made water proof. This can be achieved by either using a waterproofing agent or if this is not available in Tajikistan then a detergent will increase the density of the concrete and reduce the porosity.

2. Scope

An assessment of the sanitation facilities constructed by Caritas in 21 houses in Oftobak settlement in Khoroson District.

3. Methodology

3.1 Site visit on the 2nd September by S. Stevenson, escorted by Hassan, Community Volunteer currently living in one of the constructed houses.

3.2 Information was collected by taking measurements and discussion with the members of the local community.

3.3 There was further discussion of the results with an international hydrology expert.

4. Results

4.1. Of the 21 houses Caritas built, 13 are currently inhabited.

4.2. The sanitation facilities in the occupied houses are currently in use. Those not occupied are not in use.

4.3. The Caritas sanitation facility is constructed of a 0.07m concrete lined pit, covered with a concrete slab with a brick construction outhouse. There is no lining at the bottom of the pit. There is a plastic pipe air vent from the pit through the roof of the facility to the outside.. (See photo front page)

4.4. A selective sample of 8 of the 13 pits was examined. Their depth ranged from 1.7m – 2.5m from below ground level. (i.e. 1.70, 2.20, 2.10, 2.35, 2.10, 2.30, 2.38, 2.40m). The current depth of the latrine pits is approximately 6m above the height of the river.

4.5 The pit with a depth 1.70m below the surface level was flooded with groundwater. This pit was located 100m (approx) from the river channel to the East. This was the closest sanitation facility to the river.

4.6. The adjacent sanitation facility constructed by Save the Children was also flooded, but to a higher depth of 1.40m. The Save the Children design used porous cement blocks to line the pit.

Photo 1: Save the Children Sanitation Block made of timber frame /porous concrete blocks

4.7 The Save the Children sanitation facility is made of porous breeze block and a wood frame outhouse.

4.8 The groundwater level drops from 1.40m to deeper than 2.40m over a distance of 50m. (Moving away from the river channel)

4.9 The soil profile appears to be one solid strata of loess soil as determined by the river bank profile. (See photo 2)

4.10 The river is currently (late summer) at low flow. There was evidence of mass erosion on the apex of the meander towards the settlement. The river is approx 8m below the flood plain. It was reported that the river rose to within 20cm of the floodplain level during heavy rains of April. (i.e. time of Kulyob disaster).

Photo 2: Mass River Bank Erosion 100m from Settlement / Solid Loess Strata

4.11 There was evidence of salt deposits along the edge of the river upto half a meter above the current river water level.

Photo 3: Salt Deposits on the River Bank

4.12 There is a 0.5.m deep drainage channel 10m from the flooded sanitation pits. This runs parallel with river. The drainage channel is used as a source of water for washing clothes, watering the garden and livestock. It was reported that water for cooking and drinking was collected from the standpipes.

Photo 4: Hassam stood alongside the 1.5m deep drainage channel used for washing and watering

5. Evaluation

5.1 There is no groundwater in all but one of the sanitation facilities. However, there is evidence of seepage of ground water in the sanitation facility located 100m from the river (i.e. the closest facility to the river). This is at the time of the year when the ground water would be at its low seasonal level (groundwater follows the river height variance with a time lag dependent of the soil structure).

Adjacent to the Caritas sanitation design is a Save the Children Latrine pit, this is also flooded with ground water but to a higher level of 1.40m i.e. 30cm higher.

The evidence suggests that based upon the designs of the two sanitation facilities:

a. Save the Children Design: the porous breeze block design of Save the Children has become saturated and that water is seeping through the pit lining. This has resulted in the reported ground water level of 1.40m deep.

b. Caritas Design: The water table level is 1.70m, 30cm deeper in the Caritas sanitation facility. The difference would imply that seepage is from the bottom of the sanitation pit and not through the concrete lining. The concrete lining is 7cm thick and is acting as a water barrier.

5.2. If the groundwater can only access the sanitation facilities from below and making the assumption that the concrete lining is water proof then the groundwater level and subsequently the material in the pit, will rise and fall with the groundwater level. This would result in minimal seepage from the pit, and only when the ground water level dropped.

5.3 In wind blown silt, sand and clay soil profiles, as indicated by the river bank profile, the hydraulic conductivity rates would be minimal.

a) Material from the pit would only seep out during the dropping of the ground water level.

b) The wind blown material has a low hydraulic conductivity of 1×10^{-2}- 1×10^{2}m/yr.((*http://web.ead.anl.gov/resrad/datacoll/conuct.htm).

c) The groundwater level drops approximately 8m over the 100m to the river. This gradient combined with the hydraulic conductivity of the loess soil minimise the risk of contamination of the drainage channel.

Therefore, it is concluded that the risk of contaminated of the irrigation channel is low under current conditions.

5.4. If the river is in spate there is minimal risk of this water filtrating back and affecting the hydrology around the sanitation facilities due to the low water transmissivity and the 100m distance.

5.5. The groundwater would have to rise another 1m before it became flooded. In the conditions at the time of the visit, there is minimal risk of the groundwater becoming contaminated as the ground water was 1m below the channel.

5.6. There was evidence of dried salt deposits on the soil surface, this will impact on the concrete lining and will speed up the deterioration process over time.

6. Recommendations

6.1. Evaluation of the sanitation facilities when the water table is at its highest. (i.e. possibly May/June).

6.2 Drill a groundwater monitoring well near the sanitation facility in order to assess the groundwater height against the river height over time.

6.2. The use of concrete lining provides better protection for infiltration. The foot of the pit could be lined with a waterproof concrete. The adding of a detergent to the mix means that the less water is required to produce the cement. Therefore, when it dries the cement has a higher density and a lower porosity value. The foot of the pit should have been lined with concrete, possibly 20cm thick to prevent upwards seepage of groundwater.

6.3 The risk to the drainage channel should be monitored to see if there is bubbling in the channel to indicate upward seepage.

6.4 If resources were available a field exercise to determine water transmissivity rates though the local loess.

7. Conclusion

The local variance in the level of the groundwater means that the construction of sanitation facilities was a difficult task. Ideally, the sanitation facilities would have been a water proof lined pit. This can only be achieved by adding waterproofing agent to the concrete whilst mixing, or rendering the blocks with waterproof cement and including a concrete base to the latrine pit. Another option would be to line the cement blocks with a plastic over.

It is believed based upon the river bank profile that the soil predominantly consists of loess material, and that the water transmissivity is low There is also a low hydraulic gradient in the ground water from the settlement over the 100m to river, a drop (Sept) of around 8m. It is therefore concluded that is these assumptions are correct, then any contamination from the Caritas sanitation facilities will seep from the earth base and will be localised around the facility.

It is believed due to the 1m head difference between the bottom of the drainage ditch and the water table, there is minimal risk of contamination of the drainage ditch as water will not seep upwards.