

Pacific Southwest Research Station - Institute of Pacific Islands Forestry - Hawaii Experimental Tropical Forest Laupahoehoe Research and Education Center Construction Project Watershed and Soils Report
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Watershed and Soils Report

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Table of Contents

Introduction	2
Proposed Action	2
Alternative 1 (No Action).....	4
Alternative 2 (Proposed Action-Green Alternative).....	4
Alternative 3 (Power for Facilities from Overhead Powerline).....	4
Alternative 4 (Power for Facilities from Propane Generation)	4
Alternative 5 (No wind turbines as supplemental power supply).....	4
Existing Resource Conditions	4
Watershed and Water Quality	4
Soils.....	5
Kapali Stream Crossing.....	5
Floodplains and Wetlands	8
Existing Roads.....	8
Proposed Facilities Site	9
Effects Discussion	10
Permits to be obtained	11
Mitigation Measures and Best Management Practices.....	11
References	11

Introduction

Facility construction at the Laupahoehoe Wet Forest Unit of the Hawai'i Experimental Tropical Forest is to occur to support the 1992 Hawaii Tropical Forest Recovery Act. This will require construction of housing and research facilities, parking areas, power lines and upgrades to current road infrastructure and stream crossing structures. A site visit was made to the Laupahoehoe Unit on October 17, 2008 by TEAMS Hydrologist Chad Hermandorfer to determine the potential soil and water effects caused by this proposed project.

Proposed Action

The proposed action includes the following activities for facility construction:

- Two to three housing units (20 person sleeping quarter capacity) with centralized facilities, one caretakers living unit, one administrative unit with teaching and meeting rooms, utility storage buildings, rooftop water collection systems, permanent vehicle wash stations and a parking area (20 vehicle capacity). The parking area may serve as a helipad site, or may be constructed within the facility footprint depending on site design. Infrastructure development associated with construction would include trenching at specific locations within the facility footprint for electrical, propane for cooking, and septic systems. Depths of trenching will comply with all state and county regulations. The foot print of these facilities is approximately 1.5 to 3.0 acres.
- Fencing for security and cattle/wild ungulate control would be installed around the 1.5 to 3.0 acre facility site. Preparation of the fence corridor will involve trimming of vegetation with hand operated tools (i.e., handsaw, machete, weed eater, chainsaw) from a 6 foot (ft) wide corridor. A 4 to 6 foot high fence would be constructed using hog wire or chain link fence supported by wooden or steel fence posts. The top wire of the fence will be smooth to reduce any chances of injury to birds or bats. To ensure control of wild ungulates some barbed wire/electrical fence may be used and fencing mesh size may be more tightly woven closer to the ground and buried to control non-native predators. The fence would avoid any major geological, rare biological, terrestrial, or archeological/cultural features as determined by the archeological and biological surveys.
- All efforts in facility design would preserve existing native *Ohia* and *Pisonia* trees. No more than 5% of native trees are expected to be necessary for removal for facility construction and safety concerns. Revegetation with native plants would occur in areas disturbed by construction activities within the facility footprint. Small native plant demonstration gardens for educational purposes may also be constructed and located within the facility complex footprint.
- Although wind and solar energy sources alone cannot supply power necessary for the proposed center, installation of solar panels and wind generators would provide supplemental green energy for these facilities. One wind generator with a maximum height of 120 feet would be located near the center in an area that maximizes wind-power generation and is at least 100 feet away from existing trees. Solar panels would be located either on rooftops of facilities or on free standing posts nearby. All installations of alternative energy sources would comply with all county building and zoning codes (<http://www.co.hawaii.hi.us/countycode/chapter25.pdf>)

