

Dam ID: OA-137
OAHU RESERVOIR NO. 155

Vulnerability Index:
Extreme High Moderate Low
1 2 3 4

Inspection No: _____
Date: 4 Apr. 2006

STATE OF HAWAII - DLNR
DAM SAFETY INSPECTION SHEET

Inspection Type: Visual Dam Safety Inspection

Persons Present	Affiliation	Phone Number
<u>RAY KONG</u>	<u>US Army Corps of Engineers</u>	
<u>DOUG TOEWS</u>	<u>USDA - NRCS</u>	<u>(808) 541-2600 X126</u>
<u>GLEN</u>		
<u>PETER GIBSON</u>	<u>CAMPBELL ESTATE</u>	

Weather Condition: Rain previous day Rainy Drizzle / Mist Cloudy/Overcast Partly Cloudy Sunny Dry
Comments: _____

1. General: (Information currently on file, update as required)

Dam/Res. Name OAHU RESERVOIR NO. 155
Owner The Estate of James Campbell (C040)
Owner Contact Mr. Bert Hatton Owner Ph. 674-3232
Lessee _____ Lessee Ph. _____
O & M Contractor Waiahole Irrigation Company, Ltd. Vernon Piko O & M Ph. 330-5603
Nearest Town Waipahu Latitude 21.40755556 ° (decimal)
County HONOLULU Longitude 158.0624722 ° (decimal)
Tax Map Key(s) _____

Dam Status A: Hazard Potential L: Dam Size _____
Year Completed ~1916 Dam Length 900 ft. Dam Height 25 ft.
Normal Storage _____ ac.ft. Max. Storage 37 ac.ft. Max. Surface Area _____ ac.
Drainage Area 0 mi. Spillway Type Rec. Conc. Channel with unlined upper banks Max. Spillw _____

Owner owns land under dam facility: _____
Emergency Action Plan on file with the Department: NR
Reports on file with the Department: August 1999, US Army Corps, Phase I Inspection (2)

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2. Questions for Owner's Rep.:	Yes	No	Unknown	Comments
Construction Plans Available	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
Site / Facility Map	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
Operation & Maintenance Manual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
Emergency Action Plan	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
Modifications / Improvements	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
Conduct Routine Inspections	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
Conduct Routine Maintenance	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
Vehicle access to site	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Not accessible <input checked="" type="checkbox"/> With Standard car <input type="checkbox"/> Requires 4-Wheel Drive
Access during heavy rains	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Not accessible <input type="checkbox"/> With Standard car <input checked="" type="checkbox"/> Requires 4-Wheel Drive
Access when spillway is flowing	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Not accessible <input checked="" type="checkbox"/> With Standard car <input type="checkbox"/> Requires 4-Wheel Drive
Other Studies Conducted	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Phase I <input type="checkbox"/> Phase II <input type="checkbox"/> Hydraulics <input type="checkbox"/> Stability <input type="checkbox"/> Hazard <input type="checkbox"/> Seismic <input type="checkbox"/> Other: _____
Incident History	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Breached <input type="checkbox"/> Overtop <input type="checkbox"/> Slide <input type="checkbox"/> Down stream Flooding <input type="checkbox"/> Other: _____
Reservoir's Current Use	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Sediment <input checked="" type="checkbox"/> Irrigation <input type="checkbox"/> Recreation <input type="checkbox"/> Flood Control <input type="checkbox"/> Drinking Water <input type="checkbox"/> Power Generation <input type="checkbox"/> Other: _____

Findings and Corrective Actions:

- a. The Owner shall maintain documentations including Construction plans, specifications, improvements, modifications, Operations and Maintenance Manuals and routine inspection logs for this dam facility. *4/23/06*
- b. An Emergency Action Plan (EAP) is on file with the department, submit any updates as applicable.
- c. An EAP is required for High Hazard Dams. Submit an updated EAP for this facility.
- d. An EAP is recommended for all dams regardless of hazard class. Submit EAP if developed for the facility. *4/23/06*
- e. Submit narrative and additional information detailing the improvements, modifications, and/or alterations at the dam site, unless covered by approved dam permit.
- f. Routine inspection logs were not inspected.
- g. Dam owners shall provide for routine inspection of the dam.
- h. The dam did not appear to be maintained on a regular basis.
- i. Access to site appears to be satisfactory.
- j. There is no vehicular access to the dam site. Operational and emergency plans need to reflect this deficiency or access provided.
- k. Access to dam is questionable during severe weather conditions and/or spillway overflows. Operational plans and emergency plans need to reflect this deficiency or access provided.
- l. Provide a detailed narrative of the incident, responses taken, and any damages incurred. Dam owners are required to promptly advise the department of any sudden or unprecedented flood or unusual or alarming circumstance or occurrences which may adversely affect the dam or reservoir.
- m. Submit current Operations and Maintenance Manual or Procedures for this dam / reservoir facility.
- n. Submit Site or Facility Map of this Dam which identifies the location of major features including outlet works controls and conduits.
- o. _____

