

ジンバブエ共和国
土地・農業・水産・水・地方再定住省
灌漑局

ジンバブエ国

灌漑開発および流域農業開発に向けた 情報収集・確認調査

ファイナルレポート (附属資料)

2022年2月

独立行政法人
国際協力機構 (JICA)

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附属資料-1

マシngo州中規模灌漑計画で建設された
6 ダムに係る変状・損傷調査結果

附属資料-1-1

マグドゥダム

MAGUDU DAM record of site survey

As of FWL-0.8m

Location	Photo No.	Condition	Evaluation	Proposed Measures
EMBANKMENT				
Upstream	D(1)	Disturbance of riprap, dam body exposure and erosion	B	Since there is no significant collapse or subsidence, it is judged that the embankment stability and water storage function is not affected. However, the exposure of dam body may accelerate the erosion of the embankment, so it is judged that measures are required in the long term.
Downstream	D(2) D(3) D(4) D(5)	Gully erosion on the downstream surface. Erosion depth about 80cm, depression depth 1.8m, width 2.7m, etc. A surface water flow path (ditch) has been created in the downstream direction. Erosion is also observed on both sides of the stairway on the left bank.	B	As no seepage is observed even under high water level conditions, it is judged that there is no affect on the embank stability and water storage function at present. However, the cross-section of the embankment may shrink in the future. In addition, since soil and sand are flowing into the valve house due to erosion, it is judged that measures are needed in the long term.
Crest of dam	D(6)	Disturbance of riprap, dam body exposure and erosion.	B	Even under high water level conditions, there is no seepage on the downstream surface, so the embankment stability and water storage function is not affected. However, the exposure of the dam body may accelerate the erosion of the embankment, so it is judged that measures are required in the long term.
Foot of slope	D(7) D(8) D(9) D(10)	There are collapses due to erosion (the height of the collapses are 1.7m and 1.2m at the largest). In the original riverbed area, trees are growing but there are no signs of wetness. In the downstream, a small stream is observed and connects to the connecting canal (on the flowbed, reddish brown and a film is also observed).	C	The volume of leakage is small even under high water level conditions, so it is judged that the water storage function is not affected. *The erosion at the edge of the embankment will be dealt with as part of rehabilitation of the embankment.
Right side abutment	D(11)	There is no disturbance in the abutment. The land is high mountain. There is farmland on the downstream side.	C	Since no significant deformation is observed, it is judged that no countermeasures are necessary.
Left side abutment	D(12)	At the boundary of the spillway, no disturbance is observed.	C	Since no significant deformation is observed, it is judged that no countermeasures are necessary.

MAGUDU DAM record of site survey

As of FWL-0.8m

Location	Photo No.	Condition	Evaluation	Proposed Measures
SPILLWAY				
Crest	S(1) S(2) S(3) S(4)	Surface concrete peeling at the top and downstream of the weir.(L7.5m/t5cm, h50cm/ t5cm)	B	Management: ZINWA Slightly scrape the entire surface layer and cover it with new concrete.
Apron	S(5) S(6)	No significant damage is observed.	C	Not required: Continue regular monitoring.
Retaining wall	S(7)	No significant damage is observed.	C	Not required: Continue regular monitoring.
SPILLWAY CHANNEL				
All over the structure		No significant damage is observed.	C	Not required: Continue regular monitoring.
CONNECTION CANAL				
Right bank side	C(1)~ (4)(7)(8)	There is a large amount of erosion in two places around the upstream valve house approaching about 6 m to the embankment and 1.5 m to the valve house slope protection work.	A	Management: ZINWA To fill the unevenness of the canal bed, construction of retaining wall along the right bank side and fill of eroded areas by stone masonry and/or soil material.
Left bank side	C(5)	There is a large erosion in the upstream part of the maintenance bridge on the left bank side of the downstream part.	B	To fill of eroded areas by stone masonry and re-build the bridge.
Canal bed	C(6)	The siphon protector is exposed on the riverbed.	A	To cover the siphon lining concrete by stone masonry.
INTAKE				
Inlet	I(1)	The flap valve cannot be opened and closed because there is no opening and closing device on the upstream side.	B	Management: ZINWA Install a new flap valve operation equipment.
Outlet	I(2) ~(3)	The valve house cannot be drained. It is devised to prevent rainwater from flowing into the valve house due to embankment.	C	To keep continuous monitoring.

MAGUDU DAM record of site survey

As of FWL-0.8m

Location	Photo No.	Condition	Evaluation	Proposed Measures
MAIN CANAL				
Whole line	M(1)~(35)	There are cracks in the bottom slab throughout the channel.	C Since it has the plain concrete structure and no water leakage is observed in the surrounding area, observation is required. It is repaired every year and is maintained by ZIMWA. Since there is no significant deformation, it is judged that no countermeasures are necessary.	Management: ZINWA To keep continuous monitoring.
ON FARM Facilities				
Night storage	OF(1)~(6)	Sediment is occurring.	C Sediment is processed every two years and is maintained. There is information that the capacity is insufficient because the field area of the original plan was expanded from 37ha to 53ha now. A pond has been created due to water leakage from Night storage, and this is being maintained to cultivate tilapia. Since there is no significant deformation, it is judged that no countermeasures are necessary.	Management: Nighth storage_ZIMWA On farm.canal_IMC To keep continuous monitoring.
Night storage	OF(2)	The inlet gate has been broken.	B The outlet valve cannot be maintained easily. It is not mandatory to install it. This is because when maintaining the outlet valve, the water level in the night storage should be lowered. Long-term measures are required to repair the downstream sluice valve.	To replace the gate.
On farm canal	OF(7)~(10)	The back soil had been flowing out.	B In future, No back soil filling may collapse the on farm canal, which causes a problem for water distribution. Since the deformation may spread in the long term, it is judged that countermeasures are required in the long term.	To fill of on farm canal embankment.

Evaluation

A	Deteriorations/damages that are already affecting the safety/stability/operation of the facilities or are feared to affect them in near future.
B	Deteriorations/damages that are not affecting the safety/stability/operation of the facilities at present but may affect them in the long term.
C	No deteriorations/damages or no signal of them

MAGUDU DAM



MAGUDU DAM (1)



D(1) Embankment Upstream: Disturbance of riprap, dam body exposure and erosion, growth of plants.



D(2) Embankment Downstream: Gully erosion on the downstream surface. A surface water flow path (ditch) has been created in the downstream direction.



D(3) Embankment Downstream: Erosion depth about 80cm, depression depth 1.8m, width 2.7m, etc.



D(4) Embankment Downstream: Erosion is also observed on both sides of the stairway on the left bank.



D(5) Embankment Downstream: Eroded soil and sand are flowing to the valve house slope. (Excavating around the valve house.)



D(6) Crest of Embankment: Disturbance of riprap, dam body exposure and erosion.

MAGUDU DAM (2)



D(7) Foot of slope: There are collapses due to erosion (the height of the collapses are 1.7m and 1.2m at the largest).



D(8) Foot of slope: In the original riverbed area, trees are growing but there are no signs of wetness.



D(9) Foot of slope: In the original riverbed area, trees are growing but there are no signs of wetness.



D(10) Foot of slope: In the downstream, a small stream is observed and connects to the connecting canal (on the flowbed, reddish brown and a film is also observed).



D(11) Right side abutment: There is no disturbance in the abutment. The land is high mountain. There is farmland on the downstream side.



D(12) Right side abutment: At the boundary of the spillway, no disturbance is observed.

MAGUDU DAM (3)



S(1) Spillway entire: No significant damage is observed.



S(2) Spillway Weir: Surface concrete peeling at the top of the weir.(L7.5m/t5cm)



S(3) Spillway Weir: Surface concrete peeling at the top of the weir.(L7.5m/t5cm)



S(4) Spillway Weir: Surface concrete peeling at the downstream of the weir.(h50cm/ t5cm)



S(5) Spillway Retaining wall(Right side): No significant damage is observed.



S(6) Spillway Retaining wall(Left side): No significant damage is observed.

MAGUDU DAM (4)



S(7) Spillway Apron: No significant damage is observed.



I(1) Intake Inlet: There are no water intake facilities left.



C(1) Connecting Canal: The large erosion is observed on the right bank side (embankment side).
According to the existing photo data, the bank is eroded by about 70cm every year.



C(2) Connecting Canal: The large erosion is observed on the right bank side (embankment side).
According to the existing photo data, the bank is eroded by about 70cm every year.



C(3) Connecting Canal: The large erosion is observed on the right bank side (embankment side).



C(4) Connecting Canal: The large erosion on the right bank side (embankment side) extends beside of the valve house.

MAGUDU DAM (5)



C(5) Connecting Canal: Erosion is also observed on the left bank side (downstream). The bridge has been washed away.



C(6) Connecting Canal: The canal bed has been eroded and the concrete siphon protection are exposed.



C(7) Connecting Canal: The erosion on the right bank side has reached the slope of the valve house.



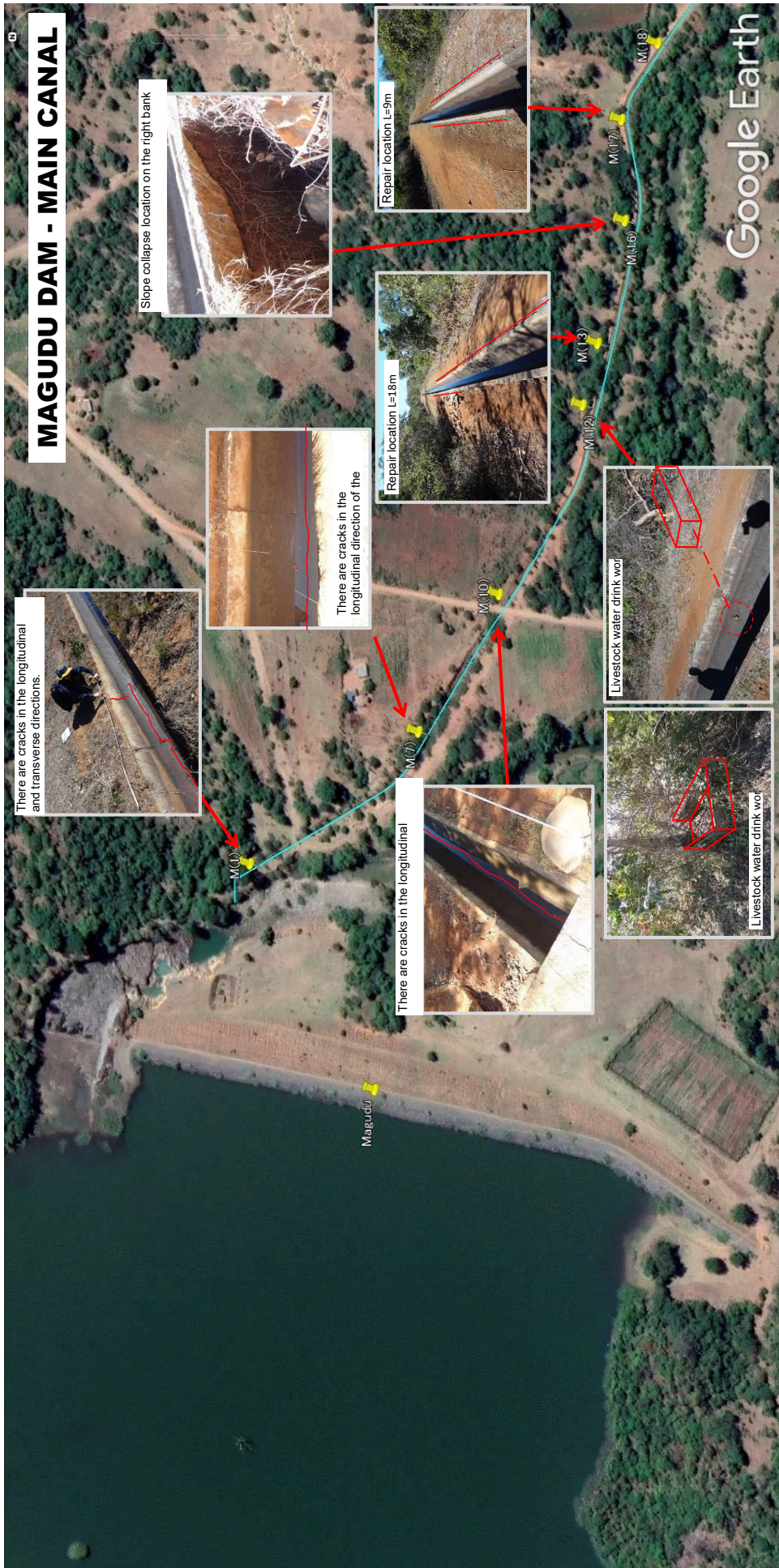
C(8) Connecting Canal:

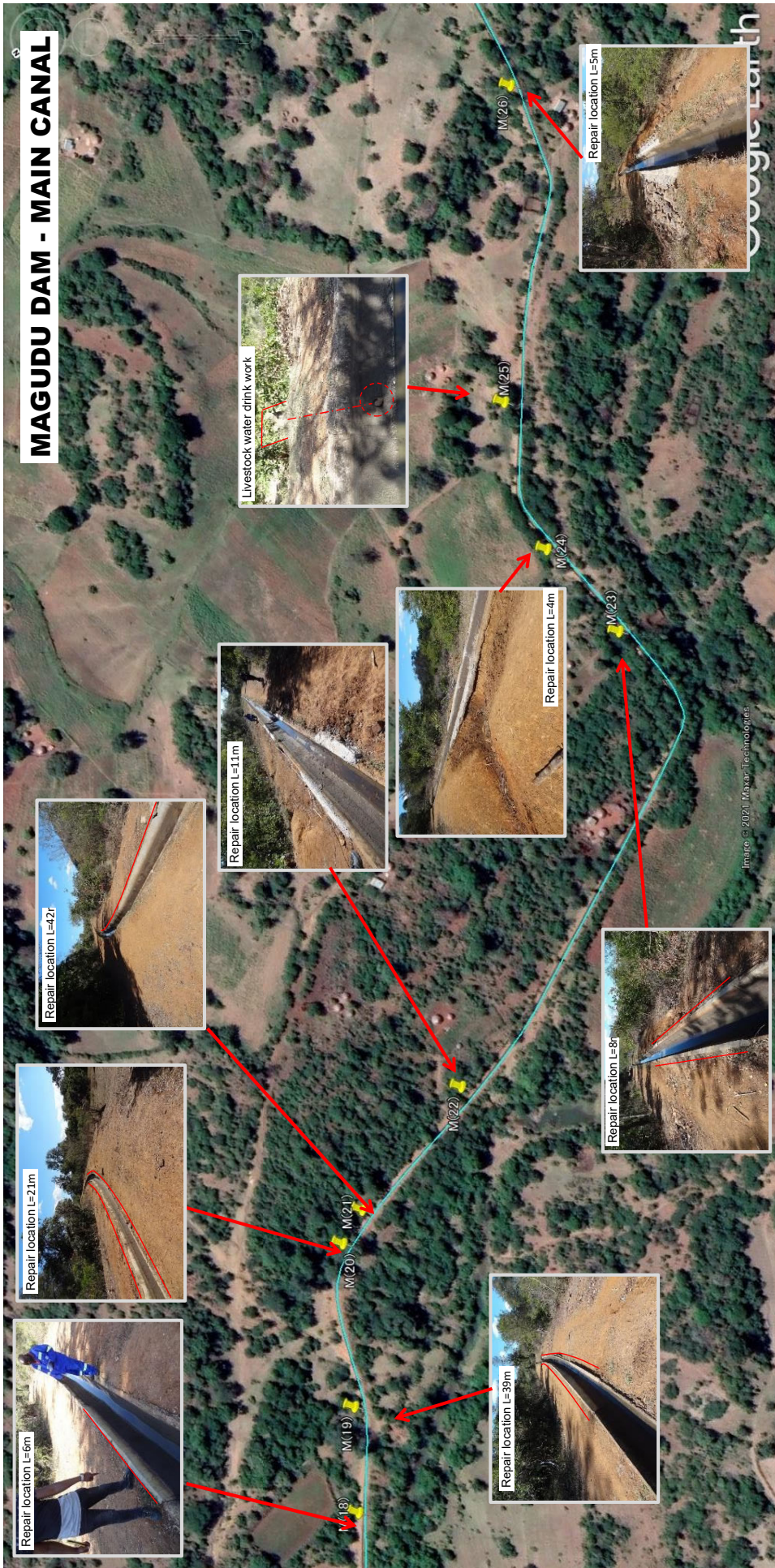


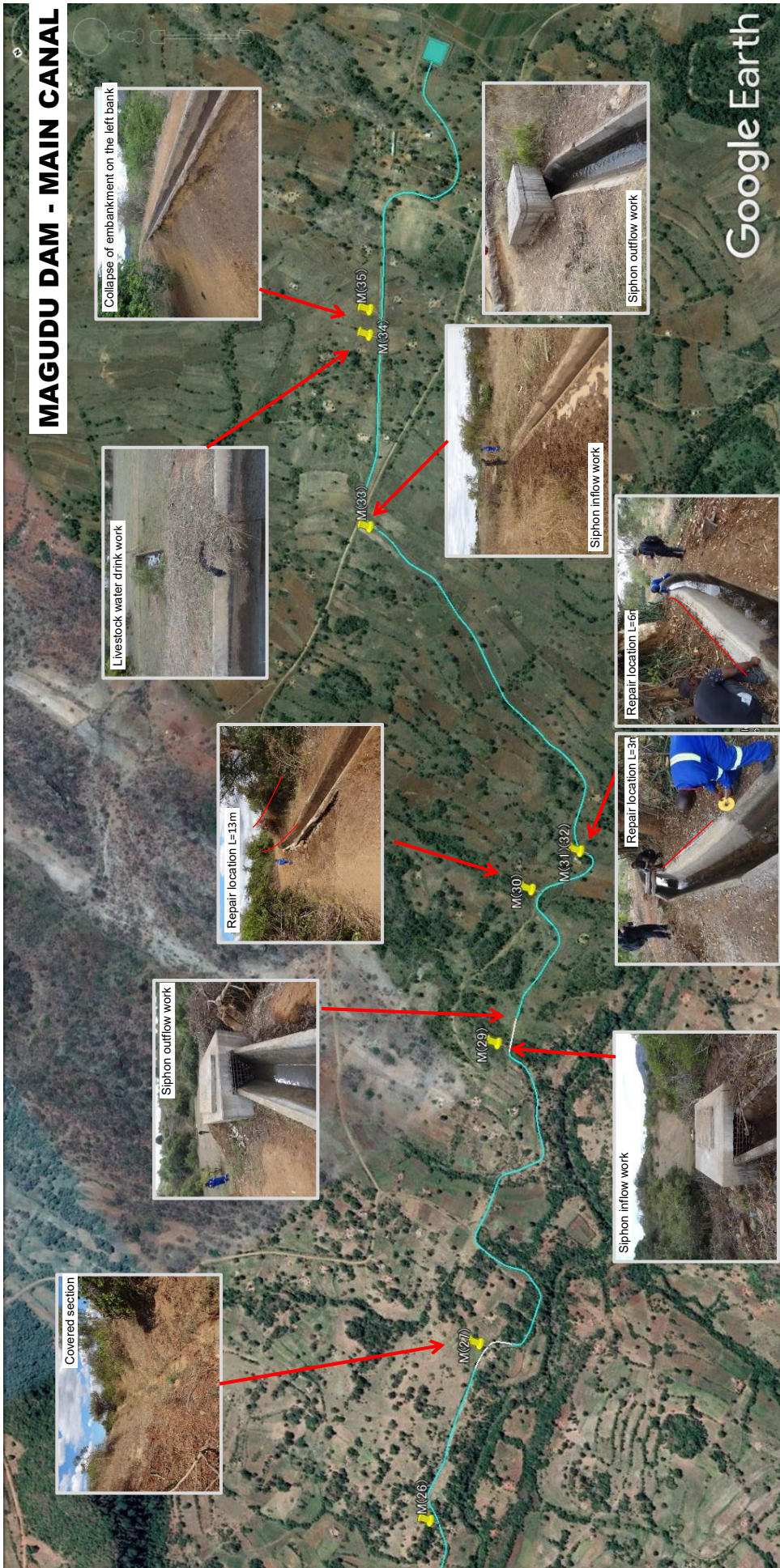
I(1):Inlet: There are no water intake facilities left.



I(2):Outlet (Valve):Good condition.





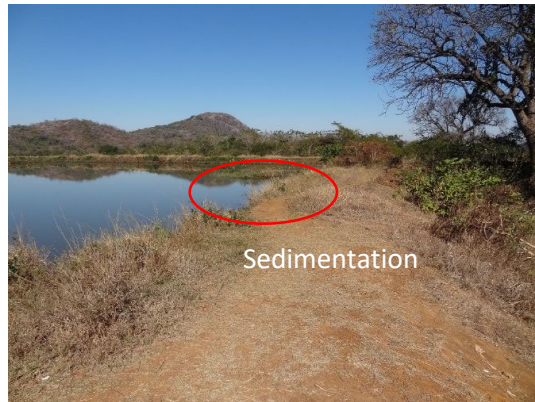


MAGUDU - ON FARM (1)



Night strage body is good condition, but it has a little sedimentation.

OF(1):Night storage(1)



Night strage body is good condition, but it has a little sedimentation at inlet.

OF(2):Night strage(2)



Situation of sedimentation at inlet.

OF(3):Night strage(3)



The upstream gate has broken.

OF(4):Night strage(Upstream gate)



The downstream valve is movable and in good condition.

OF(5):Night strage(Outlet valve)



Good condition.

OF(6):Night strage(Spillway)

MAGUDU - ON FARM (2)



The Canal is in good condition. But there is no embankment on the field side in the entire deliver canal.

OF(7):On farm canal(1)



There are repaired On farm canal by FAO in 2018.

OF(8):On farm canal(2)



Good condition.

OF(7):Diversion(1)



Good condition.

OF(8)Diversion(2)



The back soil is flowing out.

OF(9):On farm canal(3)



The end of the distribution channel is blocked by soil embankment.

OF(10):On farm canal(4)

附属資料-1-2

ムサベレマダム

MUSAVEREMA DAM record of site survey

As of FWL-0.60m

Location	Photo No.	Condition	Evaluation	Proposed Measures
EMBANKMENT				
Upstream	D(1) D(2)	Disturbance of riprap. Dam body exposure and erosion Gully erosion under the riprap which is filled by rocks. Many trees on the edge of the embankment (This makes it impossible to see and pass through, especially on the left side.)	B	Even under high water level conditions, there is no seepage from the downstream slope, so it is judged that there is no impact on the water storage function at this time. However, since erosion and the growth of plants may accelerate the erosion of the embankment, it is judged that measures are required in the long term. In order to prevent the erosion and collapse from recurring, the surface layer should be reshaped with embankment materials, and anti-erosion materials and riprap should be laid. In addition to this, it is necessary to organize regular maintenance and management systems such as tree trimming.
Downstream	D(2) D(3)	Gully erosion on the downstream surface. Downstream flow (ditch) formed by surface runoff is also observed.(ln20cm) Many trees on the left side of the embankment (This makes it impossible to see and pass through, especially on the left side.)	B	To prevent the recurrence of erosion and collapse, reshape the surface layer with embankment materials and install anti-erosion materials and riprap. Alternatively, a new bearing canal can be installed at the top, small step, and at the edge of the slope. In addition to this, it is necessary to organize regular maintenance and management systems such as tree trimming.
Crest of dam	D(4) D(5)	Disturbance of riprap. Many trees on the both edges. (This makes it impossible to see and pass through, especially on the left side.)	B	Re-establish rip-rap and trim trees. In addition to this, it is necessary to organize regular maintenance and management systems such as tree trimming.
Foot of slope	D(6)	The downstream side about 15m from the edge is a wetland. The bed turned reddish brown and a iron bacteria film could be seen. No flow is observed.	C	Not required: Continue regular monitoring.
Right side abutment	D(7)	No significant damage. Abutment area around edge of crest is flat.	C	Not required: Continue regular monitoring.

MUSAVEREMA DAM record of site survey

As of FWL-0.60m

Location	Photo No.	Condition	Evaluation	Proposed Measures
Left side abutment	D(8)	Many trees on and around embankment surface (higher than FWL) making it impossible to look out over and pass through. Out side of edge is flat.	B	Trim trees. In addition to this, it is necessary to organize regular maintenance and management systems such as tree trimming.
SPILLWAY				
Management: ZINWA				
Crest	S(1) S(2) S(3) S(4)	Surface peeling and lack of stones on the top A slight plants on the left bank side	B	The damages are small and do not affect the functioning of the facility at this time, but it is judged to require countermeasures in the long term because of the possibility that the damage will increase with long-term use.
Apron	S(7) S(8)	No significant damage.	C	Since no significant deformation is observed, it is judged that no countermeasures are necessary.
retaining wall	S(5) S(6)	No significant damage.	C	Since no significant deformation is observed, it is judged that no countermeasures are necessary.
Canal	-	-	-	-
SPILLWAY CHANNEL				
Management: ZINWA				
All over the structure		No significant damage is observed.	C	Since no significant deformation is observed, it is judged that no countermeasures are necessary.
CONNECTION CANAL				
Management: ZINWA				
Right side	C(1)	The collapses in both side (those are seen new and being progressing. There are no private houses or other structures in the surrounding area.) Crossing road across canal.	B	To reduce flood velocities and prevent erosion, an attenuation facility can be installed downstream of the weir (rock excavation surface).
Left side	C(2)		B	Construct a bridge.

MUSAVEREMA DAM record of site survey

As of FWL-0.60m

Location	Photo No.	Condition	Evaluation	Proposed Measures
INTAKE				
Inlet	I(1)	The winch is still in place, but the wires are disappeared. There is rusting all over. The handle on the right bank side is movable.	B	Management: ZINWA Install a new spare valve on the downstream side.
Outlet	I(2) ~(3)	The valve house cannot be drained, so it has been submerged.	C	To keep continuous monitoring.
MAIN CANAL				
Whole line	M(1)~ (37)	There are some cracks on the crest and some gaps.	C	Management: ZINWA To keep continuous monitoring.
ON FARM Facilities				
Night storage	OF(1) ~(2)(5)	The night storage is in good condition.	C	To keep continuous monitoring.
Night storage	OF(3)	The inlet gate has been broken.	B	To replace the gate.
Night storage	OF(4)	The original outlet valve has been in no-good condition.	B	To maintain the valve.
On farm canal	OF(6) ~(12)	The on farm canal is in good condition.	C	To keep continuous monitoring.

MUSAVEREMA DAM record of site survey

As of FWL-0.60m

Location	Photo No.	Condition	Evaluation	Proposed Measures
OTHERS				
Barbed-wire fence		The scheme fence has been reduced in strength.	-	-
Bridge	O(1)	There is also bridge downstream, but this is submerged and impassable during the rainy season, making it impossible to get to school.	C	*To prevent entering the canal, construct a new safe bridge.

