

State of Hawaii  
DEPARTMENT OF LAND AND NATURAL RESOURCES  
Engineering Division  
Honolulu, Hawaii 96813

June 24, 2011

Board of Land and Natural Resources  
State of Hawaii  
Honolulu, Hawaii

**APPLICATION FOR A DLNR DAM SAFETY CONSTRUCTION/ALTERATION PERMIT  
PERMIT NO. 54 – PAAUILO RESERVOIR (HA-0131)  
DAM REPAIR, PAAUILO, HAWAII**

The Engineering Division hereby submits an application for your approval and authorization for the Chairperson and Department to stipulate conditions and issue a Dam Safety Construction/Alteration Permit for the subject application, "Repair of the PAAUILO RESERVOIR", pursuant to Chapter 179D Hawaii Revised Statutes and current Administrative Rules.

**APPLICANT:**

Mr. Brian Kau  
Administrator and Chief Engineer  
State of Hawaii  
Department of Agriculture  
Agricultural Resource Management Division  
1428 South King Street  
Honolulu, HI 96814

**LANDOWNER**

Mr. Kaeo Duarte  
Kamehameha Schools  
567 S King Street, Suite 200  
Honolulu, HI 96813

**SUMMARY OF REQUEST:**

Application for a Dam Safety Construction/Alteration Permit for the repair of Paauiilo Reservoir, Paauiilo, Hawaii, See Exhibit 1.

**LOCATION:** Paauiilo, Hawaii, Hawaii, TMK: (3) 4-3-004:009. See Exhibit 2.

**BACKGROUND:**

Paauiilo Reservoir was constructed 1975 as a water storage facility for the Lower Hamakua Ditch Irrigation System. In 2002, the owner lined the reservoir with an impermeable HDPE liner and constructed a stabilizing buttress with internal blanket drains along its downstream embankment. The spillway was modified with concrete armor.

A Phase I inspection conducted in 2007 identified a number of deficiencies including some believed to be caused by the October, 2006 earthquakes. An application for the repair of the Paauilo Reservoir was filed on December 23, 2010 by the State of Hawaii, Department of Agriculture, Agricultural Resource Management Division.

**PROJECT DESCRIPTION:**

The Paauilo Reservoir Dam is approximately 34 ft. high, 1,092 ft. long. The surface area of the reservoir at the dam crest is approximately 2.9 acres. The reservoir impounds a maximum of 46 ac-ft at the top of the embankment. The existing outlet works consist of a 16-inch ductile iron pipe with a control valve downstream of the embankment. There is a concrete lined spillway with a base width of approximately 12 feet.

The proposed work includes clearing of existing vegetation on the downstream slopes of the embankment, modification of the existing outlet control by replacing the downstream control valve with an upstream control valve, and the construction of a grouted riprap apron along the downstream toe of the spillway to prevent erosion from water exiting from the weep holes. Monitoring wells and survey monuments will also be installed. (See Exhibit 3)

**CHAPTER 343 – ENVIRONMENTAL ASSESSMENT:**

This is a repair and maintenance of an existing structure. The proposed work will be within the current footprint of the structure and there is no change to the topography or use. See Exhibit 4.

**REMARKS:**

The applicant (DOA), and the applicant's consultant, Oceanit Laboratories, Inc., have completed a basis of design, plans and specification and requests for the approval of a dam safety construction/alteration permit. The Department and its engineering consultant, Gannett Fleming, have reviewed the documents and concluded that it is sufficient for its intended purposes. The proposed work will improve the safety conditions of the dam. (See Exhibit 5)

However, there are remaining deficiencies of the dam that this repair project will not address. The deficiencies not being addressed are as follows:

A site specific seismic analysis and a stability analysis to assess the stability and safety of the dam embankment after cracks were observed on the dam crest after the 2006 Kiholo Bay earthquake. If needed, the owner shall make necessary rehabilitation to assure the dam is safe for the Controlling Maximum Credible Earthquake (CMCE).

Staff recommends approval of this permit application with the Dam Safety Permit General Conditions, (See Exhibit 6).

**RECOMMENDATION:**

That the Board:

1. Authorize the approval and issuance of the Dam Safety Construction/Alteration Permit for this project; and
2. Direct the Chairperson to issue a dam safety permit for the repair of the Paauilo Reservoir (DLNR Dam Safety Construction/Alteration Permit No. 54) subject to such other terms and conditions as may be prescribed by the Chairperson to best serve the interests of the State.

3. Authorize the Department to oversee performance of the permitted work and take appropriate action including but not limited to selecting and procuring testing or professional services to verify the integrity of the construction work, approval of minor revisions and changes, issuance of fines and/or revocation of the permit, if necessary.

Respectfully submitted,

  
CARTY S. CHANG  
Chief Engineer

APPROVED FOR SUBMITTAL:

  
WILLIAM J. AILA, JR.  
Chairperson

- Exhibit(s):
- 1 Owner Permit Application
  - 2 Location map
  - 3 Construction Drawing pages
  - 4 Chapter 343 Environmental Assessment evaluation
  - 5 Gannett Fleming, Inc. correspondence on approval of plans
  - 6 General permit conditions

Project No: DOAW01-A  
Paaulo Reservoir (HI00131)

DLNR-Dam Safety-Sheet 1

State of Hawaii  
BOARD OF LAND AND NATURAL RESOURCES  
Department of Land and Natural Resources  
Engineering Division

APPLICATION FOR APPROVAL OF PLANS AND SPECIFICATIONS FOR CONSTRUCTION,  
ENLARGEMENT, REPAIR, ALTERATION, OR REMOVAL OF A DAM

Applicant: \_\_\_\_\_ Date of Application: December 23, 2010  
Contact Name: Brian Kau Firm / Company: State of Hawaii, Dept. of Agriculture  
Agricultural Resource Management

Mailing Address 1428 South King Street, Honolulu, Hawaii 96814

Telephone: (808) 973-1123 Fax: (808) 973-9467 Email: brian.k.kau@hawaii.gov

The Applicant hereby applies to the Board of Land and Natural Resources for the approval of the attached plans and specification for the Paaulo (HI00131) State Irrigation System Reservoir Safety Improvements (construction, etc.) in accordance with Chapter 179D HRS (as amended by Act 262, SLH 2006), and subject to the provisions, conditions, and limitations of the current Hawaii Administrative Rules and various DLNR dam safety guidelines.

