

FINAL ENVIRONMENTAL ASSESSMENT

for the

Phycal Algae Pilot Project Wahiawa and Kalaeloa, HI

November 2011



Prepared for:
Department of Energy
National Energy Technology Laboratory

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Prepared by:



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Honolulu, Hawaii 96813

**National Environmental Policy Act (NEPA) Compliance
Cover Sheet**

Proposed Action:

The United States (U.S.) Department of Energy (DOE) proposes, through a cooperative agreement with Phycal, Inc. (Phycal), to partially fund implementing and evaluating new technology for the reuse of carbon dioxide (CO₂) emissions from industrial sources for green energy products. This project would use CO₂ to grow algae for the production of algal oil and subsequent conversion to fuel. The project would generate reliable cost information and test data to assess its viability for future implementation at commercial scale. If approved, DOE would provide approximately 80 percent of the funding for the project.

Type of Statement: Final Environmental Assessment

Lead Agency: U.S. Department of Energy; National Energy Technology Laboratory (NETL)

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Abstract:

DOE prepared this Environmental Assessment (EA) to assess the potential for impacts to the human and natural environment of its Proposed Action -- providing financial assistance to Phycal under a cooperative agreement. DOE's objective is to support the development of innovative concepts for beneficial CO₂ use, which include, but are not limited to, CO₂ mineralization to carbonates directly through conversion of CO₂ in flue gas; use of CO₂ from power plants or industrial applications to grow algae or biomass.

Under the terms of the cooperative agreement, DOE would provide approximately 80 percent of the funding for the development of a pilot algae farm and processing facility in Wahiawa and Kalaeloa, Hawaii, to demonstrate the beneficial use of CO₂ for the growing of algae and production of algal oil (referred to as the "proposed project" within this EA). The proposed project would develop algae technology that demonstrates the future potential of algal oil for biofuels at a level that results in technical, economic, and environmental advantages. This advanced technology would not only help to enhance U.S. energy supplies through the responsible development of domestic renewable energy but would also help to reduce CO₂ emissions to the atmosphere. The proposed project would include developing an algae farm and processing facility, which would include constructing shallow ponds, greenhouses, lab/offices, a process building, and an outdoor area with various processing equipment facilities.

The proposed project would be split into two phases or Modules. Module 1 would provide a baseline assessment of core processes and initial optimization. Module 2 would include the scaling and integration of supporting processes. The overall objective of proposed project would be to confirm the process economics prior to commencing to a commercial scale, development of which is not funded under this award. The proposed project would create approximately 20 jobs in Module 1, and another 20 jobs in Module 2, for the total duration of the approximately three-year pilot.

The environmental analysis identified that the most notable, although minor, changes to result from the proposed project would occur in the following areas: utilities and energy use, air quality and greenhouse gas, noise, geology and soils, vegetation and wildlife, solid and hazardous wastes, transportation and traffic, and human health and safety. No significant environmental effects were identified in analyzing the potential consequences of these changes.

Public Participation and Comments:

DOE encourages public participation in the National Environmental Policy Act (NEPA) process. A public notice describing the proposed project and providing notice of availability of the Draft EA was published in the local newspaper, the *Honolulu Star Advertiser*, on August 14, 15 and 16, 2011. The Draft EA was released for public review and comment on August 15, 2011. The public were invited to provide oral, written, or e-mail comments on the Draft EA to DOE by the close of the comment period on September 13, 2011. Copies of the Draft EA were also distributed to Federal and State agencies, and copies were sent to libraries in Wahiawa and Kapolei (see distribution list in Section 6.0). Comments received by the close of the comment period were considered in preparing this Final EA for DOE's Proposed Action. The EA is also available on the National Energy Technology Laboratory (NETL) website: <http://www.netl.doe.gov/publications/others/nepa/ea.html>.

DOE received comments on the Draft EA from the State of Hawaii, Department of Agriculture (DOA), State of Hawaii, Office of Hawaiian Affairs (OHA), and the U.S. Fish and Wildlife Service (USFWS). Appendix C provides copies of these letters. No other public comments were received.

The comment from the DOA dated September 19, 2011, stated that the Department did approve a permit on March 3, 2011 for the importation and local sourcing of non-genetically modified algae. DOA also asked whether the project considered the feasibility of by-products of algae processing, such as feed for livestock. In response, the DOE referred to Section 3.2.6 Solid and Hazardous Wastes, of the EA.

In correspondence dated September 20, 2011, OHA concurred with the DOE's determination pursuant to the National Historic Preservation Act, that this action would result in "no adverse effect" to historic properties, but expressed concern relative to the inadvertent release of imported algae genera on our natural ecosystem. OHA stated that they recognized the algae genera selected for cultivation are permissible by the State of Hawaii Board of Agriculture, and that a series of measures to control the accidental release of cultures and live organisms are being incorporated into the facility. OHA stated they have no objections to the summary of impacts described in the Draft EA (Table 2.7.1).

The comment from USFWS, dated October 4, 2011, stated that "based on the avoidance and minimization measures, the Service concurs with your determination this proposed project may affect, but is not likely to adversely affect the Hawaiian moorhon, Hawaiian coot, Hawaiian stilt, and Hawaiian duck." Section 3.2.5.2.2 of the Final EA has been supplemented to address this comment.

Appendix C provides an overall summary of DOE's responses to these comments.

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ACRONYMS

| Acronym | Definition |
|-------------------|---|
| μ | microns |
| μg/m ³ | micrograms per cubic meter of air |
| AA | Archaeological Assessment |
| AAQA | Ambient Air Quality Standard |
| AIS | Archaeological Inventory Survey |
| ALISH | Agricultural Lands of Importance to the State of Hawai‘i |
| AQRV | Air Quality Related Values |
| BACT | Best Available Control Technology |
| BMP | Best Management Practices |
| BTU | British Thermal Unit |
| BWS | Board of Water Supply |
| °C | Celsius |
| CAA | Clean Air Act |
| CAB | Clean Air Branch |
| CCSP | Climate Change Science Program |
| CFR | Code of Federal Regulations |
| CIA | Cultural Impact Assessment |
| Cl | Chlorine |
| CO | Carbon monoxide |
| CO ₂ | Carbon dioxide |
| County | City and County of Honolulu |
| Cr | Coral Outcrop |
| CSP | Covered Source Permit |
| cy | cubic yards |
| CX | categorical exclusion |
| dBA | Decibel |
| DBEDT | State Department of Business, Economic Development, and Tourism |
| DCS | Distributive Control System |
| DLNR | State of Hawaii Department of Land and Natural Resources |
| DNA | Deoxyribonucleic acid |
| DOA | State of Hawaii Department of Agriculture |
| DOE | U.S. Department of Energy |
| DOH | State of Hawaii Department of Health |
| DOT | State of Hawaii Department of Transportation |
| DP | Development Plan |
| EA | Environmental Assessment |
| EIS | environmental impact statement |
| EPA | Environmental Protection Agency |
| ESA | Environmental Site Assessment |
| °F | Fahrenheit |
| FEMA | Federal Emergency Management Agency |

| Acronym | Definition |
|-----------------------|---|
| FIRM | Flood Insurance Rate Map |
| FOA | Funding Opportunity Announcement |
| FONSI | Finding of No Significant Impact |
| ft | Feet |
| gal | Gallon |
| GHG | greenhouse gases |
| GERC | General Electric Research Center |
| gpd | gallons per day |
| HAPs | Hazardous air pollutants |
| HAR | Hawaii Administrative Rules |
| HECO | Hawaiian Electric Company |
| HEPCRA | Hawaii State Emergency Planning and Community Right-To-Know Act |
| HRS | Hawaii Revised Statutes |
| HSG | Hydrologic Soil Group |
| kW | Kilowatts |
| ICCS | Industrial Carbon Capture and Sequestration |
| IPCC | International Panel on Climate Change |
| LSB | Land Study Bureau |
| LUC | State Land Use Commission |
| LUO | Land Use Ordinance |
| m | Meter |
| MACT | Maximum Achievable Control Technology |
| mg/L | Milligram per liter |
| M | Million |
| MMTCO ₂ Eq | million metric tons of CO ₂ equivalent |
| mtpy | metric tons per year |
| MT | Metric Tons |
| MW | megawatts |
| NAAQS | National Ambient Air Quality Standards |
| NEPA | National Environmental Policy Act |
| NETL | U.S. DOE National Energy Technology Laboratory |
| NO ₂ | Nitrogen dioxide |
| NO ^x | Nitrogen oxides |
| NPDES | National Pollutant Discharge Elimination System |
| NPL | National Priorities List |
| O ₃ | Ozone |
| OSHA | Occupational Safety and Health Administration |
| Pb | Lead |
| Phycal | Phycal, Inc. |
| PM | Particulate Matter |
| PM ₁₀ | Particulate Matter smaller than 10 microns |
| PM _{2.5} | Particulate Matter smaller than 2.5 microns |
| ppm | parts per million (by volume) |

| Acronym | Definition |
|-----------------|--|
| PSD | Prevention of Significant Deterioration |
| ROD | record of decision |
| SAAQS | State Ambient Air Quality Standards |
| SCP | Sustainable Communities Plan |
| sf | square feet |
| SHPD | State Historic Preservation Division |
| SHPO | State Historic Preservation Officer |
| SHWB | Solid and Hazardous Waste Branch |
| SIP | State Implementation Plan |
| SLAMS | State and Local Air Monitoring Stations |
| SO ₂ | Sulfur dioxide |
| SO _x | Sulfur oxides |
| SPCC | Spill Prevention Control and Countermeasures |
| TMK | Tax Map Key |
| tpy | tons per year |
| UPS | Uninterruptable Power Supply |
| U.S. | United States |
| USFWS | U.S. Fish and Wildlife Service |
| VOC | Volatile organic compound |
| WaA | Wahiawa silty clay, 0 to 3 percent slopes |
| WaB | Wahiawa silty clay, 3 to 8 percent slopes |
| WWTP | Wastewater Treatment Plant |

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1.0 PURPOSE AND NEED

The Department of Energy's (DOE) National Energy Technology Laboratory (NETL) selected possible recipients of financial assistance from the Department through a competitive process under Funding Opportunity Announcement (FOA) (DE-FOA-0000015), "Carbon Capture and Sequestration from Industrial Sources and Innovative Concepts for Beneficial CO₂ Use." Under this competitive financial assistance solicitation, the reasonable alternatives consist of those projects that are submitted and deemed responsive to the requirements of the FOA.

In accordance with the American Recovery and Reinvestment Act of 2009, and Section 703 of Public Law 110-140, DOE solicited applications on June 8, 2009 in two areas of interest:

- Area of Interest 1 – Projects that would demonstrate advanced technologies that capture and sequester carbon dioxide (CO₂) emissions from industrial sources.
- Area of Interest 2 – Projects that would evaluate innovative concepts for beneficial CO₂ use.

A key objective of the FOA under Area of Interest 2 is to support the development of innovative concepts for beneficial CO₂ use, which include, but are not limited to, capture of CO₂ from industrial sources and subsequent mineralization of CO₂ to carbonates; use of CO₂ from power plants or industrial applications to grow algae or biomass for subsequent conversion to fuel; or conversion of CO₂ to fuels, chemicals or plastics. DOE's program focuses on pathways and novel approaches for reducing emissions by developing value-added conversions of CO₂, such as the conversion to useable products and fuels and other breakthrough concepts that could mitigate CO₂ emissions in areas where geologic storage may not be available.

The application period closed on August 7, 2009. The selection process consisted of two phases. In Phase I, DOE selected 12 projects from Area of Interest 2 applications to undergo further project definition. Project definition activities included, but were not limited to, development of: a project baseline, detailed project management plan, project schedule, project cost estimate, firm host site commitments, firm financial commitments and a funding plan for the non-DOE share of the project costs. Project definition activities may have included preliminary design and permitting. Phase I awardees interested in continuing their project into Phase II were given an opportunity to submit a Renewal Application. Based on the Renewal Applications received, DOE selected a subset of the original projects through a second competitive process. Awardees for Phase II shall undertake further project planning, while DOE completes environmental reviews of their projects. Subsequently, successful awardees would construct and conduct pilot-scale field tests of their proposed technologies, in accordance with their application and the terms of their cooperative agreement with DOE. Of the 12 projects selected for Phase I, 11 submitted renewal applications. As there were no potential adverse impacts from Phase I, the National Environmental Policy Act (NEPA) process called for by 10 Code of Federal Regulations (CFR) §1021.216 (Code of Federal Regulations) was performed on only those 11 projects that submitted renewal applications for Phase II awards. DOE selected six projects for Phase II awards.

This project, proposed by Phycal was one of the six projects that DOE selected for Phase II funding. DOE's Proposed Action is to provide \$48.5 million (M) in financial assistance for Phase II in a cost-sharing arrangement with the project proponent, Phycal. The total cost of the Phase II project is estimated at \$60.6 million.

1.2 Purpose and Need for Department of Energy Action

In addition to stimulating the nation's economy, the overall purpose and need for DOE action pursuant to Area of Interest 2 of the Recovery Act funding opportunity DE-FOA-000015 is to carry out design, construction and testing of innovative CO₂ utilization technologies and processes at sufficient scale (e.g., pilot-scale) to generate reliable cost information and test data to assess the technical and economic viability of the concepts for future implementation at commercial scale. This work would determine possible pathways and novel approaches for reducing CO₂ emissions by developing beneficial uses for the CO₂, such as the conversion of CO₂ to useable products and fuels and other breakthrough concepts that would mitigate CO₂ emissions in areas where geologic storage may not be an optimal solution. This work focuses on increasing investment in CO₂ utilization projects by selecting projects that have progressed beyond the fundamental research and development stage and are ready for implementation at the pilot-scale level. DOE intends to further this purpose and satisfy this need by providing financial assistance under cost-sharing arrangements to this and the other five projects selected under this funding opportunity announcement.

These selected projects are needed to evaluate advanced technologies that capture CO₂ emissions from industrial sources and put it to beneficial use to reduce CO₂ emissions to the atmosphere. This project would also meaningfully assist in the nation's economic recovery by creating jobs in the United States (U.S.) in accordance with the objectives of the Recovery Act.

1.3 National Environmental Policy Act and Related Procedures

This Environmental Assessment (EA) was prepared in accordance with NEPA, as amended (42 U.S.C 4321), the President's Council on Environmental Quality regulations for implementing NEPA (40 CFR 1500-1508), and DOE's implementing procedures for compliance with NEPA (10 CFR 1021). This statute and the implementing regulations require that DOE, as a Federal agency:

- Assess the environmental impacts of any Proposed Action;
- Identify adverse environmental effects that cannot be avoided, should the Proposed Action be implemented;
- Evaluate alternatives to the Proposed Action, including a No Action Alternative; and
- Describe the cumulative impacts of the Proposed Action together with other past, present, and reasonably foreseeable future actions.

These provisions must be addressed before a final decision is made to proceed with any proposed Federal action that has the potential to cause impacts to the human environment, including providing Federal funding to a project. This EA evaluates the potential individual and cumulative effects of the proposed project and the No Action Alternative on the physical, human, and natural environment. The EA is intended to meet DOE's regulatory requirements under NEPA and provide DOE with the information needed to make an informed decision about providing financial assistance.

NEPA requires Federal agencies to take into account the potential consequences of their actions on both the natural and human environments as part of their planning and decision-making processes. To facilitate these considerations, a number of typical actions that have been determined to have little or no potential for adverse impacts are categorically excluded from the detailed NEPA assessment process. Thus, the first step in determining if an action would have an adverse effect on the environment is to assess whether it fits into a defined category for which a Categorical Exclusion (CX) is applicable. If a CX is applied, the agency prepares a Record of Categorical Exclusion to document the decision and proceeds with the action.

For actions that are not subject to a CX, the agency prepares an EA to determine the potential for significant impacts. If through the evaluation and analysis conducted for the EA process, it is determined that no significant impacts would occur as a result of the action, then the determination would result in a Finding of No Significant Impact (FONSI). The Federal agency would then publish an EA and the FONSI. The NEPA process is complete when the FONSI is executed.

If significant adverse impacts to the natural or human environment are indicated or other intervening circumstances either exist at the onset of a project or are determined through the EA process, an Environmental Impact Statement (EIS) may be prepared. An EIS is a more intensive study of the effects of the Proposed Action, and requires more rigorous public involvement. The agency formalizes its decisions relating to an action for which an EIS is prepared in a Record of Decision (ROD). Following a 30-day waiting period after publication of the Final EIS, the Agency may issue a ROD and then the NEPA process is complete.

1.4 Agency Coordination

DOE conducted consultations with the USFWS, the State Department of Land and Natural Resources (National Heritage Program), OHA, Hawaiian Civic Clubs of Honolulu, Hui Malama I Na Kupuna O Hawaii Nei, Oahu Island Burial Council, and the State Historic Preservation Division (SHPD) per requirements of Section 7 of the Endangered Species Act, and Section 106 of the National Historic Preservation Act (NHPA). Responses were received from USFWS, OHA, and SHPD. Copies of the letters and the responses received are included in Appendix A and Appendix C of this EA.

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2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 Department of Energy's Proposed Action

DOE proposes, through a cooperative agreement with Phycal to partially fund the construction and testing of a pilot scale algae farm and processing facility that would utilize CO₂ to cultivate algae, extract oil from the algal biomass and evaluate the oil as a renewable biofuel. The proposed project would be constructed in Wahiawa and Kalaeloa, Hawaii, and would support the need to evaluate advanced technologies that could mitigate CO₂ emissions in areas where geologic storage may not be viable. If approved, DOE would provide approximately 80 percent of the funding to test the feasibility of innovative concepts and process for the beneficial, economic use of CO₂ captured from otherwise emitted flue gas.

2.2 Phycal's Proposed Project

Phycal has developed an integrated system for growing algae and extracting energy products, primarily algal oil. This oil can be converted to biodiesel, drop-in "green" replacements for diesel and jet fuel, fuel oil blends, and other products. Phycal's strategic approach combines innovative technology and system engineering with a focus on producing oil at a market competitive price. Phycal would construct a pilot facility and commence the Phycal Algae Pilot project in 2012. Phycal Hawaii R&D, LLC, was created to oversee and implement the proposed project and operations in Hawaii.

Algae offers well known and documented advantages as a biofuel crop with the potential of providing a wide range of energy products and energy security with significant reductions in greenhouse gas emissions. Through combinations of breakthrough technologies, the proposed project would allow for successful demonstration and testing of components, system performance, and products to support deployment of a commercial scale farm as early as 2015.

The proposed project's strategic approach combines innovative technology with an integrated system designed to hit cost targets that would make algal oil a competitive fuel in the market. The proposed project's approach would make advances in key areas: extraction of oil, lipid production, and integration. These key areas are described in greater detail below.

- Oil Extraction process allows the oil to be extracted without co-extracting many contaminants that other typical solvent extraction processes accumulate. This reduces operating costs and the need for further oil processing, thereby lowering product losses and capital and operation expenditures.
- Heteroboost™ is an algae "feedlot" that uses mature algae from the open ponds and increases lipid content by introducing fixed carbon in a closed system, such as inedible sugar and glycerol, which dramatically increases algal productivity.
- Integrated production system in the Phycal design would reduce capital expenditures and operating expenses, and therefore minimize unit output costs. Key innovations include pond design and operations, reductions in internal energy consumption, water management, and reductions in nutrient costs.

Phycal has tested and achieved successful growth rates and oil production using algal strains commonly found in Hawaii. These strains would be used in the proposed project and would support commercial production in Hawaii.

Project Modulization

The proposed project would be developed in two separate phases or Modules. The first module would provide an assessment of the core technologies, including Pond Grow-out, Dewatering, Heteroboost™ and Aqueous extraction. Core infrastructure elements, such as grading/leveling, fencing, and power connections, at the Poamoho site would also be carried out during this phase to support the total development of the project. Once completed, Module 1 would consist of approximately 15-20% of the final production capacity of the algae farm. During the second module, the remaining 80-85% of the production capacity would be developed. This would include the anaerobic digesters, Fixed Carbon Processing, and development of the Tesoro site for processing of the algae oil into jet fuel, renewable naphtha, and renewable diesel. Figure 1 provides a view the separate modules at the Poamoho site. The approximate budget for Module 1 is \$22.9 M and \$37.7 M for Module 2, for a total project cost of \$60.6 M.

Commercial-Scale Operations

Phycal is developing a plan for the commercial scale operations in Hawaii because of its climate, significant public support, and favorable market for algal biofuel. Hawaii's combination of sunshine and consistent temperature support commercial scale growth of algae in open ponds. Additionally, Hawaii has the availability of sufficient volumes of CO₂, reclaimed water, and currently under utilized land to support a commercial scale operation. The State of Hawaii has announced the "Hawaii Clean Energy Initiative" and has established a number of mechanisms to assist in the development of renewable energy projects. The State's "Energy Agreement" with the local utility (Hawaiian Electric Company (HECO)) establishes targets for the development and use of renewable energy. Most importantly, the State currently pays a substantial premium compared to the continental U.S. for the delivery of petroleum products to the islands. There is increasing evidence that algal oil produced locally can become competitive in the Hawaii market as a fuel for both power generation and transportation.

Process Description and Facilities

Algae facilities are essentially high-tech farms that are classified as agricultural use as aquaculture production. These farms consist of a large algae crop cultivation area with relatively small area dedicated to processing and support facilities. The following is a summary description of the algae strains, pond grow out areas, various process and support facilities requirements, and anticipated process activities for the proposed project at the Poamoho site in Wahiawa, Oahu, Hawaii. Figure 1 shows the site plan concept at the Poamoho site for the proposed project.

The Poamoho project facility would include the following facility components:

- Approximately ten acres of shallow ponds of various sizes for grow-out of algae crop;
- Six greenhouses for initial phase grow-out of algae strains;
- One visitor trailer and three employee trailers including a building housing indoor algal growing and oil boosting (Heteroboost™) as well as raw material storage and a lay down area;
- An outdoor area with various processing equipment facilities and storage tanks to support (1) oil removal and purification equipment, (2) a water conditioning unit for water purity and water recycling, (3) an anaerobic digester (methane captured from the anaerobic digester would be oxidized onsite using a thermal oxidizer), and (4) gas storage (CO₂, propane, nitrogen).

The facilities at the Poamoho site would be approximately 5,000 square feet (sf) and would have a trailer type of design. These facilities would house laboratory and bench scale oil conversion equipment. Areas outside of the facilities would be used to store gases and small quantities of oil product.

Option for Improved Pond Design

The current layout and pond configuration for the proposed project incorporates large raceway ponds and paddlewheels for mixing (Figure 1). The design of these ponds is traditional in nature and of similar design to ponds that already exist in Hawaii (such as those owned by Cellana, Shell, General Atomics and Cyanotech). While the methods of construction and operation for these raceway ponds are well known within the algae farming industry, the scale required for the proposed project is beyond what has been previously deployed and/or operated. As such, Phycal is investigating and developing another layout for the pond design which may offer better mixing techniques at a larger scale. This proposed alternate layout, which is shown in Figure 2, incorporates a square or rectangular shaped pond design. The mixing method used for this layout would incorporate an overhead wire and pulley system that would drag a mixing device through the water.

Both the current and alternate site layout options would require the same amount of civil grading and site preparation. The total volume of algae culture, as well as the area total pond area, would also be the same for both options. The key difference between the two layouts is the mixing method. Both of the proposed methods have been used successfully in algae farming, therefore, Phycal would like the option of utilizing the pond design that best achieves the objectives and targets of the proposed project.