Evaluation

A
B
C

Deteriorations/damages that are already affecting the safety/stability/operation of the facilities or are feared to affect them in near future.

Deteriorations/damages that are not affecting the safety/stability/operation of the facilities at present but may affect them in the long term.

No deteriorations/damages or no signal of them

Musaverema Dam



MUSAVEREMA DAM (1)



Disturbance of riprap, dam body exposure and erosion
Gully erosion under the riprap which is filled by rocks.

D(2) Embankment Upstream, Downstream:
Many trees on the edge of the embankment
(This makes it impossible to see and pass through, especially on the left side.)



D(3) Embankment Downstream: Gully erosion on the downstream surface.
Downstream flow (ditch) formed by surface runoff is also observed.(h20cm)

D(4) Crest of Embankment: Disturbance of riprap.



D(5) Crest of Embankment: Many trees on the both edges. (This makes it impossible to see and pass through, especially on the left side.)

D(6) Foot of slope: The downstream side about 15m from the edge is a wetland. The bed turned reddish brown and a iron bacteria film could be seen. No flow is observed.

MUSAVEREMA DAM (2)



D(7) Right side abutment: No significant damage. Abutment area around edge of crest is flat.



D(8) Left side abutment: Many trees on and around embankment surface (higher than FWL) making it impossible to look out over and pass through. Out side of edge is flat.



S(1) Spillway Entire: No significant damage.



S(2) Spillway weir: Surface peeling and lack of stones on the top



S(3) Spillway weir: Surface peeling and lack of stones on the top



S(4) Spillway weir: A slight plants on the left bank side

MUSAVEREMA DAM (3)



S(5) Spillway retaining wal (right)!: No significant damage.



S(6) Spillway retaining wall (left): No significant damage.



S(7) Spillway apron: The bed is digged rock. No significant damage.



S(8) Spillway apron: The bed is digged rock. No significant damage.



I(1) Intake Inlet:The winch is still in place, but the wires are disappeared. There is rusting all over. The handle on the right bank side is movable.



I(2) Intake Outlet:The valve has movable and submerged.

MUSAVEREMA DAM (4)



C(1) Connecting Canal: The collapses in both side (those are seen new and being progressing. There are no private houses or other structures in the surrounding area.)

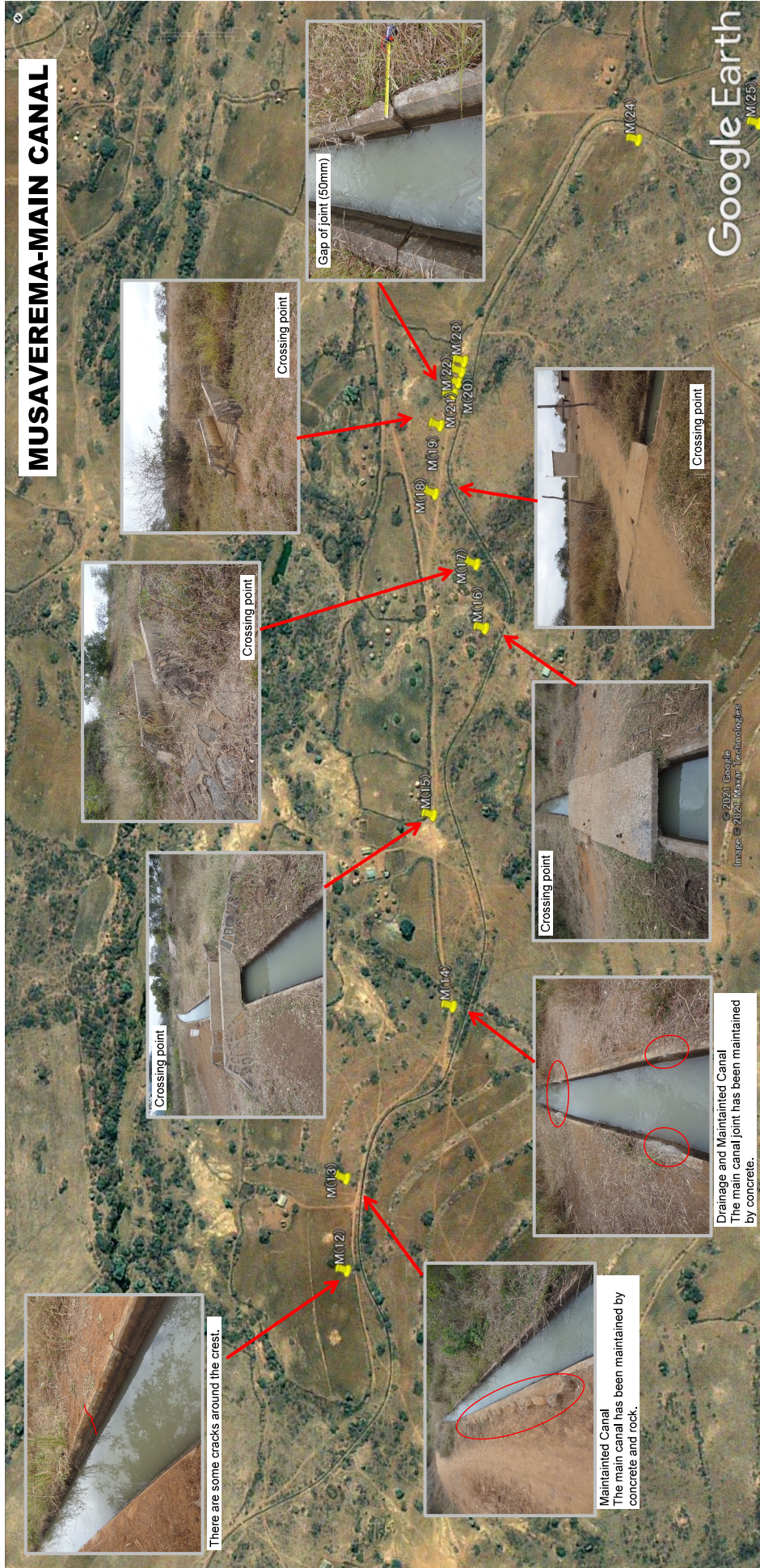
C(2) Connecting Canal: The collapses in both side (those are seen new and being progressing. There are no private houses or other structures in the surrounding area.)



C(3) Connecting Canal: Crossing road across canal. There are also bridges downstream, but they are all submerged and impassable during the rainy season, making it impossible to get to school.

O(1) Others!: There is also bridge downstream, but this is submerged and impassable during the rainy season, making it impossible to get to school.

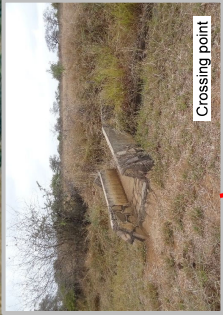
MUSAVEREMA-MAIN CANAL



There are some cracks around the crest.



Crossing point



Crossing point



Crossing point



Gap of joint (50mm)



Maintained Canal
The main canal has been maintained by concrete and rock.



Drainage and Maintained Canal
The main canal joint has been maintained by concrete.



Crossing point

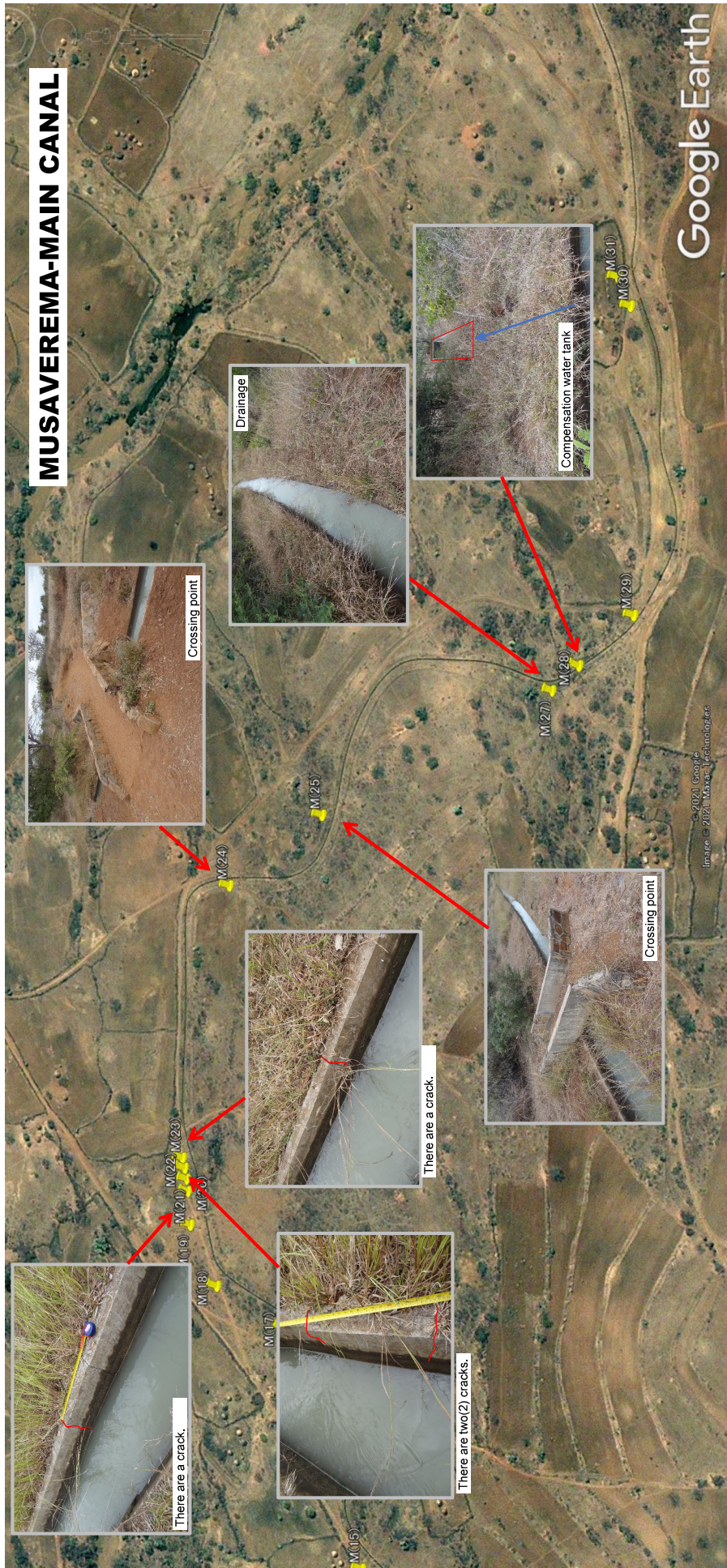


Crossing point

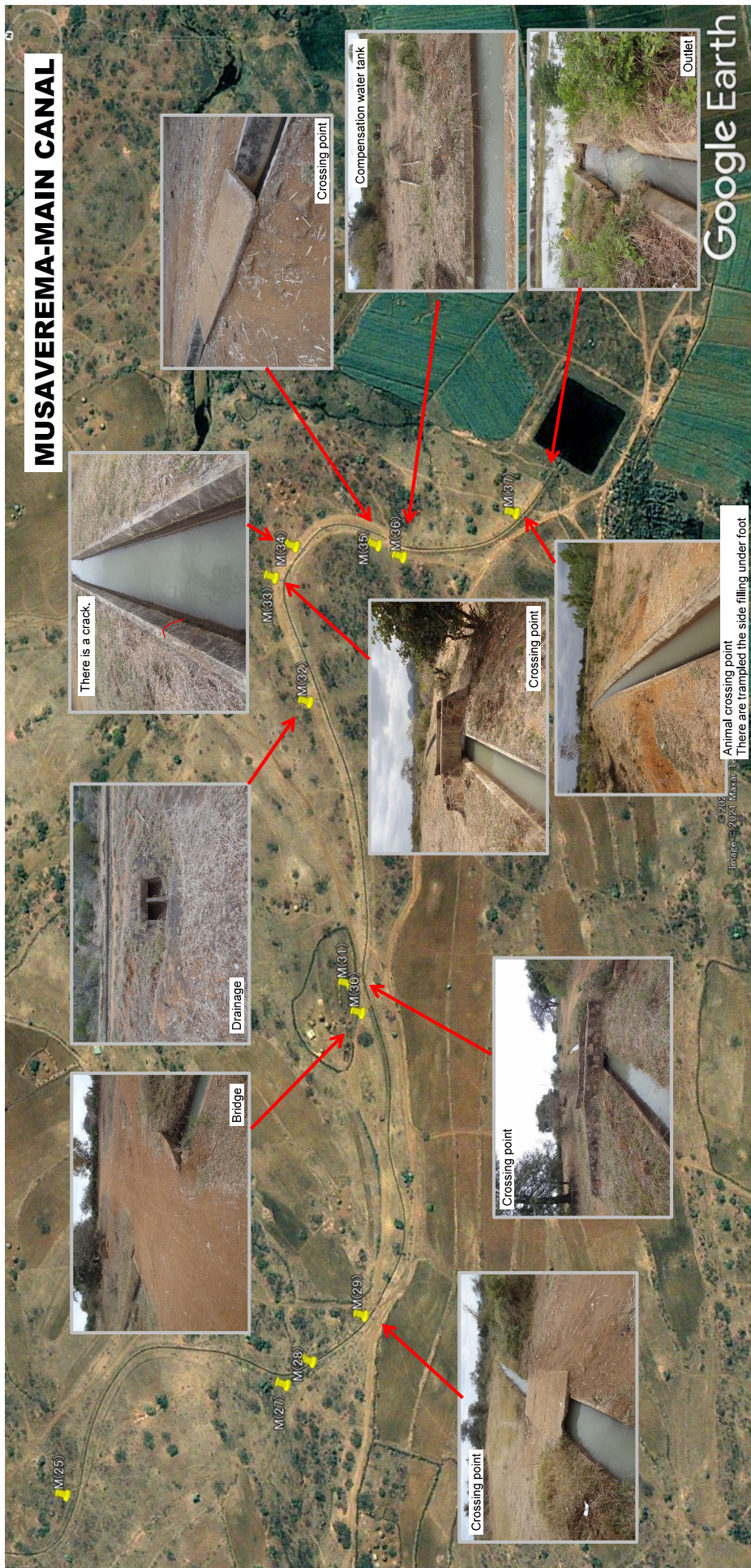
Google Earth

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MUSAVEREMA-MAIN CANAL



MUSAVEREMA-MAIN CANAL



MUSAVEREMA- ON FARM (1)



No sedimentation and good condition.
OF(1):Night storage(1)



No sedimentation and good condition.
OF(2):Night storage(2)



The gate has been broken. (B700xH400)
OF(3):Night storage(Inlet gate)



The valve have a deficit.
OF(4):Night storage(Outlet valve)



Good condition.
OF(5):Night strage(Spillway)



Good condition.
OF(6):Diversion(1)

MUSAVEREMA - ON FARM (2)



The on farm canal has been maintained by farmers committee.