Accompanying this application are:

(please check)

- |  |               |
|--|---------------|
| 1. Filing fee (\$25.00) (Waived for government agencies) | _____         |
| 2. Three (3) copies of the Detailed Cost Estimate        | _____ X _____ |
| 3. Three (3) copies of the Final Design Report           | _____ X _____ |
| 4. Three (3) copies of the Plans                         | _____ X _____ |
| 5. Three (3) copies of the Specifications                | _____ X _____ |
| 6. Proposed Construction Schedule                        | _____ X _____ |
| 7. Supporting documents:                                 | _____ X _____ |
| <u>USGS Topographic Map</u>                              | _____ X _____ |
| <u>Property Tax Map</u>                                  | _____ X _____ |
| <u>Phase I Dam Inspection Report</u>                     | _____ X _____ |

NAME OF STRUCTURE: Paaulo Reservoir (HI00131)

DAM OR RESERVOIR LOCATION: Paaulo, Hawaii Island

Island: Hawaii

Tax Map Key: (3) 4-3-004:009

Attach USGS topographic map (scale 1" = 2000') and property tax map (showing location access to site, proposed work)

State Land Use District:  Agriculture     Urban     Rural     Conservation

BRIEF DESCRIPTION OF WORK TO BE PERFORMED

The proposed dam improvement work includes clearing of existing vegetation on exterior down slopes of the dam embankment, rehabilitation/replacement of existing control system for the reservoir outlet works and construction of a grouted rip rap apron along the spillway to prevent undercutting resulting from water discharged from weep holes. Construction at the site will also include the installation of monitoring wells and embankment survey monuments. All improvements are based upon recommendations provided in the Phase I Dam Inspection Report dated January 2009 which is attached as a supporting document to this application.

EXHIBIT 1

TECHNICAL INFORMATION:

DLNR-Dam Safety-Sheet 2

1. Drainage Area .005 sq. miles or 2.91 acres
2. Classification of Dam Small-Size, Significant Hazard
3. Type of Structure Earthen Fill Embankment
4. Elevation-Area-Capacity Data:

(Inflow pipe elevation)	Elevation	Surface Area (acres)	Total Storage Volume (acre-feet)
<del>Natural Streambed</del>	844.71 ft. MSL	2.82	37.40
Primary Spillway	842.17 ft. MSL	2.49	30.72
Secondary Spillway	No secondary Spillway	N/A	N/A
Top of Dam	845.63 ft. MSL	2.91	40.02
Recent Operating <del>Design</del> Water Level	~841 ft. MSL	2.37	27.88
Invert of Drain (Outlet Structure)	~826 ft. MSL	1.13	1.79
5. Spillway Details (Type, Dimensions, Material)

Primary: Trapezoidal Grouted Rip Rap Channel, 12.5' wide x 4' deep  
Secondary: None
6. Purpose of Structure Irrigation water  
(water supply, irrigation, recreation, real estate development, etc.)
7. Attach rainfall and stream flow records, and flood-flow records and estimates (as accurately as may be readily obtained) See Attachments

ADDITIONAL INFORMATION

1. Primary Owner Contact (if different from applicant) Kaao Duarte  
Owner Company or Entity: Kamehameha Schools - Land Assets Division  
Mailing Address 567 South King Street, Suite 200, Honolulu, Hawaii 96813-3036  
Telephone: (808) 523-6200 Fax: (808) 523-6374 Email: kaduarte@ksbe.edu
2. Registered Hawaii Professional Engineer who prepared the plan Oceanit Laboratories, Inc.  
Derrick C. Eifalan  
Mailing Address 828 Fort Street Mall, Suite 600, Honolulu, HI 96813  
Registration No. 5448-C  
Telephone: (808) 531-3017 Fax: (808) 531-3177 Email: delfalan@oceanit.com
3. Registered Professional Engineer to be responsible for inspection during construction Brian Kau  
Administrator & Chief Engineer, DOA Agricultural Resource Management Division (ARM)
4. Contractor (If known) Goodfellow Bros., Inc.  
Mailing Address 1300 N. Holocono Street, Suite 201. Kikei Maul 96753  
Telephone: 808.879.5205 Fax: \_\_\_\_\_ Email: \_\_\_\_\_
5. List all other permits applications submitted to other governmental agencies:  
NPDES Permit, Grading Permit
6. Anticipated effect of proposed structure on natural environment: No impacts or chages on the natural environment are anticipated for the result of the propsed dam improvements. Proposed improvements will increase dam operational safety, add mitigative improvements to minimize and control on-site erosion and effectively improve downstream water quality.

- 7. List all other parties that have ownership or other interest on the parcels where the dam and reservoir are located and identify their interest in the property. The Owners herein listed below concur with the work proposed within this application by the applicant and by his/her signing hereto, the owner of the land extends to the Board of Land and Natural Resources, and its designated representatives, a right-of-entry onto the project site to conduct any investigations or inspections required in compliance with the provisions of Chapter 13-190, Hawaii Administrative Rules. (Submit additional copies of this sheet should there be more owners)

T. Kaew Duarte  
 (Signature of Owner)

567 S King St., Ste. 200, Honolulu, Hawaii 96813  
 / Parcel Owner

(Address / Interest in Dam or Reservoir)

[Signature]  
 (Signature of Owner)

Department of Agriculture, State of Hawaii  
 1428 South King Street, Honolulu, HI 96814 / Lessee

(Address / Interest in Dam or Reservoir)

\_\_\_\_\_  
 (Signature of Owner)

\_\_\_\_\_  
 (Address / Interest in Dam or Reservoir)

\_\_\_\_\_  
 (Signature of Owner)

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 (Address / Interest in Dam or Reservoir)

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 (Signature of Owner)

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 (Address / Interest in Dam or Reservoir)

\_\_\_\_\_  
 (Signature of Owner)

\_\_\_\_\_  
 (Address / Interest in Dam or Reservoir)