Additional Requirements:

The following investigative study(s) are:

Required	Recommended	
<input type="checkbox"/>	<input type="checkbox"/>	Phase I Study
<input type="checkbox"/>	<input type="checkbox"/>	Phase II Study (Including <input type="checkbox"/> Seepage <input type="checkbox"/> Hydrology/Hydraulics <input type="checkbox"/> EAP)
<input type="checkbox"/>	<input type="checkbox"/>	Hydrology and Hydraulics (including Probable Maximum Flood and spillway capacity)
<input type="checkbox"/>	<input type="checkbox"/>	Stability Analysis
<input type="checkbox"/>	<input type="checkbox"/>	Seismic Analysis
<input type="checkbox"/>	<input type="checkbox"/>	Hazard Classification
<input type="checkbox"/>	<input type="checkbox"/>	Other: _____

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Physical Dam Features: (Check All Applicable. Provide description of Items Observed and/or Take Photos. Indicate photo # in description.)

3. Reservoir:

Level during inspection 18 ft per gauge (gauge / other) spillway level
Normal Operating Level/Range 18-19 ft per " (gauge / other)
Description: _____
Typical Operation Spillway always flowing Kept within normal range Kept Empty Drained Daily Only filled by Storms
 Other: _____
Sinkhole in Res.: # Observed: _____ Size: _____ by _____ in. Deep Not Visible None Observed
Description: _____
Staff Gage: Description: _____

Findings:

- a. The reservoir was not inspected.
- b. The reservoir appeared to be in satisfactory condition, no corrective actions are required at this time.
- c. The reservoir appeared to be in fair to poor condition and requires corrective action.
- d. The reservoir appeared to be in unsatisfactory condition, urgent corrective action is required.

Corrective Actions:

- e. The staff gage needs maintenance and/or repair. Description: _____
- f. A staff gage was not observed at the reservoir. Provide some method of quantifying the water level within the reservoir.
- g. A sinkhole was observed in the upstream reservoir. Conduct additional investigations and monitoring to identify the cause, risk and appropriate action.
- h. _____

4. Intake Works Description:

Number of Intakes 1
 Intake Culvert / Pipe
Size: _____ in. DIP Corrugated Metal PVC HDPE Concrete Other _____
Control: Gate Valve Flow can either be Shut off or Bypassed Flash board inlets
From: Stream Diversion Pump Reservoir Other Waihole
 Ditch / Flume
Dimension: _____ (Size x Depth) Shape _____
Surface: Dirt Wood Concrete Lined w/ _____
Control: Gate Valve Flow can either be Shut off or Bypassed
From: Stream Diversion Pump Reservoir Other Waihole, ~ 15 MGD

Findings:

- a. The intake works were not inspected.
- b. The intake works were not tested.
- c. The intake works appeared to be in satisfactory condition, no corrective actions are required at this time.
- d. The intake works appeared to be in fair to poor condition and requires corrective action.
- e. The intake works appeared to be in unsatisfactory condition, urgent corrective action is required.

Corrective Actions:

- f. The intake works needs maintenance and/or repair. Description: _____
- g. _____

5. Upstream Slope:

(Typical Slope ± 3/4 : 1 #)

Slope Protection: None Dumped Rock Fitted Rip Rap Grouted Rip Rap Liner _____ Other: _____

Defect in Protection: Description: _____

Erosion: Loose soil w/ little vegetation Rut (<6") Gully (>6" deep) Not Visible None Observed

Description: _____

Cracks: Parallel with crest Perpendicular to crest Slide visible Not Visible None Observed

Description: _____

Sinkholes: # Observed: _____ Size: _____ and _____ Depth Not Visible None Observed

Description: _____

Vegetation: None Low Ground Cover Bushes or Tall Grass Trees # _____ <6" >6" & <20" >20"

Description: _____

Findings:

- a. The upstream slope was not inspected.
- b. The upstream slope appeared to be in satisfactory condition, no corrective actions are required at this time.
- c. The upstream slope appeared to be in fair to poor condition and requires corrective action.
- d. The upstream slope appeared to be in unsatisfactory condition and not expected to fulfill its intended function. Urgent corrective action is required.