EXHIBIT 2
AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS/SURVEYORS • HONOLULU, HAWAII, U.S.A.
PRELIMINARY SITE PLAN

PRELIMINARY ENGINEERING REPORT
PHICAL ALGAE PILOT PLANT
WAIHANA, OAHU, HAWAII

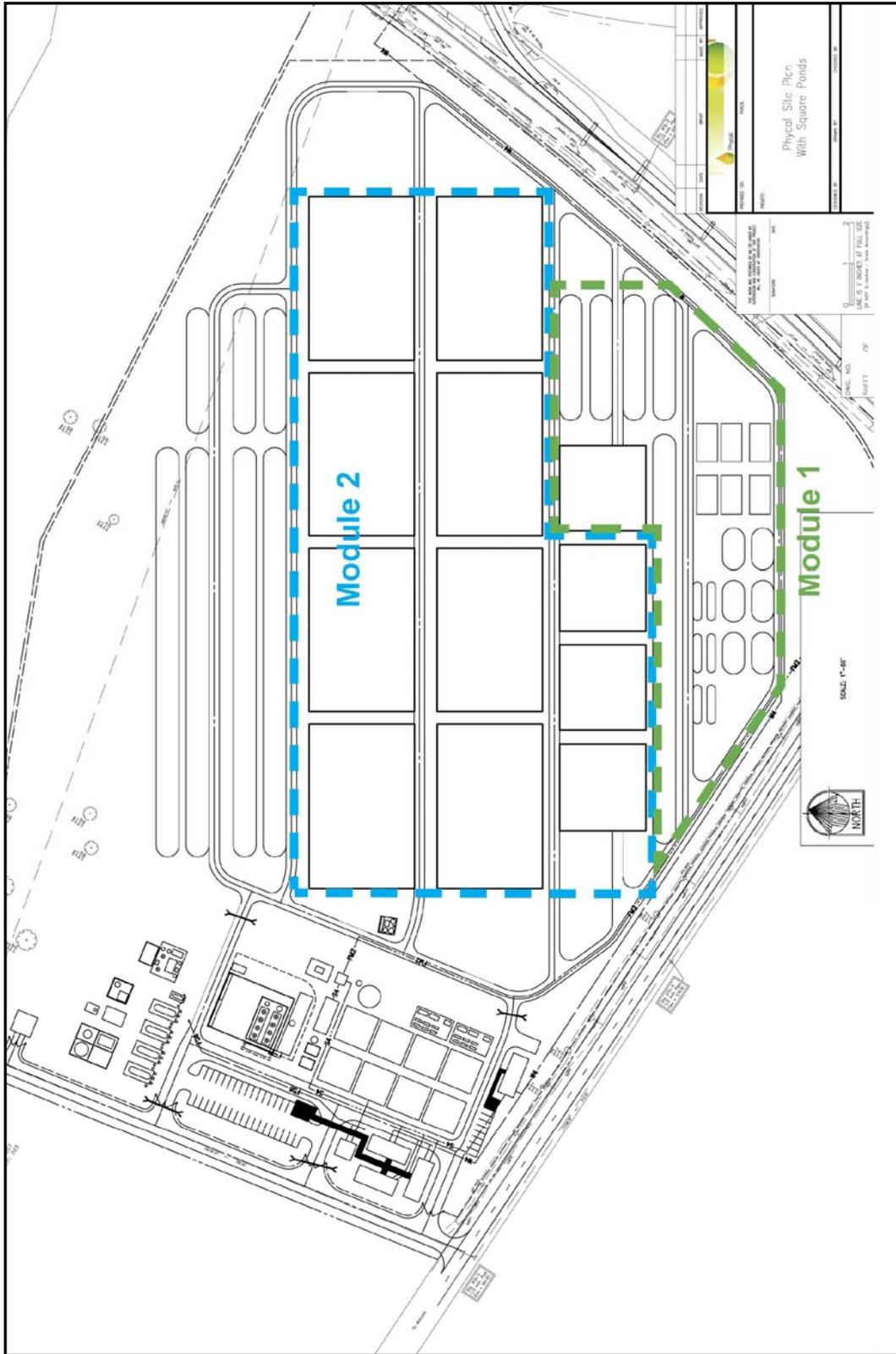


APPROXIMATE SCALE: 1" = 200'



PRELIMINARY SITE PLAN – POAMOHO SITE
(Source: Austin, Tsutsumi & Associates, Inc., 2010)

Figure 1



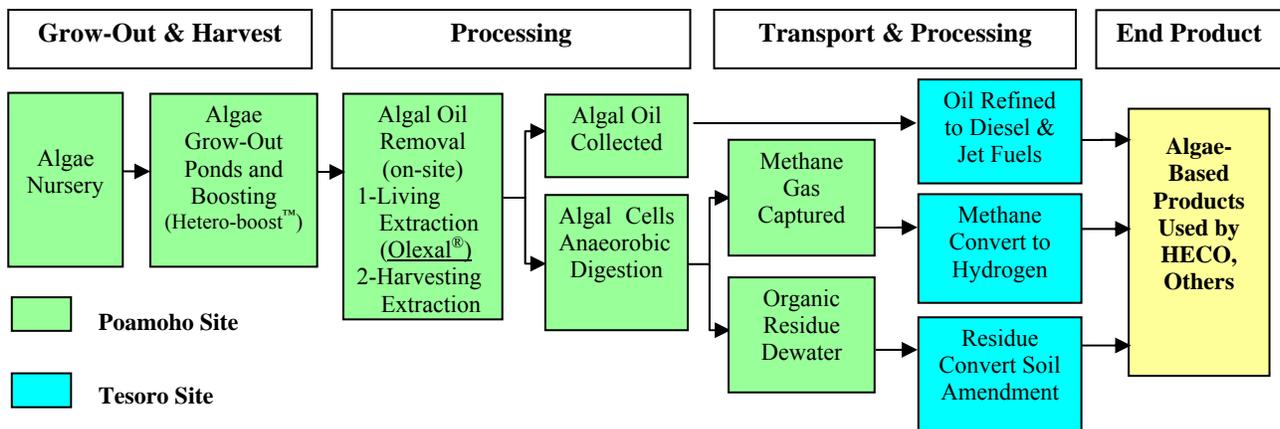
OPTION: SQUARE POND DESIGN – POAMOHO SITE
(Source: Phycal, Inc., 2011)

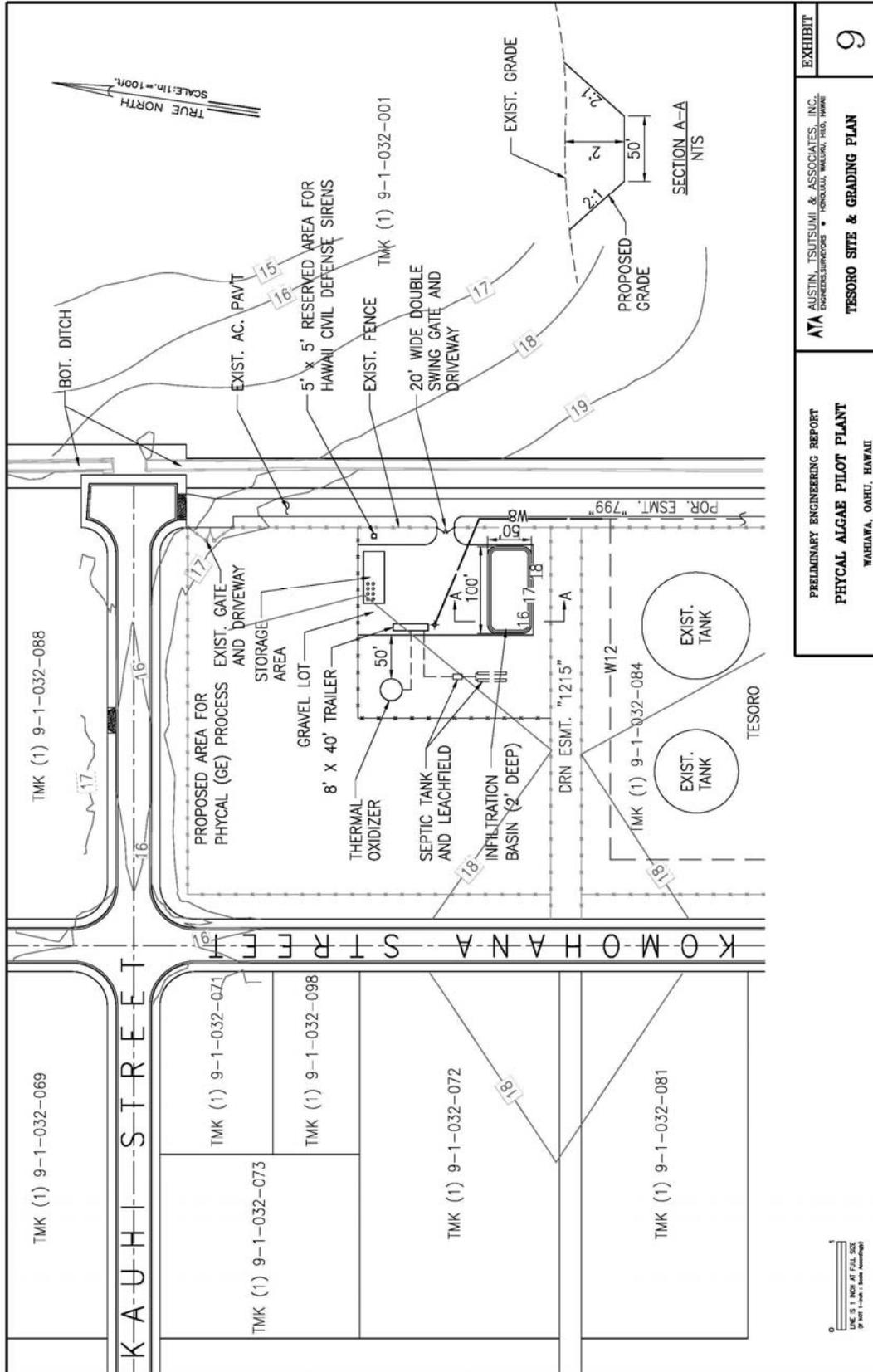
Figure 2

The algal oil product would be transported off-site for refinement by Tesoro at their existing facility in James Campbell Industrial Park. A site adjacent to the Tesoro refinery would house a small pilot scale General Electric Research Center (GERC) unit which would convert the algal oil into renewable jet fuel, renewable naphtha, and Renewable Diesel in small quantities less than 75 gallons (gal) per day (gpd) maximum throughout (Figure 3). In this process, algal oil is fed under high pressure into a liquid phase reactor or hydrotreating unit. This unit adds hydrogen to the fuel and converts higher boiling point fractions into fuels at a normal boiling point range of biodiesel and jet fuel. Intermediate products are fed into a hydrogenation reactor. This process uses a noble metal catalyst to add hydrogen to the fuels to convert them into a direct drop-in replacement for diesel, and jet fuel. The byproducts of this step are naphtha and some light molecular-weight gases. A thermal oxidizer would burn hydrogen-rich waste gases from the process.

The Tesoro project site would house an equipment trailer with a single office space, and a covered, outdoor chemical, algal oil, and fuel storage area. The covered storage area would have engineered secondary containment and capacity to store 16 55-gal algal oil drums, four 55-gal fuel drums, one drum of sulfur, and two 55-gal wastewater drums.

The following flow chart provides a simplified depiction of the steps followed in the algae grow out and processing.





PRELIMINARY SITE AND GRADING PLAN – TESORO SITE
(Source: Austin, Tsutsumi & Associates, Inc., 2010)

Figure 3

2.3 General Description and Location

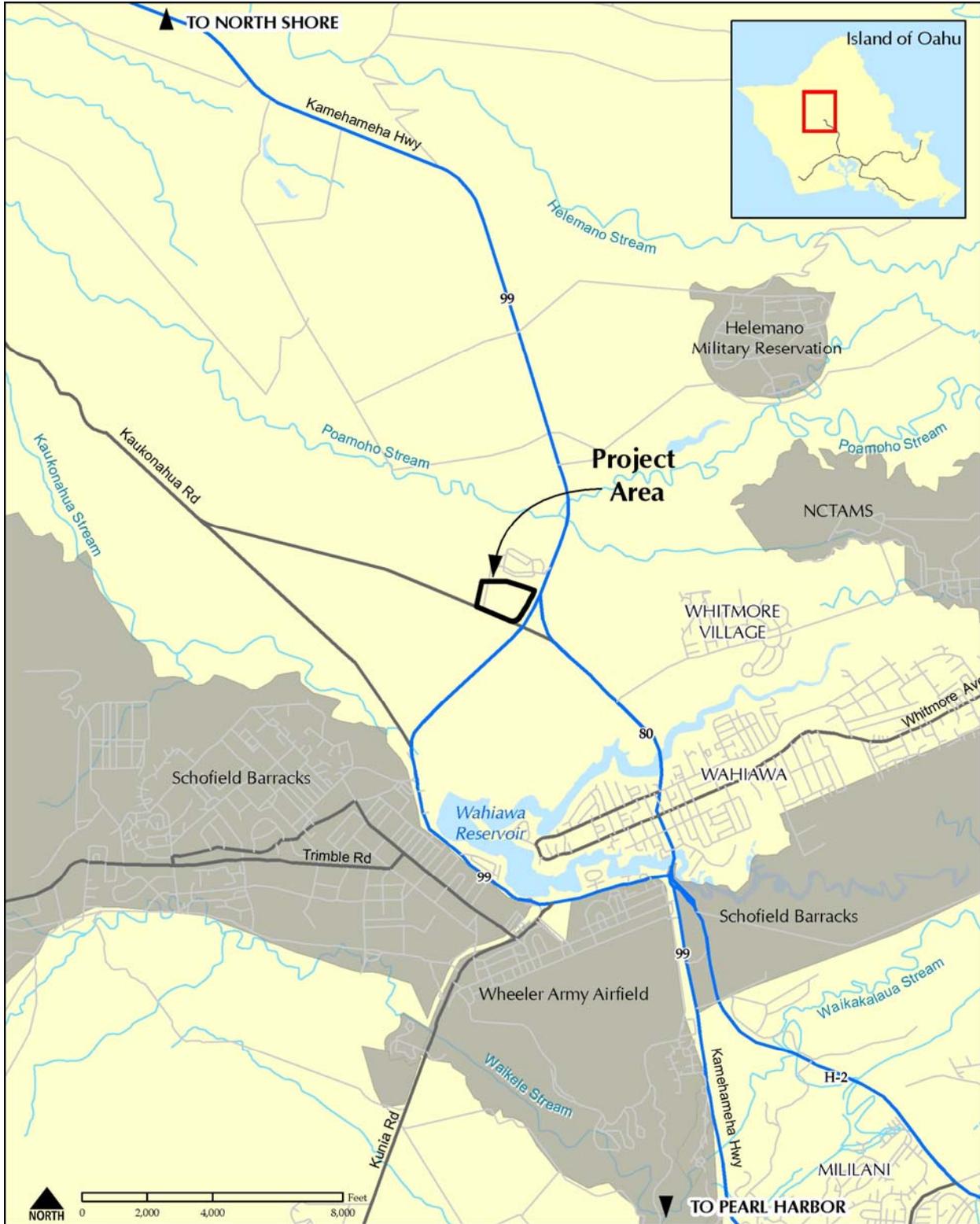
Two sites would be required to carry out the proposed project. One site would be used as for an algae farm and processing area, and the second site would be used as a refinery to further process the algae oil into energy products.

The first proposed project site (Poamoho Site) is situated on a portion of the existing Poamoho Plantation Camp which is located in Wahiawa, on the island of Oahu in the State of Hawaii (Figure 4). The site lies within the traditional moku of Waiialua and the ahupuaa of Wahiawa. The algae farm and facilities would be situated on agricultural lands to the south of the Poamoho Plantation Camp, near the corner of Kamehameha Highway and Kaukonahua Road. The agricultural land is leased from AOUO Poamoho Camp. The proposed project area is approximately 34.117 acres and encompasses portions of Tax Map Key (TMK): (1) 7-1-001: 011, 030, and 031. The proposed project site is bounded by Kamehameha Highway on the east, Kaukonahua Road on the south and agricultural lands to the north and west. Poamoho Camp residential area lies beyond the agricultural lands to north. The proposed project would be situated on vacant agricultural lands classified by the State Land Use Commission (LUC) as State Land Use Agricultural District. The land is zoned AG-1 Restricted Agricultural District by the City and County of Honolulu's (County) Land Use Ordinance (LUO). The site is designated for Agriculture on the Central Oahu Sustainable Communities Plan (SCP). Adjacent areas surrounding the proposed project site to the north, south, east and west are also designated as Agricultural.

The Poamoho site was formerly used as agricultural land dating back to 1929. The property was leased to Del Monte Corp (formerly known as California Packing Corp) from 1949 to 2005 for the cultivation pineapple crops. Del Monte was one of the largest producers of fresh pineapple on Oahu. However, in 2005, Del Monte closed its doors and gave up its lease of the agricultural property. Today, the proposed project site is no longer used to cultivate pineapple. The agricultural area remains as a former pineapple land and continues to be vacant and unused.

The second proposed project site (Tesoro Site) is situated on vacant industrial lands in James Campbell Industrial Park which is located in Kalaeloa, Ewa District on the island of Oahu (Figure 5). The vacant site is within the traditional moku of Ewa and the ahupuaa of Honouliuli. The proposed project area encompasses a portion of TMK (1) 9-1-032: 084 and is approximately 0.9 acres (39,204 sf). The Tesoro project site is bounded by Kauhi Street on the north, Komohana Street on the west, and light to medium industrial facilities to the north and west. The industrial land is leased from Tesoro Hawaii Corporation. The site is designated as State Land Use Urban District and is zoned I-2: Intensive Industrial District. Adjacent areas surrounding the proposed project site to the north, south, east and west are also designated as Industrial. Located within the Ewa District, the proposed project site is designated for Industrial use on the County, Ewa Development Plan (DP).

Up to 1998, the Tesoro project site was used by Waste Management of Hawaii, Inc. as the Hawaiian Remediation and Recycling Facility for soils bioremediation. The portion of the Tesoro site that is planned for the proposed project is currently vacant. The other portion of the 12-acre site is used by Tesoro as the "North Tank Farm", a part of their overall refinery operation which provides jet and marine fuels and gasoline to the Hawaiian Islands. The site includes four above-ground petroleum bulk storage tanks.



PROJECT LOCATION – POAMOHO SITE
(Source: Group 70 International, Inc., 2010)

Figure 4



PROJECT LOCATION – TESORO SITE
(Source: Group 70 International, Inc., 2010)

Figure 5

2.4 Alternatives

DOE's alternatives to this proposed project consisted of eleven (11) Phase II applications received in response to the FOA for Industrial Carbon Capture and Sequestration (ICCS) Technology Area 2, all of which were determined to have met the mandatory eligibility requirements listed in the FOA. The proposed projects were located in twelve states (some projects involved operations at multiple locations). The criteria for evaluating applications were published in the FOA. Technical and financial evaluations represented the total evaluation scoring; however, the environmental evaluation, which was not point-scored, entered into the evaluation and selection process. Each applicant was required to complete and submit a standard environmental information volume for each site or alternative site included in its offer. The evaluations of the applications focused on the technical description of the proposed project, financial plans and budgets, potential environmental impacts, and other information that the applicants submitted.

Prior to selection, DOE made preliminary determinations regarding the level of review required by NEPA. A portion of DOE's technical reviews was based on potentially significant impacts that could be identified. The projects' significant impacts were considered within the context and intensity of possible impacts. DOE conducted these preliminary environmental reviews pursuant to 10 CFR 1021.216 and prepared environmental critiques and synopses for projects under the Funding Opportunity Announcement. These preliminary NEPA determinations and environmental reviews were provided to the selecting official, who considered them during the selection process. Appendix B of this EA contains DOE's environmental synopsis related to Phycal's proposed project.

Following reviews by technical, environmental, and financial panels and a comprehensive assessment by a merit review board, a DOE official selected those applications that best met DOE's purpose and need. By broadly soliciting proposals to meet the programmatic purpose and need for DOE action and by evaluating the potential environmental impacts associated with each proposal before selecting applicants, DOE considered a reasonable range of alternatives for meeting its purpose and need.

2.5 No Action Alternative

Under the No Action Alternative, DOE would not provide funds to this project. As a result, this project would be delayed while the applicant seeks other funding sources. Alternatively, the applicant would abandon this proposed project if other funding sources are not obtained. Furthermore, acceleration of the development of innovative concepts for beneficial CO₂ use to grow algae would not occur or would be delayed. DOE's ability to achieve its objectives under the American Recovery and Reinvestment Act of 2009 would be reduced.

Although this and other selected projects might proceed if DOE decided not to provide financial assistance, DOE assumes for purposes of this environmental analysis that the proposed project would not proceed without DOE assistance. If projects did proceed without DOE's financial assistance, the potential impacts would be essentially identical to those under DOE's action alternative (i.e., providing financial assistance that allows the project to proceed). In order to allow a comparison between the potential impacts of a project as implemented and the impacts of not proceeding with a project, DOE assumes that if it were to decide to withhold assistance from a project, the project would not proceed.

2.6 Alternatives Considered by Phycal

Phycal's Project Development Team conducted an alternatives analysis using selection criteria to choose a location for their project. These criteria, among other items, helped them to identify and consider three groups of sites in the State of Hawaii. Those groups of sites included the vicinity of Campbell Industrial Park, vicinity of Kunia Road, and area north of Wahiawa and south of Haleiwa. While all of the sites held certain advantages over others, the Wahiawa site at Poamoho Camp was selected because it provided a better fit for the project's objectives and overall needs. The site was also chosen for both operational advantages and to ensure compliance with environmental regulations.

2.7 Summary of Environmental Consequences

Table 2.7-1 provides a summary of the environmental, cultural, and socioeconomic impacts of the No Action and the proposed project.

Table 2.7-1. Summary of Environmental, Cultural, and Socioeconomic Impacts

| Impact Area | No Action Alternative | | Proposed Project | |
|---|-----------------------|------------|------------------|------------------|
| | Construction | Operations | Construction | Operations |
| Land Use | Negligible | Negligible | Negligible | Beneficial |
| Meteorology | Negligible | Negligible | Negligible | Negligible |
| Socioeconomic (Population and Housing) | Negligible | Negligible | Negligible | Negligible |
| Socioeconomic (Taxes, Revenue, Economy, Employment) | Negligible | Negligible | Beneficial | Beneficial |
| Environmental Justice | Negligible | Negligible | Negligible | Beneficial |
| Visual Resources | Negligible | Negligible | Negligible | Negligible |
| Cultural Resources | Negligible | Negligible | Negligible | Negligible |
| Wetlands and Floodplains | Negligible | Negligible | Negligible | Negligible |
| Utilities and Energy Use | Negligible | Negligible | Minor | Minor/Negligible |
| Air Quality | Negligible | Negligible | Minor | Minor |
| Greenhouse Gases | Negligible | Negligible | Minor | Beneficial |
| Noise | Negligible | Negligible | Minor | Minor |
| Geology and Soils | Negligible | Negligible | Minor | Negligible |
| Surface Water and Groundwater | Negligible | Negligible | Negligible | Negligible |
| Vegetation and Wildlife | Negligible | Negligible | Negligible | Minor/Negligible |
| Solid and Hazardous Wastes | Negligible | Negligible | Minor | Minor |
| Transportation and Traffic | Negligible | Negligible | Minor | Minor |
| Human Health and Safety | Negligible | Negligible | Negligible | Minor |

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3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

Chapter 3 provides a description of the affected environment (existing conditions) at the project site and a discussion of the environmental consequences of the No Action Alternative and the proposed project. Additionally, cumulative impacts and mitigation measures are discussed where appropriate. The methodology used to identify existing conditions and to evaluate potential impacts on the physical and human environment involved the following: review of the Environmental Questionnaire and the Project Narrative prepared by Phycal; review of other documentation provided by Phycal; searches of various environmental databases; agency consultations; and visits to the site.

3.1 Resource Areas Dismissed from Further Consideration

DOE has determined that various resources would either not be affected or would sustain negligible impacts from the proposed project and do not require further evaluation. They include land use, meteorology, socioeconomics environmental justice, visual resources, cultural resources, wetlands and floodplains, surface water and groundwater; therefore, these resource areas are briefly discussed in this section of the EA and will not be evaluated further.

Land Use: The subject properties for the proposed project are located on a vacant area in Wahiawa and Kalaeloa, Oahu. The proposed project would not result in impacts to land use and zoning. The proposed uses of these properties are consistent with designated State land use and County zoning districts.

As classified by the State of Hawaii LUC, the Poamoho project site is situated within the State Agricultural District and the Tesoro project site is situated within the State Urban District. The proposed uses within these properties are consistent with permitted uses for the Agricultural and Urban Districts, and would not require district reclassification or boundary amendment.

The Poamoho project site is zoned as (AG-1) Restricted Agricultural District and the Tesoro project site is zoned (I-2) Intensive Industrial District by the County, LUO. The proposed uses within these properties are consistent with permitted uses for the Agricultural and Industrial Zoning Districts with the approval of Conditional Use Permits for use of “biofuels processing facilities” from the County. No change in the existing land use designation would be required for the proposed project. The proposed project is also consistent with the County’s Central Oahu SCP and the DP. Although these lands would no longer be vacant, the use would be consistent with the surrounding properties. Construction and building permits would be obtained prior to the start of construction.

Meteorology: The climate at both project sites is typical of the climate that characterizes most of the State of Hawaii. It is relatively mild with constant temperatures throughout the year, moderate humidity, persistent northeasterly trade winds, and infrequent severe rainstorms. Visibility surrounding the existing sites is typically clear except when vog is present. Vog is a result of erupting volcanoes on the island of Hawaii. During prolonged periods of southerly Kona winds, the vog can affect islands across the entire State.

The Poamoho project site has an annual average temperature ranging from the high-60s to the mid-80s Fahrenheit (°F), the average monthly low temperature is 65°F in January and February and average monthly high temperature is 88°F in August and September (WRRC, n.d.(b)). On the Ewa Plain where the Tesoro project site is located, low temperatures range from about 60°F in the winter to near 70°F in the summer and high temperatures range from 80°F in the winter to almost 90°F in the summer (UH, 1983).

Winds from the northeast, known as trade winds, are the most predominant over the Hawaiian Islands. In the winter, there is a shift in the wind patterns characterized by the arrival of the westerly winds and frontal influences from the North Temperate Zone becoming more prevalent. Westerly winds typically are characterized by the presence of strong winds and high wave activity from the southwestern sector of the Pacific. Overall, the annual average wind speed near the Poamoho project site ranges from 9 to 10 miles per hour (WRRC, n.d.(a)). Winds speeds near the Tesoro site and Barbers Point area average 12 mph (State of Hawaii Department of Agriculture (DOA) and State of Hawaii Department of Transportation (DOT), 2000).

Hawaii's heaviest rains come from winter storms that generally occur between October and April. Rainfall in the vicinity of the Poamoho project site is relatively moderate, with an average annual rainfall of approximately 40 to

60 inches. The average annual rainfall in the Barbers Point area and the vicinity of the Tesoro project site is 20 inches (DOA and DOT, 2000). The proposed project would have no effect on climate conditions.

Socioeconomics: Development of the proposed project would not be expected to result in negative impacts to socioeconomic conditions. The Poamoho site would continue to be used for agricultural activities such as aquaculture and the growing of algae. The Tesoro site would also continue to be used for industrial activities like the processing and refining of algae oil into biofuel.

The proposed project would create additional employment opportunities. Workers would be needed for the initial development of the pilot farm at the Poamoho site and the processing facility at the Tesoro site, including the site work and general construction. To support the operations and day to day activities, approximately 40 jobs would be created for the Poamoho and Tesoro sites for up to a three year duration period. The proposed project would not be expected to change the general labor mix of the Wahiawa or Kapolei (including Kalaeloa) areas. While the proposed project would require jobs, the overall labor required to support the project at a pilot scale would not be large enough to change the area's occupational character.

The proposed project would create both short-term and longer-term economic benefits. The total cost of the Phase II project is estimated at \$60.6 million, of which about \$50 million would be spent in Hawaii. The economic benefits to the State are estimated between \$5 to \$8 million per year. In the long term, the proposed project would help to promote new venues for Hawaii in biofuel and renewable energy production. The project would promote the use of vacant agricultural lands for a new type of farming industry in Central Oahu. Additionally, if the proposed project's goals to achieve a commercial-scale algal oil production are met, the system would be able to deliver fuels derived from algae oil at competitive price for the Hawaii market. This would help Hawaii to move towards achieving the State's Clean Energy Initiative, which establishes targets for both the State and local utilities' development and use of renewable energy (70% of energy needs with clean energy by 2030 – State of Hawaii, Department of Business, Economic Development and Tourism (DBEDT)).

Environmental Justice: The proposed project would not substantially affect human health and the environment. The proposed project would not impact minority communities, and would result in benefits to a low-income community, Poamoho Camp, which consists mostly of former workers of the Del Monte pineapple plantation. As indicated by the County Department of Planning and Permitting approved Zoning Variance No. 2007/VAR-62; the agricultural lands at Poamoho would remain in agricultural use and would provide income to families occupying farm dwellings in Poamoho Camp.