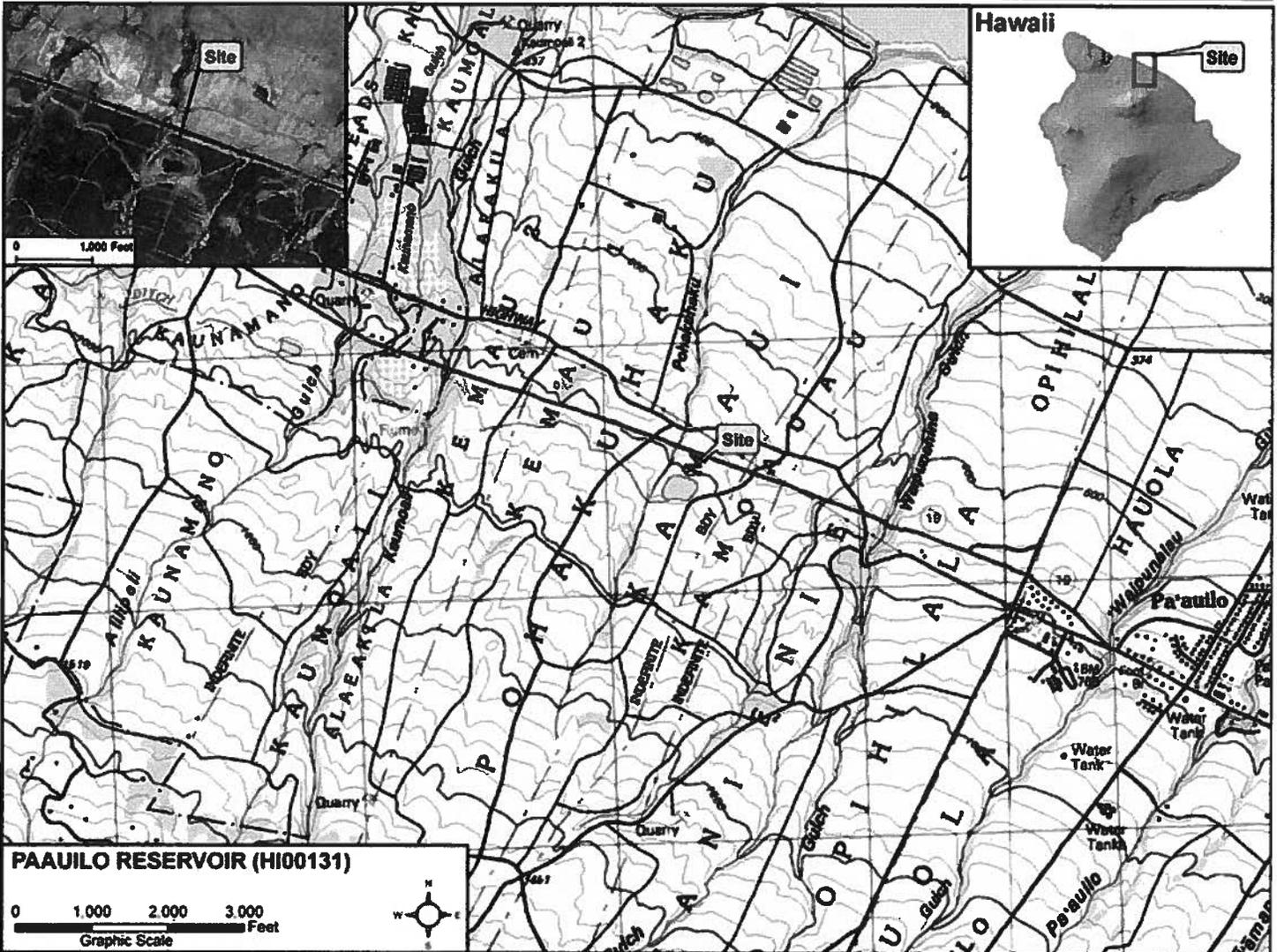
\_\_\_\_\_  
 (Signature of Owner)

\_\_\_\_\_  
 (Address / Interest in Dam or Reservoir)

I, Brian Kau, the applicant, hereby certify that the information herein is true and factual to the best of my knowledge. Signing below indicates that the applicant understands that, if the permit requested is granted by the Board of Land and Natural Resources, the proposed work is to be initiated and completed within two (2) years of the approval date, unless specifically permitted in the approved permit terms and conditions.

[Signature]  
 (Signature of Applicant & Title)  
 Brian Kau, Administrator & Chief Engineer

Date: \_\_\_\_\_

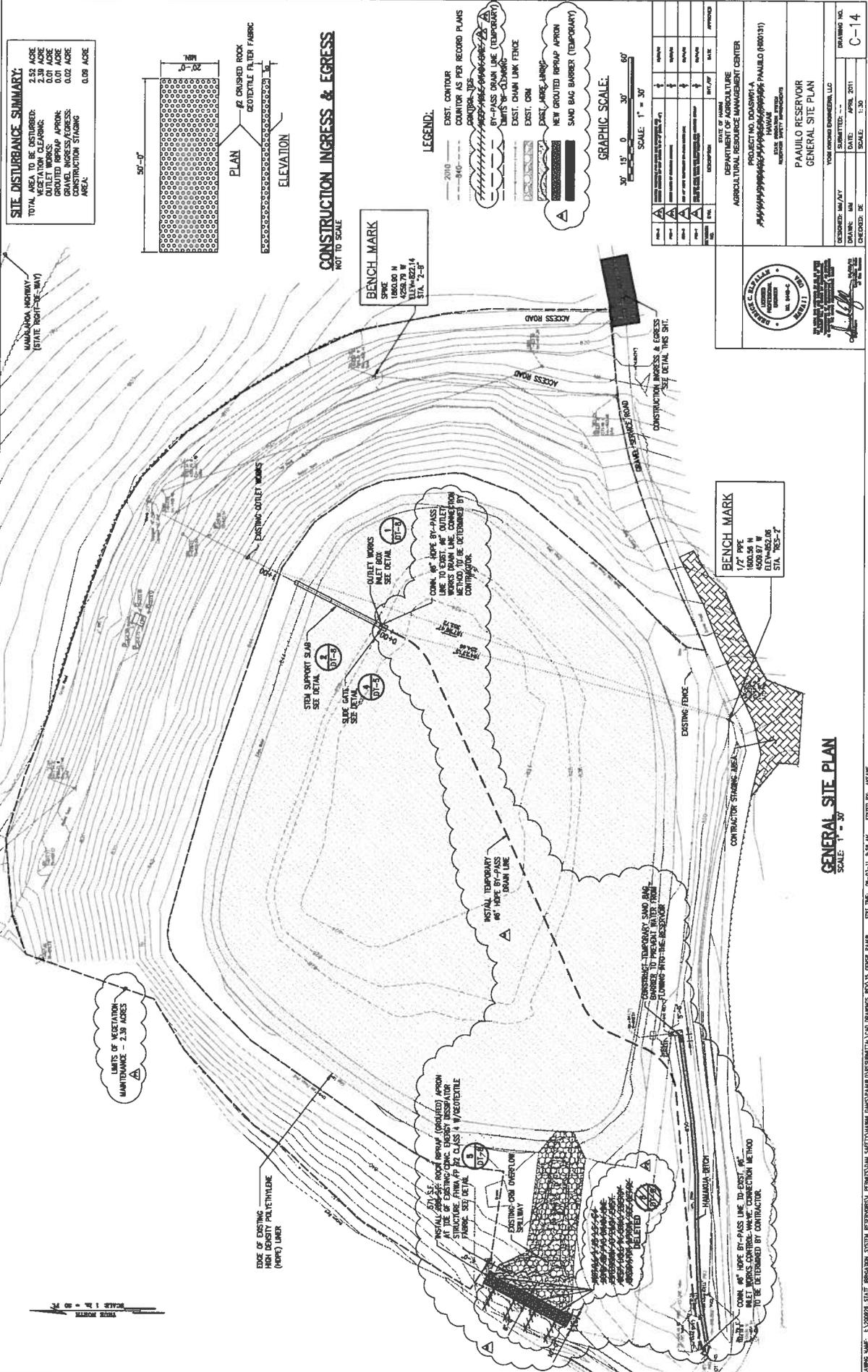


1. General Information	
a. State Dam ID	HA-0131
b. National ID	HI00131
c. Dam Name	PAAUILO RESERVOIR
d. Other Name(s)	
e. Longitude / Latitude	-155.3870 / 20.0469
f. County / Island	Hawaii / Hawaii
g. Type of Dam	Earthen
h. Purpose	Irrigation
i. Completed / Last Modified	1975 /
j. Nearest City / Town	PAAUILO
k. Water Body Type	State Regulated Dam
l. Dam Height	34 ft
m. Dam Length	1,092 ft
n. Drainage Area	0.06 sq. miles / 38 acres