- Alternative energy power sources would be installed to supplement energy needs for facilities. Wind and solar alone cannot supply all power necessary for the proposed facilities, however, wind generators and solar panels would be placed near or on facility structures to supplement energy needs and reduce usage from other power sources. All installations of alternative energy sources would comply with all county building and zoning codes (<http://www.co.hawaii.hi.us/countycode/chapter25.pdf>)
- Limited road improvements such as grading to smooth out rough areas, and resurfacing in some areas would occur along the Manowaiopae Homestead Road. No road widening beyond the existing road template will or major resurfacing would occur except for the road repair at the Kapili stream crossing. A minor road realignment at the Kapili stream crossing would provide safer passage during high water events and eliminate other safety concerns related to existing road undercut. A 12+/- foot shift of the roadway from the center of the Kapili steam road crossing and for the next 25 feet (traveling up the road) will improve the horizontal curve and also move away from the under cut. The elevation of the road may change slightly but will match the stream on the high side maintaining the same flow capacity. The existing crossing will remain intact where it is not undercut, however traffic will be diverted away from existing road undercut. Water depth indicators will be placed on each side of the stream crossing to alert vehicle drivers of water depth in the event of a large storm event.

Issues

An issue is a point of disagreement, debate, or dispute with a proposed action based on some anticipated effect. Forest Service personnel receive public comments and categorize them into significant or non-significant issues. The Council on Environmental Quality (CEQ) NEPA regulations require this delineation in Sec. 1501.7, "...identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)..."

Significant issues are those with a clear direct or indirect causal relationship from implementing the proposed action. Non-significant issues are identified as those (1) outside the scope of the proposed action; (2) already decided by law, regulation, Forest Plan, or other higher level decision; (3) irrelevant to the decision to be made; or (4) conjectural and not supported by scientific or factual evidence.

After both internal and external scoping was completed, it was determined that no significant or non-significant issues exist for this project in terms of the soil and watershed resources. Therefore, this analysis was conducted to see if the Project follows laws set up to protect soil and watershed resources either by the County of Hawaii, State of Hawaii or the United States Government.

Alternatives

The following paragraphs describe the Alternatives for the LHH project including the Proposed Action and the No Action Alternative.

Alternative 1 (No Action)

Under the No Action alternative, no ground disturbing activities, facility construction or minor road improvements would occur. Research activities associated with the HETF would continue to occur requiring research scientists to travel to HETF on a more frequent basis from Hilo or other places of residence to conduct research. Educational program scope would be reduced due to the absence of teaching rooms and facilities. Grazing activity would continue to occur on the site. .

Alternative 2 (Proposed Action-Green Alternative)

See Proposed Action page 1

Alternative 3 (Power for Facilities from Overhead Powerline)

Same as the proposed action alternative (Alternative 2) except power to the facilities would be above ground. The power line would run parallel to the Manowaiopae Homestead road within the road right-of way. Alternative 3 evaluates the scenic impact from the installation of overhead electrical power lines and costs associated with installation of above ground power.

Alternative 4 (Power for Facilities from Propane Generation)

Same as the proposed action alternative (Alternative 2) except all power for the facilities would be generated by an onsite propane generation system. No extension of power lines from existing service would occur. Some above ground electrical lines within the facility footprint (1.5 to 3 acre site) may occur at specific areas to provide service. Alternative 4 evaluates the scenic impact and costs of power generation for the facility.

Alternative 5 (No wind turbines as supplemental power supply)

Same as the proposed action alternative (Alternative 2) except wind turbines would not be installed. Alternative 5 addresses impacts to the federally listed species.

Existing Resource Conditions

Watershed and Water Quality

General Overview: Within the LHH Project area (as described in the EA), there are 3 watersheds where project activity would occur. These are the Kilau Stream watershed, the Kapili Stream watershed, and the Lapahoehoe Stream watershed. The 2006 State of Hawaii Water Quality Monitoring and Assessment Report (Hawaii State Department of Health, Environmental Planning Office 2008) was consulted to see if any of the project area streams are impaired based on the State of Hawaii water quality criteria. The report shows that all of the project area streams are meeting the water quality standards set forth by the State of Hawaii.