The proposed project would maintain a safe and healthful environment, consistent with Executive Order 12898 which underscores certain provisions of existing laws such as NEPA and the Clean Water Act to ensure that all communities and persons within the United States live in a safe and healthful environment. Public information and participation has been and would continue to be established in the community throughout the development of the proposed project. Presentations were made to local Neighborhood Boards (Wahiawa-Whitmore Village No. 26 and North Shore No. 27). Environmental considerations, such as cultural impacts, have been evaluated for the proposed project in recent studies carried out by Scientific Consultant Services. These studies include a Cultural Impact Assessment (CIA) and Archeological Assessment (AA) for each of the proposed project sites (Poamoho site and Tesoro site).

Visual Resources: Impacts to identified views and vistas were determined based on an analysis of the existing quality of the landscape views, the sensitivity of the view, and the anticipated relationship of the scale and massing of the proposed buildings and equipment to the existing visual environment. While new construction would be noticeable, the scale and massing of the buildings and equipment would be consistent with other uses in the area. Therefore, no significant impacts to scenic vistas or existing aesthetic landscaping would be anticipated.

The Poamoho project site is located in Wahiawa, Central Oahu, bounded by Kamananui Road to the east and Kaukonahua Road south. To the east, west, north and south are agricultural lands having dense brush and vegetation. Beyond the overgrown agricultural lands, particularly looking west, are mauka views of green mountainous landscapes. The algae farm would be developed on vacant agricultural lands, which are relatively flat and level. While the proposed project's facilities may be partially visible from Kamananui Road and Kaukonahua Road, a natural vegetation buffer would be located along these roadways to provide privacy and to make the proposed project less visible. From vantage points located mauka and makai of the site, the property would generally appear as a continuation of agricultural lands and uses in the Wahiawa area. The proposed project design

would maintain the visual resources of the area by meeting agricultural development standards, such as height and setback requirements, established in Section 21-3.50-4 of the County LUO. The proposed project would blend with the surrounding uses of the area while preserving the natural beauty of Wahaiwa and Central Oahu.

The Tesoro project site is located in Kalaeloa, Ewa, and is bounded by Komohana Street to the west and Kauhi Street to the north. Industrial lands surround the site to the east, west, north and south. The adjacent parcel to the east is currently vacant, having dense brush and vegetation. Beyond this industrial land, particularly looking north, are distant views of green mountainous landscapes. The processing facility at the Tesoro site would be developed on vacant industrial lands. Visual resources surrounding the proposed project site are minimal. While the facility may be visible from Komohana Street and Kauhi Street, the proposed project would be located in James Campbell Industrial Park and surrounded by other large scale industrial development. The proposed project design would meet industrial development standards, such as height and setback requirements, established in Section 21-3.130-1 of the LUO.

Cultural Resources: The Area of Potential Effects for historic archeology and cultural resources (limits of disturbance) is shown on the accompanying location maps for both the Poamoho and Tesoro project sites (Attachment 1 and 2). An AA and CIA were conducted by Scientific Consulting Services, Inc. for these areas and have been approved by the State of Hawaii, Department of Land and Natural Resources (DLNR), State Historic Preservation Division (SHPD).

In March 2010 and May 2010, two separate CIAs were completed for the Poamoho and Tesoro project sites. The CIAs were completed in compliance with Act 50 Session Laws of Hawaii 2000 and the State of Hawaii environmental review process under Chapter 343, Hawaii Revised Statutes (HRS). Through document research and cultural consultation efforts, the reports provided information that was applicable to the assessment of the proposed project and its potential impacts to cultural practices. Hawaiian organizations, agencies, and community members were contacted to identify potentially knowledgeable individuals with cultural expertise and/or knowledge of the proposed project areas and their vicinities.

For the Poamoho project site, consultation was sought from Phyllis Coochie Cayan, History and Culture Branch Chief with SHPD; the Hawaiian Civic Club of Wahaiwa; Maria Orr, a Consulting Archaeologist; Tom Lenchanko of Waha Olelo Aha Kukaniloko; and Leimaile Quitevis of the Oahu Island Burial Council. In addition, two former long-time plantation workers, living in Poamoho Camp were interviewed concerning ongoing cultural activities that might have occurred in the proposed project area or its vicinity.

For the Tesoro project site, consultation was sought from Phyllis Coochie Cayan; George Kaeliwai of the Hawaiian Civic Club of Ewa; Leimaile Quitevis, Senator Will Espero, Representative Rida Cabanilla, the Ewa Beach Neighborhood Board, Ewa Hui Aloha Senior Citizens, Shad Kane, Nettie Tiffany, and Chuck Erhorn.

The information presented in the CIA reports for the Poamoho site and the Tesoro site revealed that no notable cultural activities took place at the specific project areas. There was no additional information from the contacted organizations, newspapers, and archival research. Therefore, it was concluded that the exercise of native Hawaiian rights, or any ethnic group, related to gathering, access or other customary activities would not be affected by the activities of the proposed project.

In March 2010 and May 2010, Archaeological Inventory Surveys (AIS) were completed for the Poamoho project site and the Tesoro project site. While AIS-level investigations were completed, these reports are presented as AAs because fieldwork did not find cultural material of historic significance. A review of archival resources and the results of previous archaeological work conducted in the area for both project sites were undertaken prior to fieldwork. There are no recorded archeological sites within either of the proposed project sites.

No surface or subsurface cultural remains were identified during the AIS fieldwork at both the Poamoho and Tesoro project sites. For the Poamoho site, historical and modern-era clearing and grading in the parcel removed any previously existing surface sites and destroyed or altered subsurface deposits. Based on the AA, the proposed development at the Poamoho site would have a minimal likelihood of affecting historic properties. Therefore, no further work is recommended for the proposed project area as indicated by DLNR SHPD acceptance of the AA report in their letter dated May 18, 2010.

For the Tesoro site, the property has been subject to subsurface alterations and other such disturbances. Vast changes in landscapes of the James Campbell Industrial Park area likely started in 1890 with the re-deposition of alluvial soils to accommodate sugar cane cultivation on formerly arid portions of the coastal plain. Portions of the ground surface are also paved with asphalt and concrete, and known levels of disturbance in these areas remain limited. The findings of the AA for the Tesoro site indicate that the development of the proposed project would not likely affect historic properties. Therefore, no further work is recommended for the proposed project area as indicated by DLNR SHPD's acceptance of the AA report in their letter dated June 17, 2010.

DOE conducted consultations with SHPD and OHA, per requirements of Section 106 of the NHPA. An informal coordination letter was sent to verify the proposed project would have no impact on historic properties within the vicinity of the proposed project. SHPD and OHA provided a response letter to DOE stating concurrence with DOE's determination (Appendix A and Appendix C).

Wetlands and Floodplains: No wetlands, floodplains, or other ecologically sensitive terrain are present in the proposed project sites. The Poamoho project site is located on a high point and is well above the nearby Poamoho and Kaukonahua Stream floodways. The entire site is within flood Zone D, defined as: "Areas in which flood hazards are undetermined, but possible". The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) panel number for this area is: 15003C0120F. This map panel is a non-printed panel since FEMA has not completed a flood study for this area. The Poamoho project area is located well away from streams and coastal areas; therefore, no unique aquatic habitats are present on the existing site.

The Tesoro project site is also located within flood Zone D. The FEMA FIRM panel number for this area is 15003C0315F. The Tesoro site is located approximately 0.75 miles from the nearest coastal area, therefore no unique aquatic habitats are present on the existing site.

Surface and Groundwater: The Poamoho project site has no perennial streams or other surface water areas. The proposed project site overlies the Wahiawa aquifer that is used as a source of drinking water for Central Oahu. The State of Hawaii and County Board of Water Supply (BWS) monitor water quality in this aquifer. Application of chemicals in agriculture, and disposal of effluent to the ground surface or underground is regulated to avoid impacts to groundwater quality.

The Tesoro site has no natural lakes, reservoirs, ponds, rivers, streams, or wetlands in the vicinity of the proposed project area. However, the coastal waters are located approximately 0.75 miles south of the proposed project site. The State of Hawaii Department of Health (DOH) has classified the near shore waters of the Ewa area as Class A Open Coastal Waters which are designated to be protected for recreational use. DOH regulations state that Class A waters should not receive any discharges that have not undergone the best degree of treatment.

In the vicinity of the proposed project area, there are two aquifers, one above the other. The upper aquifer is listed as part of the Ewa aquifer system, basal (freshwater in contact with seawater), unconfined, and occurring in sedimentary or non-volcanic geologic area. The status code of the upper aquifer identifies it as being currently used, having moderate salinity (1000-5000 milligrams per liter (mg/L) Chlorine (Cl)), replaceable, and having a high vulnerability to contamination. The lower aquifer is listed as part of the Ewa aquifer system, basal, confined, and occurring in flank or horizontally extensive lavas. The status of the lower aquifer is defined as being currently used, with low salinity of (250-1000 mg/L Cl-), irreplaceable, and having a low vulnerability to contamination (Mink and Lau, 1987). The lower caprock has been used for industrial purposes and for disposal of used water, and the quality of the groundwater has suffered as a result.

The development of the proposed project at both the Poamoho site and the Tesoro site would not significantly impact ground or surface water quality or quantity. Water quality treatment of stormwater runoff would be provided by the use of grass swales and stormwater retention. The grass swales would contain native vegetation to filter stormwater runoff and remove pollutants through a natural process. The retention basins would capture suspended solids and other pollutants with no outflow, and would prevent them from flowing offsite. Temporary erosion control measures would be incorporated during the construction period to minimize soil loss and erosion hazards. At a minimum, erosion control best management practices (BMPs) to be used on-site would include: sediment traps, temporary diversion berms and swales, silt fences, dust fences, inlet protection, stabilized construction entrances and truck wash-down areas. A National Pollutant Discharge Elimination System (NPDES) permit for discharge of stormwater associated with construction activities would be obtained. The requirements of the approved NPDES permit and erosion control plan would be adhered to during construction.

The proposed project's potable water requirements for the Poamoho site and the Tesoro site would be trucked in from a source acceptable to the BWS and stored on-site. Therefore, the proposed project would not result in impacts to the existing aquifers. The proposed project's potable water requirements for the Poamoho site are estimated at an average daily domestic demand of 928 gallons per day (gpd). The domestic water line would serve the potable water needs of the employees at buildings on the site, and would not be used for pond operations and algae processing. The Tesoro site would not require significant amounts of potable water estimated at approximately 32 gpd.

Finally, impacts to surface and ground waters would not be anticipated since no wastewater would be discharged into the ground. Schofield Barracks Wastewater Treatment Plant (WWTP) would treat both the conditioned and sanitary waste that occurs from the proposed project.

3.2 Resource Areas Considered Further

Environmental resource areas considered further regarding the potential impacts of the proposed project include utilities and energy use, air quality and greenhouse gasses (GHGs), noise, geology and soils, vegetation and wildlife, solid and hazardous wastes, transportation and traffic, and human health and safety.

3.2.1 Utilities and Energy Use

3.2.1.1 Affected Environment

There are several overhead electric lines in the vicinity of the Poamoho project site. Electrical and communication overhead transmission lines run along Kamehameha Avenue along with street lights on the west side of Kamehameha Avenue. An overhead, three-phase branch line to the north of the site connects to the transmission lines on Kamehameha Avenue to serve the Poamoho Camp. HECO presently serves this area from its Helemano Substation which is located to the north of Poamoho Camp in the vicinity of the Dole Plantation. In addition, electrical lines run along the east side of Kamananui Road, just south of where it intersects with Kamehameha Highway, to provide power to the street lights. An overhead telephone transmission line runs along Kaukonahua Road along the southern boundary of the property.

The Tesoro project area contains overhead electric lines along each side of the site, including Komohana Street, Kauhi Street, Tesoro's Private Road and along the south side of Drainage Easement "1215". HECO presently serves this area from its Malakole substation located within the James Campbell Industrial Park area.

Public water supplies are currently not used at either the Poamoho or Tesoro project sites. While there is an existing 4-inch private water line in the vicinity of Kamananui Road and Kamehameha Highway that supplies water to Poamoho Camp, existing public water supplies are not available to support the proposed project operations at the Poamoho site. Therefore, potable water would be trucked in by a source acceptable to the BWS and stored on-site. Water sources are available at the Tesoro project site through Tesoro, however, potable water would also be trucked in and stored on-site. It is anticipated that the water truck would make one round trip a week to each proposed project site.

No wastewater treatment and/or disposal facilities exist on either the Poamoho site or the Tesoro project site. No wastewater is currently being generated from the site since the area consists of unused, vacant agricultural and industrial lands. Formerly, when the Poamoho site was being used for the cultivation of pineapple by Del Monte Corporation, wastewater generated from the site was disposed of using a cesspool located on the adjacent property, Poamoho Camp. An existing 10-inch sewer forcemain runs along Kamananui Road near the eastern border of the site and eventually discharges to the Schofield Barracks WWTP. No sewer lines exist at the entire Tesoro property at James Campbell Industrial Park. The properties in this area use individual wastewater systems.

3.2.1.2 Environmental Consequences

3.2.1.2.1 No Action Alternative

Under the No Action Alternative, construction and operation would not occur, therefore, no impacts would occur to utilities and energy use.

3.2.1.2.2 Proposed Project

Construction

During construction, the proposed project would bring on required utilities to the project sites. Generators would be used for electrical power until electric service connections would be completed. Water would be trucked onto the site and stored in bladders. Domestic wastewater would be maintained through use of a self contained wastewater collection system (portable toilets).

Operation

The proposed project would require energy to power the labs and office spaces on the Poamoho site. Electricity would also be needed to operate the production facility equipment and algae ponds. Peak power demand is estimated at 1.5 megawatts (MW) per day. Electric service would be provided by a connection to the Poamoho Camp's overhead electric lines. New overhead lines would be extended into the site to serve the needs of the proposed project. Telecommunications for the Poamoho site would be extended from existing overhead lines on Kaukonahua Road. Electrical power for the Tesoro site would be supplied by a drop from the Tesoro power line to the equipment trailer. Electrical demand to run the reactors is 100 kilowatts (kW). The total electrical demand is estimated at 200 kW. Telecommunications would be supplied by lines extended onto the existing HECO joint poles along Kauhi Street.

During operations, the proposed project's potable water requirements for the Poamoho site and the Tesoro site would be trucked in from a source acceptable to the BWS and stored on-site. The proposed project's potable water requirements for the Poamoho site are estimated at an average daily domestic demand of 928 gpd. The domestic water line would serve the potable water needs of the employees primarily within the building facilities on the site but would not be used for pond operations, algae processing or fire protection. The Tesoro site would not require significant amounts of potable water estimated at approximately 32 gpd. The fire flow requirements would be provided by Tesoro's 10-inch fire line, which is located adjacent to Tesoro's tanks just south of Drainage Easement "1215". A fire hydrant would be installed on site and connect to Tesoro's fire line.

Domestic wastewater at the Poamoho site would be managed through an on-site wastewater pump station which would discharge sewage through a new forcemain that would connect to the existing 10-inch forcemain in Kamananui Road. Wastewater contributions are estimated to be approximately 14,200 gpd (average daily demand) based on the 40 onsite employees, pond operations and processing water contribution. The majority of the wastewater from pond operations and processing at the Poamoho site would be reconditioned in the on-site water conditioning facility to allow for reuse in the ponds. A portion of which would be of R-1 quality to be used for wash-down areas. A maximum of 10 percent of the process water would be discharged to the wastewater pump station where it would be pumped to the Schofield Barracks WWTP.

An onsite disposal system, consisting of a septic tank and leachfield, would be installed for domestic wastewater at the Tesoro site. The average daily demand would be 160 gpd based on two employees, and domestic wastewater would be removed regularly by a private disposal service. Other wastes from industrial processes would also be disposed of off-site.

3.2.1.3 Cumulative Impacts

Currently, other than the proposed project, no other project is planned in the vicinity of the Wahiawa project site. Therefore, cumulative adverse impacts to utilities in the Wahiawa area are not anticipated.

The Tesoro project site is located within an industrial park, and a separate project is being planned for the area adjacent to the proposed project site. This project, known as the UOP Integrated Bio-Refinery Pilot Project, is a pilot scale operation that seeks to convert biomass to fuels including gasoline, diesel and jet range hydrocarbon. The feeds will be converted to fuels via integrated pyrolysis and hydroconversion technology. UOP is currently working with the U.S. DOE to develop pyrolysis oil upgrading technology. The project will require utilities and energy for the operations of the project. Potential impacts to utilities and energy use resulting from the UOP Integrated Bio-Refinery Pilot Project will be minor.

With the development of the adjacent UOP Integrated Bio-Refinery Pilot Project and full development of other areas within the industrial park, cumulative adverse impacts would likely occur to utilities and energy use associated

with the historical trend of past, present, and reasonable foreseeable future activities. These impacts would be relatively minor and would occur over time.

3.2.1.4 Proposed Mitigation Measures

No mitigation measures would be required for utilities and energy supply.

3.2.2 Air Quality and Greenhouse Gases

Air Quality Management

The purpose of the air quality analysis is to determine whether emissions from a proposed new or modified source of air pollution, in conjunction with emissions from existing sources, would cause or contribute to the deterioration of the air quality in the area. The Clean Air Act (CAA) requires the U.S. Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to public health and the environment. NAAQS include two types of air quality standards (40 CFR 50.1(e)). Primary standards protect public health, including the health of sensitive populations such as asthmatics, children, and the elderly. Secondary standards protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings. EPA has established NAAQS for six principal pollutants, which are called “criteria pollutants”: Ozone (O₃), Carbon monoxide (CO), Nitrogen dioxide (NO₂), Particulate Matter (PM), Particulate Matter 10 microns or less (PM₁₀), Particulate Matter 2.5 microns or less (PM_{2.5}), Sulfur dioxide (SO₂) and Lead (Pb). A State’s air-quality regulations may further regulate concentrations of the criteria pollutants. The State of Hawaii, DOH, Clean Air Branch (CAB) has also established State Ambient Air Quality Standards (SAAQS) for six of these air pollutants to regulate air quality statewide. The SAAQS for CO and NO₂ are more stringent than NAAQS (DOH, 2010). Hawaii also has a stringent standard for hydrogen sulfide, which is a common odorous pollutant associated with wastewater treatment facilities.

Table 3.2.2-1. Ambient Air Quality Standards

| Air Pollutant | Hawaii Standard | Federal Primary Standard | Federal Secondary Standard |
|---|---|--|------------------------------------|
| Carbon monoxide (CO) 1-hour average 8-hour block average | 9 ppm 4.4 ppm | 35 ppm 9ppm | None |
| Lead (Pb) 3-month average ⁽¹⁾ | 1.5 µg/m ³ (calendar quarter) | 0.15 µg/m ³ (rolling 3-month) | Same as Primary |
| Nitrogen dioxide (NO₂) Annual average | 0.04 ppm | 0.053 ppm | Same as Primary |
| Particulate Matter (PM₁₀) 24-hour block average Annual average | 150 µg/m ³ 50 µg/m ³ | 150 µg/m ³ None | Same as Primary None |
| Particulate Matter (PM_{2.5}) 24-hour block average Annual average | None None | 35 µg/m ³ 15 µg/m ³ | Same as Primary Same as Primary |
| Ozone (O₃) 8-hour rolling average ⁽²⁾ | 0.08 ppm | 0.075 ppm | Same as Primary |
| Sulfur dioxide (SO₂) 3-hour block average 24-hour block average Annual average | 0.5 ppm 0.14 ppm 0.03 ppm | - 0.14 ppm 0.03 ppm | 0.5 ppm - - |
| Hydrogen sulfide 1-hour average | 0.025 ppm | None | None |

(1) Final rule signed October 15, 2008.

(2) As of June 15, 2005. 1-hour O₃ was revoked in all areas except 14 8-hour O₃ nonattainment Early Action Compact Areas. Cabarrus County, North Carolina is not an Early Action Compact Area. As of September 16, 2009, EPA is reconsidering its 2008 decision for setting new national standards for 8-hr ground level ozone. The 1997 standard and its implementation rules would remain in place as EPA undertakes rulemaking to address the transition to the 2008 standard.

*ppm - parts per million by volume

*µg/m³ - micrograms per cubic meter of air

To determine compliance with the NAAQS, emissions of criteria pollutants from a new or modified source(s) are modeled to determine their air dispersion concentrations. In addition to the six criteria pollutants outlined in the CAA, several other substances raise concerns with regard to air quality and are regulated through the CAA Amendments of 1990. These substances include Hazardous air pollutants (HAPs) and toxic air pollutants (such as metals, Nitrogen oxides (NO_x), and volatile organic compounds (VOCs). NO_x and VOCs are precursors for O₃.

Areas that meet the air quality standard for the criteria pollutants are designated as being in attainment. Areas that do not meet the air quality standard for one or more of the criteria pollutants are designated as being in nonattainment for that standard. The CAA requires nonattainment states to submit to the EPA a State Implementation Plan (SIP) for attainment of the NAAQS (40 CFR 51.166; 40 CFR 93). Maintenance areas are those that at one point had not met the NAAQS but are currently maintaining the standards through the requirements in the SIP.

The 1990 Amendments to the CAA require Federal actions to show conformance with the SIP. Federal actions are those projects that are funded by Federal agencies and include the review and approval of a Proposed Action through the NEPA process. Conformance with the SIP means conformity to the approved SIP's purpose of eliminating or reducing the severity and number of violations of the NAAQS and achieving expeditious attainment of such standards (40 CFR 51 and 93). The need to demonstrate conformity is applicable only to nonattainment and maintenance areas.

Class I Areas and Sensitive Receptors

For areas that are already in compliance with the NAAQS, the Prevention of Significant Deterioration (PSD) requirements provide maximum allowable increases in concentrations of pollutants, which are expressed as increments (40 CFR 52.21). Allowable PSD increments currently exist for three pollutants: SO₂, NO₂, and PM₁₀ (Table 3.2.2-2).

Table 3.2.2-2. Allowable Prevention of Significant Deterioration Increments (µg/m³)

| Pollutant— Averaging Period | Class I Area | Class II Area |
|--|---------------------|----------------------|
| SO ₂ --3 Hour | 25 | 512 |
| --24-Hour | 5 | 91 |
| --Annual | 2 | 20 |
| NO ₂ --Annual | 2.5 | 25 |
| PM ₁₀ --24Hour | 8 | 30 |
| --Annual | 4 | 17 |

Source: 40CFR 52.21(c)

One set of allowable increments exists for Class II areas, which covers most of the United States and another set of more stringent allowable increments exists for Class I areas. Because of their pristine environment, Class I areas require more rigorous safeguards to prevent deterioration of their air quality. For the purposes of PSD review, the Federal government has identified mandatory Class I areas, which are defined in the CAA as the following that were in existence as of August 7, 1977: national parks over 6,000 acres, national wilderness areas and national memorial parks over 5,000 acres, and international parks (NPS, 2009a). In general, proposed projects that are within 62 miles of Class I areas must evaluate impacts of the project on Air Quality Related Values (AQRVs) such as visibility, flora/fauna, water quality, soils, odor, and any other resources specified by the Federal Land Manager (NPS, 2009b).

Areas that are not in attainment with NAAQS are subject to the Nonattainment New Source Review. Overall, for the purposes of air quality analysis, any area to which the general public has access is considered a sensitive receptor site, and includes residences, day care centers, educational and health facilities, places of worship, parks, and playgrounds.

3.2.2.1 Affected Environment

Air Quality

The State of Hawaii, DOH, CAB which is responsible for monitoring air quality for each of the criteria pollutants and assessing compliance, has promulgated rules governing ambient air quality in the State of Hawaii. These rules are codified in Hawaii HRS, Chapter 342B, Air Pollution Control.

The State of Hawaii, DOH, CAB regularly samples ambient air quality at monitoring stations throughout the State and annually publishes this information. On Oahu, there are nine monitoring stations. The closest station to the Poamoho project site is the Pearl City station, which is located at 860 4th Street, approximately eight miles southeast of Wahiawa. The Pearl City monitoring station currently monitors for the volume of PM₁₀, PM_{2.5}, speciation, and air toxics. The Kapolei station is the closest station to the Tesoro project site. The Kapolei station is located at 91-591 Kalaeloa Boulevard at the entrance to James Campbell Industrial Park. This station monitors NO₂, PM₁₀, CO, and SO₂.

In general, air quality in the State of Hawaii continues to be one of the best in the nation, and criteria pollutant levels remain well below NAAQS and SAAQS. According to the *Annual Summary 2008 Hawaii Air Quality Data*, air quality monitoring data compiled by the DOH indicates that the established air quality standards for all monitored parameters are consistently met throughout the State and on the island of Oahu.

Current Air Emissions

There are currently no process operations at the Poamoho or Tesoro project sites. The proposed project sites are located in “attainment areas”. Air quality in the vicinity of both sites is considered to be good, and meets the quality standards under NAAQS and SAAQS. Air quality at both of the proposed project sites is positively influenced by tradewinds that regularly blow from a northeasterly direction moving generated air pollutants on land to the southwest out to the open ocean.

Problems with poor air quality and elevated pollutant levels generally occur when tradewinds diminish or give way to southerly and southwesterly winds (known as Kona wind conditions). It is under stable conditions that the greatest potential for air pollutant buildup from ground level sources exists.

3.2.2.2 Environmental Consequences

3.2.2.2.1 No Action Alternative

The No Action Alternative is treated in this EA as the “No-Build” Alternative. That is, under the No Action Alternative, DOE would not provide funding for the proposed project, and Phycal would not proceed with the proposed project. Current emissions would continue unchanged.

With the No Action Alternative, DOE would not fully meet its goal of supporting U.S.-based design, construction and testing of beneficial CO₂ utilization technologies. With reduced DOE funding, industries may be less willing to invest in the advanced technology that would help reduce or permanently prevent CO₂ from entering the atmosphere. Without alternative fuel sources for automobiles, the U.S. would continue its dependence on and consumption of petroleum and other fossil fuels. Consequently, the current trends of increased CO₂ concentrations in the Earth’s atmosphere would continue.

3.2.2.2.2 Proposed Project

Construction

Construction activities for the proposed project would start as early as September 2011 and be completed in June 2012 for Module 1 and June 2013 for Module 2. Construction of the proposed project would result in three general categories of air emissions. First, site preparation and vehicle movement would generate fugitive dust emissions. Second, internal combustion engines in construction equipment would release NO_x, CO, and other motor fuel combustion products. And third, construction worker travel to and from the respective project sites would result in vehicular emissions.