Corrective Actions:

- e. Slope protection needs maintenance or repair. Description: _____
- f. Rut and/or Gully erosion was observed on the slope, which requires maintenance and/or repair. Description: _____
- g. A crack was observed on the slope, which requires further investigation to determine the underlining cause. Monitor the area and/or repair as required.
- h. A sinkhole was observed on the slope, which requires further investigation to determine the underlining cause. Repair and monitor the area.
- i. The upstream slope was not visible due to high grass and bush vegetation. Clear high vegetation and maintain low to enable easy visual inspection.
- j. Tree(s) were observed on the dam embankment. Trees have been identified as the probably cause of piping failures, and can possibly cause sever damage to the embankment if they are uprooted during a high winds. Corrective action is required to remove the tree hazards from the dam. Acceptable remedies include removal of the tree and its root structure down to a 2" diameter and reconstructing the damaged embankment section. All repair work shall be accomplished as per the requirements of licensed geotechnical or structural engineer. Routinely monitor the damaged area for signs of settlement and seepage.
- k. check slope stability

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6. Crest:

Approximate Crest Width: n20'

- Access: None Walking Path Roadway, Surface / Width / Usage: _____
- Erosion: Loose soil w/ little vegetation Rut (<6") Gully (>6" deep) Not Visible None Observed
Description: caused by traffic
- Cracks: Parallel with crest Perpendicular to crest Slide visible Not Visible None Observed
Description: _____
- Sinkholes: _____ in. Wide x _____ in. Long x _____ in. Deep Not Visible None Observed
Description: _____
- Vegetation: None Low Ground Cover Bushes or Tall Grass Trees # _____ <6" >6" & <20" >20"
Description: _____

Findings:

- a. The dam crest was not inspected.
- b. The dam crest appeared to be in satisfactory condition, no corrective actions are required at this time.
- c. The dam crest appeared to be in fair to poor condition and requires corrective action.
- d. The dam crest appeared to be in unsatisfactory condition and not expected to fulfill its intended function. Urgent corrective action is required.

Corrective Actions:

- e. Access along the crest was satisfactory.
- f. Access along the crest was not possible. Description: _____
- g. Rut and/or Gully erosion was observed on the crest, which requires maintenance and/or repair. 4/23/06
Description: _____
- h. A crack was observed on the crest, which requires further investigation to determine the underlining cause. Monitor the area and/or repair as required.
- i. A sinkhole was observed on the crest, which requires further investigation to determine the underlining cause. Repair and monitor the area.
- j. Portions of the crest were not visible due to high grass and bush vegetation. Clear high vegetation and maintain low to enable easy visual inspection. 4/23/06
- k. Tree(s) were observed along the dam crest. Trees have been identified as the probably cause of piping failures, and can possibly cause sever damage to the embankment if they are uprooted during a high winds. Corrective action is required to remove the tree hazards from the dam. Acceptable remedies include removal of the tree and its root structure down to a 2" diameter and reconstructing the damaged embankment section. All repair work shall be accomplished as per the requirements of licensed geotechnical or structural engineer. Routinely monitor the damaged area for signs of settlement and seepage.
- l. _____

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7. Downstream Slope:

(Typical Slope ± 1 1/2: 1) or 1/2:1

Access: lower roadway along toe roadway to outlet works walkway to outlet works None Observed

Slope Protection: None Dumped Rock Rip Rap Grouted Rip Rap Concrete

Erosion: Loose soil w/ little vegetation Rut (<6") Gully (>6" deep) Not Visible None Observed

Description: _____

Cracks: Parallel with crest Perpendicular to crest Slide visible Not Visible None Observed

Description: _____

Sinkholes: _____ in. Wide x _____ in. Long x _____ in. Deep Not Visible None Observed

Description: _____

Vegetation: None Low Ground Cover Bushes or Tall Grass Trees # _____ <6" >6" & <20" >20"

Description: _____

Seepage:

Seep Spot Number 1

Green Vegetation Wet or Muddy Ground Ponding Water Not Visible None Observed

Flowing, Description: _____

Water Clarity: Clear Some particles Muddy Other: _____

Description: _____

Seep Spot Number 2

Green Vegetation Wet or Muddy Ground Ponding Water Not Visible None Observed

Flowing, Description: _____

Water Clarity: Clear Some particles Muddy Other: _____

Description: _____

Findings:

- a. The downstream slope was not inspected.
- b. The downstream slope appeared to be in satisfactory condition, no corrective actions are required at this time.
- c. The downstream slope appeared to be in fair to poor condition and requires corrective action.
- d. The downstream slope appeared to be in unsatisfactory condition and not expected to fulfill its intended function. Urgent corrective action is required.

Corrective Actions:

- e. Slope protection needs maintenance or repair. Description: _____
- f. Rut and/or Gully erosion was observed on the slope, which requires maintenance and/or repair. Description: _____
- g. A crack was observed on the slope, which requires further investigation to determine the underlining cause. Monitor the area and/or repair as required.
- h. A sinkhole was observed on the slope, which requires further investigation to determine the underlining cause. Repair and monitor the area.
- i. The down stream slope was not visible due to high grass and bush vegetation. Clear high vegetation and maintain low to enable easy visual inspection.
- g. Tree(s) were observed on the downstream slope. Trees have been identified as the probably cause of piping failures, and can possibly cause sever damage to the embankment if they are uprooted during a high winds. Corrective action is required to remove the tree hazards from the dam. Acceptable remedies include removal of the tree and its root structure down to a 2" diameter and reconstructing the damaged embankment section. All repair work shall be accomplished as per the requirements of licensed geotechnical or structural engineer. Routinely monitor the damaged area for signs of settlement and seepage.
- h. Seepage/Ponding water was observed. Monitor and conduct further investigation to locate the source of water and extent of any possible hazardous or developing condition.
- i. Seepage was observed flowing and particles were observed to be removed by the flow. Take immediate action to stop the loss of soil from the embankment. Conduct further investigation to determine the underlining cause and take corrective action. Monitor the area.
- j. The slope was very steep, around a 1 to 1 slope, further study is required to verify slope stability.
- k. _____

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8. Abutments/Toe:

Erosion: Loose soil w/ little vegetation Rut (<6") Gully (>6" deep) Not Visible None Observed
Description: _____

Cracks: Parallel with crest Perpendicular to crest Slide visible Not Visible None Observed
Description: _____

Vegetation: None Low Ground Cover Bushes or Tall Grass Trees # _____ <6" >6" & <20" >20"
Description: _____

Seepage: Seep Spot Number 1
 Green Vegetation Wet or Muddy Ground Ponding Water Not Visible None Observed
 Flowing, Description: _____
Water Clarity: Clear Some particles Muddy Other: _____
Description: _____

Seep Spot Number 2
 Green Vegetation Wet or Muddy Ground Ponding Water Not Visible None Observed
 Flowing, Description: _____
Water Clarity: Clear Some particles Muddy Other: _____
Description: _____

Findings:

- a. The abutments/toe were not inspected.
- b. The abutments/toe appeared to be in satisfactory condition, no corrective actions are required at this time.
- c. The abutments/toe appeared to be in fair to poor condition and requires corrective action.
- d. The abutments/toe appeared to be in unsatisfactory condition and not expected to fulfill its intended function. Urgent corrective action is required.

Corrective Actions:

- e. Slope protection needs maintenance or repair. Description: _____
- f. Rut and/or Gully erosion was observed, which requires maintenance and/or repair.
Description: vertical eroded cut
- g. A crack was observed along the abutments/near the toe, which requires further investigation to determine the underlining cause. Monitor the area and/or repair as required.
- h. The abutment/toe area was not visible due to high grass and bush vegetation. Clear high vegetation and maintain low to enable easy visual inspection.
- i. Tree(s) were observed along the abutment/toe. Trees have been identified as the probably cause of piping failures, and can possibly cause sever damage to the embankment if they are uprooted during a high winds. Corrective action is required to remove the tree hazards from the dam. Acceptable remedies include removal of the tree and its root structure down to a 2" diameter and reconstructing the damaged embankment section. All repair work shall be accomplished as per the requirements of licensed geotechnical or structural engineer. Routinely monitor the damaged area for signs of settlement and seepage.
- j. Seepage/Ponding water was observed. Monitor and conduct further investigation to locate the source of water and extent of any possible hazardous or developing condition.
- k. Seepage was observed flowing and particles were observed to be removed by the flow. Take immediate action to stop the loss of soil from the embankment. Conduct further investigation to determine the underlining cause and take corrective action. Monitor the area.
- l. _____