Laws to be followed: The Hawaii Experimental Tropical Forest Laupahoehoe Facility Construction Project must meet the standards set forth in the Clean Water Act. The Clean Water Act of 1977 was created to restore and maintain the chemical, physical and biological integrity of the Nation's waters. (Section 101(a)). It also regulates discharge of dredged or fill material into navigable waters (waters of the U.S.) (Section 404).

Soils

General Overview: The dominant soil type within the 1.5 to 3 acre project footprint site where the research and education center facility will be constructed is the Kiloa Extremely Stony Muck, 6 to 20 percent slopes Map Unit. The map unit symbol is: rKXD.

The following information for the rKXD soil comes from the Natural Resources Conservation Service (NRCS) website <http://soildatamart.nrcs.usda.gov/>

Description Category: S05

The Kiloa series consists of well drained, thin, extremely stony organic soils over fragmental aa lava. The surface layer is very dark brown extremely stony muck about 10 inches thick. It is underlain by fragmental aa lava. They are on uplands at an elevation ranging from 1,000 to 4,000 feet. They receive 90 to 150 inches of rainfall annually. Their mean annual temperature is between 64 and 67 degrees F.

Description Category: S01

This is a well drained, extremely stony organic soil that is shallow to fragmental aa lava, but deep to underling bedrock. It occurs on moderately sloping to moderately steep uplands. Slightly weathered ash and cinders are in the voids of the lava. The soil is strongly acid. Permeability is rapid, runoff is very slow, and the erosion hazard is slight.

Other pertinent facts about the Kiloa Extremely Stony Muck soil include:

- No ponding or flooding concerns
- It is recommended that small buildings not be built on slopes greater than 8%
- Greater than 50% of the soil has rock fragments greater than 3" in size.
- Not ideal for septic tank construction.
- The large rocks do not make this an ideal building site.
- 127 cm to bedrock

Kapali Stream Crossing

General Overview: As stated in the Proposed Action, minor road realignment (12+/- foot) at the Kapili stream crossing would occur to provide safer vehicle passage during high water events and eliminate other safety concerns related to the existing road undercut shown in Figure 1.



Figure 1. Existing stream crossing at the Kapili Stream. Notice the actively eroding undercut just right of center in the photo.

The Kapili stream is a 5-10 foot wide intermittent stream channel consisting of a boulder and cobble substrate (Figure 2). The vegetation in and around the stream and at the stream crossing site consists primarily of Sugarcane, Hilo grass, Vasey grass, and Glenwood grass. In checking the USGS Real Time Water Data for Hawaii website (<http://waterdata.usgs.gov/hi/nwis/rt>), no past flow data exists for the Kapili Stream. From eyewitness accounts, it should be noted that the stream is known to be flashy. Flows approaching 6-10 feet above channel bottom elevation have been seen (IPIF Staff, 2008). The stability of the channel bodes well for the proposed work that is planned for the site.



Figure 2. Typical substrate found within the Kapili Stream. Notice the predominance of cobbles and boulders.

Laws to be followed: The U.S. Army Corps of Engineers regulates the discharge of fill material into the waters of the United States. The Corps derives its authority from the two Federal laws that are central to the Corps regulatory program. Section 10 of the Rivers and Harbors Act of 1899 applies to all navigable waters of the United States and Section 404 of the Clean Water Act applies to all waters including wetlands that have sufficient nexus to interstate commerce. Waters of the United States include essentially all surface waters such as all navigable waters and their tributaries, all interstate waters and their tributaries, all wetlands adjacent to these waters, and all impoundments of these waters.

Due to the fact that the Kapili stream is not a navigable waterway, only Section 404 applies to the LHH Project. The following is a description of when a Section 404 permit is needed (<http://www.poh.usace.army.mil/EC-R/EC-R.htm>)

Clean Water Act – Section 404

Section 404 of the Clean Water Act requires approval prior to discharging dredged or fill material into the waters of the United States in dealing with any of the following:

- Deposition (placement) of fill or dredged material in waters of the U.S. or adjacent wetlands.
- Site-development fill for residential, commercial, or recreational developments.
- Construction of revetments, groins, breakwaters, levees, dams, dikes, and weirs.
- Placement of riprap and road fills.