2. Owner Information	
a. Name of Owner	State of Hawaii, Dept of Agriculture
b. TMK(s):	(3) 4-3-004:009

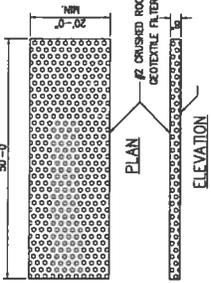
3. Hazard Potential Classification	
a. Hazard Rating	Proposed Significant
b. Date of Assessment	

4. Other Information	
a. Last Inspection	10/25/2010
b. Emergency Action Plan Date	



**SITE DISTURBANCE SUMMARY:**

TOTAL AREA TO BE DISTURBED:	2.55 ACRES
CONSTRUCTION STAGING:	0.01 ACRES
OUTLET WORKS:	0.01 ACRES
GRAVEL INGRESS APRON:	0.01 ACRES
GRAVEL INGRESS/EGRESS:	0.02 ACRES
CONSTRUCTION STAGING:	0.02 ACRES
CLUB ACRES:	0.00 ACRES



**CONSTRUCTION INGRESS & EGRESS**  
NOT TO SCALE

**BENCH MARK**  
SPK1  
1840.00 N  
4250.70 W  
ELEV=827.14  
STA. 7+5

**LEGEND:**

- 2010 CONTOUR AS PER RECORD PLANS
- 940 CONTOUR AS PER RECORD PLANS
- CONCRETE-125
- BY-PASS DRAIN LINE (TEMPORARY)
- LIMITS OF VEGETATION MAINTENANCE
- EXIST. CHAIN LINK FENCE
- EXIST. CRN
- EXIST. PIPE LAMP
- NEW GROUDED REPRAP APRON
- SAND BAG BARRIER (TEMPORARY)

**GRAPHIC SCALE:**  
30' 15' 0' 30' 60'

NO.	DATE	DESCRIPTION	BY/APP.	DATE	APPROVED
1		ISSUED FOR PERMITS			
2		ISSUED FOR CONSTRUCTION			
3		ISSUED FOR RECORDS			
4		ISSUED FOR RECORDS			
5		ISSUED FOR RECORDS			

DATE OF ISSUE: \_\_\_\_\_  
 DEPARTMENT OF AGRICULTURE  
 AGRICULTURAL RESOURCE MANAGEMENT CENTER  
 PROJECT NO. DOASW01-A  
 STATE IRRIGATION SYSTEM RESERVOIR SAFETY IMPROVEMENTS  
 HAWAII  
 PAALUO RESERVOIR  
 GENERAL SITE PLAN

YOUR ENGINEER, LLC  
 1000 W. KALANANAKU AVE., SUITE 200  
 HONOLULU, HI 96811

DESIGNED: M/J/AY  
 DRAWING: UM  
 CHECKED: DE  
 DATE: APRIL 2011  
 SCALE: 1"=30'  
 DRAWING NO.: C-14

**GENERAL SITE PLAN**  
SCALE: 1"=30'

DRAWING NAME: S:\000001 STATE\_PROJECTS\STATE\_IRRIGATION\_SYSTEMS\STATE\_IRRIGATION\_SYSTEMS\PROJECTS\DOASW01\DOASW01-A\GENERAL\_SITE\_PLAN.dwg DATE: 04-03-11 10:58 AM CDD BY: MGE/KE

NEIL ABERCROMBIE  
Governor



RUSSELL S. KOKUBUN  
Chairperson, Board of Agriculture

JAMES J. NAKATANI  
Deputy to the Chairperson

State of Hawaii  
DEPARTMENT OF AGRICULTURE  
1428 South King Street  
Honolulu, Hawaii 96814-2512

June 6, 2011

TO: Edwin Matsuda  
Flood Control/Dam Safety  
Engineering Division, DLNR

FROM:  Brian Kau, Administrator  
Agricultural Resource Management Division

SUBJECT: Comprehensive Exemption List for the Division of Agricultural Resource Management

I am sending you this letter in clarification of the exemption to CH 343 (Environmental Assessment) as it applies to the proposed improvements projects at Pu'u Kapu (HI-00042), Pu'u Pulehu (HI-00123) and Pa'auilo (HI-00131) reservoirs which are part of the greater State Irrigation System Reservoir Safety Improvements Project (SIRSIP). The work will performed under exemption of CH 343 (Environmental Assessment) based on exemptions allowed in DOA-ARM's comprehensive exemption list (posted on the OEQC web site).

Exemption Class I allows exemptions for operations, repairs or maintenance of existing structures, facilities involving negligible or no expansion or change of use beyond that previously existing. Each of the reservoirs are considered 'existing' structures as defined in the DOA-ARM's comprehensive exemption list. Each of the reservoirs are intended for irrigation storage and no significant storage increase or expansion or change in use is proposed beyond that which is currently existing based on the proposed scope of work. DOA-ARM has existing lease agreements with the respective landowners.

Exemption Class I (Paragraph 5) allows for Ch 343 exemptions for repairs which are necessary to maintain existing structures and facilities used in the irrigation systems at the Waimea-Lalamilo and Lower Hamakua Ditch Systems. The Puu Kapu and Puu Pulehu Reservoirs are operational structures/facilities that are of the Waimea-Lalamilo Irrigation Systems. Likewise, the Paauilo Reservoir is an operational structure/facility that is part of the Lower Hamakua Ditch System.

Please feel free to contact Mr. Glenn Okamoto at (808) 973-1123 if you need any additional clarification on this subject.

Enclosures



EXHIBIT 4

**COMPREHENSIVE EXEMPTION LIST FOR THE  
DIVISION OF AGRICULTURAL RESOURCE MANAGEMENT  
DEPARTMENT OF AGRICULTURE  
STATE OF HAWAII  
MARCH 8, 2000**

Pursuant to Section 11-200-8, Hawaii Administrative Rules, the following types of action, where they fall within the given classes of action, shall generally be exempt from the preparation of an environmental assessment:

**EXEMPTION CLASS 1:** Operations, repairs or maintenance of existing structures, facilities, equipment, or topographic features, involving negligible or no expansion or change of use beyond that previously existing.