OF(7):Delivery canal(1)



The on farm canal joints have been maintained by farmers committee.

OF(8)On farm canal(2)



The on farm canal has been maintained by farmers committee.

OF(9):Diversion(2)



The on farm canal has been maintained by farmers committee.

OF(10):Diversion(3)



The on farm canal has been maintained by farmers committee.

OF(11):On farm canal(3)



The end of the on farm canal is free discharge.

OF(12):On farm canal(4)

附属資料-1-3

チニャマツムワダム

CHINYAMATUMA DAM record of site survey

* As of FWL-0.20m

Location	Photo No.	Condition	Evaluation	Proposed Measures
EMBANKMENT				
Upstream	D(1)	Dam body exposure, gully erosion under riprap, and trees.	B	<p>Management: ZINWA</p> <p>Re-establish rip-rap and trim trees. In addition to this, it is necessary to organize regular maintenance and management systems such as tree trimming.</p>
Downstream	D(2) D(3) D(4) D(5) D(6)	<p>Dam body exposure, gully erosion under riprap, and trees. Below the first step, there are several sinks (collapsed embankment material is filled with rock material. The largest one is about B2.0m.). In the lower part of it, the soil is exposed in some places.</p> <p>There is no visible seepage or wetting of the slope.</p> <p>Seepage and slight flow at the downstream slope edge.</p> <p>Around here, there are parts where the plants are different from those around them.</p>	B	<p>In order to prevent the erosion and collapse from recurring, the surface layer should be reshaped with embankment materials, and anti-erosion materials and riprap should be laid.</p> <p>In addition to this, it is necessary to organize regular maintenance and management systems such as tree trimming.</p> <p>In addition, a new drainage canal should be installed at the mine edge.</p> <p>If seepage volume shows an increasing trend, water sealing measures such as curtain grouting should be implemented.</p>
Crest of dam	D(7)	Since no significant damage is observed.	C	Not required: Continue regular monitoring.
Foot of slope	D(8)	It is a wetland. The bed is turned reddish brown and a film of iron bacteria can be seen. The flow is slight.	C	Not required: Continue regular monitoring.
Right side abutment	D(9)	No significant damages are observed. Elevation difference is small (hill-like terrain).	C	Not required: Continue regular monitoring.
Left side abutment	D(10)	No significant damages are observed at the boundary with the spillway. Elevation difference is small (hill-like terrain). There is farmland in the upstream side.	C	Not required: Continue regular monitoring.

CHINYAMATUMA DAM record of site survey

* As of FWL-0.20m

Location	Photo No.	Condition	Evaluation	Proposed Measures
SPILLWAY				
Crest	S(1)	Slight damage on the crest Leakage on the downstream side	B	Since the damage is small and leakage is less than that affecting the water storage capacity, it is judged that there is no affect on the function at present. However, since the damage may expand due to long-term use, it is judged that measures are required in the long term.
	S(2)			
	S(3)			
Apron	S(4)	Small rocks, a slight plants, and some water are observed.	C	Since the damage is slight, it is judged that no countermeasures are required.
Retaining walls	S(5) S(6)	No significant damages are observed.	C	Since no significant damage is observed, no measures are required.
SPILLWAY CHANNEL				
Canal	S(7)	Small rocks, a slight plants, and some water are observed.	C	Since the damage is slight, it is judged that no countermeasures are required.
CONNECTION CANAL				
Right bank side	C(1)	No significant damages are observed. A slight leak can be seen, which seems to have flowed down the back of the canal. Collapse of both banks at the end of the spillway canal(right: L5m,B1.5m,H6m left: L4m,B3.5m,H6m). Crossing road across canal	B	As for the collapse at the end of the spillway canal, it is judged that no urgent measures are required at this time, as there is enough distance from the embankment and houses, and no rapid progress can be identified. However, if the collapse progresses due to long-term use, it may affect the sidewalk on the left side of the river, so it is judged that measures are required in the long term. Also, entering the canal must be prohibited.
	C(2)			
Left bank side	C(3)		B	
	C(4)			
INTAKE				
Inlet	I(1)	The flap valve at the inflow port stays open all the time, It has been stolen.	B	The water inlet is remain open and the intake volume can be controlled by the downstream valve, so there is no affect on the function at present. However, since the water cannot be shut off when the downstream valve needs to be repaired, it is judged that measures will be required in the long term.
Outlet	I(2)	The valve has movable and submerged.	C	The valve is submerged, but there is no problem in operation. To keep continuous monitoring.

CHINYAMATUMA DAM record of site survey

* As of FWL-0.20m

Location	Photo No.	Condition	Evaluation	Proposed Measures
Pump	PS(1) ~(10)	FAO upgraded from two (2) diesel pumps to two (2) electric pumps in 2016. The replaced pump cannot deliver required volume to the night storage due to insufficient electricity current volume.	B	The Power current is low (55-60A) and requires about 80A. This due to transmission loss since transformer is located 500m away from the pump station. Replace the transformer.
PIPE LINE Management: ZINWA				
Pipeline	PL(1) ~(7)	The pipeline is properly maintained.	C	There is no water leakage from the pipeline, so there is no problem. To keep continuous monitoring.
Air valve	PL(3)(5)	The one(1) air valve is in good condition, but the other has a very small amount of leakage.	B	Two air valves are no problem with water flow. The air valves are checked by FAO in 2016. But it is not necessary to measures immediately. To maintain the air valve.
ON FARM Facilities Management: IMC				
Night storage	OF(1) ~(5)	No sedimentation and good condition. Night storage is properly maintained.	C	There is no water leakage from the night storage, and no sedimentation, so there is no problem in future. To keep continuous monitoring.
On farm canal	OF(6) ~(14)	The on farm canal has not been distributed for more than 5 years and is not maintained. The distribution canal embankment on the back is flowing out.	B	The lack of on farm canal embankment is in danger of collapsing. But it is not necessary to measures immediately, embankment. To fill of on farm canal embankment.
OTHERS				
			-	

Evaluation

A	Deteriorations/damages that are already affecting the safety/stability/operation of the facilities or are feared to affect them in near future.
B	Deteriorations/damages that are not affecting the safety/stability/operation of the facilities at present but may affect them in the long term.
C	No deteriorations/damages or no signal of them

Chinyamatumwa Dam



CHINYAMATUMWA DAM (1)



D(1) Embankment Upstream: Dam body exposure, gully erosion under riprap, and trees.



D(2) Embankment Dam body exposure, gully erosion under riprap, and trees.



D(3) Embankment Downstream: Below the first step, there are several sinks (collapsed embankment material is filled with rock material. The largest one is about B2.0m.). In the lower part of it, the soil is exposed in some places.



D(4) Embankment Downstream(left): Seepage at the downstream slope edge.



D(5) Embankment Downstream(right): Seepage and slight flow at the downstream slope edge.



D(6) Embankment Downstream: Seepage and slight flow at the downstream slope edge. Around here, there are parts where the plants are different from those around them.

CHINYAMATUMWA DAM (2)



D(7) Crest of Embankment: Since no significant damage is observed.



D(8) Foot of slope: It is a wetland. The bed is turned reddish brown and a film of iron bacteria can be seen. The flow is slight.



D(9) Right side abutment: No significant damages are observed. Elevation difference is small (hill-like terrain) .



D(10) Left side abutment: No significant damages are observed at the boundary with the spillway. Elevation difference is small (hill-like terrain) .
There is farmland in the upstream side.



S(1) Spillway entire: No significant damages are observed.



S(2) Spillway weir: Slight damage on the crest.

CHINYAMATUMWADAM (3)



S(3) Spillway weir: Leakage on the downstream side



S(4) Spillway apron: Small rocks, a slight plants, and some water are observed.



S(5) Spillway Retaining walls(right): No significant damages are observed.



S(6) Spillway Retaining walls(left): No significant damages are observed.



S(7) Spillway canal: Small rocks, a slight plants, and some water are observed.

CHINYAMATUMWA DAM (4)



I(1) Intake Inlet: The flap valve at the inflow port stays open all the time, It has been stolen.

I(2) Intake Outlet: The valve has movable and submerged.



C(1) Connecting Canal: No significant damages are observed. A slight leak can be seen, which seems to have flowed down the back of the canal.

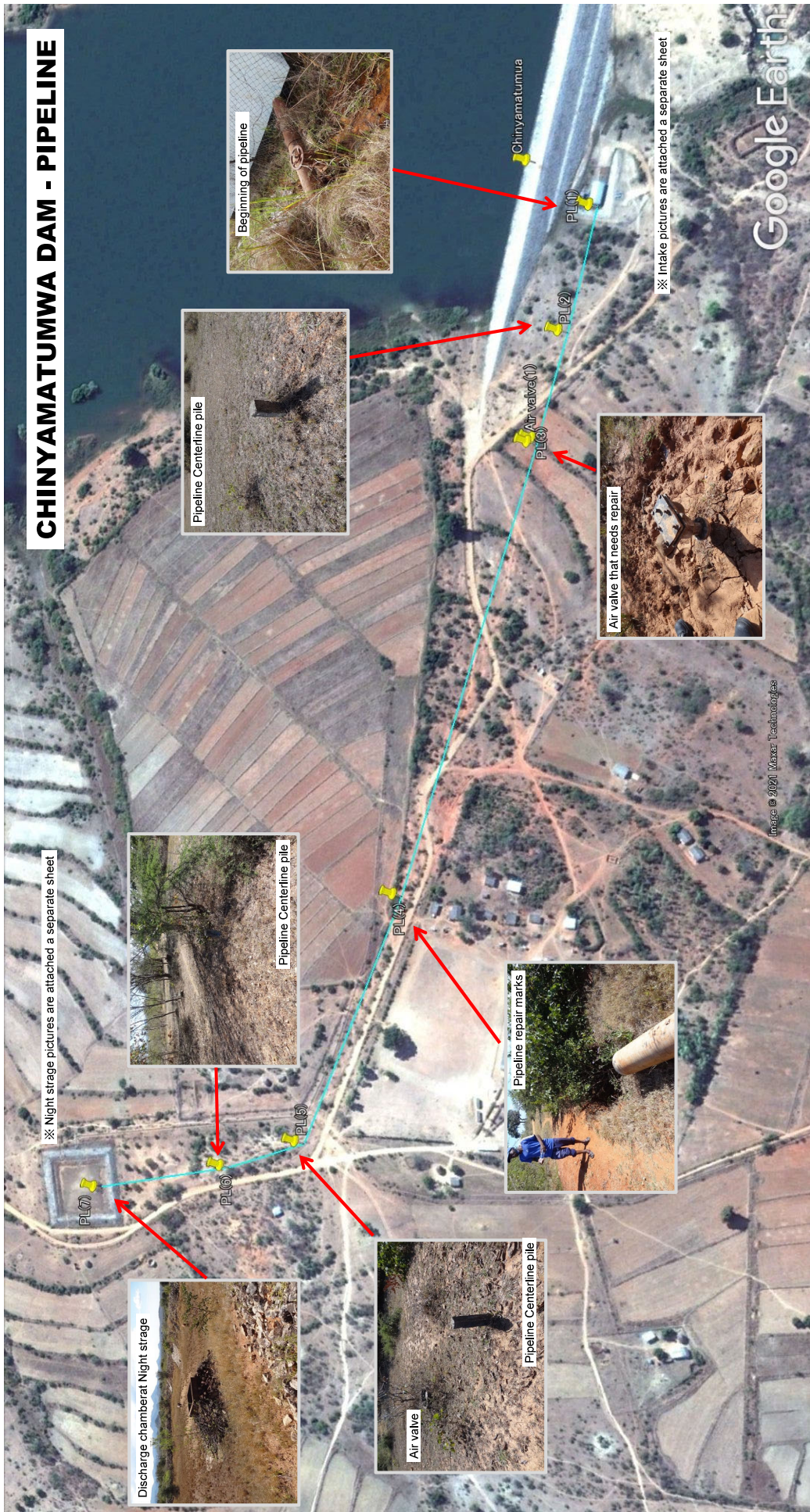
C(2) Connecting Canal: Crossing road across canal



C(3) Connecting Canal: Collapse of both banks at the end of the spillway canal (right: L5m, B1.5m, H6m).

C(4) Connecting Canal: Collapse of both banks at the end of the spillway canal (left: L4m, B3.5m, H6m).