In the case of the Kapili stream crossing site, road fill will be placed directly in the stream channel, thus triggering the need for a Section 404 permit from the Corps. This must be completed prior to project implementation.

Floodplains and Wetlands

Laws to be followed: There are 2 executive orders that must be addressed in regards to floodplains and wetlands. They are as follows:

- Executive Order 11990, 1977; (Wetlands Management) requires federal agencies to follow avoidance, mitigation, and preservation procedures with public input before proposing new construction in wetlands. To comply with Executive Order 11990, the federal agency would coordinate with the ACOE, under Section 404 of the Clean Water Act, and mitigate for impacts to wetland habitats.
- Executive Order 11988, 1977 (Floodplain Management) requires all federal agencies to take actions to reduce the risk of flood loss, restore and preserve the natural and beneficial values in floodplains, and minimize the impacts of floods on human safety, health, and welfare.

Field reconnaissance of the project foot print site in October 2008 as well as the LHH project area did not locate any existing wetlands, riparian, or hydric vegetation. Further, there are no ponding or flooding concerns associated with project area soils. Therefore, Executive Order 11990 would be followed.

There will be minor impacts to the stream channel/floodplain at the Kapili Stream Crossing. The channel would be excavated upstream of the current crossing approximately 12 feet. This equates to a disturbance site of approximately 0.01 acres. Excavation would occur so that pavement could be placed to match the current stream gradient at the site. The flow capacity of the stream would not be compromised with this activity. The channel roughness would be changed at this site, but 12-15 feet of stream channel is so minor that it would not be detectable at a watershed scale. For these reasons, Executive Order 11998 would be followed.

Existing Roads

General Overview: The Manowaiopae Homestead Road is the only access route into the proposed LHH facilities site. The road is maintained by the County of Hawaii and other private landowners who reside in the area. The road is paved in the lower portions before becoming a mixture of pavement and gravel shortly above the Kapili Stream Crossing. The road is approximately 10-12 feet wide supporting regular 4 wheel drive high clearance vehicles. From a hydrological perspective, the road showed little to no areas of rill or gully erosion. There are areas with past evidence of minor sheet erosion but, overall, the road base was stable and drainage structures were functioning.

Proposed Facilities Site

General Overview: The facilities for the LHH research station are to be constructed within a 1.5 to 3 acre parcel of land. The northern area of the parcel is shown in Figure 3. According to the professional survey conducted by the U.S. Forest Service, the parcel has slopes between 5-15%. Slope stability for the site is not an issue and drainage at the site is rapid with no evidence of standing water or wetland vegetation. According to NRCS soils information, the site is not ideal for a septic system. The rocky soils would not leave enough time for effluent to properly filter through the soil profile.

On January 21, 2009 TEAMS Hydrologist Chad Hermandorfer talked with the County of Hawaii, Department of Water Supply, Engineering Department about the intention to use a rooftop rainwater catchment as the water supply for the facilities. There is no need to file for a water right if a rooftop rainwater catchment is used in the County of Hawaii.



Figure 3. Photo of proposed Laupahoehoe Facilities Construction Site.

Effects Discussion

Implementation of the No Action Alternative would keep existing soil and water resource conditions static. There would be no disturbance to the stream channel and floodplain at the Kapili stream crossing site. Further, no road maintenance would occur to the Manowaiopae Homestead Road and no disturbance would occur at the LHH project foot print site.

Regardless of which action alternative is selected, soil and watershed effects would be the same.

Water Quality: Water quality concerns exist at the Kapili Stream Crossing and the facilities construction site. There is the potential for a flush of sediment during construction of the low water crossing at the Kapili stream. This potential exists if construction is started and, then, interrupted by heavy rainfall that would produce a significant flow in the channel. It is recommended that the construction take place when heavy rains and streamflow is not likely. The work should not take place when the stream is flowing. This would reduce the risk of sedimentation to the Kapili stream and protect water quality downstream.