The word "existing" means presently in use. The following enumerated actions shall not be undertaken: 1) if the structure, facility, equipment, or topographic feature is not owned, leased, set aside, or under the legal control of the Department of Agriculture and the Agribusiness Development Corporation; or 2) if the structure, facility, equipment or topographic features have been abandoned.

1. Repairs or rehabilitation which are necessary to maintain existing infrastructure improvements and facilities used in the agricultural parks at Pahoehoe, Panaewa, Hamakua, and Keahole -- all on Hawaii; Waianae, Kahuku, Waimanalo, Kalaeloa, and Royal Kunia - all on Oahu; Lanai Agricultural Park on Lanai; Molokai Agricultural Park on Molokai; and Kekaha on Kauai; also in agricultural product processing and marshalling plants at Kula, Maui; Molokai Cooling Plant on Molokai; Maunawili Experimental Station on Oahu; and Kamuela, Honalo, Hamakua, and Panaewa -- all on Hawaii. Removing of trees, shrubbery, and other foliage which are threatening to damage the existing infrastructures. Performing routine preventive maintenance trimming of brush and branches; and removing sediment and debris to keep access clear.
2. Repairs which are necessary to keep in useful condition existing roads, drainage improvements, street lights and roadway structures or facilities, other subdivision improvements installed in accordance with County subdivision Ordinances.
3. Repairs or rehabilitation to maintain existing buildings, control buildings, warehouses, storage or paint sheds, baseyards, grounds, and other related facilities being used in the administration, operation and maintenance of the agricultural parks and agricultural processing and marshalling facilities.
4. Repair, operate and maintain pumps and controls, pipes and other water control devices in the same location in order to provide service to existing agricultural parks and agricultural processing and marshalling facilities. Repair existing electrical, electronic or telemetering systems used to control or operate facilities, equipment, and appurtenances in the existing infrastructures.

**COMPREHENSIVE EXEMPTION LIST FOR THE  
DIVISION OF AGRICULTURAL RESOURCE MANAGEMENT  
DEPARTMENT OF AGRICULTURE  
STATE OF HAWAII  
MARCH 8, 2000**

Page 2 of 8

5. Repairs which are necessary to maintain existing structures and facilities used in the irrigation systems at Waimanalo, Waiahole, and Kahuku, Oahu; Waimea-Lalamilo and Lower Hamakua Ditch (Honokaa-Paauilo), Hawaii; Upcountry (Kula), Maui; Kekaha, Kauai; and Molokai. Cutting of trees which are threatening to damage existing structures, facilities and waterways in the irrigation systems. Performing maintenance trimming of brush, removing and depositing sediment and debris in order to open the waterways for irrigation systems. Provided that the action of removing and depositing sediment and debris shall be limited respectively to removing from existing waterways and depositing within the right-of-ways of such waterways.
6. Repairs which are necessary to maintain in a useful condition the existing access roads and road structures (such as culverts and bridges) to the minimum width required for the operation of vehicles used in the operation and maintenance of irrigation systems. These actions do not exempt the Division of Agricultural Resource Management from required permits and other regulatory requirements of federal, state, or county agencies.
7. Repairs which are necessary to maintain existing office buildings, control buildings, warehouses, paint sheds, baseyards, grounds, water treatment plants, and other existing facilities used in the existing water systems.
8. Repair, operate and maintain existing pumps and controls, pipes and channels in the same location in order to maintain service in existing water systems. Repair existing electrical and telemetering systems used to operate water facilities, equipment, and appurtenances in existing water systems. Repair existing diversions and intake structures, including valves, gates, and intake boxes. These actions do not exempt the Division of Agricultural Resource Management from required permits and other regulatory requirements of federal, state, or county agencies.
9. Modification required to existing buildings and equipment to meet new codes and regulations, i.e., Occupational Safety & Health Administration, building, fire, security, accessibility for the handicapped, environmental compliance, etc.
10. Request to the Department of Land and Natural Resources for setting aside of State lands by Governor's Executive Order to the Department of Agriculture and for award of land leases and permits. This exemption applies only to:
  - a. land designated by the Land Use Commission for agricultural use and not Conservation District land;



**GANNETT FLEMING, INC.**  
Suite 250  
4722 North 24th Street  
Phoenix, AZ 85016-4852

**Office: (602) 553-8817**  
Fax: (602) 553-8816  
www.gannettfleming.com

June 6, 2011

Mr. Jimmy M. Leung, P.E.  
State of Hawaii – DLNR  
Engineering Division – Dam Safety Section  
1151 Punchbowl Street  
Honolulu, HI 96813

**RE: Dam Safety Permit Application Review – Paauilo Reservoir, HI**

Dear Mr. Leung:

**Gannett Fleming, Inc. (Gannett Fleming)** has completed review of Dam Safety Permit Application Paauilo Reservoir (HI00131), Waimea, Hawaii. The following documents were submitted for review:

- Engineering Report Paauilo (HI0031) 05-10-2011
- DLNR Dam Safety Permit Application HI00131 (04-14-2011)

Our comments were provided on May 28, 2011 and responses to our comments were received on June 2, 2011. In general, the responses to our comments address the issues that were raised. It is our understanding the applicant is completing a Phase II Geotechnical Investigation as a separate project and that the improvements presented in the Permit Application dated 04-14-2011 and Engineering Report dated 05-10-2011 are not intended to address the safety deficiency related to seismic stability of the dam and cracking observed after the Kiholo Bay earthquake.

I have attached a copy of the completed comment resolution form for your records. Please do not hesitate to call me at 602-553-8817, ext. 8228 if you have any questions or require additional information.

Sincerely,  
**GANNETT FLEMING, INC.**

A handwritten signature in black ink that reads "Dean B. Durkee".

Dean B. Durkee, Ph.D., P.E.  
Vice President

Dam Safety Permit  
 Comment Response Form

PROJECT NAME/DESCRIPTION: DAM SAFETY PERMIT APPLICATION (REV 1),  
 PAUULO RESERVOIR (HI-00131), ISLAND OF HAWAII, JOB NO. DOASW01-A

DLNR PERMIT NO.