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9. Outlet Works:

Culvert / Pipe

Type / Size: _____

Culvert: Concrete Masonry unlined earth Other Cast Iron

Pipe: DIP Corrugated Metal PVC HDPE Concrete Other Cast Iron

Control Type: Gate Valve Other _____

Location: Control on Upstream side Control on Downstream side

Seepage: Green Vegetation Wet or Muddy Ground Ponding Water Not Visible None Observed

Flowing, Description: _____

Water Clarity: Clear Some particles Muddy Other: _____

Description: _____

Findings:

- a. The outlet works were not inspected.
- b. The outlet works were not tested.
- c. The outlet works appeared to be in satisfactory condition, no corrective actions are required at this time.
- d. The outlet works appeared to be in fair to poor condition and requires corrective action.
- e. The outlet works appeared to be in unsatisfactory condition and not expected to fulfill its intended function. Urgent corrective action is required.

Corrective Actions:

- f. Seepage/Ponding water was observed. Conduct further investigation to locate the source of water and extent of any possible hazardous or developing condition.
- g. Seepage was observed flowing and particles were observed to be removed by the flow. Take immediate action to stop the loss of soil. Conduct further investigation to determine the underlining cause and take corrective action. Monitor the area. Failures caused by seepage/piping along the outlet conduit are very common and are considered to be a dangerous situation.
- h. Were not visible due to high grass and bush vegetation. Clear high vegetation and maintain low to enable easy visual inspection.
- i. _____
- j. _____

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10. Spillway:

Type: None Culvert/Pipe Channel
Description: _____
Dimension: 3' ft. Invert elevation: _____ ft. per staff gage
Slope Protection: None Grass Dumped Rock Fitted Rip Rap Grouted Rip Rap Concrete
 Defect in Protection: Description: _____
Approach: Clear High Veg. Trees Other: _____
Erosion: Scour Gully Headcut Not Observed Other: _____
Description: _____
Vegetation: None Low Ground Cover Bushes or Tall Grass Trees # _____ <6" >6" & <20" >20"
Description: _____

Findings:

- a. The Spillway appeared to be in satisfactory condition, no corrective actions are required at this time.
- b. The Spillway appeared to be in fair to poor condition and requires corrective action.
- c. The Spillway appeared to be in unsatisfactory condition and not expected to fulfill its intended function. Urgent corrective action is required.

Corrective Actions:

- d. Slope protection needs maintenance or repair. Description: _____
- e. The spillway approach was blocked. Clear approach.
- f. Severe scour erosion was observed which requires maintenance and/or repair.
Description: _____
- g. A headcut (vertical drop in channel due to erosion) was observed downstream of the spillway. Corrective action is required to prevent this problem from moving upstream.
- h. Trees are unacceptable in the spillway channel and approach. Take corrective action to address the woody vegetation problem and repair the damaged area.
- i. Unclear if spillway is adequately sized. Spillway should pass the probable maximum flood. Verify spillway capacity and take corrective action as required.
- j. clear vegetation and one tree

11. Down Stream Channel:

Name: _____
Downstream: Sump Open Area Un-Defined Drainage-way Defined Drainage-way Other _____
Items along Stream Bank: None Road Houses Town Not Inspected
Description: _____

Findings:

- a. The downstream channel was not inspected.
- b. The downstream channel appeared to be in satisfactory condition, no corrective actions are required at this time.
- c. The downstream channel appeared to be in fair to poor condition and requires corrective action.
- d. The downstream channel appeared to be in unsatisfactory condition and not expected to fulfill its intended function. Urgent corrective action is required.

Corrective Actions:

- e. _____

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View of the reservoir



Looking at the upstream slope, notice heavy vegetation



Downstream slope, only protected in the outlet works area, otherwise only heavily vegetated



Abutment area beyond protected upstream slope, notice erosion of slope

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Inflow channel



View of spillway weir from the upstream

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Looking upstream of the spillway, notice vegetation and tree to the left



View of the outlet works from the crest. Wet area of road appears to be from just rain