The quantity of emissions released during the construction process would generally be low but would vary due to weather conditions and would fluctuate on an hourly and daily basis as construction progresses. Fugitive dust emissions would be greatest during the site preparation phase. Fugitive dust emissions would also be greater during the more active construction periods as a result of increased vehicle traffic on the construction site.

Fugitive dust emissions from the construction site would be minimized using appropriate dust suppression control methods. Standard control methods include the application of environmentally approved dust-suppressing chemicals or water to unpaved roads and other exposed surfaces and the seeding of exposed areas. Construction-related fugitive dust emissions would be temporary and would cease once construction is completed.

Emissions from internal combustion engines would occur during site preparation and construction because of the use of onsite construction equipment for site grading, concrete placement, and major equipment installation. In addition to the pollutants associated with the combustion of motor fuel by the construction equipment engines, the following construction activities would result in minor emissions of volatile organic compounds (VOCs):

- Evaporative losses from onsite painting.
- Refueling of construction equipment.
- Application of adhesives, waterproofing chemicals, and cleaning solvents.

There would be an estimated 30 construction workers on a monthly average basis. While not readily quantifiable, the temporary net changes in vehicle-miles traveled (VMT) in the area would be minimal, as would any temporary net changes in areawide vehicular emissions due to the relatively low number of construction workers anticipated.

Air quality impacts caused by construction activity would vary from day to day as a function of the level of activity, specific nature of the activity, weather conditions while the activity occurs, and emissions controls applied to the activity. However, even under worst-case conditions, maximum ambient impacts caused by construction emissions are expected to be modest, temporary, and limited to the general area of the construction site.

In summary, based on the type and nature of the construction-related emissions sources, air quality impacts caused by construction-related emissions would be minor and localized, primarily limited to the immediate onsite area of the construction activity, and well within the property boundaries of the Poamoho and Tesoro project sites. Construction personnel would implement appropriate mitigation measures, such as applying water to exposed surfaces or stockpiles of dirt, when windy or dry conditions promote problematic fugitive dust emissions. Adhering to mitigation measures and BMPs would reduce the adverse impacts from fugitive dust emissions. Air quality monitoring would be implemented to ensure compliance with NAAQS and SAAQS. Due to the limited duration of the construction phases, DOE expects the overall impacts to air quality from the construction of the proposed project would be short-term and minor.

Operation

During the approximate 24-month operation phase, the proposed project would have minimal impacts on ambient air quality due to the size of the project's emissions sources. Emission sources associated with operation of the proposed project at the Poamoho site is provided in the table below (Table 3.2.2.2.2-1). Outputs would occur daily at specified rates throughout the duration of the proposed project. According to the current design and specifications for the proposed project, the potential point source emissions at the Poamoho site include the propane-fired, ten million British Thermal Unit (MM BTU) boiler, a propane fired 2 MM BTU thermal oxidizer, and a supplemental 1230 electrical kW Tier II diesel engine generator (Tier II refers to standard level air emissions controls available on new diesel generator equipment). Based on potential aggregate emissions from the above mentioned point sources, the proposed project is required to obtain a Noncovered Source Permit (NSP) with the State DOH, CAB and would be subject to sections of the State and Federal Regulations listed in Table 3.2.2.2.2-2.

Table 3.2.2.2.2-1. Poamoho Site: Summary of Potential Emissions

| Emission Source | Potential Emissions After Control (ton/yr) | | | | | | DOH Permit Status |
|---|--|------|-----------------|-----------------|------|------|-------------------|
| | PM | CO | NO _x | SO _x | VOC | HAPs | |
| 1,000 EkW Stand-by DEG (P-01) | 0.11 | 0.88 | 7.23 | 0.20 | 0.12 | 0.04 | Noncovered Source |
| 2x4.18 MMBTU/hr Propane Boiler (P-02) | 0.13 | 2.35 | 2.71 | 0.03 | 0.25 | n/a | Exempt |
| Algal Lipid Extraction through 2.0 MMBTU/hr Thermal Oxidizer (P-03) | 0.051 | 0.55 | 0.95 | 0.011 | 0.93 | 0.93 | Noncovered Source |
| TOTAL | 0.28 | 3.78 | 10.89 | 0.23 | 1.30 | 0.97 | |
| TOTAL (NonCovered) | 0.16 | 1.43 | 8.18 | 0.21 | 1.05 | 0.97 | |

*SOX – Sulfur Oxides

Table 3.2.2.2.2-2. Poamoho and Tesoro Site: State and Federal Air Quality Regulations

| Applicable Regulations | State | Federal | Requirements |
|---|-----------------------------------|--|--|
| Non-Covered Source Permit/Minor New Source Review (NSR) Permit | Yes HAR11-60.1 Subchapter 4 | Authority delegated to State of Hawaii | AAQA using screening model, Propose to use existing SLAMs data for comparison. Compliance Plan and Certification. |
| New Source Performance Standards (NSPS) | Yes HAR11-60.1 Subchapter 8 | Yes 40CFR60 Subpart A Subpart III | Comply with General Provisions, and Stationary Compression Ignition Internal Combustion Engines |
| MACT & National Emission Standards for Hazardous Air Pollutants (NESHAP) | Yes HAR11-60.1 Subchapter 9 | Yes 40CFR63 Subpart ZZZZ | Emission limits, control, operational, and maintenance requirements, compliance dates, and associated recordkeeping, monitoring, testing, notification, and reporting requirements |

*AAQA – Ambient Air Quality Standard

*SLAMS – State and Local Air Monitoring Stations

*BACT – Best Available Control Technology

*CFR – Code of Federal Regulations

*MACT – Maximum Achievable Control Technology

Operations at the Tesoro processing facility would also have minimal impacts on ambient air quality. These gases, which would be emitted after the combustion flare, include water vapor, CO₂, nitrogen, and SO₂. Outputs would occur daily at specified rates listed in Table 3.2.2.2.2-3. Emissions resulting from the processing facility would not significantly impact existing air quality levels. Based on the emission estimates, the Upgrading Unit is required to obtain a NSP with the State DOH, CAB. The Upgrading Unit would also likely be subject to the sections of the State and Federal Regulations listed in Table 3.2.2.2.2-2.

Table 3.2.2.2.2-3 – Tesoro Site: Summary of Potential Emissions

| Emission Source | Potential Emissions After Control (ton/yr) | | | | | | DOH Permit Status |
|-------------------|--|------|-----|-----|------|------|-------------------|
| | PM | CO | NOX | SOX | VOC | HAPs | |
| GE Upgrading Unit | 0 | 1.04 | 0 | .66 | <1.0 | 0.21 | Noncovered Source |

The output releases to the air resulting from the proposed project would be managed according to Federal and State air quality standards. The overall CO₂ emissions from the proposed project would be low. It is estimated that operations at the Poamoho project site would result in approximately 3,813 mtpy of CO₂ per year and approximately 45 mtpy of CO₂ would be produced from operations at the Tesoro project site.

During the pilot phase, the proposed product would be purified algal oil that would be tested for use at a power station in Hawaii. The targeted quantity of 150,000 gal of oil would be used under controlled condition in one of the grid connected power stations, therefore saving the burning of approximately 150,000 gal of non-renewable fuel oil. The pilot would reduce CO₂ production by 1,662 MT for that test run.

3.2.2.3 Cumulative Impacts

Currently, other than the proposed project, no other projects are planned in the vicinity of the Poamoho site in Wahiawa. Therefore, no reasonable foreseeable actions have been identified in the Wahiawa area that would interact with the proposed project to generate cumulative adverse impacts to air quality.

As described above in Section 3.2.1.3, the UOP Integrated Bio-Refinery Pilot Project, is being planned for the area adjacent to the Tesoro project site. Potential impacts to air quality resulting from the UOP Integrated Bio-Refinery Pilot Project would be minor. Short-term impacts would occur during the construction period. Operations would also result in some outputs; however, these emissions are not expected to significantly impact existing air quality levels. The UOP project is in the process of obtaining a Non-Covered Source Permit with the State of Hawaii, DOH, CAB. The output releases to the air resulting from the UOP project would be managed according to Federal and State air quality standards.

With the development of the adjacent UOP Integrated Bio-Refinery Pilot Project and full development of other areas within the industrial park, cumulative adverse impacts would likely occur to air quality associated with the historical trend of past, present, and reasonable foreseeable future activities. These impacts would be relatively minor and would occur over time. Mitigation measures such as those described below would be implemented to minimize adverse impacts.

Greenhouse Gas and Global Warming

According to the International Panel on Climate Change (IPCC) (2007a), a worldwide environmental issue is the likelihood of changes in the global climate as a consequence of global warming produced by increasing atmospheric concentrations of GHGs (IPCC, 2007). The atmosphere allows a large percentage of incoming solar radiation to pass through to the earth's surface, where it is converted to heat energy (infrared radiation) that is more readily absorbed by GHGs such as CO₂ and water vapor than incoming solar radiation. The heat energy absorbed near the earth's surface increases the temperature of the air, soil, and water.

GHGs include water vapor, CO₂, methane, nitrous oxide, ozone, and several chlorofluorocarbons. The GHGs constitute a small percentage of the earth's atmosphere. Water vapor, a natural component of the atmosphere, is the most abundant GHG. The second-most abundant GHG is CO₂, which remains in the atmosphere for long periods of time. Due to man's activities, atmospheric CO₂ concentrations have increased approximately 35 percent over preindustrial levels. Fossil fuel burning is the primary contributor to increasing concentrations of CO₂ (IPCC, 2007a).

According to the IPCC fourth assessment report, "[w]arming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level" (IPCC, 2007b). The IPCC report finds that the global average surface temperature has increased by approximately 0.74 degrees Celsius (°C) in the last 100 years; global average sea level has risen approximately 150 millimeters over the same period; and cold days, cold nights, and frosts over most land areas have become less frequent during the past 50 years. The report concludes that most of the temperature increase since the middle of the twentieth century "is very likely due to the observed increase in anthropogenic [GHG] concentrations."

The IPCC 2007 report estimates that, at present, CO₂ accounts for approximately 77 percent of the climate change potential attributable to anthropogenic releases of GHGs, with the vast majority (74 percent) of this CO₂ coming from the combustion of fossil fuels.

IPCC and the U.S. Climate Change Science Program (CCSP) examined the potential environmental impacts of climate change at global, national, and regional scales. IPCC's report states that, in addition to increases in global surface temperatures, the impacts of climate change on the global environment may include:

- More frequent heat waves, droughts, and fires.
- Rising sea levels and coastal flooding; melting glaciers, ice caps, and polar ice sheets.
- More severe hurricane activity and increases in frequency and intensity of severe precipitation.
- Spread of infectious diseases to new regions.
- Loss of wildlife habitats.
- Heart and respiratory ailments from higher concentrations of ground-level ozone (IPCC, 2007b).

On a national scale, average surface temperatures in the United States have increased, with the last decade being the warmest in more than a century of direct observations (CCSP, 2008). Impacts on the environment attributed to climate change that have been observed in North America include:

- Extended periods of high fire risk and large increases in burned area.
- Increased intensity, duration, and frequency of heat waves.
- Decreased snow pack, increased winter and early spring flooding potentials, and reduced summer stream flows in the western mountains.
- Increased stress on biological communities and habitat in coastal areas (IPCC, 2007b).

In Hawaii, where the proposed project would be located, daily temperature range is decreasing, resulting in a warmer environment, especially at higher elevations and at night. Historically, temperature has been rising over the last 100 years with the greatest increase after 1975 (USFWS, 2011). Over the last century, Hawaii has also experienced decreased precipitation overall, and in all seasons, including winter. Data on precipitation shows a steady decline of approximately 15% over the last 15 to 20 years. During the next century, Hawaii's climate may change even more; IPCC predicts that the largest increases in future temperatures are likely to occur in the northern latitudes (IPCC, 2007b). The average ambient temperature (at sea level) is projected to increase by about 4.1 (2.7 to 6.7) °F by 2100 (IPCC, 2007). These changes would increase the monthly average temperature to between 77°F to 86°F (USFWS, 2011).

Because climate change is a cumulative phenomenon produced by releases of GHGs from industry, agriculture, and land use changes around the world, it is generally accepted that any successful strategy to address it must rest on a global approach to controlling these emissions. In other words, imposing controls on one industry or in one country is unlikely to be an effective strategy. And because GHGs remain in the atmosphere for a long time and industrial societies will continue to use fossil fuels for at least 25 to 50 years, climate change cannot be avoided. As IPCC report states, “[s]ocieties can respond to climate change by adapting to its impacts and by reducing [GHG] emissions (mitigation), thereby reducing the rate and magnitude of change” (IPCC, 2007b).

According to the IPCC, there is a wide array of adaptation options. While adaptation will be an important aspect of reducing societies' vulnerability to the impacts of climate change over the next two to three decades, “adaptation alone is not expected to cope with all the projected effects of climate change, especially not over the long term as most impacts increase in magnitude” (IPCC, 2007b). Therefore, it will also be necessary to mitigate climate change by stabilizing the concentrations of GHGs in the atmosphere. Because these gases remain in the atmosphere for long periods of time, stabilizing their atmospheric concentrations will require societies to reduce their annual emissions. The stabilization concentration of a particular GHG is determined by the date that annual emissions of the gas start to decrease, the rate of decrease, and the persistence of the gas in the atmosphere. The IPCC report predicts the magnitude of climate change impacts for a range of scenarios based on different stabilization levels of GHGs. “Responding to climate change involves an iterative risk management process that includes both mitigation and adaptation, taking into account actual and avoided climate change damages, co-benefits, sustainability, equity, and attitudes to risk” (IPCC, 2007b).

The main purposes of the proposed project is to develop and prove technical and economic feasibility of farming algae for biofuels at near-commercial scale in a way that releases 50% less GHG emissions as compared to comparable petroleum fuels as required by the Energy Independence and Security Act of 2007. This would allow Phycal to take the next step toward commercial operation. At a commercial-scale, the algae farm and processing facility would reduce GHG emissions by utilizing higher quantities of CO₂, which would otherwise have been

released to the atmosphere. For example, a commercial scale plant of 50 Mgal per year would reduce CO₂ emissions by about 560,000 mtpy. In addition, the use of algae oil as drop in green replacements for diesel and jet fuel, fuel oil blends, would result in the use of energy products that would have lower carbon footprints relative to the petroleum products they are planned to replace. Overall, there would be a beneficial reduction in greenhouse gas emissions as the proposed project would help the viability of the commercial market for green energy products, such as algae, thereby reducing the carbon footprint of the transportation sector.

3.2.2.4 Proposed Mitigation Measures

State of Hawaii Air Pollution Control regulations prohibit visible emissions of fugitive dust from construction activities at the property line. A dust control program would be implemented to control dust from construction activities. Fugitive dust emission would be controlled through the mitigation measures such as watering active work areas, using wind screens, keeping adjacent paved roads clean, covering open-bodied trucks and limiting the area to be disturbed at any given time. Other typical mitigation measures to minimize air quality issues caused by fugitive dust and tailpipe emissions would include the following:

- Require all construction crews and contractors to comply with the state regulations for fugitive dust control during construction.
- Maintain the engines of construction equipment according to manufacturers' specifications.
- Minimize the idling of equipment while the equipment is not in use.
- Implement reasonable measures, such as applying water to exposed surfaces or stockpiles of dirt, when windy or dry conditions promote problematic fugitive dust emissions. Adhering to these BMPs would minimize any fugitive dust emissions. Adhering to mitigation measures and BMPs would reduce the adverse impacts from fugitive dust emissions.

During operations, appropriate mitigation measures would be implemented such as the use of thermal oxidizer units and equipment that minimizes output levels. Monitoring of air quality would also be carried out regularly to ensure compliance with NAAQS and SAAQS. Required Federal and State air quality permits would be obtained prior to construction and operations of the proposed project. With permitting requirements in place, emissions would be minimized to avoid potential air quality effects.

3.2.3 Noise

3.2.3.1 Affected Environment

Title 11, Chapter 46, of the HAR 11-46 defines maximum permissible sound levels which are intended to protect, control, and abate noise pollution from stationary sources and construction, industrial, and agricultural equipment. As detailed below, maximum permissible sound levels in various zoning districts are set for excessive noise sources during the day (7am to 10 pm) and night (10pm to 7am) at the property line where the activity occurs.

- Class A - Residential, conservation, preservation, public space, open space, or similar type zones – 55 Decibel (dBA) (day) and 45 dBA (night)
- Class B - Multi-family dwellings, apartment, business, commercial, hotel, resort, or similar type zones – 60 dBA (day) and 50 dBA (night)
- Class C - Agriculture, country, industrial, or similar type zones – 70 dBA (day) and 70 dBA (night)

Major contributors to the existing background ambient noise levels within the Poamoho project area are largely attributed to motor vehicle traffic along streets bordering the proposed project site. This includes Kamananui Road which turns into Kamehameha Highway, in particular, due to its larger traffic capacity and volume. The predominant source of noise near the Tesoro site is aircraft performing takeoff and landing operations at the nearby airfield. Other noise sources at both sites include wind moving through vegetation, birds, and occasional noises related to construction near the area.

3.2.3.2 Environmental Consequences

3.2.3.2.1 No Action Alternative

Under the No Action Alternative, construction and operation would not occur, therefore, no impacts would occur regarding noise levels.

3.2.3.2.2 Proposed Project

Construction

The proposed project is not likely result in significant increases in ambient noise levels on the Poamoho agricultural site. While noise may be generated during the construction period, the proposed project would not impact the distant neighbors to the north of the site at Poamoho Camp. Construction activities would be monitored by the State to comply with the provisions of the regulation for community noise control. The dominant noise sources during construction would be earth moving equipment. Noise levels associated with construction equipment typically range from 80 to 95 dBA at 50 feet (ft) from the source. While significant impacts to neighboring areas would not be anticipated, mitigation measures would be implemented to minimize construction noise impacts. These measures include limiting work to daytime hours and reducing truck/equipment idling when not in use.

During construction of the Tesoro project site, noise levels would likely increase as a result of earth moving equipment, construction vehicles and other construction activities taking place on the site. While significant impacts to neighboring areas would not be anticipated to occur, mitigation measures would be implemented to minimize adverse impacts.

Operation

The ongoing operations at the Poamoho site would not increase noise levels. All significant noise producing equipment would be located toward the southern end of the property line - furthest away from the residential areas at Poamoho Camp. Impacts to other noise sensitive areas would not be expected to occur since the proposed project site is located well away from schools, hospitals, and nursing homes.

The proposed project's processing facility at the Tesoro site would generate some noise during the conversion process of the algae oil. However, noise levels would be minimal and within the allowable ranges associated with industrial areas. Located in James Campbell Industrial Park, the proposed project would not adversely impact neighboring industrial areas.

3.2.3.3 Cumulative Impacts

Other than the proposed project, no other projects are planned in the vicinity of the Wahiawa project site. However, as described above in Section 3.2.1.3, the UOP Integrated Bio-Refinery Pilot Project, is being planned for the area adjacent to the Tesoro project site. Potential impacts to noise resulting from the UOP project would be minor. Short-term impacts will occur during the construction period, and a community noise permit will be obtained.

The proposed project would generate minor impacts that would contribute to cumulative noise impacts associated with the historical trend of past, present, and reasonable foreseeable future activities. Noise emissions could have a minor cumulative impact when occurring with other noises. While significant impacts to neighboring areas are not anticipated to occur, mitigation measures will be implemented to minimize adverse impacts.

3.2.3.4 Proposed Mitigation Measures

The proposed project includes the construction and maintenance of a natural vegetation buffer along the southern and eastern borders of the Poamoho project site to reduce noise and visual disturbance from adjacent roadways and nearby residences at Poamoho Camp. The Tesoro project site is located in James Campbell Industrial Park; therefore the site is surrounded by other industrial uses. All construction and operations associated with this proposed project would abide by the noise guidelines documented in Title 11, Chapter 46 of the Hawaii Administrative Rules. Community noise permits would be obtained for construction and operation of the proposed project from the DOH.

3.2.4 Geology and Soils

3.2.4.1 Affected Environment

According to the Geology of the State of Hawaii (1985), the Poamoho project site is situated within the Schofield Plateau that spans the central part of Oahu. The Schofield Plateau was formed by the lava flows from the Koolau Range to the east banking against the older Waianae Range to the west. These lava flows are part of the Koolau volcanic series comprising the majority of the Schofield Plateau, however, some of the Koolau volcanic series partially overlaps the Waianae volcanic series within the plateau. Both the Koolau volcanic series and Waiyanae volcanic series emerged during the Tertiary period of the Cenozoic era, with the lavas erupting in the Pliocene time; however, the Koolau volcanic series is the younger of the two series. On the west side of the plateau and along the rim of the Kaukonahua Valley, the plateau consists of alluvium from the Waianae Range piled against and interweaved with the Koolau lavas. These alluvial deposits occurred during the Holocene and Pleistocene ages.

The soils on the Poamoho project site consist of two types of Wahiawa silty clay - 0 to 3 percent slopes (WaA) and 3 to 8 percent slopes (WaB). These soil types are of the Wahiawa Series, which consists of well-drained soils that occur within elevation ranges from 500 to 1,200 feet. A representative soil profile consists of about 12 inches of dusky red silty clay followed by about 48 inches of dark reddish-brown silty clay that has a subangular blocky structure. The substratum is weathered basic igneous rock, although this is generally quite deep. Permeability is moderately rapid and the erosion hazard is slight. The Hydrologic Soil Group (HSG) for runoff is Type "B".

- WaA surface layer is very dusky red and dusky red silty clay about 12 inches thick. The subsoil, about 48 inches thick, is dark reddish-brown silty clay that has subangular blocky structure. The underlying material is weathered basic igneous rock. The soil is medium acid in the surface layer and medium acid to neutral in the subsoil. Permeability is moderately rapid. Runoff is slow and the erosion hazard is no more than slight. This subsoil is used for sugar cane, pineapple, pasture and homesites.
- WaB runoff is slow and the erosion hazard is slight. This soil is used for sugar cane, pineapple, and pasture.

The Land Study Bureau (LSB) classifies the Poamoho project area as Class B soils which have the second highest agricultural productivity rating. The Agricultural Lands of Importance to the State of Hawaii (ALISH) rating characterized the vast majority of the Poamoho project site as "Unique" agricultural land which is defined as Non-Prime agricultural land used for the production of specific high-value crops (e.g., coffee and taro).

The Tesoro project area is on a portion of the Ewa Plain which was formed as the lava from the two volcanoes merged. The coastal areas of the Ewa Plain consist of sediments from the erosion of the volcanoes and the remains of coral growth. The Ewa Coastal Plain comprises an area of approximately 28 square miles and is composed of an exposed emergent reef. The caprock has sequences of relatively flat Pleistocene marine sedimentary deposits and terrestrial alluvium deposits. The marine sedimentary deposits consist of calcareous silts, sands and gravels and reef limestone layers. The terrestrial alluvium deposits consist of silts and clays derived from upslope volcanic material (UH, 1983).

The Tesoro project site and a large part of the surrounding area contains soil classified Coral Outcrop (Cr). This soil consists of coral and cemented calcareous sand. Coral reefs were formed in shallow ocean water at a previous time when the ocean level was higher. Coral outcrop can be found exposed at the ocean shore, on the coastal plains, and at the foot of the uplands. 80 to 90 percent of the coral outcrop is made from coral reef. The remaining 10 to 20 percent consists of a thin layer of red soil in cracks, crevices, and depressions within the coral outcrop. Vegetation on this type of soil consists of kiawe, koa haole, and fingergrass. Permeability is rapid and the HSG is Type "A".

No LSB data exists for the proposed Tesoro project site. No ALISH data is available for the Tesoro project site.

3.2.4.2 Environmental Consequences

3.2.4.2.1 No Action Alternative

Under the No Action Alternative, construction and operations would not occur, therefore, no additional impacts would occur to existing geology and soil resources.

3.2.4.2.2 Proposed Project

Construction

The construction of the proposed project would result in minor impacts to the existing land at both of the proposed sites (Poamoho site and Tesoro site).

The development of the proposed project at the Poamoho site would require grading of the soils and leveling of the land. The site would be graded in terraces to provide level areas for the large algae ponds. There would be a mix of excavation and embankment, with a net excess of approximately 3,000 cubic yards (cy) of material. Concrete would be used to support the production equipment and the parking lot. Approximately 68,000 sf of concrete would be used in concrete foundations and pads to support processing equipment, labs and offices. Approximately 76,000 sf of asphalt or pavement would be used for the roadways and parking lots. The ponds would cover approximately 10.1 acres. The proposed project would also require new drainage area and wastewater service within the Poamoho site. Underground piping would be fitted throughout the site to accommodate the proposed project. Although changes would be made to the existing site, the land would remain in agricultural use for aquaculture. Development of the proposed project would not change the overall soil composition at the site, however soil would be distributed.

The Tesoro Site is nearly flat and minimum grading would be necessary. The overgrown vegetation and brush would be cleared for the placement of the equipment and equipment trailer facility. The proposed project area is approximately 40,000 sf, and roughly 14,000 sf would be covered with gravel to allow for vehicular access and for placement of the trailers. Some added impervious surfaces onsite would contribute to a slight increase in stormwater runoff. To mitigate the increase, a small infiltration basin would be constructed adjacent to the facility to collect runoff and promote infiltration into the permeable soils.

Temporary erosion control measures would be incorporated during the construction period to minimize soil loss and erosion hazards. At a minimum, erosion control BMPs to be used onsite would include: sediment traps, temporary diversion berms and swales, silt fences, dust fences, inlet protection, stabilized construction entrances and truck wash-down areas. The BMPs would be closely monitored during construction. Periodic spraying of loose soils would also be carried out as required for dust control on disturbed surfaces. A NPDES permit for discharge of stormwater associated with construction activities would be obtained for the Poamoho site. The requirements of the approved NPDES permit and erosion control plan would be adhered to during construction as appropriate.

Operation

Operations of the site would have no impacts to either geology or soil resources. The algae farm and processing at the Poamoho site would occur within the ponds and the facilities. The algae oil would be transferred to the Tesoro site using existing road infrastructure where it would be converted into various forms of biofuels.

3.2.4.3 Cumulative Impacts

Agricultural uses adjacent to the Poamoho project site have caused localized and adverse disturbances to soils. The Poamoho project site is surrounded by other agricultural uses in Wahiawa, Central Oahu. As these vacant lands are developed for agricultural uses, additional disturbances would likely occur to soils. These impacts would be localized, and disturbance would occur over time. Therefore, overall adverse cumulative impacts to soils and geology would be minor.