COMMENTS BY: GANNETT FLEMING, INC. GANNETT FLEMING  
 RESPONSE/RESOLUTION BY: YOGI KWONG ENGINEERS, LLC AND OCEANIT

DATE: 25 APRIL 2011  
 DATE: 02JUNE 2011

COMMENT NUMBER	REPORT SECTION	COMMENT	RESPONSE	RESOLUTION
<b>Comments on the Paaulio Reservoir (HI00131) State Irrigation System Reservoir Safety Improvements Project Engineering Report</b>				
1.	Section 5 Recommendations	The first sentence states, "The objective of this proposed reservoir improvements project is to meet the minimum design outlined in current Hawaii State Dam Safety Regulations pertaining to the operations and structural integrity of the dam." However, the dam safety deficiencies, as observed and reported in the University of Hawaii Research Report, "Reconnaissance Following the October 15 <sup>th</sup> , 2006 Earthquakes on the Island of Hawaii" by Ian N. Robertson, Peter G. Nicholson, Horst G. Brandes, Research Report UHM/CEE/06-07, October 26, 2006" indicated that larger cracking of the same nature, as reported for Puu Puhelu Reservoir, was reported for the Paaulio Reservoir, located further away from the epicenter. Please see reviewer's comments, dated 25 April 2011, regarding the <b>Dam Safety Permit Application, Paaulio Reservoir (HI00131), Waimea, Hawaii, Hawaii by Yogi Kwong Engineers, LLC: Phase I Dam Inspection Report, HA-00131, Hawaii County, Hawaii by LFR, Inc. dated January 9, 2009.</b>	Will amend Section 5 to read as follows:  <i>"The objective of this proposed reservoir improvements project is to perform maintenance operations improvements of the dam as summarized in the following subsections."</i>	Concur
2.	Section 5.3 Dam Instrumentation	The sentence states that 6 monitoring wells will be installed. The second and third sentences discuss 4 monitoring wells on the crest and 3 monitoring wells along the toe for a total of 7 monitoring wells. Please clarify.	This section will be corrected to indicate that seven wells will be installed (as indicated in the plans).	Concur
<b>Comments on the DAM NAME/PROJECT H&amp;H Report: Title/Date</b>				

Dam Name: Paaulio Reservoir, HI  
 Dam ID: HI 00131

**Dam Safety Permit  
 Comment Response Form**

PROJECT NAME/DESCRIPTION: DAM SAFETY PERMIT APPLICATION (REV 1), PAUULLO RESERVOIR (HI-00131), ISLAND OF HAWAII, JOB NO. DOASW01-A		DLNR PERMIT NO.		
COMMENTS BY: GANNETT FLEMING, INC. GANNETT FLEMING		DATE: 25 APRIL 2011		
RESPONSE/RESOLUTION BY: YOGI KWONG ENGINEERS, LLC AND OCEANIT		DATE: 02JUNE 2011		
COMMENT NUMBER	REPORT SECTION	COMMENT	RESPONSE	RESOLUTION
1	General Comment	The University of Hawaii Research Report, "Reconnaissance Following the October 15 <sup>th</sup> , 2006 Earthquakes on the Island of Hawaii" by Ian N. Robertson, Peter G. Nicholson, Horst G. Brandes, Research Report UHM/CEE/06-07, October 26, 2006", reported that larger cracking of the same nature, as reported for Puu Puhelu Reservoir, was reported for the Paaulio Reservoir, located further away from the epicenter.	Comment is noted. Please also see response to comment #2.	Concur
Comments on the Dam Safety Permit Application, Paaulio Reservoir (HI00131), Waimea, Hawaii, Hawaii by Yogi Kwong Engineers, LLC: Phase I Dam Inspection Report, HA-00131, Hawaii by LFR, Inc. dated January 9, 2009				

**Dam Safety Permit  
 Comment Response Form**

**PROJECT NAME/DESCRIPTION:** DAM SAFETY PERMIT APPLICATION (REV 1),  
 PAUULIO RESERVOIR (HI-00131), ISLAND OF HAWAII, JOB NO. DOASW01-A

DLNR PERMIT NO.

**COMMENTS BY:** GANNETT FLEMING, INC. GANNETT FLEMING  
**RESPONSE/RESOLUTION BY:** YOGI KWONG ENGINEERS, LLC AND OCEANIT

DATE: 25 APRIL 2011  
 DATE: 02JUNE 2011

COMMENT NUMBER	REPORT SECTION	COMMENT	RESPONSE	RESOLUTION
2	EXECUTIVE SUMMARY	<p>The Executive Summary confirms the above condition of Paaulio Reservoir, as a result of the 2006 Kiholo Bay earthquake. The recommendations made include those for "Priority I Recommendations", which "include those recommendations that address situations that may affect the safety of the dam or appurtenance." Paragraph PRIORITY 1 RECOMMENDATIONS, Subparagraph 1. Conduct Phase II Geotechnical Study states, "A slope stability analysis was conducted by EHA in 2001 (prior to the modifications to the dam and reservoir) that indicated that the embankment was unstable for a seismic condition with steady seepage (EHA 2001). Additionally, sizeable cracks were observed on the dam crest after the 2006 Kiholo Bay earthquake. Therefore LFR recommends that a Phase II Geotechnical Study be conducted to assess the stability and safety of the dam embankment in its present state. The phase II study should assess the applicability of the pseudo-static coefficient used in the 2001 EHA analysis (0.3g) and the seismic factor of safety of the embankment."</p> <p>It is noted that there was no Phase II Geotechnical Study (i.e. Geotechnical Exploration and Evaluation Report) submitted with the Permit Application for this project and the construction plans do not address the above dam safety deficiencies for the Paaulio Reservoir project.</p>	<p>We understand that a geotechnical investigation was conducted as part of the Pa'aulio Reservoir Lining Project. Due to budgetary constraints, a geotechnical investigation was not a part of this evaluation. A topographic survey of the embankment was conducted to evaluate the dimensions of the downstream embankment with respect to the design drawings for the Pa'aulio Reservoir Lining Project.</p> <p>Groundwater monitoring wells will be installed to allow monitoring of the presence of potential seepages through the liner reservoir and embankment.</p>	<p>Note, we have reviewed the permit application for Paaulio Reservoir. As stated above, we understand ..... "The objective of this proposed reservoir improvements project is to perform maintenance operations improvements of the dam as summarized in the following subsections."</p> <p>We further understand DLNR Dam Safety considers the current issues relating to geotechnical seismic stability analyses, to be a deficiency until the outstanding investigation and analyses related to cracking observed after the 2006 Kiholo Bay earthquake are addressed.</p>

**Dam Safety Permit  
 Comment Response Form**

**PROJECT NAME/DESCRIPTION:** DAM SAFETY PERMIT APPLICATION (REV 1),  
 PAUULO RESERVOIR (HI-00131), ISLAND OF HAWAII, JOB NO. DOASW01-A

DLNR PERMIT NO.

