

~~13 March 1999~~

To: Mark Pont, MCI/Quetta

From: Dick Scott, MCI/Lashkar Gah

~~Subject: Repair of Diversion Dikes, Service Roads, Siphons and Underdrains.~~

Fifty years ago when Morrison-Knutson (MKA) built the Boghra Canal there were a series of dikes built to divert desert flood water into siphon crossings, underdrains, wash crossing structures, and for other purposes. Some say that some of the dikes over hilly areas were put there to slow the seasonal winds that would and do carry considerable amounts of silt and sand into the canal. The desert floods do not occur often each year but when they do occur they have the potential for being very destructive. Fifty years of erosion from these floods and wind have damaged and heavily silted these structures as they have taken their toll on the canal itself.

In both Loy Manda siphon 29+878 and Ab Pashak siphon 15+432 the siphon barrels have been exposed by flood excavation putting these structures in danger of damage. In both cases, work has been completed or is in process to protect the barrels of these siphons. At Shovel siphon 39+830 both edges of the horseshoe shaped service roads protruding into the siphon wash have also eroded. The down stream road lost perhaps a quarter of road surface in the flood of 7 February, the flood that took out the Chan-i-Anjir wash foot bridge, which is down stream of this siphon. It is said that the flood topped this service road and passed into the Boghra Canal to some limited extent. If true, the damage was surprisingly small. We have completed fill and compaction work at this siphon. We moved the large diversion stones originally placed by MKA along the edges of the wash-crossing back along the edge of this wash. On the up-stream side, the villagers at some point in history had moved these stones away from the embankment out into the wash channel in an attempt to divert the flood water to reclaim farmable land down-stream in the wash. This action resulted in the siphon service road erosion noted. It also slowed the flow of flood water over the siphon resulting in the accumulation of gravel/silt in the middle of the channel. We moved this accumulation to the outer edges of the channel.

Virtually all the siphons need work of re-channeling, desilting and diversion if they are to be protected from further damage.. In many areas this means repairing or rebuilding the diversion dikes originally built by MKA. At Loy Manda siphon the center of the flood channel is considerably higher than the outer edges causing much of the flood water to flow along the edges and excavate the siphon barrels. Erosion control engineers need to be

consulted on required actions. It would appear that removal of some of the thick brush that has grown in the center of the channel, slowed water and deposited gravel/silt would be required. This would likely help re-channel the flood away from the edges.

In the desert above and southwest of Siphon 46+767 there is a very large earth-filled check dam built by MKA to slow flood water in a very large nullah. MKA built diversion dikes in this area and near the siphon to insure that the flood water would pass into the siphon channel and down a wasteway and not damage the canal. Many of these dikes were badly eroded or washed out over 50 years. The result was that a 32 m. section of right bank canal wall and service road was blown out by flood build up something over one kilometer down stream from the siphon. It is unknown when this break occurred but it would have been within the past 20 years. Each flood season added desert mud and gravel to the canal, and eroded more of the canal wall. The land on this side of the canal is higher than canal waterline so there has been no problem of water loss. We desilted this section of the canal, starting with a tractor with blade in the bed of the channel. There was a lot of compacted erosion material in the bed. We repaired and compacted the canal embankment and service road, and we repaired some of the MKA eroded dikes that had allowed the flood water to flow to this point. Originally they probably should have put in an underdrain at this point.

Two major fill/repairs were completed in the upper reaches of the Boghra canal, each plus or minus 100 yards in length. One is about one km. below the intake on the left bank where up to one half of the service road width had flaked into the canal, reason undetermined. As with many of these breaks, if the flaking had developed far enough, the canal water pressure would have produced a breach flooding farmland and villages. The canal waterlevel at this point is considerably above the surrounding land. At Wasteway number one, 10+930, there was a very large breach in the right bank of the canal that took out the service road completely. Since the breach is on the uphill side, it did not result in water loss but has provided tons of silt with each rain. A large nullah comes out of the desert at this point and originally flowed under the canal via an underdrain which is still intact and open. But during the Russian occupation, this site was a major stronghold of a mujahadin commander (who died there) and his men. The site received major bombardment as evidenced by the holes in the wasteway gates in the process of being replaced. The initial damage to the canal wall occurred at that time. The re-channelled flood water from the nullah continued to eat away at the breach through the years resulting in a huge hole (more than 100 yards) and a lot of silting.

There are numerous places along the Boghra Canal in need of such repair. The examples cited above are perhaps the worst and could

not be ignored in the context of desilting but many others are in full process. Fifty years of erosion and 20 years of maintenance neglect have done and continue to do their work. There are several areas along the canal where villages and farm land are no longer being protected by the MKA built dikes, dikes originally built to protect the canal but later functioned to protect land and people.

We desilted some 15 underdrains in the Nad-i-Ali and north Marja areas. There are more than that number still to be worked on in central and south Marja. These structures are concrete conduits, from one to four barrels in one location depending on potential flood volume from desert nullahs. They are a smaller alternative to the wash crossing structures and siphons to allow desert flood water to pass the Boghra canal. Underdrains allow desert flood water to pass under the Boghra canal rather than collect in pools against the up-hill side of the canal embankment which would act as a dam blocking the original flow of the water down the nullah. This pooling would put pressure on the canal wall with the potential of making a breach. In big flood, the canal wall might be topped which would also take out the wall and the service road. The 7 February flood topped the canal wall in at least three places. Most of the underdrains are blocked with silt accumulation over the past 20 years producing a potential problem.

At about 70+350 (there is no underdrain at this location indicated on the maps we are working with) there is an underdrain where desilting work was started. Work was stopped when the local watermaster informed us that at the time of the mujahadin government(s) a commander had blasted a hole in the concrete barrel of the drain in the middle of the canal. This allowed irrigation water to be tapped from the canal and channelled down the outlet drain to fields that did not have regular water access from other laterals. This was a time when a limited amount of water reached Marja. Apparently the hole was later blocked and the underdrain is presently filled with silt. We did not complete the desilting of this underdrain that can be repaired the next time the water flow is closed. We did not learn of this problem until after the water was again flowing in the canal.

There are a multitude of relatively small repairs and maintenance actions required along most of the Boghra canal to eliminate weak points in the system that could develop into major problems. We addressed a few of these problems during this work period but many more remain untouched. We must plan to address more of these problems during any future work period. Some have the potential for developing into disasters for the Boghra canal. Only a few examples have been noted here.