CHINYAMATUMWA DAM - PIPELINE



CHINYAMATUMWA DAM - PUMP STATION(1)



PS(1): Full view of pump station



Rusted float valve

PS(2): Float valve



Electric pump equipment has been installed by FAO in 2016.

PS(3): Full view of pump



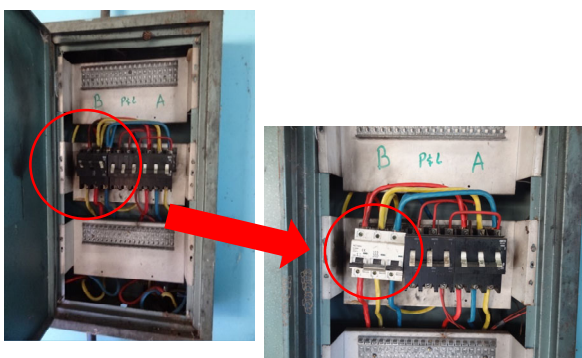
Maximum lift: 52.20m, Flow rate: 150.1m³/hr

PS(4): Name plate of pump



Dustproof / waterproof motor (IP55)

PS(5): Name plat of electric motor



Circuit breaker has been replaced by DOL on 7th July, 2021.

PS(6): Switchboard

CHINYAMATUMWA DAM - PUMP STATION(2)



The Power current is low (55-60A) and requires about 80A.

PS(7):Operation board

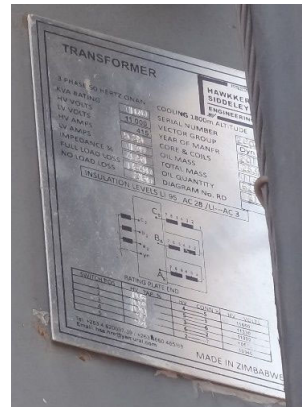


PS(8):Power receiving board



Installed by ZESA.

PS(9):Transformer



Convert from 11,000V to 415V.

PS(10):Name plate fo transformer

CHINYAMATUMWA DAM - ON FARM(1)



No sedimentation and good condition.
OF(1):Night storage (1)



No sedimentation and good condition.
OF(2):Night storage(2)



Good condition.
OF(3):Night storage (Spillway)



Good condition.
OF(4):Night storage(Distribution hole)



Good condition.
OF(5):Night strage (Distribution facility)



Good condition of movable gate and divirsion.
OF(6):Diversion

CHINYAMATUMWA DAM - ON FARM(2)



This on farm canal has not been distributed for more than 5 years and is not maintained.

OF(7):On farm canal(1)



The embankment on the back is flowing out.

OF(8):On farm canal(2)



The diversion and on farm canal that have been renovated in the past.

OF(9):On farm canal(3)



The on farm canal that has been renovated in the past.

OF(10):On farm canal(4)



The on farm canal that has been renovated in the past.

OF(11):On farm canal(5)



The end of the on farm canal is free discharge.

OF(12):On farm canal(6)

附属資料-1-4

マシヨコダム

MASHOKO DAM record of site survey

As of FWL-0.55m

Location	Photo No.	Condition	Evaluation	Proposed Measures
EMBANKMENT				
Upstream	D(1)	Many trees (making it impossible to see the condition of the surface) . Partially disturbed riprap and exposure of dam body.	B	Trim the all of trees and the surface layer should be reshaped with embankment materials, and anti-erosion materials and riprap should be laid. In addition to this, it is necessary to organize regular maintenance and management systems such as tree trimming.
	D(2)			
	D(3)			
Foot of slope	D(4)	Wetness is observed, but there is no flow.	C	Not required: Continue regular monitoring.
Right side abutment	D(5)	Many trees (making it impossible to see the condition of the surface) . No damage is observed at the boundary between the	C	Not required: Continue regular monitoring.
Left side abutment	D(6)	There is no damage. The abutment is about 2 m higher than the crest (like a hill). There is a house in the downstream.	C	Not required: Continue regular monitoring.
SPILLWAY				
Crest	S(1)	No significant damage.	C	Not required: Continue regular monitoring.
	S(2)			
Apron	S(5)	A few rocks and cracks are observed on the bottom. There is no scouring at the bed. Low plants in joints.	C	Not required: Continue regular monitoring.
	S(6)			
Retaining wall	S(3) S(4)	Efflorescence from cracks (not draining from drainage holes).	C	Not required: Continue regular monitoring.
SPILLWAY CHANNEL				
Canal	S(7)	The end of the spillway canal is a gabion works of L4.5m (50cm). There is no erosion. Crossing road across canal.	B	A bridge will be built to cross the river.
	S(8)			

MASHOKO DAM record of site survey

As of FWL-0.55m

Location	Photo No.	Condition	Evaluation	Proposed Measures
CONNECTION CANAL				
Right side		No significant damage is observed.	C	Management: ZINWA Not required: Continue regular monitoring.
Left side		No significant damage is observed.	C	Management: ZINWA Not required: Continue regular monitoring.
INTAKE				
Inlet	I(1)	Missing of the wires (The water can be taken. Gate is fully open anytime it cannot be controlled). Rusting all over	B	Management: ZINWA Install a new spare valve on the downstream side.
Outlet	I(2)	The valve is movable and there is no problem.	C	To keep continuous monitoring.
MAIN CANAL				
Whole line	M(1) ~(10)	The main canal has been rebuilt on the wall of the original channel at a height of 150 mm.	C	Management: ZINWA To keep continuous monitoring.
ON FARM Facilities				
Night storage	OF(1) ~(4)	The night storage is in good condition. The outlet valve is movable. The spillway is in good condition.	C	Management: Nighth storage_ZIMWA On farm canal_IMC To keep continuous monitoring.
On farm canal	OF(5)(6) (9)~(12)	The on farm canal back soil has been flowied out.	B	To fill of on farm canal embankment.
On farm canal	OF(7)	The sluice gata has been broken.	B	To replace the gate.
On farm canal	OF(8)	The diversion has a small amount of water leaks.	C	To keep continuous monitoring.

Evaluation

A

B

C

Deteriorations/damages that are already affecting the safety/stability/operation of the facilities or are feared to affect them in near future.

Deteriorations/damages that are not affecting the safety/stability/operation of the facilities at present but may affect them in the long term.

No deteriorations/damages or no signal of them

Mashoko Dam



MASHOKO DAM (1)



D(1) Embankment Upstream: Many trees (making it impossible to see the condition of the surface) . Partially disturbed riprap and exposure of dam body.

D(2) Embankment Downstream: ditto



D(3) Crest of Embankment : ditto

D(4) Foot of slope:Wetness is observed, but there is no flow.



D(5) Right side abutment: Many trees (making it impossible to see the condition of the surface) . No damage is observed at the boundary between the embankment and the spillway.

D(6) Left side abutment: There is no damage. The abutment is about 2 m higher than the crest (like a hill). There is a house in the downstream.

MASHOKO DAM (2)



S(1) Spillway over view: No significant damage.



S(2) Spillway crest: No significant damage.



S(3) Spillway Retaining wall (right):
Efflorescence from cracks (not draining from drainage holes).



S(4) Spillway Retaining wall (left):
Efflorescence from cracks (not draining from drainage holes).



S(5) Spillway Apron: A few rocks and cracks are observed on the bottom.
There is no scouring at the bed.
Low plants in joints.



S(6) Spillway Apron: A few rocks and cracks are observed on the bottom.
There is no scouring at the bed.
Low plants in joints.

MASHOKO DAM (3)



S(7) Spillway canal: The end of the spillway canal is a gabion works of L4.5m (t50cm). There is no erosion. Crossing road across canal.



S(8) Spillway canal: The end of the spillway canal is a gabion works of L4.5m (t50cm). There is no erosion. Crossing road across canal.



I(1) Intake Inlet: Wire is missing and equipment is dysfunctional. Rust over all. The left side lever is not functional.

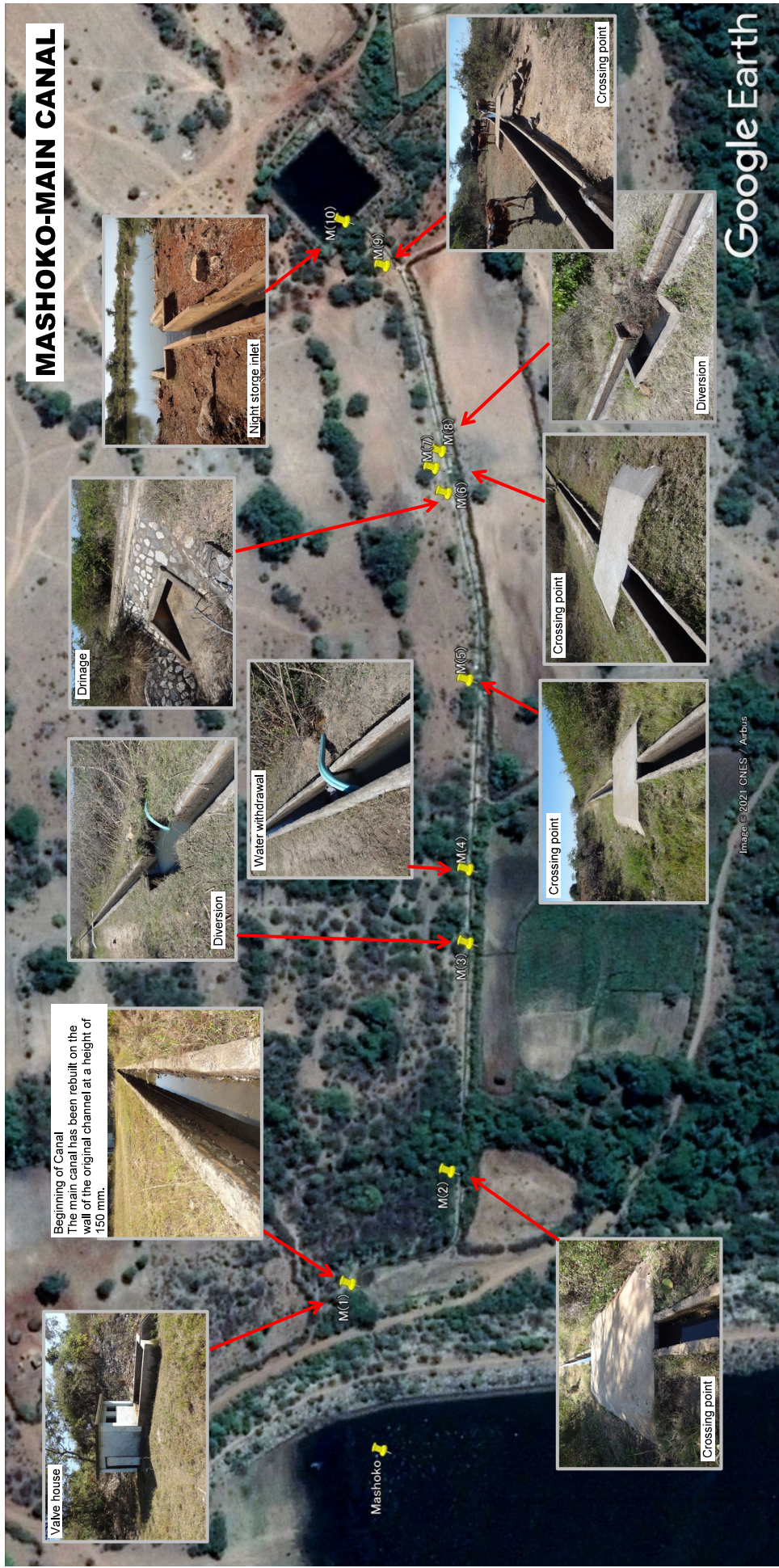


I(2) Intake Outlet: The valve is movable and there is no problem so far.



O(1) Others: A bridge downstream of the canal has been spilled. The right side is on the rocks. The left side, which is the flow route of the connecting canal, has collapsed.

MASHOKO-MAIN CANAL



Google Earth

Image © 2021 CNES / Airbus

MASHOKO - ON FARM (1)



No sedimentation and good condition.
OF(1):Night storage(1)



No sedimentation and good condition.
OF(2):Night storage(2)



The valve is movable and in good condition.
OF(3):Night storage(Outlet valve)



Good condition.
OF(4):Night storage(Spillway)



Good condition.
OF(5):On farm canal(1)



Good condition.
OF(6):On farm canal(2)

MASHOKO - ON FARM (2)



Gate has been broken. (H600xW520)
OF(7):Diversion(1)



A small amount of water leaks, but there is no problem.
OF(8)Diversion(2)



The back soil is flowing out.
OF(9):On farm canal(3)



The back soil is flowing out.
OF(10):On farm canal(4)



The water intake pipe from the on farm canal.
OF(11):On farm canal(5)



The end of the on farm canal is blocked by soil embankment.
OF(12):On farm canal(6)

附属資料-1-5

マプテダム

MABVUTE DAM record of site survey

As of FWL-0.40m

Location	Photo No.	Condition	Evaluation	Proposed Measures
EMBANKMENT				
Upstream	D(1)	Exposure of dam body, gully erosion under riprap, and trees.	B	No significant collapse was observed, and it is judged that there is no affect on the water storage function. However, the sinks and growth of plants may lead to the erosion of the embankment, so it is judged that measures are required in the long term.
Downstream	D(2) D(3) D(4) D(5) D(6)	Riprap is disturbance and dam body is exposed near the crest, edge, and paths. Many trees in the left side. Gully erosion under riprap makes downstream ditch which is filled with rocks. Lower those area, dam body is exposed but there is no seepage. At the both side of slope edge, there are flow route and those eroded the egde. (No flow or wetness.)	B	Even under the high water level condition, there is no seepage on the slope, so it is judged that the water storage function is not affected. However, the collapse of the riprap and the exposure of the embankment materials will lead to the erosion and the reduction of the embankment, so it is judged that measures will be required in the long term.
Crest of dam	D(9) D(10)	There are small amount of trees in the left side.	C	No significant damage is observed, and it is judged that there is no affect on the water storage function. However, the growth of plants may lead to the erosion of the embankment, so it is judged that measures are required in the long term.
Foot of slope	D(7) D(8)	It is a wetland. The bottom turns reddish brown and a film of iron bacteria can be seen. The flow is slight.	C	Even under high water level conditions, the volume of leakage is small, so it is judged that the water storage function is not affected.
Right side abutment	D(11)	No significant damage is observed. The abutment around the edge of the crest is flat.	C	Since no significant damage is observed, no measures are required.
Left side abutment	D(12)	No significant damage is observed between embankment and spillway. The abutment is about 1m higher than the crest, and around there is flat.	C	Since no significant damage is observed, no measures are required.
				Management: ZINWA In order to prevent the erosion and collapse from recurring, the surface layer should be reshaped with embankment materials, and anti-erosion materials and riprap should be laid. In addition to this, it is necessary to organize regular maintenance and management systems such as tree trimming.
				Trim trees. In addition to this, it is necessary to organize regular maintenance and management systems such as tree trimming.
				Not required: Continue regular monitoring.
				Not required: Continue regular monitoring.
				Not required: Continue regular monitoring.