**COMMENTS BY:** GANNETT FLEMING, INC. GANNETT FLEMING  
**RESPONSE/RESOLUTION BY:** YOGI KWONG ENGINEERS, LLC AND OCEANIT

DATE: 25 APRIL 2011  
 DATE: 02JUNE 2011

COMMENT NUMBER	REPORT SECTION	COMMENT	RESPONSE	RESOLUTION
<b>Comments on the Paaulio Reservoir (HI-00131), Waimea, HI Construction Plans: State Irrigation System Reservoir Safety Improvements, Project No. DOAW01-A, dated 5/6/2010</b>				
1	Construction Drawing No. T-2 (Sheet No. 2 of 38 Sheets)	In GRADING NOTES, note 6, suggest replacing "5:1" with "5H:1V" for clarification.	Note revised	Concur
2	Construction Drawing No. T-3 (Sheet No. 3 of 38 Sheets)	In the GEOTECHNICAL NOTES, Paragraphs 1.A. and 1.B., change the date of the referenced Geotechnical Exploration and Evaluation reports to April 2011	Note revised	Concur
3	Construction Drawing No. T-3 (Sheet No. 3 of 38 Sheets)	In the GEOTECHNICAL NOTES, delete "& B-3" in Note 4. There is no Sheet B-3.	Note revised	Concur
1	SECTION 01401, QUALITY CONTROL, Paragraph 3.4 RECORDS, page 01401-2	In subparagraph B.1., change "sate" to "date". In subparagraph B.5., change "ne" to "meet". In subparagraph D., change "am" to "and".	Spec corrected and revised.	Concur

**Comments on the Paaulio Reservoir (HI-00131), Waimea, HI Project Specifications: Job No. DOASW01-A, State Irrigation System Reservoir Safety Improvements Project, Puu Kapu Reservoir (HI-000420), Puu Pulehu Reservoir (HI-00123), Paaulio Reservoir (HI-00131), Island of Hawaii, dated May 2010**

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PROJECT NAME/DESCRIPTION: DAM SAFETY PERMIT APPLICATION (REV 1),  
 PAULIO RESERVOIR (HI-00131), ISLAND OF HAWAII, JOB NO. DOASW01-A

DLNR PERMIT NO.

COMMENTS BY: GANNETT FLEMING, INC. GANNETT FLEMING  
 RESPONSE/RESOLUTION BY: YOGI KWONG ENGINEERS, LLC AND OCEANIT

DATE: 25 APRIL 2011  
 DATE: 02JUNE 2011

COMMENT NUMBER	REPORT SECTION	COMMENT	RESPONSE	RESOLUTION
2	SECTION 02200, EARTHWORK, Paragraph 1.7 CONSTRUCTION LINES, LEVELS AND GRADES, page 02200-2	In subparagraph B., suggest deleting "or a licensed Civil Engineer" unless the State of Hawaii Board of Registration for Professional Engineers and Licensed Surveyors permits or allows registered Civil Engineers to perform surveys.	Section revised. Licensed Civil engineer deleted.	Concur
3	SECTION 02200, EARTHWORK, Paragraph 2.1 MATERIALS, page 02200-3	In subparagraph A., suggest changing "Yard Fill" to "Earth Fill".	Section revised. "Yard Fill" to "Earth Fill".	Concur
4	SECTION 02200, EARTHWORK, Paragraph 3.2 BACKFILL, page 02200-4	In subparagraph A., suggest changing "Yard Area" to "Earth Fill Area".	Section revised. "Yard Fill" to "Earth Fill Area".	Concur
5	SECTION 02200, EARTHWORK, Paragraph 3.2 BACKFILL, page 02200-4	In subparagraph A. 1., revise subparagraph to read, "Earth fill, where no concrete slab occurs, shall be...compacted to at least 95% of the maximum density, as determined by ASTM D 698." Include moisture content requirements for "earth fill".	Concur. Will revise compaction requirement to at least 95% of the maximum density, as determined by ASTM D 698.	Concur
6	SECTION 02200, EARTHWORK, Paragraph 3.2 BACKFILL, subparagraph B. Structural Fill, page 02200-5	Revise subparagraph 3. to read, "New structural fill material...and compacted to at least 95% of the maximum density, as determined by ASTM D 698." Include moisture content requirements for structural fill.	Concur. Will revise compaction requirement to at least 95% of the maximum density, as determined by ASTM D 698.	Concur

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 PAUULO RESERVOIR (HI-00131), ISLAND OF HAWAII, JOB NO. DOASW01-A

DLNR PERMIT NO.

COMMENTS BY: GANNETT FLEMING, INC. GANNETT FLEMING  
 RESPONSE/RESOLUTION BY: YOGI KWONG ENGINEERS, LLC AND OCEANIT

DATE: 25 APRIL 2011

DATE: 02JUNE 2011

COMMENT NUMBER	REPORT SECTION	COMMENT	RESPONSE	RESOLUTION
7	SECTION 02200, EARTHWORK, Paragraph 3.2 BACKFILL, subparagraph B. Structural Fill, page 02200-5	In subparagraphs 4. and 5., change "yard" to "earth".	Section revised. Changed "change "yard" to "earth".	Concur
8	SECTION 02200, EARTHWORK, Paragraph 3.2 BACKFILL, subparagraph B. Structural Fill, page 02200-5	Revise subparagraph 6. to read, "The ground shall be...and recompact to at least 95% of the maximum density, as determined by ASTM D 698."	Concur. Will revise compaction requirement to at least 95% of the maximum density, as determined by ASTM D 698.	Concur
9	SECTION 02230 VEGETATION CONTROL, Paragraph 2.0 PART 2 - MATERIALS, page 02230-1	In subparagraph A., change "deleterious".	Detritus is the correct term for silt and debris material	Concur
10	SECTION 02230 VEGETATION CONTROL, Paragraph 3.1 VEGETATION CONTROL, page 02230-1:	In subparagraph D., change "optimal" to "optimum moisture content" and change "compact" to "compacted".	Revised "optimal" to "optimum moisture content" and change "compact" to "compacted".	Concur

Dam Name: Paaulo Reservoir, HI  
 Dam ID: HI 00131

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DLNR PERMIT NO.