Industrial uses adjacent to the Tesoro project site have caused localized and adverse disturbances to soils. As described in Section 3.2.1.3, the UOP Integrated Bio-Refinery Pilot Project is being planned for the area adjacent to the Tesoro project site. Potential impacts to geology and soils resulting from the UOP project would be minor. The project design is a low-impact development process and will have no long term impact on the land. Construction work will be performed in accordance with the Federal, State, and City approved design standards.

As the Tesoro project site is located within James Campbell Industrial Park, additional disturbances would likely occur to soils within the remaining undeveloped lots located in the industrial park as they become developed. These impacts would be localized, and disturbance would occur over time. Therefore, overall adverse cumulative impacts to soils and geology would be minor.

3.2.4.4 Proposed Mitigation Measures

During construction of the proposed project, erosion control practices would comply with County, State, and Federal regulations. BMPs would be implemented pursuant to the required Grading Permit to mitigate potential impacts of soil erosion and fugitive dust during grading or excavation. The State DOH NPDES permit would be obtained for the proposed project (Poamoho site) from the State prior to construction. Soils would be stabilized following construction to minimize erosion and offsite impacts.

Following the completion of the proposed project, development of the project sites, including new infrastructure and concrete slab areas would be removed. Pond areas at the Poamoho site would be filled, and buildings and equipment would be removed. Concrete areas would be demolished and re-used as construction materials for other projects. The land within the proposed project areas would be leveled to its natural state and grasses would be planted to minimize erosion. The proposed project design is a low-impact development process and would have no long-term effect to the land.

3.2.5 Vegetation and Wildlife

3.2.5.1 Affected Environment

A botanical survey for both the Poamoho site and the Tesoro site was conducted for the proposed project in April 2010.

Vegetation

The Poamoho project site is an abandoned pineapple field. Weedy growth now dominates the parcel; however, evidence of the former agricultural use is present in the farm access roads and planting rows, as well as the occasional groupings of commercial pineapple plants still growing in the field. A majority of the site is covered by grasses, with several other herbaceous plants present and mixed within the grasses. Tall Guinea grass (*Urochloa maxima*) occurs in patches, especially around the margins bordering the paved highways and along the unpaved farm roads. Most of the ground previously occupied by pineapple is a mixture of sourgrass (*Digiteria insularis*) and beggars tick (*Bidens spp.*), growth of which tend to be under 0.6 meters (m) high. In addition, shrubs and small trees are scattered over the parcel. The majority of these are pua nana honua (*Solanum mauritianum*) and dog tail (*Buddleia asiatica*). No plant species currently listed, or proposed for listing under either the federal or State of Hawai'i endangered species statutes was detected during the course of the survey, and none would be anticipated given the nature of the vegetation.

The northern end of the Tesoro parcel was completely developed as a bioremediation facility until 1998. This facility was removed and the site completely cleaned of structures and debris. The site is now a graded level lot with the vegetation slowly returning. Presently, this vegetation is mostly open scrub and grassland with a few scattered small trees, mostly kiawe (*Prosopis pallida*). The grass is mostly buffel grass (*Cenchrus ciliaris*), but low growing (spreading), ruderal herbs are nearly as common as grass across the lot. A total of 28 plant species were recorded in the survey of the empty lot adjacent to the Tesoro Refinery in James Campbell Industrial Park. These are mostly weedy species reflecting the relatively recent disturbance of the site. Of the 28 species identified on the lot, three are native (all indigenous; no endemics) or 10.7%. The only plant observed of potential sensitivity and endangered species concern is the tree tobacco (*Nicotiana glauca*). This plant is an introduced species and not an endangered or threatened plant species. However, this plant is a known food source for the caterpillar (larva) of the endangered Blackburn's sphinx moth (*Manduca blackburni*). The moth is thought to be extinct on Oahu, but host plants are inspected for caterpillars, and there were none found on the site.

Wildlife

At the Poamoho site, a total of 334 individual birds of 15 different species, representing 12 separate families, were recorded. None of these avian species are currently listed, or proposed for listing under either the Federal or State of Hawai'i endangered species statutes.

The Tesoro site was deemed lacking in habitat resources to support avian fauna other than common, introduced species. Some of the avian faunal species recorded during the site survey were the Spotted Dove (*Streptopelia chinensis*), Zebra Dove (*Geopelia straiata*), Common Myna (*Acridotheres tristis*), and the House Finch (*Carpodacus mexicanus*).

No mammalian species currently listed, or proposed for listing under either the Federal or State of Hawai'i endangered species statutes detected during the course of the Poamoho site or Tesoro site surveys.

3.2.5.2 Environmental Consequences

3.2.5.2.1 No Action Alternative

Under the No Action Alternative, construction and operations would not occur, therefore, no impacts would occur to vegetation and wildlife.

3.2.5.2.2 Proposed Project

Informal coordination letters were sent to both the USFWS and the State of Hawaii, DLNR to verify the proposed project would have no impact on any Federally- or State-listed threatened, endangered, or candidate species, or critical habitat within the vicinity of the proposed project. As stated in Section 3.2.5.1, there are no areas on both of the proposed project sites that were not previously cleared of natural vegetation. The vegetation found at the Poamoho project site is entirely one of early succession from a previously used and maintained agricultural field. The vegetation at the Tesoro site is reminiscent of an industrial area having a graded level lot with slowing returning vegetation. The potential for rare, threatened or endangered species or habitat, therefore, would be unlikely and additional surveys would not be warranted.

In a letter dated October 4, 2011, the USFWS stated that in accordance with Section 7 of the Endangered Species Act of 1973, the proposed project may affect, but is not likely to adversely affect the Hawaiian moorhen, Hawaiian coot, Hawaiian stilt, and Hawaiian duck. A copy of the letter is included in Appendix C of this EA.

Vegetation

Construction

Construction activities associated with the proposed project would require site grading and removal of vegetation. This vegetation community, however, would not be considered rare or of high value within the region; therefore, overall impacts from construction would be minor. At the Poamoho site, a natural vegetation buffer would be retained at the Poamoho site along the east and south sides of the aquaculture ponds fronting the two roadways (Kamanananui Road and Kaukonahua Road). The berm would be vegetated with non-native common grasses and low shrubs currently found on the site, such as those mentioned above, to maintain the weedy type agricultural setting of the area. At the Tesoro site, trees and/or shrubs would also be planted along the eastern boundary of the site to meet County landscaping requirements.

Operation

Other than maintenance of the vegetated berm at the Poamoho site and grass areas along the eastern boundary of the Tesoro site, operations of the proposed project would not be expected to cause adverse impacts to existing vegetation.

The proposed project would require the importation of algae representing several genera in an effort to use well studied and characterized strains to speed the deployment of the processing system. Phycal's current targeted production strain is *Chlorella*; however, if an improved strain becomes available, Phycal may supplement and/or replace the current production strain. No genetic modification has been or would be done on the strains used in the proposed project. All algae genera and species proposed for production strains in the proposed project are on the Hawaii DOA approved importation list. An algae importation permit was approved by the State DOA in March 2011.

Phycal would continue Research and Development (R&D) to select and improve strains within the *Chlorella* genera by classical selection. R&D would also be carried out for other algae genera that may provide an added benefit to overall production and operations of the proposed project. These algae genera include *Nannochloropsis*, *Skeletonema*, and *Tetraselmis*. While R&D of algae production strains would be a small scale operation on the pilot site, it is an important component for the future efforts and success of the proposed project. Continuing to improve algae production strains would help to decrease the risk of failure should specific viruses or other conditions occur that threaten Phycal's targeted production strain. Alternatively, rotation of strains can also be a way to maintain a

healthy system (i.e. avoiding build up of species specific predators or viruses). Algal strains that are newly identified from collaborators and in the literature may also be evaluated in the R&D process.

Descriptions of algae genera are provided below.

Chlorella - *Chlorella* are unicellular green algae. Members of the genus *Chlorella* are among the most widely distributed and frequently encountered algae in freshwaters (Fott & Novakova, 1969). *Chlorella* reproduces with autospores where the young cells are contained within the wall of the original cell and released as new cells on breakup of the autospore. The Chlorophytes (Class Chlorophyceae; Order Chlorococcales) are split into several Orders and *Chlorella* is in the Chlorococcales. These are defined as coccoid chlorophytes. Mitosis is closed, following cytokinesis each daughter cell becomes surrounded by its own cell wall. They form autospores and then the fully formed daughter cells are released from the autospore on enzymatic breakdown of the parental cell wall. The cells are small 2-12 μ and cells are spherical or ellipsoidal. *Chlorella* only propagates vegetatively and occurs in soils and freshwater (Van Den Hoek & Mann, 1995). No *Chlorella* species have been shown to be pathogenic or to be pests. The isolation of *Chlorella* at locations that produce fixed carbon sources such as tree sap is to be expected since a large number of algae are capable of heterotrophic and mixotrophic growth. While none are obligate heterotrophs they often can be grown on simple fixed carbon sources such as acetate and sugars. This explains why algae are often found growing on damp bark where additional resources are available to the alga. None have been shown to cause disease or be phytopathogens.

Chlorella is native to Hawaii and can be found in mountains, valleys, ponds, streams and lakes. Phycal is evaluating a number of different strains of *Chlorella*, including *Chlorella kessleri*, *Chlorella sorokiniana*, and *Chlorella protothecoides*. While the algae strain of focus is the *Chlorella protothecoides*, the process would use different strains to prevent the development of specific predators and or viruses.

Nannochloropsis - *Nannochloropsis* is an alga from the Heterokontophyta, Class Eustigmatophyceae. Normally referred to as an Eustigmatophyte, this genus is composed of non-flagellated, spherical to slightly ovoid cells from 2-4 microns (μ) in diameter. Each cell has a single chloroplast that is free of a pyrenoid. Only chlorophyll is present in this genus and the main accessory pigment is violaxanthin. The cells do not form starch. The genus' species are widely distributed in the world's oceans (Van Den Hoek & Jahns, 1995). *Nannochloropsis* is already being used in aquaculture in Hawaii as a live feed for fish farming. One example is a report out of the Oceanic Institute and The University of Hawaii at Manoa where they grew both *Nannochloropsis* and *Chlorella* in 246 m² outdoor culture facilities (Kam, Leung P-S, & Molnar, 2001). This is a current favorite strain for algal biofuels producers who rely on brackish or saltwater for their ponds. Phycal's current production strains are not *Nannochloropsis*; however, they are requesting its use for R&D and potential future use for the proposed project should its performance exceed the current production strain.

Skeletonema - *Skeletonema* is a centric diatom which is in the Heterokontophyta: Class Bacillariophyceae (Diatomophyceae or the diatoms); Order Centrales. As a diatom they have a unique cell wall structure composed of siliceous materials that form a "box" enclosing the cell (called a frustule). They have a sexual cycle that is flagellated. Chloroplasts are golden brown due to accessory pigments such as fucoxanthin. Chloroplast Deoxyribonucleic acid (DNA) is organized in a ring structure and mitosis is open as the nuclear envelope breaks down before metaphase. The whole Phylum is widespread in the world's marine and freshwaters. All cells of the Order Centrales are circular in shape from a top view. Asexual cellular enlargement is more common in *Skeletonema* than the production of auxospores. In this case the frustules open, the cytoplasm extrudes and clips off to form a new cell (Van Den Hoek & Mann, 1995). *Skeletonema* strains are naturally occurring in Hawaii. One report sampled six sites on the Ala Wai Canal at low flood and high tides and found *Skeletonema* in the waters at all stages (Beach, Harris, & Rabago, 1995). *Skeletonema* is not Phycal's current strain for the proposed project; however, this genus has been requested for R&D and potential future use for the proposed project should its performance exceed the current production strain.

Tetraselmis - *Tetraselmis* strains are members of the Chlorophyta or green algae. The genus is in the Class Prasinophyceae and members are free living, flagellated green algae. The cell and flagella are covered with elaborate organic scales. The flagella lack tubular hairs are attached to rhizoplasts, which are contractile organs that are attached to both the flagella and the nucleus; these are "root-like" and appear striated. The genus occurs in marine and fresh waters with *Tetraselmis* strains mostly isolated from seawaters; the genus is considered to be cosmopolitan in distribution (Van Den Hoek & Mann, 1995). *Tetraselmis* strains have already been used in open pond culture in Hawaii. The use of *Tetraselmis* in outdoor flumes has been shown to be possible either with the

introduction of carbon dioxide or flue gases from emission stacks. This work was done at the Natural Energy Laboratory of Hawaii on the Big Island (AE & Berning, 1991) (Laws, Taguchi, Hirata, & Pang, 1986). *Tetraselmis* is also used in aquaculture in Hawaii as a live feed for crustaceans and fish fry. While this is not Phycal's current production strain and they are requesting its use for R&D and potential future use for the proposed project should its performance exceed the current production strain.

No adverse impacts relating to the importation of algae genera would be anticipated. The proposed project is being planned to have minimal impact on the surrounding environment. Phycal would maintain the cultures in a controlled system that is open to the environment. The engineering is designed to accommodate harsh weather and heavy rainfall. Management plans are would respond to impending weather with rapid harvests and culture distribution to minimize the chance of accidental release of culture and live organisms into the surrounding streams and lakes. The pond system would be surrounded by a berm to prevent loss of culture in case of an accidental spill. There would be overflow ponds and areas where an accidental release from a pond would accumulate on site and be treated before escape to the environment. Other safeguards are also in place to prevent culture from escaping into surrounding streams. The culture itself would be aerated using paddlewheels not for aeration, but rather to propel the liquid forward in the raceway format. Phycal is also testing other methods to mix the ponds to further reduce possibilities of producing aerosols.

Wildlife

Construction

While none of the habitat present at the Poamoho or Tesoro project sites is unique or important for listed avian or mammalian species currently known on the island of Oahu, the construction of the proposed project would result in an indirect adverse impact to wildlife from the loss of existing habitat. Construction activities associated with the proposed project would require site grading and removal of vegetation. Wildlife utilizing this area would likely move to similar habitat available adjacent to the site.

Noise from construction activities (see Section 3.2.3) would have the potential to disturb wildlife species within proximity to the study area. Overall adverse impacts, however, would be minor as the area already contains disturbance to habitat within the proposed project sites from previous vegetation removal and grading for past agricultural and industrial uses.

Operation

Operation of the proposed project would not be expected to create disturbances to existing wildlife. From a native avian and mammalian perspective there is nothing unique about the habitat present within either of the proposed project sites (Poamoho site or Tesoro site), and none of the habitat are important for any listed avian or mammalian species currently known from the Island of Oahu.

While no endangered Hawaiian Waterbirds were detected during the survey, depending on how the aquaculture facility is laid out at the Poamoho site, and whether open ponds, raceways or other standing water would be present following the build-out of the proposed project, several listed waterbird species may be attracted to the facility. The four extant endangered waterbird species currently known from Oahu, Hawaiian Duck (*Anas wyvilliana*), the Hawaiian endemic sub-species of the Common Moorhen (*Gallinula chloropus sandvicensis*), Hawaiian Coot (*Fulica alai*), and the Hawaiian endemic sub-species of the Black-necked Stilt (*Himantopus mexicanus knudseni*), are all opportunistic species that are readily attracted to water features. All of these species have been recorded utilizing aquaculture facilities in the Hawaiian Islands.

DOE conducted consultations with the USFWS and DLNR, per requirements of Section 7 of the Endangered Species Act (Appendix A). Informal coordination letters were sent to these agencies to verify the proposed project would have no impact on any Federally- or State-listed threatened, endangered, or candidate species, or critical habitat within the vicinity of the proposed project. The USFWS provided a response letter to DOE stating concurrence with DOE's determination that the proposed project would not likely adversely affect listed Hawaiian Waterbirds (Appendix A). The USFWS expressed concerns that the construction of water features could become an attractive nuisance to Hawaiian Waterbirds species. In order to avoid these potential impacts, they requested that raceway ponds and other water holding bodies, including stormwater retention ponds be shielded with bird netting to reduce the attractiveness of the site to endangered Hawaiian Waterbirds. To address concerns expressed by USFWS, Reginald David, Terrestrial Vertebrate Biologist, contacted Aaron Nadig at USFWS on behalf of the proposed project. Following discussions, the USFWS recommendation to provide wildlife netting enclosure around

each raceway pond and the detention basin could be waived in lieu of on-site endangered Waterbird Best Management Practices (BMPs). The BMPs developed would be derived from an evaluation of both the current and alternate site layouts and pond configurations for the proposed project. While there is the potential that the operation of aquaculture ponds at the Poamoho site may attract one or more endangered waterbird species, the proposed project would minimize the potential effects to endangered waterbirds by implementing mitigation measures.

3.2.5.3 Cumulative Impacts

Agricultural uses adjacent to the Poamoho project site have caused localized and adverse disturbances to vegetation and wildlife. The Poamoho project site is surrounded by other agricultural uses in Wahiawa, Central Oahu. As these vacant lands are developed for agricultural uses, additional disturbances would likely occur to vegetation and wildlife. These impacts would be localized, and disturbance would occur over time. Therefore, overall adverse cumulative impacts to vegetation and wildlife would be negligible.

Industrial uses adjacent to the Tesoro project site have caused localized and adverse disturbances to vegetation and wildlife. As described in Section 3.2.1.3, the UOP Integrated Bio-Refinery Pilot Project is being planned for the area adjacent to the Tesoro project site. Potential impacts to vegetation and wildlife resulting from the UOP project would be negligible. The vegetation at the UOP project site is reminiscent of an industrial area having a graded level lot with slowing returning vegetation. There are no areas that were not previously cleared of natural vegetation. The site was also deemed lacking in habitat resources to support avian fauna other than common, introduced species.

As the Tesoro project site is located within James Campbell Industrial Park, additional disturbances would likely occur to vegetation and wildlife within the remaining undeveloped lots located in the industrial park as they become developed. These impacts would be localized, and disturbance would occur over time. The overall adverse cumulative impacts to vegetation and wildlife would be negligible.

3.2.5.4 Proposed Mitigation Measures

No mitigation measures would be required for vegetation at the proposed project areas.

To mitigate potential effects to wildlife at the Poamoho project site, particularly endangered Hawaiian Waterbirds, BMPs would be implemented. These include: (1) An on-site Endangered Species Awareness Program (ESAP) and (2) Predator trapping for feral cats and mongoose. The ESAP would provide employees with training which addresses endangered waterbirds species, and specific restrictions that would be in place to ensure that facility operation activities do not cause harm to any of the species in question. The ESAP would also outline BMPs that would be followed to protect threatened and endangered Hawaiian Waterbird species, including an emergency response plan and protocols to address potential incidents that may occur. This training module would consist of a PowerPoint training module along with an electronic version of the plan as a stand-alone set of BMPs. With the proposed BMPs in place, the proposed project would not be likely to adversely affect federally threatened or endangered species.

No mitigation measures would be required for wildlife at the Tesoro project site.

3.2.6 Solid and Hazardous Wastes

3.2.6.1 Affected Environment

The existing project sites are vacant; therefore, no solid or hazardous wastes are being generated and no form of solid or hazardous waste disposal is taking place on the sites.

The Poamoho site is currently vacant property that is overgrown with dense vegetation and tall brush. The Poamoho project site was formally used to cultivate pineapple. A Phase I Environmental Site Assessment (ESA) was completed for the Poamoho site by TEC, Inc in June 2009, which indicated no environmental concerns at the subject property (TEC, 2009). The Poamoho site was formerly listed as a Superfund site on the National Priorities List (NPL). However, EPA has determined that site investigations have shown that the Poamoho section of the Del Monte Corporation (Oahu Plantation) Superfund Site poses no significant threat to public health or the environment. The Poamoho section of the site is deleted from the NPL.

The Tesoro site is currently vacant and covered mostly by leftover concrete particles and overgrown vegetation. The site has been historically used for the refining of oil for jet and marine fuels and gasoline for the State of Hawaii. The proposed project area within the Tesoro site was previously used by Waste Management of Hawaii, Inc. until 1998 for bioremediation services by the Hawaiian Remediation and Recycling Facility. Following the closure of the Hawaiian Remediation and Recycling Facility, the facility was removed and the site was cleaned of structures and debris. Closure activities were implemented with soil and groundwater sampling to evaluate the environmental condition of the soil/coral on the site, and the environmental condition of the groundwater beneath and emanating from the site. The survey determined that no significant degradation of the environmental condition of the soil/coral occurred on the site. The Final Closure Report by Dames & Moore (June 28, 1999) was approved by the DOH in October 1999 with a determination that minimum applicable regulatory criteria for possible site contamination were met and “No Further Action” was needed.

3.2.6.2 Environmental Consequences

3.2.6.2.1 No Action Alternative

Under the No Action Alternative, construction and operation would not occur, therefore, no impacts would occur to solid and hazardous wastes.

3.2.6.2.2 Proposed Project

Construction

Other forms of solid waste would be generated during the construction of the proposed project. However, construction wastes would be minimal since the site would require no demolition of existing structures. Most of the facilities and equipment would be brought onto the site to provide for low-impact development.

Construction of the proposed project would not involve hazardous waste since there are no existing structures located on the project site that would need to be removed. Some hazardous materials would be used in the course of construction such as fuels and lubricants.

Operation

The proposed project would result in the generation of general solid waste, and would require solid waste management services. A private waste disposal service would be contracted to pick up and dispose of refuse at the Waimanalo Gulch Sanitary Landfill one time per week. Typical refuse generated from daily operations and employee use of facilities on the site may include materials such as lunchroom waste, office paper, cardboard, plastics, aluminums, glass, etc. Recyclable materials would be collected separately from this refuse.

Solid waste resulting from production outputs of the proposed project, such as biomass, gums, waxes, and sulfur, would be collected and placed into an anaerobic digester located on the site. After digestion, the material would be used as a soil amendment for compost and fertilizer within the proposed project site. No solid waste would be generated from the Tesoro site. Solid waste management would conform to State DOH and County requirements.

The operations of the pilot processing facility at the Poamoho and Tesoro sites would involve the use of hazardous materials in the facilities maintenance activities, including fuels, lubricants and cleaning products. The laboratory processes and algae oil extraction process would also require the use of chemicals, some of which are classified as hazardous materials.

The proposed use of limited quantities of hazardous materials would require pre-start-up and annual Hawaii Emergency Planning and Community Right-To-Know Act (HEPCRA) reporting to the State DOH. NPDES Storm water pollution control discharge permits would be required for both the construction and operation of the proposed project. Based on preliminary estimates of the aggregate amount of fuel stored on the site, a Spill Prevention Control and Countermeasures (SPCC) plan would be required. While project operations at the Poamoho site would not be expected to generate hazardous waste materials, hazardous materials would be used as inputs for the growing and processing of algae. A list of the hazardous substances is provided below in Table 3.2.6.2.2-1.

Table 3.2.6.2.2-1. Poamoho Site: Hazardous Materials List

| | | |
|---|------------------------------|---------------------|
| • | Ammonia or Urea (Fertilizer) | |
| • | Gas | Compressed Propane |
| • | Strong Oxidizing Agents | Bleach |
| | | Sodium Percarbonate |
| • | Strong Reducing Agents | NaOH |
| | | Ammonium Hydroxide |
| • | Acids | Phosphoric Acid |
| | | Sulfuric Acid |
| • | Solvents | Isopropyl Alcohol |
| | | Hexane |
| | | Isopar-H |

Project operations at the Tesoro processing facility would require the use of chemicals which are commonly used in the refining and processing industry. A list of these materials that would be used as inputs in the GERC process are listed in Table 3.2.6.2.2-2. Additionally, the conversion process of the algae oil into biofuels would also generate various forms of fuels including naphtha, diesel, and jet.

Table 3.2.6.2.2-2. Tesoro Site: Materials Input List

| Component | Quantity | Unit |
|-----------|----------|------|
| Algal Oil | 13,700 | lbs |
| Hydrogen | 1,900 | lbs |
| Sulfur | 30 | lbs |
| Nitrogen | 530 | lbs |

Adverse impacts relating to the hazardous waste would not be anticipated as a result of the proposed project. Hazardous waste from operations of the proposed project would meet applicable environmental standards and regulations. Hazardous materials kept on site would have proper storage methods and locations within the site. Employees handling toxic or hazardous substances would receive appropriate training for health and safety measures. Coordination of hazardous waste and materials would continue to be carried out with the appropriate governmental agencies such as DOH, Solid and Hazardous Waste Branch (SHWB).

3.2.6.3 Cumulative Impacts

No other projects are currently planned in the vicinity of the Poamoho site in Wahiawa. Therefore, cumulative adverse impacts relating to solid and hazardous wastes in the Wahiawa area would not be anticipated.

The Tesoro project site is located within an industrial park. As described in Section 3.2.1.3, the UOP Integrated Bio-Refinery Pilot Project, is being planned for the area adjacent to the Tesoro project site. Potential impacts to solid and hazardous waste resulting from the UOP project would be minor. While operations of the UOP project will involve the use of hazardous materials and generate solid and hazardous waste, proper handling and disposal techniques, will minimize adverse impacts from occurring. Proper reporting (HEPCRA) and prevention plans (SWPCP and SPCC) will also be carried out in accordance with State requirements.

With the development of the adjacent UOP project and other areas within the industrial park, cumulative adverse impacts would likely occur resulting in the generation of additional solid and/or hazardous wastes and the need for additional disposal services of these materials. Overall, these impacts would be relatively minor and would occur over time as various projects are developed.

3.2.6.4 Proposed Mitigation Measures

During construction, no mitigation measures would be required for solid waste and hazardous waste. Construction of the proposed project would not involve hazardous waste and solid waste would be minimal since most of the facilities and equipment would be brought onto the site to provide for low-impact development.

During operations, adoption of safety and emergency response plans and the safe handling and storage of chemicals at the site as well as employee training would limit the potential for impacts related to hazardous waste. General recycling practices would be carried out for the proposed project. Efforts would also be made to reuse residual biomass as a soil amendment for compost and fertilization of agricultural crops.

3.2.7 Transportation and Traffic

3.2.7.1 Affected Environment

The Poamoho project site is bounded by Kamananui Road on the east and Kaukonahua Road on the south. Access to the site would be from Kaukonahua Road, an existing two lane City & County Roadway, approximately 1,300 ft west of its intersection with Kamananui Road. In 2008, traffic counts were conducted by the City and County of Honolulu. The 24-hour volume on Kaukonahua Road fronting the proposed project site was approximately 1,660 vehicles. On Kaukonahua Road, during the AM peak hour of traffic there were 150 vehicles and 136 during the PM peak hour of traffic.