MABVUTE DAM record of site survey

As of FWL-0.40m

Location	Photo No.	Condition	Evaluation	Proposed Measures
SPILLWAY				
Crest	S(2)	Only slight damage (lack of stone) is observed on the top of weir.	C	Management: ZINWA Not required: Continue regular monitoring.
	S(3)	There is small leakage from crack on the downstream, no flow can be seen.		
	S(4)	Slight plants on the left side of weir.		
Apron	S(5)	No scour is observed, and small rocks, plants, and open joints can be observed. Stones are deposited at the upstream end.	C	Management: ZINWA Conduct joint filling work. Cut down and remove boulders.
	S(6)			
Retaining wall	S(7) S(8)	Efflorescence is observed. On the left bank side, leakage of seepage water from the ground (water can be seen, but there is no flow).	C	Management: ZINWA Not required: Continue regular monitoring.
SPILLWAY CHANNEL				
Canal	S(9) S(10)	There is a slight leak from the back of the canal. Although there is no gabion, it may be the result of previous gabions that were washed away because of the rock material scattered around there.	C	Management: ZINWA Not required: Continue regular monitoring.
CONNECTION CANAL				
Right side	C(1)	No significant damage is observed.	C	Management: ZINWA Not required: Continue regular monitoring.
Left side	C(2) C(3)	Collapses next to the spillway canal, but those does not seem to be in progress(L10.0m,B3.0m,H7.0m). Although the canal is used as a road to school, children cannot go to school during the rainy season because of the flow.	B	Management: ZINWA A retaining wall will be built in the collapsed area using stone masonry. The end of the spillway canal will be improved as a drop-off and pond. A bridge will be built to cross the canal.

MABVUTE DAM record of site survey

As of FWL-0.40m

Location	Photo No.	Condition	Evaluation	Proposed Measures
INTAKE				
Inlet	I(1)	No significant damage is observed.	C	Management: ZINWA Not required: Continue regular monitoring.
Outlet	I(2)	The valve is movable and there is no problem.	C	To keep continuous monitoring.
Pump	PS(1) ~(10)	FAO upgraded from the diesel pump to the electric pump in 2016. The other diesel pump can move in standby. The check valve has been under repair at the time of the site visit	C	To keep continuous monitoring.
PIPELINE				
Pipeline	M(1) ~(17)	The pipeline is properly maintained.	C	Management: ZINWA To keep continuous monitoring.
Air valve	M(7)(16))	The air valves are in good condition.	C	To keep continuous monitoring.
ON FARM FACILITIES				
Night storage	OF(1) ~(4)	The night storage is in good condition and no sedimentation.	C	Management: Nighth storage_ZIMWA On farm canal_IMC To keep continuous monitoring.
On farm canal	OF(5) ~(12)	The on farm canal is in good condition. FAO maintained the diversion and the gates in 2016.	C	To keep continuous monitoring.

Evaluation

A
B
C

Deteriorations/damages that are already affecting the safety/stability/operation of the facilities or are feared to affect them in near future.

Deteriorations/damages that are not affecting the safety/stability/operation of the facilities at present but may affect them in the long term.

No deteriorations/damages or no signal of them

Mabvute Dam



MABVUTE DAM (1)



D(1) Embankment Upstream: Exposure of dam body, gully erosion under riprap, and trees.



D(2) Embankment Downstream(right): At the slope edge, there are flow route and those eroded the edge. (No flow or wetness.)



D(3) Embankment Downstream(left): At the slope edge, there are flow route and those eroded the edge. (No flow or wetness.)



D(4) Embankment Downstream: Riprap is disturbance and dam body is exposed near the crest, edge, and paths. The stone is not stable and hard to walk on.



D(5) Embankment Downstream: Riprap is disturbance and dam body is exposed near the crest, edge, and paths. Many trees in the left side.



D(6) Embankment Downstream: Gully erosion under riprap makes downstream ditch which is filled with rocks. Lower those area, dam body is exposed but there is no seepage.

MABVUTE DAM (2)



D(7) Foot of slope: It is a wetland.



D(8) Foot of slope: It is a wetland. The bottom turns reddish brown and a film of iron bacteria can be seen. The flow is slight.



D(9) Crest of Embankment: No significant damage is observed.



D(10) Crest of Embankment: Tree in the left side.



D(11) Right side abutment: No significant damage is observed. The abutment around the edge of the crest is flat.



D(12) Left side abutment: No significant damage is observed between embankment and spillway. The abutment is about 1m higher than the crest, and around there is flat.

MABVUTE DAM (3)



S(1) Spillway entire: No significant damage is observed.



S(2) Spillway weir: Only slight damage (lack of stone) is observed on the top of weir.



S(3) Spillway weir: There is small leakage from crack on the downstream, no flow can be seen.



S(4) Spillway weir: Slight plants on the left side of weir.

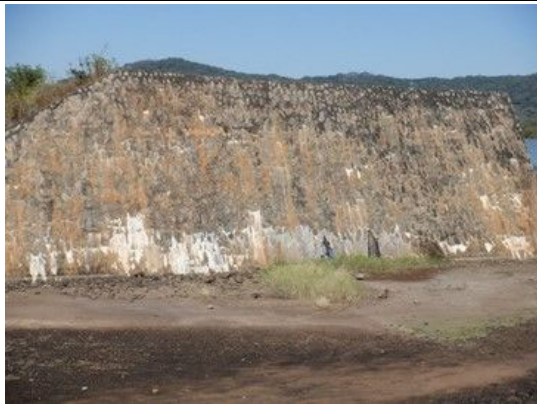


S(5) Spillway Apron: No scour is observed, and small rocks, plants, and open joints can be observed.



S(6) Spillway Apron: Stones are deposited at the upstream end.

MABVUTE DAM (4)



S(7) Spillway Retaining wal(right): Efflorescence is observed.



S(8) Spillway Retaining wall(left): Efflorescence is observed. On the left bank side, leakage of seepage water from the ground (water can be seen, but there is no flow).



S(9) Spillway canal: There is a slight leak from the back of the canal.



S(10) Spillway canal: Although there is no gabion, it may be the result of previous gabions that were washed away because of the rock material scattered around there.



I(1) Intake Inlet: No significant damage is observed.



I(2) Intake Outlet: The valve has movable and submerged.

MABVUTE DAM (5)



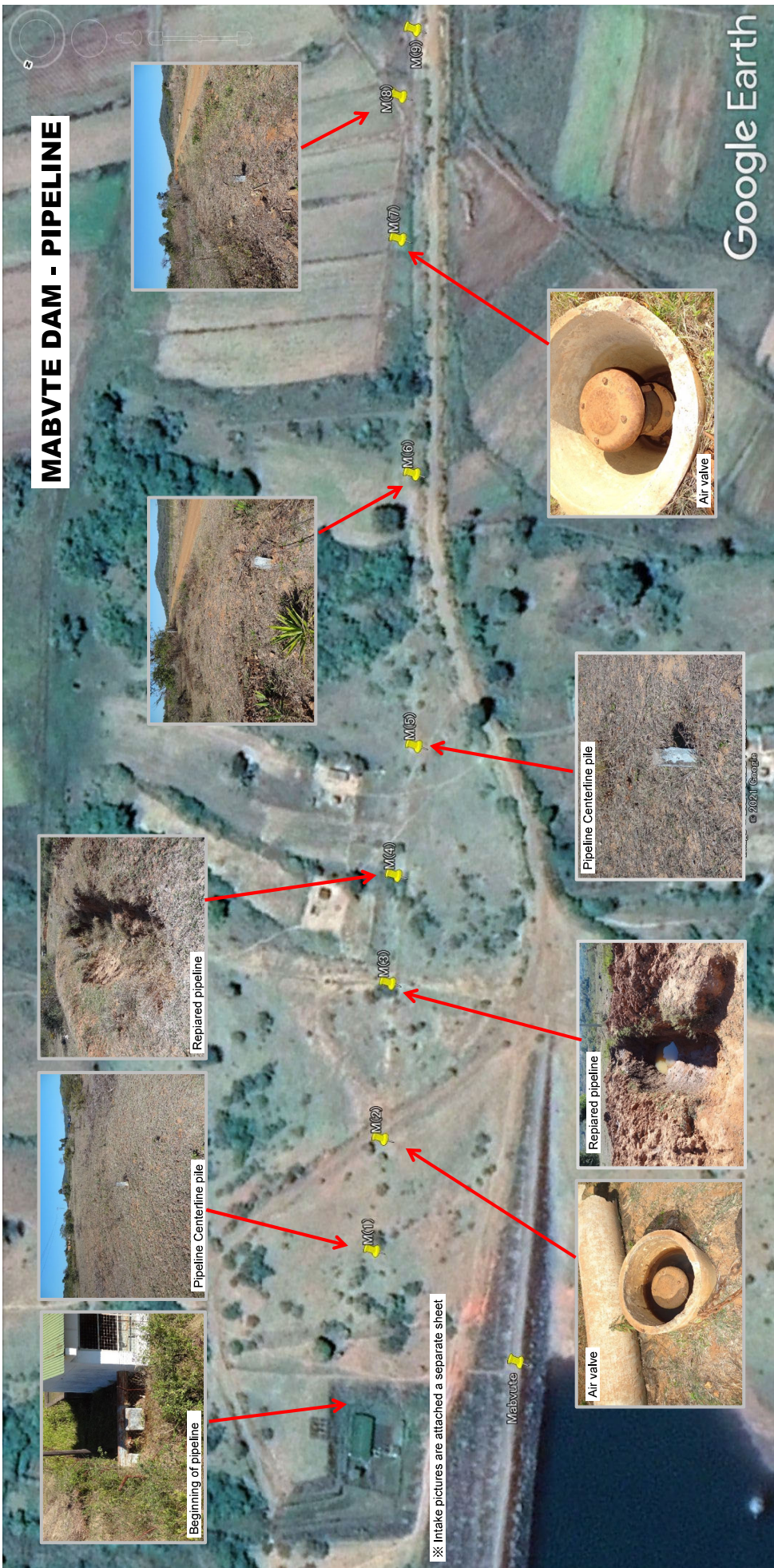
C(1) Connecting Cana(right): No significant damage is observed.



C(2) Connecting Canal(left): Collapses next to the spillway canal, but those does not seem to be in progress(L10.0m,B3.0m,H7.0m).



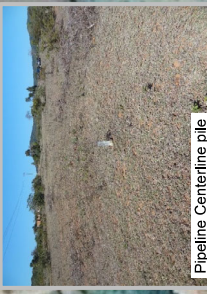
C(3) Connecting Canal: Although the canal is used as a road to school, children cannot go to school during the rainy season because of the flow.



MABVUTE DAM - PIPELINE



Beginning of pipeline



Pipeline Centerline pile



Repaired pipeline



Air valve



Repaired pipeline



Pipeline Centerline pile



Air valve

※ Intake pictures are attached a separate sheet

MABVTE DAM - PUMP STATION(1)



PS(1): Full view of pump station



Rusted float valve

PS(2): Float valve

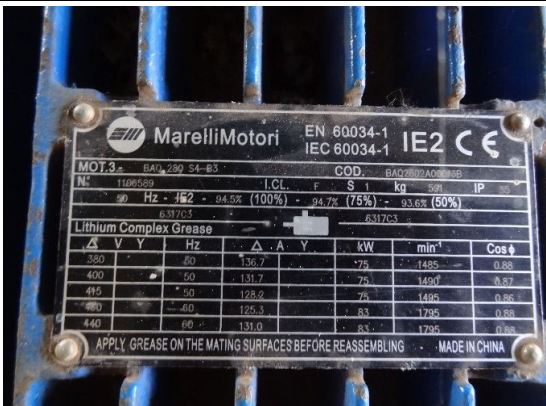


One electric pump equipment has been installed by FAO in 2017.