Proper installation of the septic system at the LHH facilities site is important. According to the NRCS soils database, the Kiloa Extremely Stony Muck soil is not ideal for septic system placement due to the rapid drainage of the soil. A leech bed site must be selected where proper filtration of the effluent can occur. If this is not achievable, mitigations or alternatives may be necessary. Guidance from the County of Hawaii Health Department or the NRCS may be warranted.

Construction activities for the LHH facilities should not impact water quality in terms of sediment. The closest stream drainages are approximately ¼ mile from the LHH project foot print site. Silt fencing is recommended around the construction site during construction and until the site has revegetated, but whatever sediment does leave would be filtered out before reaching project area stream channels.

Road maintenance activities would be a positive in terms of water quality. Improvements to road drainage on the Manowaiopae Homestead Road would reduce the already minor sediment yield entering project area streams from the road.

Trenching for power lines would not cross any streams and therefore would not be a concern in terms of erosion and subsequent sedimentation to project area streams.

Soils: Impacts to soils would be seen at the LHH project foot print site. There would be a permanent allocation of the soil resource to construct the facilities. At most, 3 acres would be allocated. With HETF lands located in the watersheds above and state and county lands located just below, it is not expected that major allocations of other soils in the area would occur, making this a very minor overall impact to the soils resource in the area.

Floodplains and Wetlands: Please see the Floodplains and Wetlands Section above for a discussion of effects.

Permits to be obtained

Two permits pertaining to water quality would need to be obtained before implementation of this project can occur. The Section 404 permit dealing with the placement of road fill into the Kapili stream must be obtained from the U.S. Army Corps of Engineers. Contact information for the regulatory branch of the Corps in Honolulu and how to apply for a permit are located in the planning record.

The second permit is the building permit which also includes the septic tank permit. It is important that the County of Hawaii approves the placement of the septic tank. The steps to applying for a building permit in the County of Hawaii are located in the planning record as well.

Mitigation Measures and Best Management Practices

The Best Management Practices Manual for Construction Sites in Honolulu 1999 was consulted regarding implementation of BMPs for the LHH Facilities Project. The Manual was the only document found for the State of Hawaii that specifically dealt with Construction BMPs. Implementation of these BMPs would insure protection of soil and watershed resources in the LHH project area into the future.

The entire Best Management Practices Manual for Construction Sites in Honolulu is located in the planning record. It is recommended that this document be reviewed prior to contract preparation. The following is a list of BMPs recommended to be implemented with this project:

- ESC1: Scheduling
- ESC2: Preservation of Existing Vegetation
- ESC3: Location of Potential Sources of sediment
- ESC10: Seeding and Planting
- ESC23: Construction Road Stabilization
- ESC25: Protection of Stockpiles
- ESC50: Silt Fence Installation

References

County of Hawaii, Department of Public Works, How to Obtain a Building Permit webpage:
http://www.hawaii-county.com/permits/how_to_get_permit.html

Department of Environmental Services, City and County of Honolulu, May 1999, Best Management Practices Manual for Construction Sites in Honolulu, 144pp.

Description of Executive Order 11990, protection of wetlands:
<http://www.archives.gov/federal-register/codification/executive-order/11990.html>

Description of Executive Order 11988, Floodplain management:
<http://www.archives.gov/federal-register/codification/executive-order/11988.html>

Hawaii State Department of Health, Environmental Planning Office, 2008, 2006 State of Hawaii Water Quality Monitoring and Assessment Report, 40pp.

Natural Resources Conservation Service (NRCS) Soil Mart Data webpage:
<http://soildatamart.nrcs.usda.gov/>

United States Army Corps of Engineers webpage on how to apply for a Section 404 permit:
<http://www.poh.usace.army.mil/EC-R/EC-R.htm>