**COMMENTS BY:** GANNETT FLEMING, INC. GANNETT FLEMING

DATE: 25 APRIL 2011

**RESPONSE/RESOLUTION BY:** YOGI KWONG ENGINEERS, LLC AND OCEANIT

DATE: 02JUNE 2011

COMMENT NUMBER	REPORT SECTION	COMMENT	RESPONSE	RESOLUTION
11	SECTION 02300 EXCAVATION AND EMBANKMENT: General Comment	Although this section is provided primarily for construction of the buttress toe fill for Puu Pulehu Reservoir (HI-00123), this section should be revised similar to that provided for Opaaula No. 1 and No. 2 Reservoirs, as applicable (Reference previous review comments for this Section provided for Opaaula Reservoirs No. 1 and No. 2).	Section to be revised	Concur
12	SECTION 02895 SURVEY MONUMENTS, Paragraph 4.01 MEASUREMENT, page 02895-2	Revise sentence to read, "Survey monuments shall...including concrete and brass cap, in-place complete."	Section 02895 revised as Embankment Monuments.	Aren't these really survey monuments?
13	SECTION 02995 GROUND WATER MONITORING WELLS	Subparagraph A of Paragraph 3.02 GROUNDWATER MONITORING is not included. Recommend including this subparagraph as follows: "Provide an electrical water level sensor with maximum cable of 100 feet, and with depths marked in 0.1 foot intervals. The Contractor shall make water level readings available to the Engineer on request. If more than one day is required to complete a boring, the Contractor shall take water level readings each morning prior to commencement of drilling operations. Water level readings shall be made from the top of the solid 2-inch diameter PVC casing. Elevations of top of PVC casings shall be provided by the Contractor after installation of each groundwater monitoring well."	Subparagraph A is added to 3.03 Groundwater Monitoring.	Concur
14	SECTION 02995 GROUND WATER MONITORING WELLS	In Paragraph 3.04 PERMEABILITY TESTING IN BORINGS, subparagraph E, edit the first sentence to read, "Install the slotted casing, solid casing, free-draining annulus backfill materials, bentonite plug, and concrete grout, as shown in the Construction Plans."	Assume comments refers to Paragraph	Please clarify

Dam Name: Paaulo Reservoir, HI  
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DATE: 25 APRIL 2011

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COMMENT NUMBER	REPORT SECTION	COMMENT	RESPONSE	RESOLUTION
15	SECTION 02995 GROUND WATER MONITORING WELLS	In Paragraph 3.06 INSTALLING PROTECTIVE COVERS, subparagraph 2., revise the second sentence to read, "Distance from the top...shall not exceed 6 inches."	Sub paragraph revised.	Concur

## **DAM SAFETY PERMIT GENERAL CONDITIONS**

### **APPROVAL OF PLANS AND SPECIFICATIONS FOR DAM AND RESERVOIR CONSTRUCTION, ENLARGEMENT, REPAIR, ALTERATION OR REMOVAL**

The following General Conditions shall be adhered to for all Dam Safety permits unless otherwise authorized in writing.

1. Actual construction, enlargement, repair, alteration or removal shall be completed within 5 years of issuance of the permit application approval unless an extension authorized in writing by the Board is issued.
2. Prior to the start of work the owner or applicant shall provide a construction engineer to ensure compliance with the approved plans and specifications and who shall have ultimate responsibility for the supervision of all inspection tasks. The construction engineer may assign some inspection tasks to a duly authorized agent under the construction engineer's supervision. The engineer shall be licensed in the State of Hawaii.
3. The construction engineer shall maintain a record of construction that at a minimum, shall include, daily activity, and progress reports, all test results pertaining to construction; photographs sufficient to provide a record of foundation conditions and various stages of the construction through completion, all geologic information obtained; and construction problems and remedies.
4. A construction quality assurance plan shall be prepared and submitted to the Department for approval prior to the start of construction, which details the minimum requirements of the construction engineer's observation of construction.
5. A construction schedule, which includes the notice to proceed date and estimated project duration and a construction emergency action plan shall be submitted prior to the preconstruction meeting.
6. A preconstruction meeting shall be held subsequent to submitting the quality assurance plan, construction schedule and construction emergency action plan, but not later than 14 days prior to the start of construction. All parties actively involved in the construction should be requested to attend, such as the dam owner, the design engineer, the construction engineer, the contractor and the Department.
7. The Department shall be notified 5 calendar days prior to the commencement of construction.
8. Any changes from the approved plans and specifications shall be approved by the design engineer and a change order, including details and supporting calculations, must be provided to the Department. Major changes must be submitted in writing with supporting documentation and approved in writing by the Department. No work shall be initiated until the approval by the Department or Board is received. Minor changes may be transmitted verbally and approved by the Department verbally provided that documentation of the change is provided to the Department within 10 days of the approval.

9. For new dam construction and for dams and reservoirs that have lowered the water level or have been drained to facilitate construction, the construction engineer shall file and obtain approval of a filling plan with the Department. The applicant/owner shall not proceed with the filling of the reservoir until it receives permission from the Department. The construction engineer shall provide documentation of monitoring during the filling operation.
10. Prior to the filling of the reservoir, the construction engineer shall submit one copy each of the approved Operations Manual and the approved Emergency Action Plan for the facility upon completion of the project as applicable.
11. The construction engineer shall give the Department at least ten days advanced notice of initial materials placement of the dam's foundation, in the cutoff trench, outlet backfill, outlet foundation, and any appurtenance requested by the Department in the approval of the plan for construction observation, to allow for observation by the Department.
12. Notice of substantial completion shall be issued by the construction engineer to the Department stating that the permitted improvements are functionally complete such that filling of the reservoir can be initiated with an approved filling plan.
13. The construction engineer shall give the Department fifteen (15) calendar days advance written notice prior to the project's final construction inspection. The construction engineer shall coordinate with the Department to conduct this inspection in the presence of the Department's dam safety personnel.
14. The construction engineer shall provide notice at least ten (10) days prior to initiating filling the reservoir, unless agreed at the final inspection.
15. If conditions are revealed which will not permit the construction, enlargement, repair, alteration, or removal of a safe dam or reservoir, the application for approval for construction, enlargement, repair, alteration, or removal shall be revoked.
16. A topographic survey of completed work including all monuments, inverts, crest alignment, spillways, and significant appurtenant features, when required by the Department shall be completed.
17. The applicant/owner shall utilize appropriate erosion control best management practice measures during construction to minimize turbidity (such as scheduling of work during period of low stream flow) and prevent debris and construction materials, including concrete, petroleum products, and other pollutants from enter the waters of the State. Construction related water and debris should be properly disposed of in a legal and environmentally safe manner and in accordance with the Department of Health and other Federal regulations.
18. The applicant/owner shall submit a copy of the dam safety application and the plans and specifications of the proposed improvements to the County Engineer of the County for which the dam resides for compliance with County codes.
19. Within fifteen (15) calendar days of completing the project, the applicant/owner or its representative shall provide the Department with a confirmation letter of compliance, signed and stamped by the construction engineer, indicating that the construction

was completed in accordance to approved plans and specifications including any field changes. The construction engineer shall submit the remaining construction completion documents which may include, but not be limited to, as-constructed drawing, final construction report, topographic survey, record of the location of permanent monuments, log of recorded water levels and other readings from the refilling operation, long-term instrumentation monitoring plan, and affidavit showing the actual cost of construction including engineering costs, within 60 calendar days of the submittal of the final construction inspection.

20. Construction completion documents and the construction engineer's certification shall be provided to the Department within 60 days of the final construction inspection. The Department will review the submitted items and furnish acceptance or denial within 60 days of receipt of satisfactorily completed construction completion documents and close out the dam safety permit.
21. This permit does not relieve the applicant/owner of their obligations to comply with all applicable Federal, State, and County regulations.