PS(3): Full view of pump

No name plate of pump

PS(4): Name plate of pump



Dustproof / waterproof motor (IP55)

PS(5): Name plat of electric motor

No switchboard

PS(6): Switchboard

MABVTE DAM - PUMP STATION(2)



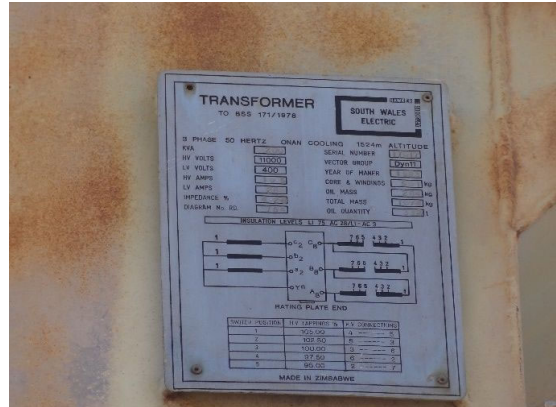
The Voltage indicator has been breakdown.
PS(7):Operation board



PS(8):Power receiving board



PS(9):Transformer



Convert from 11,000V to 400V.
PS(10):Name plate fo transformer

MABVTE DAM - ON FARM(1)



No sedimentation and good condition.
OF(1):Night strage (1)



No sedimentation and good condition.
OF(2):Night storage(2)



Good condition.
OF(3):Night storage(Outlet valve)



Good condition.
OF(4):Night storage(Spillway)



Good condition.
OF(5):Night storage (Distribution facility)



Good condition of movable gate and divirsion.
OF(6):Diversion

MABVTE DAM - ON FARM(2)



Good condition.

OF(7):On farm canal(1)



Good condition.

OF(8):On farm canal(2)



Diversion is properly maintained.

OF(9):On farm canal(3)



The end of the distribution canal is free discharge.

OF(10):On farm canal(4)



The diversion and on frm canal that have been renovated by FAO in 2017.

OF(11):On farm canal(5)



The diversion and on farm canal that have been renovated by FAO in 2017.

OF(12):On farm canal(6)

附属資料-1-6

ムンジャンガンジャダム

MUNJANGANJA DAM record of site survey

As of FWL-0.3m

Location	Photo No.	Condition	Evaluation	Proposed Measures
EMBANKMENT				
Upstream	D(1)	Overall, there is limited plant growth, but relatively thick trees are found only near the edge of the left bank (elevation above FWL at the abutment). There is almost no collapse of riprap or exposure of embankment materials.	B	Management: ZINWA Trim trees. In addition to this, it is necessary to organize regular maintenance and management systems such as tree trimming.
Downstream	D(2) D(3) D(4)	Erosion under riprap makes downstream ditches(filled with rocks). In the lower part of those area, fine particles of embankment material are deposited (there is no seepage) . Especially at the lower part of the steps, the riprap is relatively thin and there is a lot of plants. Relatively thick trees are found only near the edge of the left bank (elevation above FWL at the abutment). Exposed embankment material on walkways.	B	In order to prevent the erosion and collapse from recurring, the surface layer should be reshaped with embankment materials, and anti-erosion materials and riprap should be laid. In addition to this, it is necessary to organize regular maintenance and management systems such as tree trimming.
Crest of dam	D(5)	Overall, there is limited plant growth.	C	Trim trees. In addition to this, it is necessary to organize regular maintenance and management systems such as tree trimming.
Foot of slope	D(6)	It is a wetland and there is a puddle of water on the downstream road. The flow is slight. The water has turned reddish brown and a film of iron bacteria can be seen.	C	Not required: Continue regular monitoring.
Right side abutment	D(7)	No significant damage is observed. The abutment is flat.	C	Not required: Continue regular monitoring.
Left side abutment	D(8)	No significant damage is observed. The abutment is flat.	C	Not required: Continue regular monitoring.

MUNJANGANJA DAM record of site survey

As of FWL-0.3m

Location	Photo No.	Condition	Evaluation	Proposed Measures
SPILLWAY				
Management: ZINWA				
Crest	S(1) S(2)	There are slight leakages and flows from cracks on the downstream.	B	The damage is slight and does not affect the functions at this time, but it is judged that measures are required in the long term because the damage may expand due to continuous overflow.
Apron	S(5) S(6)	No cracks, plants, or washes are observed. Opening of joints (up to 3cm, detached joint material), damage to joints (60cm, 40cm), and small stonors are observed.	B	The damage is slight and does not affect the function at present, but it is judged that measures will be required in the long term because this spot may become a weak point in flood and the damage may expand.
SPILLWAY CHANNEL				
Management: ZINWA				
Retaining wall	S(3) S(4)	There are cracks less than 1cm width on the top of the both retaining wall.(right side L12m, left side L10m).	B	The damage is slight and does not affect the functions at present, but it is judged that measures will be required in the long term because of the risk of the damage expanding due to rainwater infiltration.
Canal	S(7) S(8)	There is seepage at joints and the boundary of the retaining wall (no flow is observed). The bottom of the drainage hole at the bottom of the retaining wall is wet.	C	Since no significant damage is observed, no measures are required.
Right side	C(1) C(2)	The right side of the gabions (t50cm) has been washed away. The remaining area is on the rock, but the area that was washed away is a depression with no rock visible at the bottom. It is used as a walkway for crossing.	B	At present, no collapse has been observed, and it is judged that the drainage function will not be affected. However, it is judged that measures will be required in the long term, as there is a risk that the collapse of the slopes and disturbance of the flow may occur due to long-term use. In addition, entering the canal should be prevented.
CONNECTION CANAL				
Management: ZINWA				
Left side	C(3) C(4)	The cages are damaged. Downstream of the gabions, there is a collapse on the left side (L1.8m, B1.2m, H3.0m).	B	Since the collapse is small, it is judged that the drainage function is not affected. However, since the collapse may progress over time and affect the surroundings, it is judged that measures are required in the long term.

MUNJANGANJA DAM record of site survey

As of FWL-0.3m

Location	Photo No.	Condition	Evaluation	Proposed Measures
INTAKE				
Inlet	I(1)	The building and winch are located at the crest, but the wires have disappeared. The handle can be turned.	B	Management: ZINWA Install a new spare valve on the downstream side.
Outlet	I(2)	The valve is movable and there is no problem.	C	To keep continuous monitoring.
MAIN CANAL				
Management: IMC				
Siphon	M(6)(7)	The siphon is in good condition.	C	To keep continuous monitoring.
Whole line	M(1)~(37)	The main canal has some cracks on crest and some leakage.	C	To keep continuous monitoring.
ON FARM Facilities				
Management: IMC				
Night storage	OF(1)~(4)	The night storage is in good condition. The outlet valve is movable and some leakages. The spillway is in good condition.	C	To keep continuous monitoring.
On farm canal	OF(5)~(12)	The on farm canal is good condition.	C	To keep continuous monitoring.
On farm canal	OF(11)	The some sluice gatas have been broken.	B	To replace the gates.
OTHERS				
Barbed-wire fence		The scheme fence has been reduced in strength.	-	-

MUNJANGANJA DAM record of site survey

As of FWL-0.3m

Location	Photo No.	Condition	Evaluation	Proposed Measures
entry road	O(1)	No damage is observed at the entry road downstream of the river.	C Since no significant damage is observed, no measures are required.	Not required: Continue regular monitoring.

Evaluation

A	Deteriorations/damages that are already affecting the safety/stability/operation of the facilities or are feared to affect them in near future.
B	Deteriorations/damages that are not affecting the safety/stability/operation of the facilities at present but may affect them in the long term.
C	No deteriorations/damages or no signal of them

Munjanganja Dam



MUNJANGANJA DAM (1)



D(1) Embankment Upstream: Overall, there is limited plant growth, but relatively thick trees are found only near the edge of the left bank (elevation above FWL at the abutment). There is almost no collapse of riprap or exposure of embankment materials.

D(2) Embankment Downstream: Especially at the lower part of the steps, the riprap is relatively thin and there is a lot of plants.



D(3) Embankment Downstream: Erosion under riprap makes downstream ditches (filled with rocks). In the lower part of those area, fine particles of embankment material are deposited (there is no seepage).

D(4) Embankment Downstream: Relatively thick trees are found only near the edge of the left bank (elevation above FWL at the abutment).
Exposed embankment material on walkways.



D(5) Crest of Embankment : Overall, there is limited plant growth, but relatively thick trees are found only near the edge of the left bank (elevation above FWL at the abutment).

D(6) Foot of slope: It is a wetland and there is a puddle of water on the downstream road. The flow is slight. The water has turned reddish brown and a film of iron bacteria can be seen.

MUNJANGANJA DAM (2)



D(7) Right side abutment : No significant damage is observed. The abutment is flat.



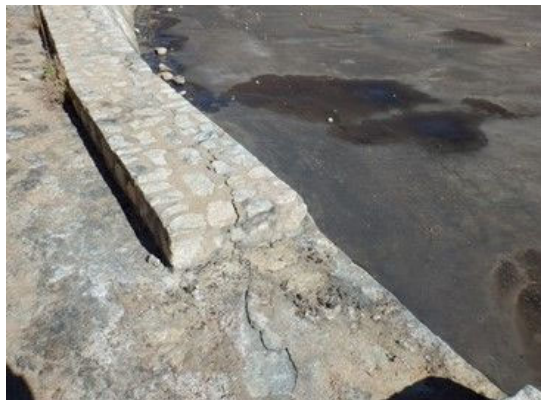
D(8) Left side abutment : No significant damage is observed. The abutment is flat.



S(1) Spillway entire: No significant damage is observed. The abutment is flat.



S(2) Spillway 越流堰: There are slight leakages and flows from cracks on the downstream.



S(3) Spillway retaining wall (right): There is a crack less than 1cm width on the top of the retaining wall. (L12m).



S(4) Spillway retaining wall (left): There is a crack less than 1cm width on the top of the retaining wall. (L10m).

MUNJANGANJA DAM (3)



S(5) Spillway apron : No cracks, plants, or washes are observed.



S(6) Spillway apron : Opening of joints (up to 3cm, detached joint material), damage to joints (60cm, 40cm), and small stoners are observed.



S(7) Spillway canal: There is seepage at joints and the boundary of the retaining wall (no flow is observed).



S(8) Spillway canal: The bottom of the drainage hole at the bottom of the retaining wall is wet.

MUNJANGANJA DAM (4)



I(1) Intake Inlet: The building and winch are located at the crest, but the wires have disappeared. The handle can be turned.



I(2) Intake Outlet: The handle has been vanished away.



I(3) Intake Outlet: The middle of spindle had been broken.



I(4) Intake Outlet: The valve has been controlled in good condition.

MUNJANGANJA DAM (5)



C(1) Connecting Canal: The right side of the gabions (t50cm) has been washed away.



C(2) Connecting Canal: The remaining area is on the rock, but the area that was washed away is a depression with no rock visible at the bottom.



C(3) Connecting Canal: The cages are damaged. It is used as a walkway for crossing.

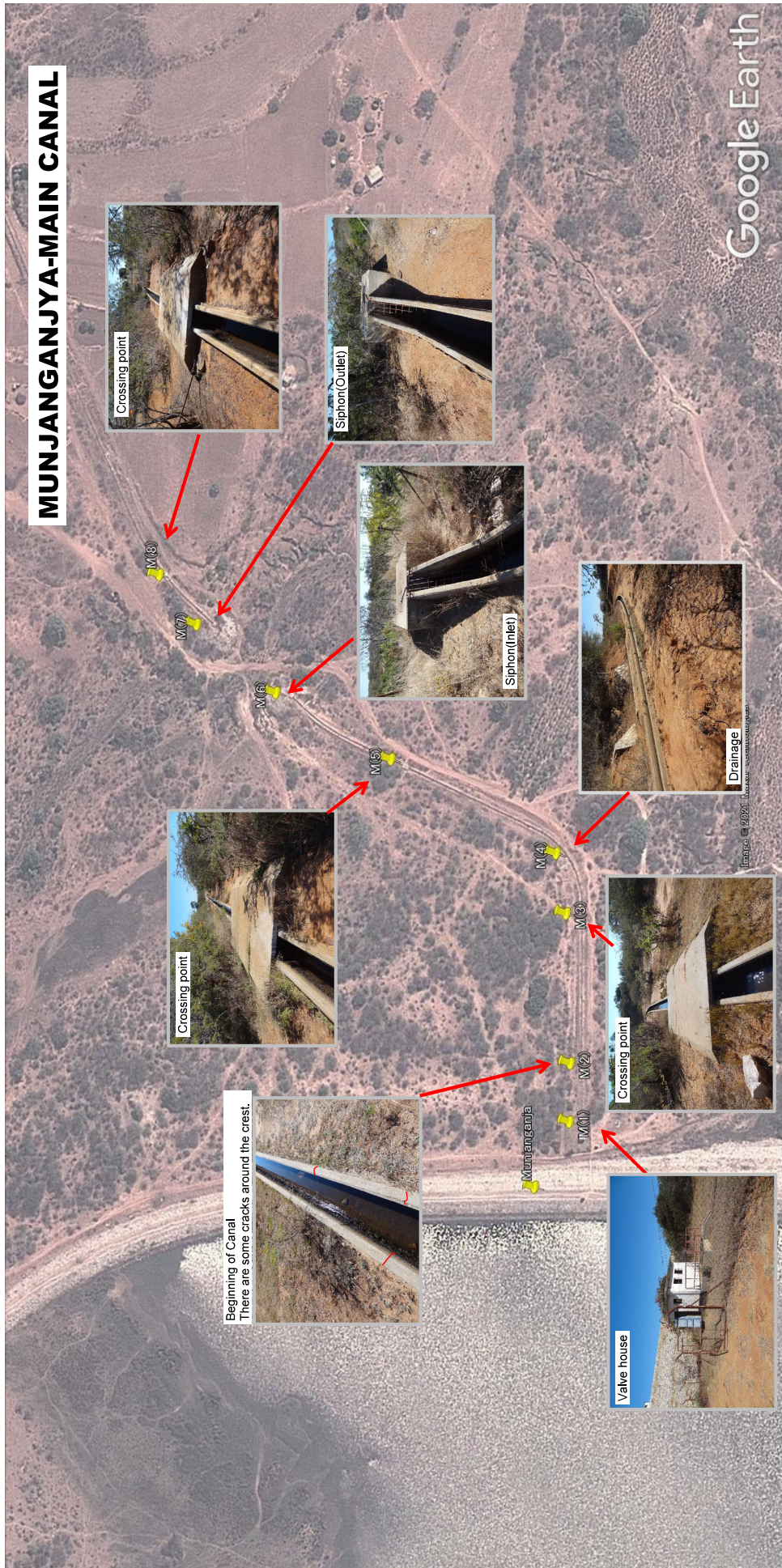


C(4) Connecting Canal: Downstream of the gabions, there is a collapse on the left side (L1.8m, B1.2m, H3.0m).