The Tesoro project site is bounded by Kauhi Street on the north and Komohana Street, an existing two lane City & County Roadway with a paved width of 36 ft, on the west. Access to the Tesoro site would be from a private road owned by Tesoro located along the eastern boundary of the parcel at the end of Kauhi Street. These roadways are used by workers vehicles and employees associated with industrial operations at James Campbell Industrial Park. A mid-day site inspection of the areas observed infrequent vehicle use of this portion of Komohana Street.

Existing Bus Service

Bus service is provided to the Poamoho project site by routes mainly along Kamehameha Highway, including Routes 52 and 83.

Bus service for the Tesoro site in James Campbell Industrial Park is provided by Route 413.

3.2.7.2 Environmental Consequences

3.2.7.2.1 No Action Alternative

Under the No Action Alternative, construction and operation would not occur, therefore, no impacts would occur to transportation and traffic.

3.2.7.2.2 Proposed Project

Construction

Short-term but measurable adverse minor impacts to traffic would be expected during the construction phase of the proposed project. Site preparation and construction would include final grading of the property, construction of the various building shells and all internal structural configurations, needed roadway access, and employee parking area, installation of utility lines, and installation of all manufacturing and other facility equipment.

It is anticipated that approximately 65+ construction workers would access the site during the construction phase. Construction-related vehicles would add to existing local traffic and would potentially cause minor congestion, higher traffic noise, and increased vehicle emissions along the routes. Construction worker traffic would occur primarily at the beginning and ending of the workday. Construction delivery truck traffic would be sporadic throughout the day. The roads most impacted for the Poamoho project site would be Kaukonahua Road and Kamananui Road which eventually turns into Kamehameha Highway. For the Tesoro site, the roads most impacted outside James Campbell Industrial Park would be the H-1 West, Kalaeloa Boulevard, and Malakole Street. The roads most impacted within the industrial park would be Kauhi Street and Komohana Street, which have been designed to accommodate industrial or construction truck and vehicle traffic.

Construction impacts to existing transportation resources would be minor, temporary and localized (i.e., limited to proximity of the project site), and could be accommodated through the existing road network. No aspect of the construction phase would be anticipated to force temporary road closures or detours. The construction would be expected to last for approximately six to eight months.

Operation

The proposed project would employ 37 workers over three shifts with a maximum of 15 employees working during the day time at the Poamoho site. A single water truck would provide water to the algae plant from the Schofield Barracks WWTP. It is anticipated that the water truck would make 15 round trips a day. Other deliveries would also be made on an as-needed basis to the site to supply other farm operation materials. The proposed project would be anticipated to generate less than 50 trips during the AM and PM peak hours of traffic and would not impact the traffic operations on the roadways near the Poamoho project site. The proposed project would have no effect on the military road used for Stryker Brigade Convoy Training, located to the west of the property.

The proposed Tesoro site would have a total of three shifts with a maximum of two employees working during the day time. A single water truck would provide water to the algae plant. It is anticipated that the water truck would make one round trip a week. Algae oil deliveries from the Poamoho site for refining and conversion into biofuel would be anticipated to occur two times per month. Other deliveries would also be made on an as-needed basis to the site to supply other operation materials. The proposed project would be anticipated to generate less than five total trips during the AM and PM peak hours of traffic and would not affect the traffic operations on the roadways near the project site.

Existing bus service for both the Poamoho and Tesoro project sites would not be affected by the proposed project. The proposed project would not generate any significant increases or decreases in the existing ridership.

3.2.7.3 Cumulative Impacts

Currently, other than the proposed project, no other projects are planned in the vicinity of the Poamoho site in Wahiawa. Therefore, cumulative adverse impacts to transportation and traffic in the Wahiawa area would not be anticipated.

The Tesoro project site is located within an industrial park. The UOP Integrated Bio-Refinery Pilot Project, is being planned for the area adjacent to the Tesoro project site (Section 3.2.1.3). Potential impacts to transportation and traffic resulting from the UOP project would be minor. Operations would occur on an intermittent basis, and would require a total of six workers over two shifts. The project is anticipated to generate less than seven vehicle trips during the AM and PM peak hours of traffic. In addition, the UOP project will not generate significant increases or decreases in the existing bus ridership.

With the development of the adjacent UOP project and full development of other areas within the industrial park, cumulative adverse impacts would likely occur to the local roadway network associated with the historical trend of past, present, and reasonable foreseeable future activities. However, the overall adverse impacts to transportation and traffic would be expected to be minor.

3.2.7.4 Proposed Mitigation Measures

While impacts to existing traffic and bus services would not be anticipated to occur as a result of the proposed project, prior to construction, the Contractor would notify the County, Department of Transportation Services, Public Transit Division and Oahu Transit Services, Inc. (bus operations and para-transit operations) of the scope of work, location, proposed closure of any street, traffic lane, sidewalk, or bus stop and duration of proposed project at least two weeks prior to construction. No other mitigation measures would be required for transportation and traffic.

3.2.8 Human Health and Safety

3.2.8.1 Affected Environment

The Poamoho project site is currently vacant property that is overgrown with dense vegetation and tall brush. As discussed in Section 3.2.6, an ESA was performed for the site and no evidence of environmental concerns were

present at the property (TEC, 2009). Therefore, EPA determined that site investigations have shown that the Poamoho section of the Del Monte Corporation (Oahu Plantation) Superfund Site poses no significant threat to public health or the environment. The Poamoho section of the site is deleted from the NPL.

The Tesoro site is currently vacant and covered mostly by leftover concrete particles and overgrown vegetation. As discussed in Section 3.2.6, soil and groundwater sampling to evaluate the environmental conditions determined that no significant degradation of the environmental condition of the soil/coral occurred on the site. The Final Closure Report by Dames & Moore (June 28, 1999) was approved by the DOH in October 1999 with a determination that minimum applicable regulatory criteria for possible site contamination were met and “No Further Action” was needed.

3.2.8.2 Environmental Consequences

3.2.8.2.1 No Action Alternative

Under the No Action Alternative, construction and operations would not occur, therefore, no impacts would occur to human health and safety.

3.2.8.2.2 Proposed Project

Construction

The proposed project would involve new construction on vacant land adjacent at both the Poamoho and Tesoro project sites. The proposed project would not require the removal of any existing structures. Construction workers would follow safety standards applicable to the construction site hazards to protect the health and safety of workers. No impact related to health and safety would occur from construction of the proposed project.

Operation

The proposed project would have some potentially toxic and hazardous materials on site for the production and processing of the algae. A list of these substances and a detailed description of hazardous waste is provided in Section 3.2.6. New toxic substances would also be generated from the refinery process at the Tesoro site; however outputs occurring from the production and refining process of the proposed project would be treated, handled, and/or disposed of accordingly to meet Federal, State, and County regulations.

Hazardous substances kept on the proposed project sites would be stored appropriately in designated areas of the site. Appropriate training would be provided to employees handling any toxic or hazardous substances. Other health and safety measures that respond to emergency situations such as chemical spills or using the emergency eyewash and shower would also be provided through the environmental, health and safety training.

While prevention measures can be taken, there is always a possibility for occupation hazards to occur. Below are some of the possible risks and mitigation measures that would be associated with the proposed project.

- Potential Risk of Fire – Fire protection would be provided throughout the site. All employees would be trained on fire prevention and on the handling of fires.
- Potential Risk of Material Spills – Employees would be trained in spill prevention and clean up.
- Potential of Pond Overflow - Employees would be trained in operations such as maintaining controlled levels in the ponds to prevent an overflow from occurring.
- Potential for Release of Pressurized Gases - Pressurized vessels would have relief valves for over pressurized occurrences during fills or when ambient temperature rises and material expands in the vessels. While these releases should be minimal, there is a potential of gas releases when disconnecting and connecting of hoses and piping occur. Employees would be trained to prevent these releases of gases.

Because hazardous materials and resulting wastes would be handled onsite, the potential risk of exposure would be greatest for Phycal employees, who would be trained in proper safety procedures. The risk of exposure to the general population is negligible since operations would be contained within the designated project sites, secured against public access and away from the general public. With appropriate safety procedures in place and the use of personal protective equipment, the potential for an impact to the health and safety of workers would be minor.

3.2.8.3 Cumulative Impacts

The proposed project would not have manufacturing processes or products that could be involved in cumulative impacts on human health and safety, locally or nationally. No reasonably foreseeable actions have been identified that would interact with the proposed project to result in cumulative adverse impacts to human health and safety.

Currently, other than the proposed project, no other projects are planned in the vicinity of the Poamoho site in Wahiawa. Therefore, cumulative adverse impacts to health and safety in the Wahiawa area would not be anticipated.

The UOP Integrated Bio-Refinery Pilot Project is being planned for the area adjacent to the Tesoro project site, within the industrial park (Section 3.2.1.3). While project operations and processing activities will involve various hazardous substances, potential impacts to health and safety resulting from the UOP project would be minor with the implementation of safety measures and BMPs. Safe and healthful working conditions and prevention measures will also be incorporated to minimize adverse impacts from occurring.

The cumulative impacts of existing and future activities in the industrial park, including the planned UOP project and the proposed project, does not represent a substantial risk to human health and safety with mitigation and safety procedures in place. Overall adverse impacts would be minor and would occur over time as new projects are developed.

3.2.8.4 Proposed Mitigation Measures

During construction, safety measures such as establishing contained storage areas, and controlling the movement of construction equipment and personnel would reduce the potential for an accident to occur. There would be safety awareness training for construction workers on the chemical hazards present at the site and emergency procedures to follow in the event of an accidental release.

During operations, mitigation measures would include appropriate training of all employees. Safe and healthful working conditions are considered a priority for any employee of Phycal. An Environmental, Health and Safety Training program intended to provide a wide variety of instruction on general safety and health standards was created for laboratory, pilot plant and staff employees. The proposed project's safety program also looks towards many other aspects to provide avenues for better and safer working conditions. These include site safety, plant process and equipment, personal safety, and process materials. Each of these safety measures are discussed in more detail below.

Site Safety - The proposed project would coordinate with local emergency response organizations by providing all agencies with a site safety plan which includes a description of processes, equipment and materials. The safety equipment along with spill prevention and site evacuation plans would also be provided as required by local, state and government agencies.

Plant Process and Equipment - The proposed project's processing plant and ponds would be monitored and controlled with a Distributive Control System (DCS) that monitors process temperatures, levels and flows at all times. The DCS would be equipped with an Uninterruptable Power Supply (UPS) that maintains control of the plants processing equipment during an unplanned utility power outage. This would enable plant operators to shut down in a safe and controlled manner until utility power is restored.

Personnel Safety - Site personnel would be provided with proper safety training for all equipment operations, process operations, lab operations and material handling as required by the company's safety policy and Occupational Safety and Health Administration (OSHA) regulations.

Process Materials - Proper documentation would be maintained for all process material, hazardous and non-hazardous as required by the company's policy and OSHA regulations.

A Safety Officer would be designated for the proposed project to coordinate the training program, ensure proper health and safety procedures are carried out and provide appropriate documentation necessary to meet established rules and regulations.

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Appendix A
Agency Consultation

APPENDIX A
AGENCY CONSULTATION

This appendix contains copies of the following consultation letters:

- DOE's letter to the U.S. Fish and Wildlife Service and their response to DOE.
- DOE's letter to the State of Hawaii Department of Land and Natural Resources.
- DOE's letter to the Office of Hawaiian Affairs, their response to DOE, and DOE's response.
- DOE's letter to the Hawaii State Historic Preservation Division and their response to DOE.
- DOE's letter to the Hawaiian Civic Clubs of Honolulu.
- DOE's letter to the Hui Malama I Na Kupuna O Hawaii Nei.
- DOE's letter to Oahu Island Burial Council.

DOE sent the same two figures with the original letters, so they are reproduced only after the first letter.



December 15, 2010

Loyal Mehrhoff, Ph.D.
Field Supervisor
U.S. Fish and Wildlife Service
Pacific Islands Office
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Honolulu, HI 96850

RE: Section 7 Consultation under the Endangered Species Act for the proposed Physical Algae Pilot Project, Physical LLC., Oahu, HI. TMK: (1) 7-1-007:011 por., 030 por. and 031 por. and TMK (1) 9-1-084: 032 por.

Dear Dr. Mehrhoff,

The U.S. Department of Energy (DOE) is proposing to provide a financial assistance grant (DOE's Proposed Action) to Physical, LLC (Physical) as part of the funding opportunity announcement titled "Carbon Capture and Sequestration from Industrial Sources and Innovative Concepts for Beneficial CO₂ Use," which is funded through the American Recovery and Reinvestment Act (ARRA) of 2009. Physical seeks to develop an algae farm and processing production facility. The pilot project facility, located at the Poamoho site will include shallow raceway ponds of various sizes for grow-out of algae crop, greenhouses for initial phase grow-out of algae strains, visitor and employee trailers, a processing building, and an outdoor area with equipment such as the anaerobic digester for conversion of biomass to methane gas, and water conditioning unit for water purity and water recycling. The refining and processing facility located at the Tesoro site will include a small bench scale unit which will convert the algal oil into Hydrotreated Renewable Jet Fuel, Renewable Naphtha, and Renewable Diesel.

Two sites will be used to develop and operate the proposed project. The first project site located in Wahiawa, Oahu, will be used for the development of an algae farm (Poamoho site). The Poamoho Site is located on a portion of the existing Poamoho Plantation Camp (Figure 1). The algae farm and facilities will be situated on agricultural lands to the south of the Camp, near the corner of Kamehameha Highway and Kaukonahua Road. The agricultural land is leased from AOUO Poamoho Camp. The project area is approximately 34.117 acres and encompasses TMK: (1) 7-1-001: 011, 030, and 031. The project site is bounded by Kamehameha Highway on the east, Kaukonahua Road on the south and agricultural lands to the north and west. Poamoho Camp residential area lies beyond the agricultural lands to north.

The second project site, located in Kaleloa, Oahu, will be used for the development of a processing facility (Tesoro Site). The Tesoro Site is located on vacant industrial lands in James Campbell

Industrial Park (Figure 2). The project area encompasses a portion of TMK (1) 9-1-032: 084 and is approximately 0.9 acres (39,204 square feet). The Tesoro project site is bounded by Kauhi Street on the north, Komohana Street on the west, and light to medium industrial facilities to the north and west. The industrial land is leased from Tesoro Hawaii Corporation.

DOE reviewed the U.S. Fish and Wildlife Service (USFWS) list of federally endangered and threatened species that are known to occur in Oahu, Hawaii, and found no other threatened or endangered species that might occur on the site.

A botanical survey for both the Poamoho site and the Tesoro site was conducted for the project by AECOS, Inc in April 2010; the survey is included as Attachment 3. During the course of the survey, no plant species currently listed, or proposed for listing under either the federal or State of Hawaii's endangered species statutes, was detected. The vegetation found at the Poamoho site is entirely one of early succession from a previously used and maintained agricultural field. The vegetation at the proposed Tesoro site is reminiscent of an industrial area having a graded level lot with slowing returning vegetation. No wetlands, floodplains, or other ecologically sensitive terrain are also present.

The development of the proposed project will result in the introduction of a new flora species to the Poamoho project site. The algae plant species known as *Chlorella* will be grown on the site and processed for oil extraction. *Chlorella* is native to Hawaii and can be found in mountains, valleys, ponds, streams and lakes. Particular species and strains of this common alga selected for the project are safe for use as biofuels. An algae import permit will be obtained from the State of Hawaii, Department of Agriculture.

From a native avian and mammalian perspective the survey found nothing unique about the habitat present within either of the project sites, and none of the habitat are important for any listed avian or mammalian species currently known from the Island of O'ahu. No mammalian species currently listed or proposed for listing under either the Federal or State of Hawaii endangered species statutes was detected during the course of the Poamoho site or Tesoro site surveys.

Although no endangered Hawaiian Waterbirds were detected during the botanical survey, there is the potential that the operation of aquaculture ponds at the Poamoho site may attract one or more endangered waterbird species. The four extant endangered waterbird species currently known from O'ahu, Hawaiian Duck (*Anas wyvilliana*), the Hawaiian endemic subspecies of the Common Moorhen (*Gallinula chloropus sandvicensis*), Hawaiian Coot (*Fulica alai*), and the Hawaiian endemic subspecies of the Blacknecked Stilt (*Himantopus mexicanus knudseni*), are all opportunistic species that are readily attracted to water features. All of these species have been recorded utilizing aquaculture facilities in the Hawaiian Islands. The project will minimize the potential effects to endangered waterbirds. The water circulation equipment for the raceway ponds and other water holding bodies on the site will be shielded with bird netting, or other materials to prevent the endangered waterbirds from being harmed at the facilities.

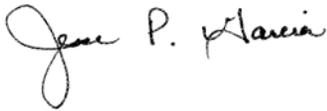
Based on the above information, DOE determined that there would be no adverse effects to federally threatened or endangered species. DOE asks for your concurrence with this finding and thanks you in advance for your consideration. Please forward the results of your review and any requests for additional information to our contractor:

Jeffrey H. Overton, AICP, LEED AP, Principal
Group 70 International, Inc.
925 Bethel Street, 5th Floor
Honolulu, HI 96813
Email: jho1@group70int.com
Telephone: (808) 523-5866

An environmental assessment (EA) is being prepared and will be released to the public in the near future. DOE will provide your office a copy of the EA and where you may further comment on any of your concerns. All correspondence between DOE and the USFWS will be included in an appendix to the EA. At this time, DOE anticipates a 30-day public comment period for this proposed project.

If you have any questions, I can be reached at 304-285-0256 or by e-mail Jesse.Garcia@NETL.doe.gov

Sincerely,

A handwritten signature in black ink that reads "Jesse P. Garcia". The signature is written in a cursive style with a large, looped initial "J".

Jesse Garcia
NEPA Document Manager

Attachments

1. Figure 1. Project Location – Poamoho Site
2. Figure 2. Project Location – Tesoro Site
3. Biological Survey – Poamoho and Tesoro Site

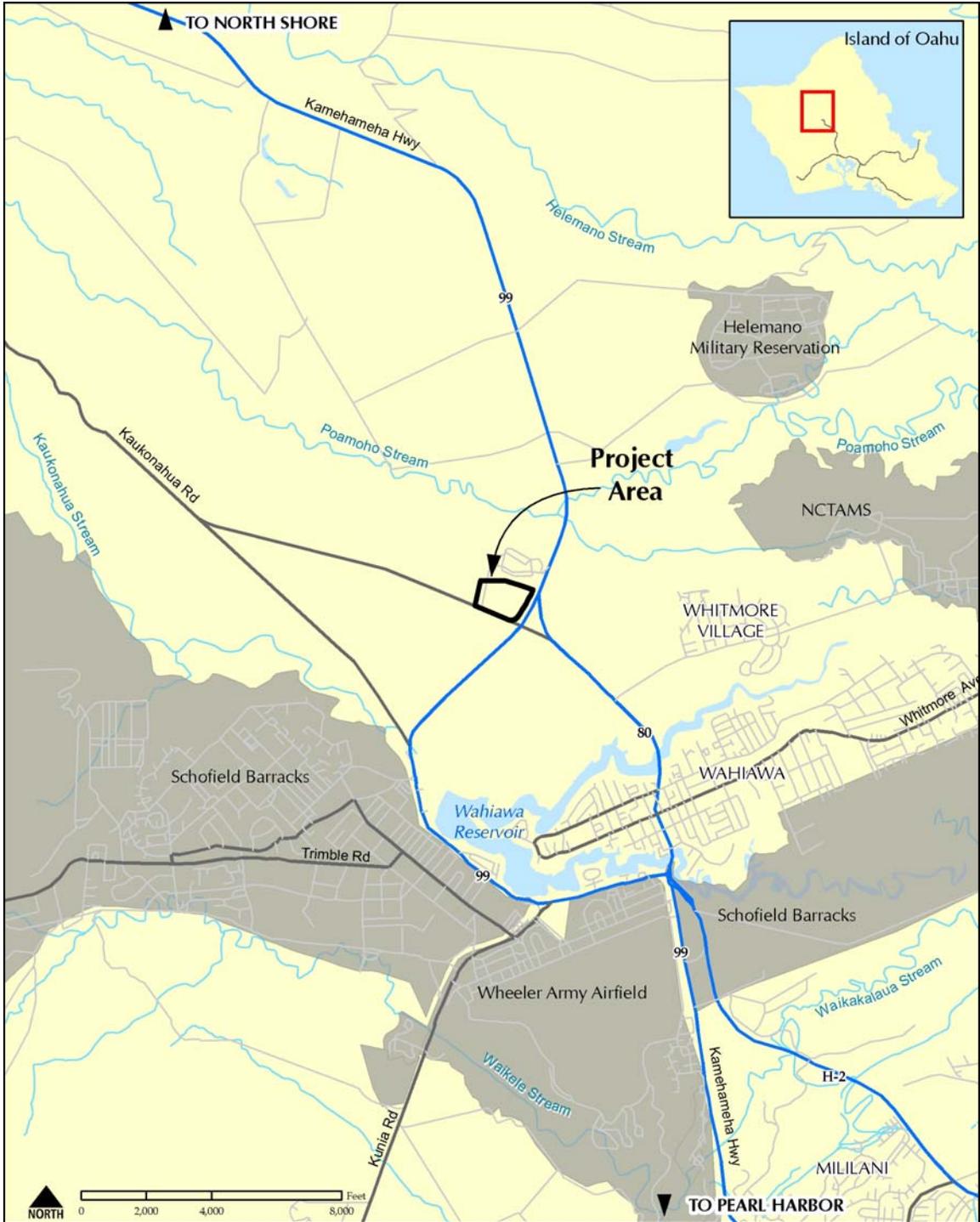


Figure 1 Project Location – Poamoho Site



Figure 2 Project Location – Tesoro Site



United States Department of the Interior



FISH AND WILDLIFE SERVICE
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122, Box 50088
Honolulu, Hawaii 96850

In Reply Refer To:
2011-I-0083

JAN 18 2011

Mr. Jesse Garcia
NEPA Document Manager
U.S. Department of Energy
3610 Collins Ferry Road
P.O. Box 880
Morgantown, West Virginia 26507

Subject: Informal Consultation for the Development of the Phycal Algae Farm and Processing Production Facility, Oahu

Dear Mr. Garcia:

The U.S. Fish and Wildlife Service (Service) is in receipt of your letter dated December 15, 2010, received on December 20, 2010. We understand that the U.S. Department of Energy is proposing to offer financial assistance to Phycal, LLC, for the development of an algae farm located in Wahiawa and a processing production facility located at Kaleloa, both on the island of Oahu [TMK (1) 7-1-007:011, 030, 031 and TMK (1) 9-1-084:032]. The proposed project in Wahiawa will consist of shallow raceway ponds, two stormwater retention basins, greenhouses, visitor and employee trailers, a processing building, an outdoor storage area, and a water conditioning unit. The processing production facility, located on the Kaleloa site, will include a small bench scale unit used to convert algae into fuel. The funding provided for this project comes through the American Recovery and Reinvestment Act (ARRA).

In your letter, you request our concurrence with your determination that the installation of these two facilities is not likely to adversely affect the federally endangered Hawaiian moorhen (*Gallinula chloropus sandvicensis*), endangered Hawaiian coot (*Fulica alai*), endangered Hawaiian stilt (*Himantopus mexicanus knudseni*), and endangered Hawaiian duck (*Anas wyvilliana*) pursuant to section 7 of the Endangered Species Act (16 U.S.C. 1531 *et seq.*), as amended. We provided comments on the draft Environmental Assessment (EA) for this project in a letter dated January 27, 2010.

In order to avoid impacts to endangered Hawaiian waterbirds, the project description states that the water circulation equipment for the raceway ponds and other water holding bodies on the site will be shielded with bird netting. To clarify, the stormwater retention ponds must also be covered to reduce the attractiveness of the site to waterbirds. Netting must be used at all times that water is present, and should be maintained as needed. Based on this project description, we concur with your determination that the proposed action is not likely to adversely affect listed Hawaiian waterbirds.

Should project plans change, or if additional information on the distribution of listed or proposed species becomes available, this determination may be reconsidered. If, during the construction or operation of this project, it is found that listed Hawaiian waterbird species are being attracted to the site despite avoidance measures, the project manager should contact our office immediately. Additional conservation measures may be necessary to avoid the take of listed species. If take of listed species cannot be avoided, it may be necessary to consult with us pursuant to section 7(a)(2) of the ESA or apply for an incidental take permit under section 10(a)(1)(a) of the ESA.

We appreciate your efforts to conserve endangered species. If you questions regarding this letter please contact Michelle Bogardus, Fish and Wildlife Biologist (phone: 808-792-9473; fax: 808-792-9581).

Sincerely,

A handwritten signature in cursive script, appearing to read "Michelle Bogardus", with a long horizontal flourish extending to the right.

for Loyal Mehrhoff
Field Supervisor

cc: Mr. Jeffery H. Overton, Group 70 International, Inc.



December 15, 2010

Laura H. Thielen, Chairperson
Department of Land and Natural Resources
P. O. Box 2359
Honolulu, Hawaii 96804

RE: Consultation for the proposed Phycal Algae Pilot Project, Phycal LLC., Oahu, HI.
TMK: (1) 7-1-007:011 por., 030 por. and 031 por. and TMK (1) 9-1-084: 032 por.

Dear Ms. Thielen,

The U.S. Department of Energy (DOE) is proposing to provide a financial assistance grant (DOE's Proposed Action) to Phycal, LLC (Phycal) as part of the funding opportunity announcement titled "Carbon Capture and Sequestration from Industrial Sources and Innovative Concepts for Beneficial CO₂ Use," which is funded through the American Recovery and Reinvestment Act (ARRA) of 2009. Phycal seeks to develop an algae farm and processing production facility. The pilot project facility located at the Poamoho site will include shallow raceway ponds of various sizes for grow-out of algae crop, greenhouses for initial phase grow-out of algae strains, visitor and employee trailers, a processing building, and an outdoor area with equipment such as the anaerobic digester for conversion of biomass to methane gas, and water conditioning unit for water purity and water recycling. The refining and processing facility located at the Tesoro site will include a small bench scale unit which will convert the algal oil into Hydrotreated Renewable Jet Fuel, Renewable Naphtha, and Renewable Diesel.