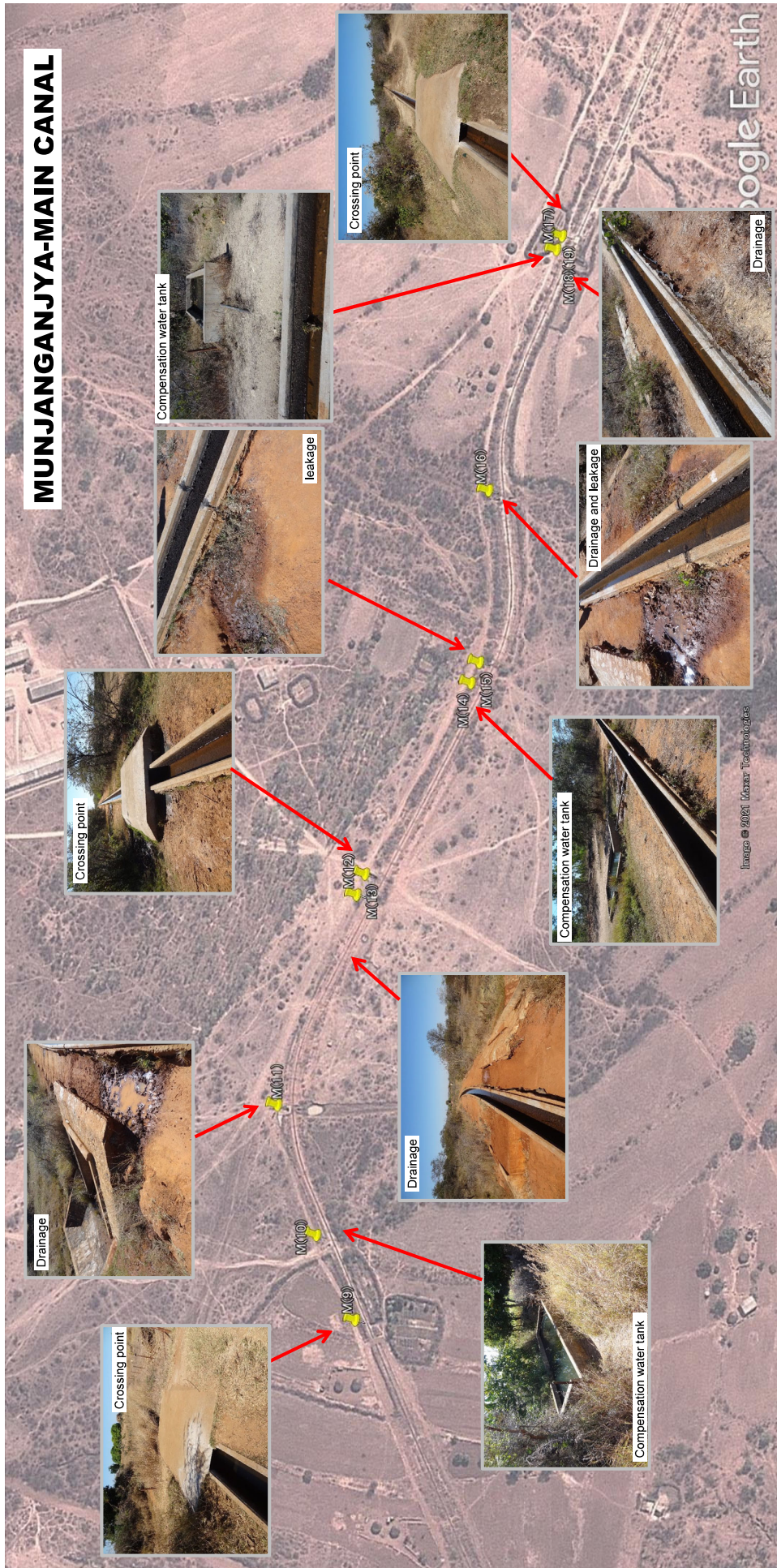


O(1) Others: No damage is observed at the entry road downstream of the river.

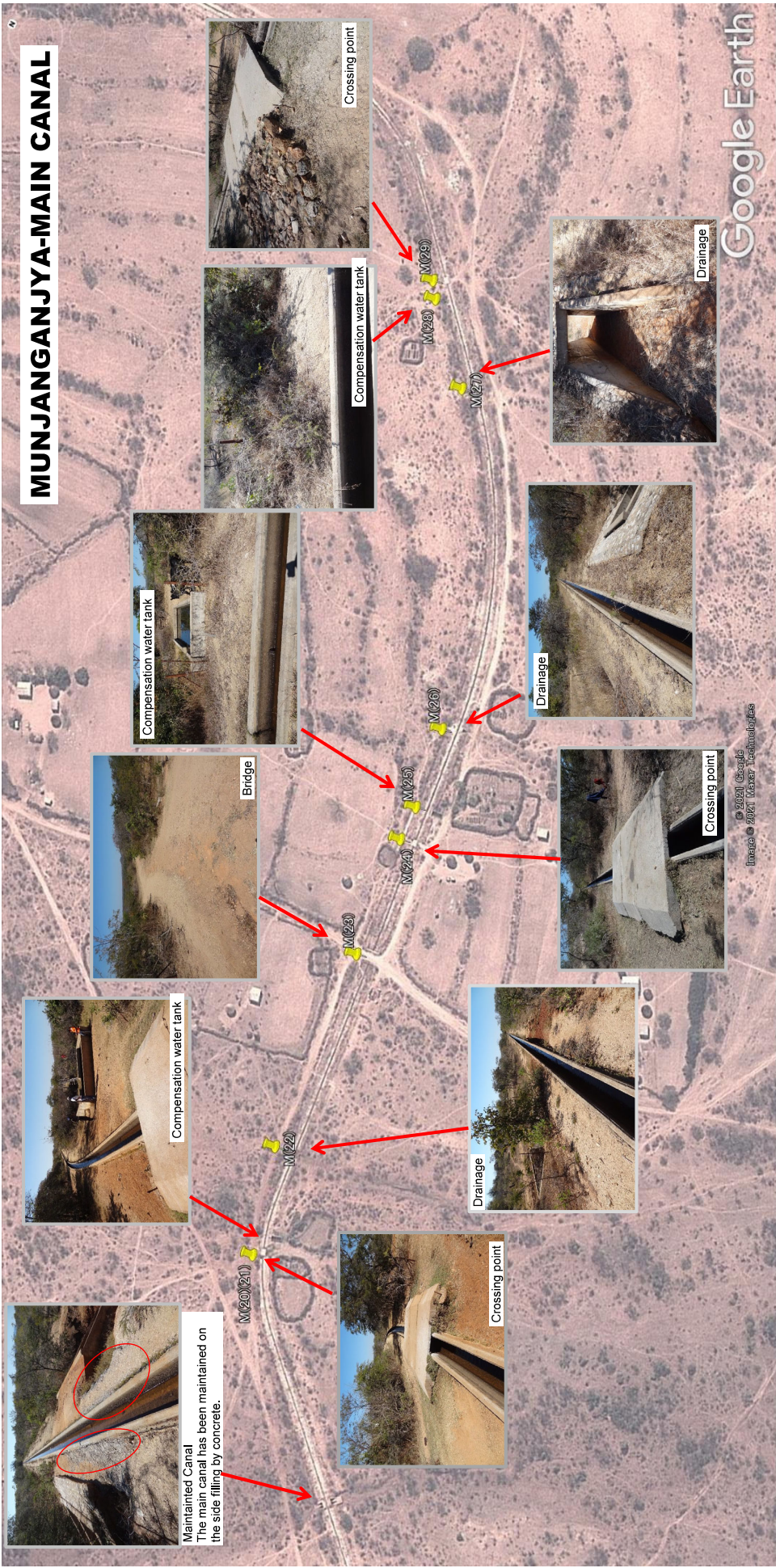
MUNJANGANJYA-MAIN CANAL



MUNJANGANJYA-MAIN CANAL



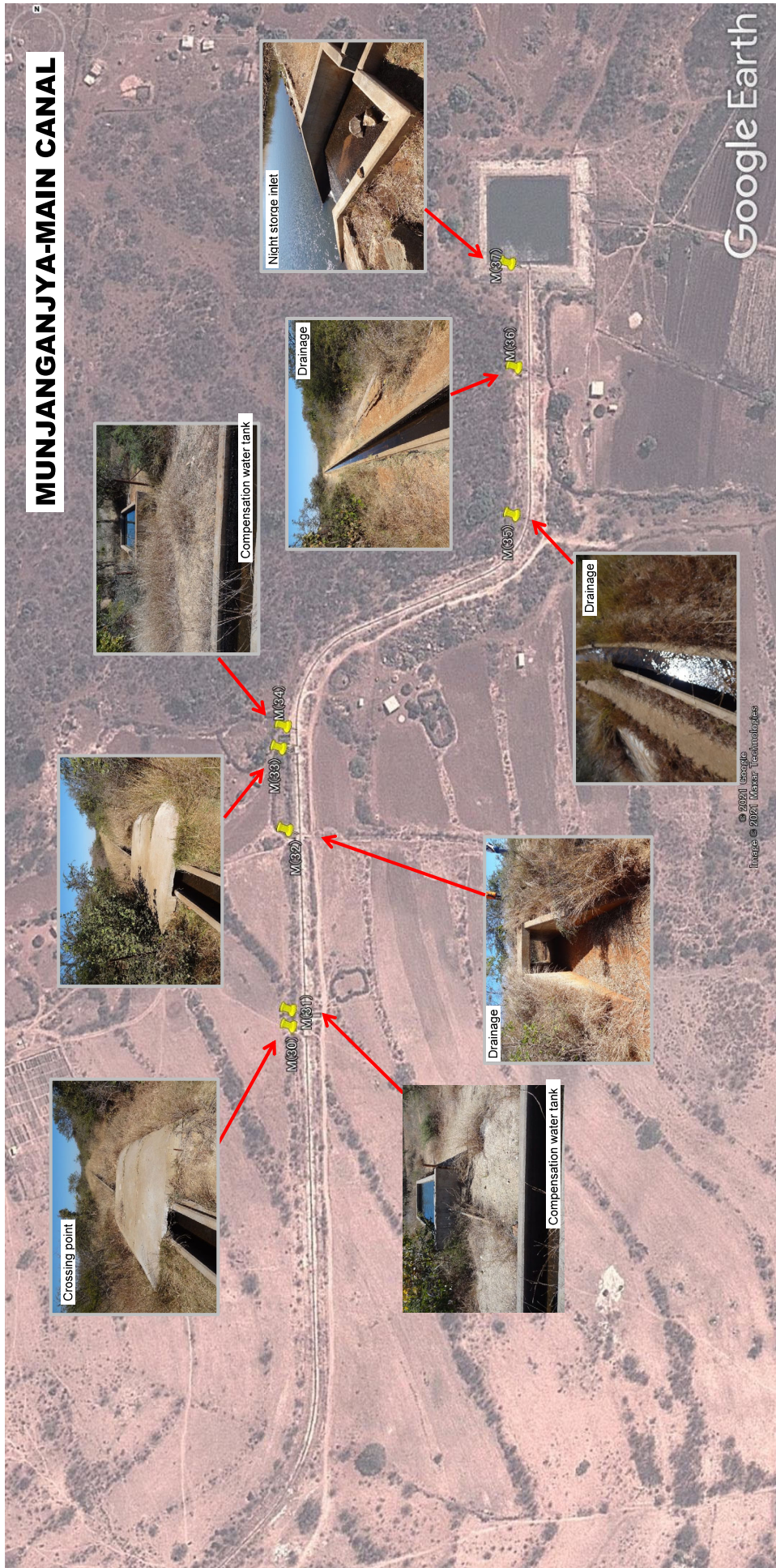
MUNJANGANJYA-MAIN CANAL



Google Earth

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MUNJANGANJYA-MAIN CANAL



Google Earth

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MUNJYANGANJYA- ON FARM (1)



No sedimentation and good condition.
OF(1):Night storage (1)



No sedimentation and good condition.
OF(2):Night storage(2)



The valve is movable and in good condition.
OF(3):Night storage(Outlet valve)



Good condition.
OF(4):Night storage(Spillway)



Good condition.
OF(5):On farm canal(1)



Good condition.
OF(6):Diversion(1)

MUNJYANGANJYA - ON FARM (2)



The diversion has been rehabilitated by FAO in 2019.

OF(7):Diversion(1)



Good condition.

OF(8)On farm canal(2)



The diversion has been rehabilitated by FAO in 2019.

OF(9):Diversion(2)



The diversion has been rehabilitated by FAO in 2019.

OF(10):Diversion(3)



The gate has been lost.

OF(11):On farm canal(3)



The end of the on farm canal is free discharge.

OF(12):On farm canal(4)