Two sites will be used to develop and operate the proposed project. The first project site, located in Wahiawa, Oahu, will be used for the development of an algae farm (Poamoho site). The Poamoho Site is located on a portion of the existing Poamoho Plantation Camp (Figure 1). The algae farm and facilities will be situated on agricultural lands to the south of the Camp, near the corner of Kamehameha Highway and Kaukonahua Road. The agricultural land is leased from AOOU Poamoho Camp. The project area is approximately 34.117 acres and encompasses TMK: (1) 7-1-001: 011, 030, and 031. The project site is bounded by Kamehameha Highway on the east, Kaukonahua Road on the south and agricultural lands to the north and west. Poamoho Camp residential area lies beyond the agricultural lands to north.

The second project site, located in Kaleloa, Oahu, will be used for the development of a processing facility (Tesoro Site). The Tesoro Site is located on vacant industrial lands in James Campbell Industrial Park (Figure 2). The project area encompasses a portion of TMK (1) 9-1-032: 084 and is approximately 0.9 acres (39,204 square feet). The Tesoro project site is bounded by Kauhi Street

on the north, Komohana Street on the west, and light to medium industrial facilities to the north and west. The industrial land is leased from Tesoro Hawaii Corporation.

DOE reviewed the U.S. Fish and Wildlife Service (USFWS) list of federally endangered and threatened species that are known to occur in Oahu, Hawaii, and found no other threatened or endangered species that might occur on the site.

A botanical survey for both the Poamoho site and the Tesoro site was conducted for the project by AECOS, Inc in April 2010; the survey is included as Attachment 3. During the course of the survey, no plant species currently listed, or proposed for listing under either the federal or State of Hawaii's endangered species statutes, was detected. The vegetation found at the Poamoho site is entirely one of early succession from a previously used and maintained agricultural field. The vegetation at the proposed Tesoro site is reminiscent of an industrial area having a graded level lot with slowing returning vegetation. No wetlands, floodplains, or other ecologically sensitive terrain are also present.

The development of the proposed project will result in the introduction of a new flora species to the Poamoho project site. The algae plant species known as *Chlorella* will be grown on the site and processed for oil extraction. *Chlorella* is native to Hawaii and can be found in mountains, valleys, ponds, streams and lakes. Particular species and strains of this common alga selected for the project are safe for use as biofuels. An algae import permit will be obtained from the State of Hawaii, Department of Agriculture.

From a native avian and mammalian perspective the survey found nothing unique about the habitat present within either of the project sites, and none of the habitat are important for any listed avian or mammalian species currently known from the Island of O'ahu. No mammalian species currently listed or proposed for listing under either the Federal or State of Hawaii endangered species statutes was detected during the course of the Poamoho site or Tesoro site surveys.

Although no endangered Hawaiian Waterbirds were detected during the botanical survey, there is the potential that the operation of aquaculture ponds at the Poamoho site may attract one or more endangered waterbird species. The four extant endangered waterbird species currently known from O'ahu, Hawaiian Duck (*Anas wyvilliana*), the Hawaiian endemic subspecies of the Common Moorhen (*Gallinula chloropus sandvicensis*), Hawaiian Coot (*Fulica alai*), and the Hawaiian endemic subspecies of the Blacknecked Stilt (*Himantopus mexicanus knudseni*), are all opportunistic species that are readily attracted to water features. All of these species have been recorded utilizing aquaculture facilities in the Hawaiian Islands. The project will minimize the potential effects to endangered waterbirds. The water circulation equipment for the raceway ponds and other water holding bodies on the site will be shielded with bird netting, or other materials to prevent the endangered waterbirds from being harmed at the facilities.

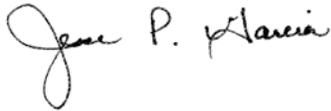
Based on the above information, DOE determined that there would be no adverse effects to federally threatened or endangered species. DOE has carried out Section 7 Consultation under the Endangered Species Act with the USFWS. DOE asks for your concurrence with this finding and thanks you in advance for your consideration. Please forward the results of your review and any requests for additional information to our contractor:

Jeffrey H. Overton, AICP, LEED AP, Principal
Group 70 International, Inc.
925 Bethel Street, 5th Floor
Honolulu, HI 96813
Email: jho1@group70int.com
Telephone: (808) 523-5866

An environmental assessment (EA) is being prepared and will be released to the public in the near future. DOE will provide your office a copy of the EA and where you may further comment on any of your concerns. All correspondence between DOE and the State of Hawaii Department of Land and Natural Resources will be included in an appendix to the EA. At this time, DOE anticipates a 30-day public comment period for this proposed project.

If you have any questions, I can be reached at 304-285-0256 or by e-mail Jesse.Garcia@NETL.doe.gov.

Sincerely,



Jesse Garcia
Document Manager
Office of Project Facilitation and Compliance
NETL
3610 Collins Ferry Road
Mail Stop B07
Room 333
Morgantown, WV 26507

Attachments

1. Figure 1. Project Location – Poamoho Site
2. Figure 2. Project Location – Tesoro Site
3. Biological Survey – Poamoho and Tesoro Site



December 15, 2010

Clyde W. Namuo, Chief Executive Officer
Office of Hawaiian Affairs
711 Kapi'olani Blvd., Suite 500
Honolulu, HI 96813

SUBJECT: Consultation for the proposed Phycal Algae Pilot Project, Phycal LLC., Oahu, HI. TMK: (1) 7-1-007:011 por., 030 por. and 031 por. and TMK (1) 9-1-084: 032 por.

Dear Mr. Namuo:

The U.S. Department of Energy (DOE) is proposing to provide a financial assistance grant (DOE's Proposed Action) to Phycal, LLC (Phycal) as part of the funding opportunity announcement titled "Carbon Capture and Sequestration from Industrial Sources and Innovative Concepts for Beneficial CO₂ Use," which is funded through the American Recovery and Reinvestment Act (ARRA) of 2009. Phycal seeks to develop an algae farm and processing production facility. The pilot project facility, located at the Poamoho site, will include shallow raceway ponds of various sizes for grow-out of algae crop, greenhouses for initial phase grow-out of algae strains, visitor and employee trailers, a processing building, and an outdoor area with equipment such as the anaerobic digester for conversion of biomass to methane gas, and water conditioning unit for water purity and water recycling. The refining and processing facility, located at the Tesoro site, will include a small bench scale unit which will convert the algal oil into Hydrotreated Renewable Jet Fuel, Renewable Naphtha, and Renewable Diesel.

Two sites will be used to develop and operate the proposed project. The first project site, located in Wahiawa, Oahu, will be used for the development of an algae farm (Poamoho site). The Poamoho Site is located on a portion of the existing Poamoho Plantation Camp (Figure 1). The algae farm and facilities will be situated on agricultural lands to the south of the Camp, near the corner of Kamehameha Highway and Kaukonahua Road. The agricultural land is leased from AOUO Poamoho Camp. The project area is approximately 34.117 acres and encompasses TMK: (1) 7-1-001: 011, 030, and 031. The project site is bounded by Kamehameha Highway on the east, Kaukonahua Road on the south and agricultural lands to the north and west. Poamoho Camp residential area lies beyond the agricultural lands to north.

The second project site, located in Kaleloa, Oahu, will be used for the development of a processing facility (Tesoro Site). The Tesoro Site is located on vacant industrial lands in James Campbell Industrial Park (Figure 2). The project area encompasses a portion of TMK (1) 9-1-032: 084 and is approximately 0.9 acres (39,204 square feet). The Tesoro project site is bounded by Kauhi Street

on the north, Komohana Street on the west, and light to medium industrial facilities to the north and west. The industrial land is leased from Tesoro Hawaii Corporation.

The Area of Potential Effects for historic archeology and cultural resources (limits of disturbance) is shown on the accompanying location maps for both the Poamoho and Tesoro project sites (Attachment 1 and 2). An Archaeological Assessment (AA) and Cultural Impact Assessment (CIA) were conducted by Scientific Consulting Services, Inc. for these areas and have been approved by the State of Hawaii, Department of Land and Natural Resources (DLNR), State Historic Preservation Division (SHPD).

In March 2010 and May 2010, two separate CIAs were completed for the Poamoho and Tesoro project sites (Attachment 3 and 4). The CIAs were completed in compliance with Act 50 Session Laws of Hawaii 2000 and the State of Hawaii environmental review process under Chapter 343, Hawaii Revised Statutes. Through document research and cultural consultation efforts, the reports provided information that was applicable to the assessment of the proposed project and its potential impacts to cultural practices. Hawaiian organizations, agencies, and community members were contacted to identify potentially knowledgeable individuals with cultural expertise and/or knowledge of the project areas and their vicinities.

For the Poamoho project site, consultation was sought from Phyllis (Coochie) Cayan, History and Culture Branch Chief with SHPD; the Hawaiian Civic Club of Wahiawa; Maria Orr, a Consulting Archaeologist; Tom Lenchanko of Waha Olelo Aha Kukaniloko; and Leimaile Quitevis of the Oahu Island Burial Council. In addition, two former long-time plantation workers, living in Poamoho Camp were interviewed concerning ongoing cultural activities that might have occurred in the project area or its vicinity.

For the Tesoro project site, consultation was sought from Phyllis (Coochie) Cayan; George Kaeliwai of the Hawaiian Civic Club of Ewa; Leimaile Quitevis, Senator Will Espero, Representative Rida Cabanilla, the Ewa Beach Neighborhood Board, Ewa Hui Aloha Senior Citizens, Shad Kane, Nettie Tiffany, and Chuck Erhorn.

The information presented in the CIA reports for the Poamoho site and the Tesoro site revealed that no notable cultural activities took place at the specific project areas. There was no additional information from the contacted organizations, newspapers, and archival research. Therefore, it was concluded that the exercise of native Hawaiian rights, or any ethnic group, related to gathering, access or other customary activities will not be affected by the activities of the proposed project.

In March 2010 and May 2010, Archaeological Inventory Surveys (AIS) were completed for the Poamoho project site and the Tesoro project site (Attachment 5 and 6). While Inventory Survey-level investigations were completed, these reports are presented as AAs because fieldwork did not find cultural material of historic significance. A review of archival resources and the results of previous archaeological work conducted in the area for both project sites were undertaken prior to fieldwork. There are no recorded archeological sites within either of the proposed project sites.

No surface or subsurface cultural remains were identified during the AIS fieldwork at both the Poamoho and Tesoro project sites. For the Poamoho site, historic and modern-era clearing and grading in the parcel removed any previously existing surface sites and destroyed or altered subsurface deposits. Based on the AA, the proposed development at the Poamoho site will have a

minimal likelihood of affecting historic properties. Therefore, no further work is recommended for the project area as indicated by DLNR SHPD acceptance of this AA report in their letter dated May 18, 2010 (Attachment 7).

For the Tesoro site, the property has been subject to subsurface alterations and other such disturbances. Vast changes in landscapes of the James Campbell Industrial Park area likely started in 1890 with the re-deposition of alluvial soils to accommodate sugar cane cultivation on formerly arid portions of the coastal plain. Portions of the ground surface are also paved with asphalt and concrete, and known levels of disturbance in these areas remains limited. The findings of the AA for the Tesoro site indicate that the proposed development of the project will not likely affect historic properties. Therefore, no further work is recommended for the project area as indicated by DLNR SHPD's acceptance of this AA report in their letter dated June 17, 2010 (Attachment 8).

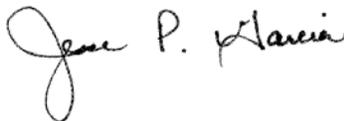
Based on the determination of "no findings" during fieldwork, for both the Poamoho and Tesoro project sites, DOE has made a finding of No Historic Properties Effected for archeological resources in regards to this undertaking. DOE has carried out Section 106 Compliance and consultation with the State of Hawaii DLNR, SHPD. DOE asks for your concurrence with this finding and thanks you in advance for your consideration. Please see the supporting documents attached to this letter for further details on this project. Please forward the results of your review and any requests for additional information to our contractor:

Jeffrey H. Overton, Principal
Group 70 International, Inc.
925 Bethel Street, 5th Floor
Honolulu, HI 96813
Email: jho1@group70int.com
Telephone: (808) 523-5866

An environmental assessment (EA) is being prepared and will be released to the public in the near future. DOE will provide your office a copy of the EA and where you may further comment on any of your concerns. All correspondence between DOE and the Office of Hawaiian Affairs will be included in an appendix to the EA. At this time, DOE anticipates a 30-day public comment period for this proposed project.

If you have any questions, I can be reached at 304-285-0256 or by e-mail Jesse.Garcia@NETL.doe.gov

Sincerely,



Jesse Garcia
NEPA Document Manager

Attachments

1. Figure 1. Project Location – Poamoho Site
2. Figure 2. Project Location – Tesoro Site
3. Cultural Impact Assessment – Poamoho Site
4. Cultural Impact Assessment – Tesoro Site
5. Archaeological Assessment – Poamoho Site
6. Archaeological Assessment – Tesoro Site
7. SHPD Approval Letter – Poamoho Site
8. SHPD Approval Letter – Tesoro Site



STATE OF HAWAII
OFFICE OF HAWAIIAN AFFAIRS
711 KAPI'OLANI BOULEVARD, SUITE 500
HONOLULU, HAWAII 96813

HRD11/4806

January 14, 2011

Jessie Garcia, Document Manager
National Energy Technology Laboratory
United States Department of Energy
3610 Collins Ferry Road
P.O. Box 880
Morgantown, WV 26507

**Re: National Historic Preservation Act and Cultural Impact Assessment consultation
Phycal Algae Pilot Project
Wahiawa and Kalaeloa, Island of O'ahu**

Aloha e Jessie Garcia,

The Office of Hawaiian Affairs (OHA) is in receipt of your November 15, 2010 letter initiating consultation pursuant to Section 106 of the National Historic Preservation Act of 1966 as amended (NHPA) and seeking comments on cultural impact assessments (CIA) for a proposed Phycal Algae Pilot Project (undertaking).

Your letter details that the United States Department of Energy (DOE) intends to use funding through the American Recovery and Reinvestment Act (ARRA) to provide financial assistance to the undertaking proponent, Phycal LLC, whom will develop an algae farm and processing production facility. Although the actual objective of the undertaking is unclear to us at this time, your letter details it as an opportunity to conduct "*carbon capture and sequestration from industrial sources and innovative concepts for beneficial CO₂ use*".

Two sites will be developed to support the undertaking. The first site is on approximately 34.117 acres of agricultural land in Wahiawa where development of the actual phycal algae farm is proposed. The second site is on approximately 0.9 acres of industrial land in Kalaeloa where development of a processing facility is proposed.

OHA sees your letter as requiring comments on two distinctly separate issues: concurrence with your level of effort and determinations pursuant to the consultation requirements of the NHPA and comments on the cultural impact assessments conducted for the two sites which will support the undertaking. Your letter also indicates an environmental assessment (EA) will be prepared for the undertaking and released to the public in the near future. We offer the following comments:

National Historic Preservation Act (NHPA)

You have determined the “area of potential effect” (APE) of this undertaking to be the two sites which will be developed. OHA concurs with this determination.

In order to conduct the “good faith effort” to identify historic properties within the APE which could be adversely affected by the undertaking, an archaeological consultant, Scientific Consultant Services, Inc. (SCS) was retained to conduct archaeological assessments (AA) at both sites. We will rely on assurances that the broad range of knowledgeable groups and individuals listed in your letter were consulted on this undertaking and provided an opportunity to comment.

For the Wahiawa site, the history of land use of the entire parcel for intensive agricultural indicated the strong possibility that no historic properties were present. A pedestrian survey and the archaeological monitoring of the mechanical excavation of 24 trenches 15 meters long and 0.6 meters wide to a depth of 2.2 to 2.45 meters resulted in no historic properties being identified. The Department of Land and natural Resources-State Historic Preservation Division (SHPD) accepted this AA and the finding of “no historic properties” via letter dated May 18, 2010.

The Kalaeloa site was also subject to an AA conducted by SCS. The site is situated within a vacant portion of a larger 12 acre land parcel used for a Tesoro Hawaii Corporation refinery which is in an industrialized portion of the Campbell Industrial Park. The AA indicates the site has been subject to mechanical grubbing and/or grading in the past and a pedestrian survey identified no historic properties. The SHPD accepted this AA and the finding of “no historic properties” via letter dated June 17, 2010.

OHA believes the “good faith effort” to identify historic properties within the APE required by the NHPA have been met by conducting these AA. The DOE has determined that this undertaking will result in “no adverse effect” to historic properties eligible for listing or listed on the National Register of Historic Places because none are situated within the APE. OHA concurs with this determination.

Cultural Impact Assessment (CIA)

OHA appreciates that efforts were made to conduct CIA for this undertaking. SCS was also retained to prepare separate CIA for each site. As detailed in the CIA, OHA responded to consultation requests for both CIA (via letters dated February, 18 and May 17, 2010) and recommended other organizations and individuals who might be knowledgeable of the study areas. We rely on the assurances in the CIA that consultation with all recommended groups and individuals occurred and that any thoughts or concerns shared afforded appropriate consideration.

While we recognize that the AA did not identify any historic properties, we are concerned that the CIA were completed before the AA and seem to discount that traditional cultural practices are associated with cultural sites. In a scenario where historic properties were identified in the AA, consulted parties would not be given the appropriate context of recent archaeological work and a regional overview of previous archaeological studies in study area. In our February 18, 2010 response letter to the CIA preparer, we specifically requested that the

results of any historical review or archaeological studies be included in their CIA consultation. Again, no historic properties were identified in the AA for the sites, so these CIA are not problematic at this time. We feel that this is a pattern and practice which must be corrected and we assert that in the future, CIA be conducted after the completion of archaeological studies.

A second issue which we raised in our February 18, 2010 letter to the CIA preparer was our concerns on the possible accidental release or introduction of physical algae into the environment. We provided the following comment:

It is difficult for us to completely assess the possible impacts of this proposed development on traditional and cultural practices without knowing additional details of this proposed algae farm and production facility and methods which will be employed to prevent impacts to the natural environment. When considering the potentially devastating impacts introduced and alien species of algae can have on natural resources in Hawai'i, Kappaphycus spp. immediately comes to mind. This species of red algae was introduced to the reef systems within Kāne'ohe Bay in the 1970's to study its potential for aquaculture production. When experimental trial plantings were completed, they were abandoned as it was believed it could not spread from the site if introduction. Today, Kappaphycus spp. dominates Kāne'ohe Bay, smothering coral reef ecosystems.

While we are in no way implying that the proprietor of this development has any malicious intents towards our natural resources, we do strongly advocate that careful consideration be afforded to the potentially devastating impacts this farmed algae could have should it be accidentally released into our environment.

OHA never received any response to this concern and it was certainly not addressed in the CIA.

Environmental Assessment (EA)

After considering the comment in your letter that an EA for this project would be prepared in the future, OHA reviewed our records related to this project and we are now aware that a draft environmental assessment (*Group 70 International, Inc., June 2010*) has been prepared pursuant to Chapter 343, Hawaii Revised Statutes. It is our understanding that preparation of this draft environmental assessment (DEA) was required because the use State of Hawai'i-Department of Business, Economic Development and Tourism funds to support the undertaking was proposed. OHA provided comments in response to a pre-DEA consultation request via letter dated February 10, 2010. In this letter, we offered our general support for the undertaking and its potential to offer employment and contribute to the local economy.

After reviewing the DEA, it appears that our concerns regarding the potential impacts of accidental release or introduction of phycal algae into the environment are partially addressed.

The DEA details (Section 1.5.1, page 1-4) that an application to the Department of Agriculture (DOA) for a "Phytosanitary Certificate" (certificate) will be required to import phycal algae into Hawai'i for this undertaking. We understand that this certificate will be required during a DOA-Plant Quarantine Branch inspection, which is intended to prevent the spread of harmful diseases and pests in the State. The DEA also describes (Section 2.3.1, page 2-11) that the undertaking will "*only include species of algae that are listed by the State Board of Agriculture (BOA) as permissible for use in Hawai'i. The project will not import or use genetically modified algae. In preparation for the Hawai'i pilot, Phycal has used algae species that meet the State BOA regulations for use in Hawai'i*".

The DEA acknowledges (Section 1.5, page 1-3) that because of the use of federal funds to support the project are being proposed by the DOE through the ARRA, preparation of an environmental assessment (EA) pursuant to the provisions of the National Environmental Policy Act (NEPA) will also be required. While it appears this NEPA EA is what your letter references, the DEA prepared by Group 70, International, Inc. indicates it will be "*prepared in the future for Phase II of the project*". OHA seeks clarification of whether this project is phased and if it is, what phase this undertaking is in.

Conclusion

While we are disappointed the concerns and requests we expressed in the pre-CIA consultation were not addressed in the CIA, we do acknowledge that this project, like many others in Hawai'i require a wide range of compliance documents to facilitate necessary agency permits and approvals. After considering our comments, you may decide a response is appropriate and we are confident that it will come expeditiously as planning for this undertaking moves forward towards completion. Thank you for initiating consultation and providing the opportunity to provide comments. Should you have any questions or concerns, please contact Keola Lindsey at 594-0244 or keolal@oha.org.

'O wau iho nō me ka 'oia'i'o,



Clyde W. Nāmu'o
Chief Executive Officer

C: William Aila, Jr.- State of Hawai'i Historic Preservation Officer
Dr. Pua Aiu, Administrator, State Historic Preservation Division
Jeffrey H. Overton, Principle- Group 70 International, Inc.
925 Bethel Street,, Honolulu, Hawaii 96813



September 14, 2011

Clyde W. Namuo, Chief Executive Officer
Office of Hawaiian Affairs
711 Kapi'olani Blvd., Suite 500
Honolulu, HI 96813

SUBJECT: Section 106 Compliance for the proposed Phycal Algae Pilot Project, Phycal LLC., Oahu, HI. TMK: (1) 7-1-007:011 por., 030 por. and 031 por. and TMK (1) 9-1-084: 032 por.

Dear Mr. Namuo:

Thank you for your comment letter dated January 14, 2011, in response to the Section 106 Consultation under the National Historic Preservation Act for the proposed Phycal Algae Pilot Project. We appreciate Keola Lindsey of your office, taking the time to discuss the project with us on September 14, 2011.

National Historic Preservation Act (NHPA)

We appreciate the Office of Hawaiian Affairs' (OHA) concurrence with the "area of potential effect" (APE) and determination that the project will result in "no adverse effect" to historic properties eligible for listing or listed on the National Register of Historic Places. We also recognize your concurrence that a "good faith effort" to identify historic properties within the APE has been met by conducting Archaeological Assessments (AA) for each of the proposed project sites (Poamoho Site and Tesoro Site).

Cultural Impact Assessment (CIA)

We understand your comments regarding the preparation of the Cultural Impact Assessments (CIA) for the proposed project. We have contacted and coordinated with the CIA preparer to share OHA's concerns. We would like to note that no historic properties were identified in the Archaeological Assessments for each of the proposed project sites. In addition, the State Historic Preservation Division has accepted and agreed with the findings of the CIA reports, which was noted in their Section 106 consultation letter (Log No. 2010.3955). This letter was also included in Appendix A of the National Environmental Policy Act (NEPA) Draft Environmental Assessment (EA).

Regarding the second concern raised in your February 18, 2010 letter to the CIA preparer, relating to the potential impacts of accidental release or introduction of algae into the environment, we would like to refer you to Section 3.2.5 (Vegetation and Wildlife) of the NEPA Draft EA. Excerpts from this section are provided below:

The proposed project would require the importation of algae representing several genera in an effort to use well studied and characterized strains to speed the deployment of the processing system. Phycal's current targeted production strain is Chlorella; however, if an improved strain becomes available, Phycal may supplement and/or replace the current production strain. No genetic modification has been or would be done on the strains used in the proposed project. All algae genera and species proposed for production strains in the proposed project are on the Hawaii DOA approved importation list. An algae importation permit was approved by the State DOA in March 2011.

Phycal would continue Research and Development (R&D) to select and improve strains within the Chlorella genera by classical selection. R&D would also be carried out for other algae genera that may provide an added benefit to overall production and operations of the proposed project. These algae genera include Nannochloropsis, Skeletonema, and Tetraselmis. While R&D of algae production strains would be a small scale operation on the pilot site, it is an important component for the future efforts and success of the proposed project. Continuing to improve algae production strains would help to decrease the risk of failure should specific viruses or other conditions occur that threaten Phycal's targeted production strain. Alternatively, rotation of strains can also be a way to maintain a healthy system (i.e. avoiding build up of species specific predators or viruses). Algal strains that are newly identified from collaborators and in the literature may also be evaluated in the R&D process.

No adverse impacts relating to the importation of algae genera would be anticipated. The proposed project is being planned to have minimal impact on the surrounding environment. Phycal would maintain the cultures in a controlled system that is open to the environment. The engineering is designed to accommodate harsh weather and heavy rainfall. Management plans are designed to respond to impending weather with rapid harvests and culture distribution to minimize the chance of accidental release of culture and live organisms into the surrounding streams and lakes. The pond system would be surrounded by a berm to prevent loss of culture in case of an accidental spill. There would be overflow ponds and areas where an accidental release from a pond would accumulate on site and be treated before escape to the environment. Other safeguards are also in place to prevent culture from escaping into surrounding streams. The culture itself would be aerated using paddlewheels not for aeration, but rather to propel the liquid forward in the raceway format. Phycal is also testing other methods to mix the ponds to further reduce possibilities of producing aerosols.

Environmental Assessment

We appreciate OHA's general support for the proposed project expressed in comments provided for the State EA (Chapter 343, Hawaii Revised Statutes). We note that OHA's previous concerns relating to the potential impacts of accidental release or introduction of algae into the environment were partially addressed in the State Draft EA.

Regarding the phasing of the proposed project, The Phycal Algae Pilot Project is Phase II of a pilot project implementation plan, which follows the Phase I laboratory study. Phase II will conduct field testing and validation of the algae-to-energy technology through harvesting integration, process optimization and scaling, and cost model validation. Additional details on the project's phasing and development process can be found in Section 1.0 (Purpose and Need) and 2.2 (Project Modulization) of the NEPA Draft EA.

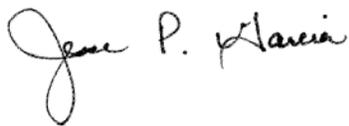
Conclusion

Based on the determination of “no findings” during fieldwork, for both the Poamoho and Tesoro project sites, DOE has made a finding of No Historic Properties Effectuated for archeological resources in regards to this undertaking. DOE has carried out Section 106 Compliance and consultation with the State of Hawaii OHA. DOE acknowledges your concurrence with this finding as stated in your letter dated January 14, 2011.

A Final EA is being prepared and will be released to the public in the near future. DOE will provide your office a copy of the Final EA. All correspondence between DOE and OHA will be included in an appendix to the Final EA.

If you have any questions, I can be reached at 304-285-0256 or by e-mail Jesse.Garcia@NETL.doe.gov

Sincerely,

A handwritten signature in black ink that reads "Jesse P. Garcia". The signature is written in a cursive style with a large, looping initial "J".

Jesse Garcia
NEPA Document Manager



December 15, 2010

Pua Aiu, Ph.D., Administrator
State Historic Preservation Division
State Department of Land and Natural Resources
Kamokila Blvd., Room 555
Kapolei, HI 96707

SUBJECT: Section 106 Compliance for the proposed Phycal Algae Pilot Project, Phycal LLC., Oahu, HI. TMK: (1) 7-1-007:011 por., 030 por. and 031 por. and TMK (1) 9-1-084: 032 por.

Dear Dr. Aiu:

The U.S. Department of Energy (DOE) is proposing to provide a financial assistance grant (DOE's Proposed Action) to Phycal, LLC (Phycal) as part of the funding opportunity announcement titled "Carbon Capture and Sequestration from Industrial Sources and Innovative Concepts for Beneficial CO₂ Use," which is funded through the American Recovery and Reinvestment Act of 2009. Phycal seeks to develop an algae farm and processing production facility. The pilot project facility located at the Poamoho site will include shallow raceway ponds of various sizes for grow-out of algae crop, greenhouses for initial phase grow-out of algae strains, visitor and employee trailers, a processing building, and an outdoor area with equipment such as the anaerobic digester for conversion of biomass to methane gas, and water conditioning unit for water purity and water recycling. The refining and processing facility located at the Tesoro site will include a small bench scale unit which will convert the algal oil into Hydrotreated Renewable Jet Fuel, Renewable Naphtha, and Renewable Diesel.

Two sites will be used to develop and operate the proposed project. The first project site, located in Wahiawa, Oahu, will be used for the development of an algae farm (Poamoho site). The Poamoho Site is located on a portion of the existing Poamoho Plantation Camp (Figure 1). The algae farm and facilities will be situated on agricultural lands to the south of the Camp, near the corner of Kamehameha Highway and Kaukonahua Road. The agricultural land is leased from AOOU Poamoho Camp. The project area is approximately 34.117 acres and encompasses TMK: (1) 7-1-001: 011, 030, and 031. The project site is bounded by Kamehameha Highway on the east, Kaukonahua Road on the south and agricultural lands to the north and west. Poamoho Camp residential area lies beyond the agricultural lands to north.

The second project site, located in Kaleloa, Oahu, will be used for the development of a processing facility (Tesoro Site). The Tesoro Site is located on vacant industrial lands in James Campbell Industrial Park (Figure 2). The project area encompasses a portion of TMK (1) 9-1-032: 084 and is approximately 0.9 acres (39,204 square feet). The Tesoro project site is bounded by Kauhi Street

on the north, Komohana Street on the west, and light to medium industrial facilities to the north and west. The industrial land is leased from Tesoro Hawaii Corporation.

The Area of Potential Effects for historic archeology and cultural resources (limits of disturbance) is shown on the accompanying location maps for both the Poamoho and Tesoro project sites (Attachment 1 and 2). An Archaeological Assessment (AA) and Cultural Impact Assessment (CIA) were conducted by Scientific Consulting Services, Inc. for these areas and have been approved by the State of Hawaii, Department of Land and Natural Resources (DLNR), State Historic Preservation Division (SHPD).

In March 2010 and May 2010, two separate CIAs were completed for the Poamoho and Tesoro project sites (Attachment 3 and 4). The CIAs were completed in compliance with Act 50 Session Laws of Hawaii 2000 and the State of Hawaii environmental review process under Chapter 343, Hawaii Revised Statutes. Through document research and cultural consultation efforts, the reports provided information that was applicable to the assessment of the proposed project and its potential impacts to cultural practices. Hawaiian organizations, agencies, and community members were contacted to identify potentially knowledgeable individuals with cultural expertise and/or knowledge of the project areas and their vicinities.

For the Poamoho project site, consultation was sought from Phyllis (Coochie) Cayan, History and Culture Branch Chief with SHPD; the Hawaiian Civic Club of Wahiawa; Maria Orr, a Consulting Archaeologist; Tom Lenchanko of Waha Olelo Aha Kukaniloko; and Leimaile Quitevis of the Oahu Island Burial Council. In addition, two former long-time plantation workers, living in Poamoho Camp were interviewed concerning ongoing cultural activities that might have occurred in the project area or its vicinity.

For the Tesoro project site, consultation was sought from Phyllis (Coochie) Cayan; George Kaeliwai of the Hawaiian Civic Club of Ewa; Leimaile Quitevis, Senator Will Espero, Representative Rida Cabanilla, the Ewa Beach Neighborhood Board, Ewa Hui Aloha Senior Citizens, Shad Kane, Nettie Tiffany, and Chuck Erhorn.

The information presented in the CIA reports for the Poamoho site and the Tesoro site revealed that no notable cultural activities took place at the specific project areas. There was no additional information from the contacted organizations, newspapers, and archival research. Therefore, it was concluded that the exercise of native Hawaiian rights, or any ethnic group, related to gathering, access or other customary activities will not be affected by the activities of the proposed project.

In March 2010 and May 2010, Archaeological Inventory Surveys (AIS) were completed for the Poamoho project site and the Tesoro project site (Attachment 5 and 6). While Inventory Survey-level investigations were completed, these reports are presented as AAs because fieldwork did not find cultural material of historic significance. A review of archival resources and the results of previous archaeological work conducted in the area for both project sites were undertaken prior to fieldwork. There are no recorded archeological sites within either of the proposed project sites.

No surface or subsurface cultural remains were identified during the AIS fieldwork at both the Poamoho and Tesoro project sites. For the Poamoho site, historic and modern-era clearing and grading in the parcel removed any previously existing surface sites and destroyed or altered subsurface deposits. Based on the AA, the proposed development at the Poamoho site will have a

minimal likelihood of affecting historic properties. Therefore, no further work is recommended for the project area as indicated by DLNR SHPD acceptance of this AA report in their letter dated May 18, 2010 (Attachment 7).

For the Tesoro site, the property has been subject to subsurface alterations and other such disturbances. Vast changes in landscapes of the James Campbell Industrial Park area likely started in 1890 with the re-deposition of alluvial soils to accommodate sugar cane cultivation on formerly arid portions of the coastal plain. Portions of the ground surface are also paved with asphalt and concrete, and known levels of disturbance in these areas remains limited. The findings of the AA for the Tesoro site indicate that the proposed development of the project will not likely affect historic properties. Therefore, no further work is recommended for the project area as indicated by DLNR SHPD's acceptance of this AA report in their letter dated June 17, 2010 (Attachment 8).

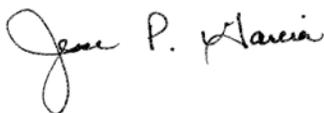
Based on the determination of "no findings" during fieldwork, for both the Poamoho and Tesoro project sites, DOE has made a finding of No Historic Properties Effected for archeological resources in regards to this undertaking. DOE asks for your concurrence with this finding and thanks you in advance for your consideration. Please see the supporting documents attached to this letter for further details on this project. Please forward the results of your review and any requests for additional information to our contractor:

Jeffrey H. Overton, Principal
Group 70 International, Inc.
925 Bethel Street, 5th Floor
Honolulu, HI 96813
Email: jho1@group70int.com
Telephone: (808) 523-5866

An environmental assessment (EA) is being prepared and will be released to the public in the near future. DOE will provide your office a copy of the EA and where you may further comment on any of your concerns. All correspondence between DOE and SHPD will be included in an appendix to the EA. At this time, DOE anticipates a 30-day public comment period for this proposed project.

If you have any questions, I can be reached at 304-285-0256 or by e-mail Jesse.Garcia@NETL.doe.gov

Sincerely,

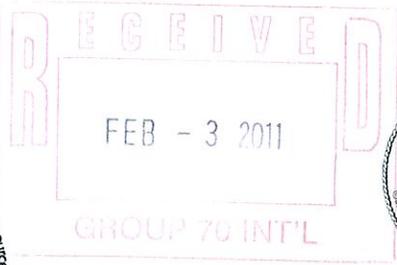


Jesse Garcia
NEPA Document Manager

Attachments

1. Figure 1. Project Location – Poamoho Site
2. Figure 2. Project Location – Tesoro Site
3. Cultural Impact Assessment – Poamoho Site
4. Cultural Impact Assessment – Tesoro Site
5. Archaeological Assessment – Poamoho Site
6. Archaeological Assessment – Tesoro Site
7. SHPD Approval Letter – Poamoho Site
8. SHPD Approval Letter – Tesoro Site

NEIL ABERCROMBIE
GOVERNOR OF HAWAII



WILLIAM J. AILA, JR.
INTERIM CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

GUY KAULUKUKUI
FIRST DEPUTY

WILLIAM M. TAM
ACTING DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

February 2, 2011

Jesse Garcia
National Energy Technology Laboratory
3610 Collins Ferry Road, PO Box 880
Morgantown, WV 26507

LOG NO: 2010.3955
DOC NO: 1101MV16
Archaeology

Dear Jesse:

**SUBJECT: National Historic Preservation Act (NHPA) Section 106 Consultation –
Proposed Phycal Algae Pilot Project
Poamoho and Honouliuli Ahupua‘a, Wahiawa and ‘Ewa Districts, Island of O‘ahu
TMK: (1) 7-1-007:011, :030 & :031 and 9-1-084:032**

This is in response to your letter dated December 15, 2010 that was received by our office on December 21, 2010. Your letter seeks consultation on the proposed undertaking to develop a phycal algae farm and a processing plant at two separate locations on Oahu. The farm is planned for Poamoho, at the corner of Kamehameha Highway and Kaukonahua Road in Wahiawa, and the processing plant is planned for the Campbell Industrial Park in ‘Ewa. Both of these properties have been subjected to Archaeological Inventory Surveys that recorded no historic sites, and were presented to SHPD as Archaeological Assessments pursuant to HAR 13-284. These two AA were accepted by SHPD via Log No. 2010.0752, Doc No. 1005MV07 (for the Poamoho property) and Log No. 2010.2010, Doc No. 1006NM60 (for the Campbell Industrial park lot). In addition, Cultural Impact Assessments (CIA) were conducted for these two undertakings, and both assessments resulted in the determination that no customary activities would be affected by this project. Therefore, our office concurs with your determination that **no historic properties will be affected** by this undertaking.

In the unlikely event that historic resources, including human skeletal remains, structural remains, sand deposits, midden deposits, lava tubes, or lava blisters/bubbles are identified during construction activities, please cease work in the immediate vicinity of the find, protect the find from additional disturbance, and contact the State Historic Preservation Division at (808) 692-8015.

Please contact Michael Vitousek at (808) 692-8029 or Michael.Vitousek@hawaii.gov if you have any questions or concerns regarding this letter.

Aloha,

A handwritten signature in black ink, appearing to read "Theresa K. Donham".

Theresa K. Donham
Acting Archaeology Branch Chief
Deputy State Historic Preservation Officer
Historic Preservation Division

cc:
Jeff Overton
Group 70 international
925 Bethel Street 5th floor
Honolulu, HI 96813



April 19, 2011

Hawaiian Civic Club of Honolulu
P.O. Box 1513
Honolulu, HI 96806

SUBJECT: Consultation for the proposed Phycal Algae Pilot Project, Phycal LLC, Oahu, HI. TMK: (1) 7-1-007:011 por., 030 por. and 031 por. and TMK (1) 9-1-084: 032 por.

Aloha,

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Two sites will be used to develop and operate the proposed project. The first project site located in Wahiawa, Oahu, will be used for the development of an algae farm (Poamoho site). The Poamoho Site is located on a portion of the existing Poamoho Plantation Camp (Figure 1). The algae farm and facilities will be situated on agricultural lands to the south of the Camp, near the corner of Kamehameha Highway and Kaukonahua Road. The agricultural land is leased from the Association of Unit Owners, AOOU Poamoho Camp. The project area is approximately 34.117 acres and encompasses TMK: (1) 7-1-001: 011, 030, and 031. The project site is bounded by Kamehameha Highway on the east, Kaukonahua Road on the south and agricultural lands to the north and west. Poamoho Camp residential area lies beyond the agricultural lands to north.

The second project site, located in Kaleloa, Oahu, will be used for the development of a processing facility (Tesoro Site). The Tesoro Site is located on vacant industrial lands in James Campbell Industrial Park (Figure 2). The project area encompasses a portion of TMK (1) 9-1-032: 084 and is approximately 0.9 acres (39,204 square feet). The Tesoro project site is bounded by Kauhi Street on the north, Komohana Street on the west, and light to medium industrial facilities to the north and west. The industrial land is leased from Tesoro Hawaii Corporation.

The Area of Potential Effects for historic archeology and cultural resources (limits of disturbance) is shown on the accompanying location maps for both the Poamoho and Tesoro project sites (Attachment 1 and 2). An Archaeological Assessment (AA) and Cultural Impact Assessment

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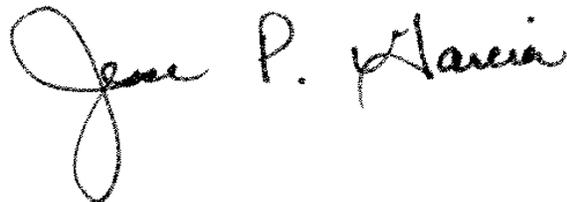
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Jeffrey H. Overton, Principal
 Group 70 International, Inc.
 925 Bethel Street, 5th Floor
 Honolulu, HI 96813
 Email: jho1@group70int.com
 Telephone: (808) 523-5866

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Sincerely,



Jesse Garcia
 NEPA Document Manager

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April 19, 2011

Mr. William Aila Jr.
Hui Malama I Na Kupuna O Hawaii Nei
622 Wainaku Avenue
Honolulu, HI 96720

SUBJECT: Consultation for the proposed Phycal Algae Pilot Project, Phycal LLC, Oahu, HI. TMK: (1) 7-1-007:011 por., 030 por. and 031 por. and TMK (1) 9-1-084: 032 por.

Dear Mr. Aila:

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The second project site, located in Kaleloa, Oahu, will be used for the development of a processing facility (Tesoro Site). The Tesoro Site is located on vacant industrial lands in James Campbell Industrial Park (Figure 2). The project area encompasses a portion of TMK (1) 9-1-032: 084 and is approximately 0.9 acres (39,204 square feet). The Tesoro project site is bounded by Kauhi Street on the north, Komohana Street on the west, and light to medium industrial facilities to the north and west. The industrial land is leased from Tesoro Hawaii Corporation.

The Area of Potential Effects for historic archeology and cultural resources (limits of disturbance) is shown on the accompanying location maps for both the Poamoho and Tesoro project sites

(Attachment 1 and 2). An Archaeological Assessment (AA) and Cultural Impact Assessment (CIA) were conducted by Scientific Consulting Services, Inc., for these areas and have been approved by the State of Hawaii, Department of Land and Natural Resources (DLNR), State Historic Preservation Division (SHPD).

In March 2010 and May 2010, two separate CIAs were completed for the Poamoho and Tesoro project sites (Attachment 3 and 4). The CIAs were completed in compliance with Act 50 Session Laws of Hawaii 2000 and the State of Hawaii environmental review process under Chapter 343, Hawaii Revised Statutes. Through document research and cultural consultation efforts, the reports provided information that was applicable to the assessment of the proposed project and its potential impacts to cultural practices. Hawaiian organizations, agencies, and community members were contacted to identify potentially knowledgeable individuals with cultural expertise and/or knowledge of the project areas and their vicinities.

For the Poamoho project site, consultation was sought from Phyllis Coochie Cayan, History and Culture Branch Chief with SHPD; the Hawaiian Civic Club of Wahiawa; Maria Orr, a Consulting Archaeologist; Tom Lenchanko of Waha Olelo Aha Kukaniloko; and Leimaile Quitevis of the Oahu Island Burial Council. In addition, two former long-time plantation workers, living in Poamoho Camp were interviewed concerning ongoing cultural activities that might have occurred in the project area or its vicinity.

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The information presented in the CIA reports for the Poamoho site and the Tesoro site revealed that no notable cultural activities took place at the specific project areas. There was no additional information from the contacted organizations, newspapers, and archival research. Therefore, it was concluded that the exercise of native Hawaiian rights, or any ethnic group, related to gathering, access or other customary activities will not be affected by the activities of the proposed project.

In March 2010 and May 2010, Archaeological Inventory Surveys (AIS) were completed for the Poamoho project site and the Tesoro project site (Attachment 5 and 6). While Inventory Survey-level investigations were completed, these reports are presented as AAs because fieldwork did not find cultural material of historic significance. A review of archival resources and the results of previous archaeological work conducted in the area for both project sites were undertaken prior to fieldwork. There are no recorded archeological sites within either of the proposed project sites.

No surface or subsurface cultural remains were identified during the AIS fieldwork at both the Poamoho and Tesoro project sites. For the Poamoho site, historic and modern-era clearing and grading in the parcel removed any previously existing surface sites and destroyed or altered subsurface deposits. Based on the AA, the proposed development at the Poamoho site will have a minimal likelihood of affecting historic properties. Therefore, no further work is recommended for the project area as indicated by DLNR SHPD acceptance of this AA report in their letter dated May 18, 2010 (Attachment 7).

For the Tesoro site, the property has been subject to subsurface alterations and other such disturbances. Vast changes in landscapes of the James Campbell Industrial Park area likely started in 1890 with the re-deposition of alluvial soils to accommodate sugar cane cultivation on formerly

arid portions of the coastal plain. Portions of the ground surface are also paved with asphalt and concrete, and known levels of disturbance in these areas remains limited. The findings of the AA for the Tesoro site indicate that the proposed development of the project will not likely affect historic properties. Therefore, no further work is recommended for the project area as indicated by DLNR SHPD's acceptance of this AA report in their letter dated June 17, 2010 (Attachment 8).

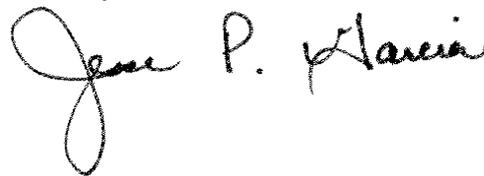
Based on the determination of "no findings" during fieldwork, for both the Poamoho and Tesoro project sites, DOE has made a finding of No Historic Properties Effectuated for archeological resources in regards to this undertaking. DOE has carried out Section 106 Compliance and consultation with the State of Hawaii DLNR, SHPD. DOE asks for your concurrence with this finding and thanks you in advance for your consideration. Please see the supporting documents attached to this letter for further details on this project. Please forward the results of your review and any requests for additional information to our contractor:

Jeffrey H. Overton, Principal
 Group 70 International, Inc.
 925 Bethel Street, 5th Floor
 Honolulu, HI 96813
 Email: jho1@group70int.com
 Telephone: (808) 523-5866

An environmental assessment (EA) is being prepared and will be released to the public in the near future. DOE will provide your office a copy of the EA and where you may further comment on any of your concerns. All correspondence between DOE and the Hui Malama I Na Kupuna O Hawaii Nei will be included in an appendix to the EA. At this time, DOE anticipates a 30-day public comment period for this proposed project.

If you have any questions, I can be reached at 304-285-0256 or by e-mail Jesse.Garcia@netl.doe.gov

Sincerely,



Jesse Garcia
 NEPA Document Manager

Attachments

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7. SHPD Approval Letter – Poamoho Site
8. SHPD Approval Letter – Tesoro Site



April 19, 2011

NAGPRA Contact
Oahu Island Burial Council
601 Kamokila Blvd., Suite 555
Kapolei, HI 96707

SUBJECT: Consultation for the proposed Phycal Algae Pilot Project, Phycal LLC, Oahu, HI. TMK: (1) 7-1-007:011 por., 030 por. and 031 por. and TMK (1) 9-1-084: 032 por.

Aloha,

The U.S. Department of Energy (DOE) is proposing to provide a financial assistance grant to Phycal, LLC (Phycal) as part of the funding opportunity announcement titled “Carbon Capture and Sequestration from Industrial Sources and Innovative Concepts for Beneficial CO₂ Use,” which is funded through the American Recovery and Reinvestment Act of 2009. Phycal seeks to develop an algae farm and processing production facility. The pilot project facility located at the Poamoho site will include shallow raceway ponds of various sizes for grow-out of algae crop, greenhouses for initial phase grow-out of algae strains, visitor and employee trailers, a processing building, and an outdoor area with equipment such as the anaerobic digester for conversion of biomass to methane gas, and water conditioning unit for water purity and water recycling. The refining and processing facility located at the Tesoro site will include a small bench scale unit which will convert the algal oil into Renewable Jet Fuel, Renewable Naphtha, and Renewable Diesel.

Two sites will be used to develop and operate the proposed project. The first project site located in Wahiawa, Oahu, will be used for the development of an algae farm (Poamoho site). The Poamoho Site is located on a portion of the existing Poamoho Plantation Camp (Figure 1). The algae farm and facilities will be situated on agricultural lands to the south of the camp, near the corner of Kamehameha Highway and Kaukonahua Road. The agricultural land is leased from the Association of Unit Owners, AOUO Poamoho Camp. The project area is approximately 34.117 acres and encompasses TMK: (1) 7-1-001: 011, 030, and 031. The project site is bounded by Kamehameha Highway on the east, Kaukonahua Road on the south and agricultural lands to the north and west. Poamoho Camp residential area lies beyond the agricultural lands to north.

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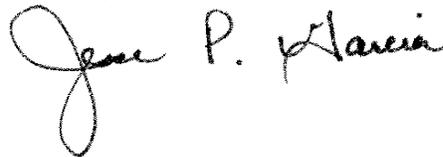
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Appendix B

**Environmental Synopsis
Industrial Carbon Capture & Sequestration (ICCS)
Technology Area 2
DE-FOA-000015**

ENVIRONMENTAL SYNOPSIS
Industrial Carbon Capture & Sequestration (ICCS)
Technology Area 2
DE-FOA-0000015

January 2011

National Energy Technology Laboratory
U.S. Department of Energy
Morgantown, West Virginia

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INTRODUCTION

The U.S. Department of Energy (DOE or the Department) prepared this Environmental Synopsis pursuant to the Department's responsibilities under 216 of DOE's National Environmental Policy Act (NEPA) Implementing Procedures set forth in 10 CFR Part 1021. This synopsis summarizes the consideration given to environmental factors and records that the relevant environmental consequences of reasonable alternatives were evaluated in the process of selecting awardees seeking financial assistance under Technology Area 2 of the Industrial Carbon Capture and Sequestration (ICCS) Program. DOE initially selected twelve applicants seeking financial assistance under Technology Area 2 and provided cost-shared funding for project definition activities; DOE then selected six of the initial twelve awardees for continued funding beyond project definition, pending completion of project-specific NEPA reviews. As required by section 216, this synopsis does not contain business sensitive, confidential, trade secret or other information that statues or regulations would prohibit DOE from disclosing. It also does not contain data or other information that may reveal the identity of the offerors.¹

BACKGROUND

The ICCS program is a cost-shared collaboration between the government and industry to increase investment in clean industrial technologies and carbon capture and sequestration (CCS) projects. In contrast to other federally funded activities, these projects are not federal projects ; instead, they are private projects seeking federal financial assistance. Under the ICCS funding opportunity, industry proposes projects that meet their needs and those of their customers while furthering the national goals and objectives of DOE. The successful development of advanced technologies and innovative concepts that reduce emissions of carbon dioxide into the atmosphere is a key objective of the nation's effort to help mitigate the effects of climate change.

Awardees under this Funding Opportunity Announcement (FOA) would receive assistance using funds appropriated by the American Recovery and Reinvestment Act of 2009, Public Law 111-5, (Recovery Act). The Recovery Act's purposes are to stimulate the economy and to create and retain jobs. Accordingly, special consideration was given to projects that promote and enhance job creation, preservation and economic recovery, in an expeditious manner. In accordance with the Recovery Act, and Section 703 of Public Law 110-140, DOE's two specific objectives were identified in the FOA as (1) Technology Area 1 – *Large-Scale Industrial CCS Projects from Industrial Sources*; and (2) Technology Area 2 – *Innovative Concepts for Beneficial CO₂ Use*. This synopsis specifically deals with the review process conducted for applications under Technology Area 2.

The applications reviewed under this FOA were initially selected for a first phase funding in October 2009 as the first of a two phase process for final awards of financial assistance. Under Phase 1 of the review process for Technology Area 2, DOE selected 12 projects related to supporting the development of innovative concepts for beneficial use of CO₂. During Phase I, DOE provided cost shared funding for applicants to conduct project definition activities (e.g. preliminary design and permitting) and to prepare information that would assist the Department

¹ The six awardees selected for continued financial assistance are identified in this synopsis and information on these proposed projects will be available on DOE National Energy Technology Laboratory (NETL) website at <http://www.netl.doe.gov/technologies/iccs/index.html>.

in performing its obligation pursuant to NEPA. Near the end of Phase I, awardees were given an opportunity to submit Renewal Applications for Phase II awards that would provide financial assistance for detailed design, construction and demonstration of the proposed technologies. DOE received eleven renewal applications from the twelve projects selected under Phase I.

Applications under the ICCS program were evaluated against specific programmatic criteria:

- Technology merit, technical plan, and site suitability;
- Project organization and project management plan;
- Commercial potential;
- Funding plan;
- Financial condition and capacity of proposed funding sources;
- Financial commitment to meet cost-sharing requirements.

These criteria represented the total evaluation scoring. However, the selection official also considered the results of the environmental evaluation and the applicant's budget information and financial management system, as well as program policy factors, in making final selections.

As a federal agency, DOE must comply with NEPA (42 U.S.C. §§ 4321 *et seq.*) by considering potential environmental issues associated with its actions prior to deciding whether to undertake these actions. The environmental review of applications received in response to the ICCS FOA was conducted pursuant to Council on Environmental Quality Regulations (40 Code of Federal Regulations (CFR) Parts 1500 - 1508) and DOE's NEPA Implementing Procedures (10 CFR Part 1021), which provide directions specific to NEPA in the context of procurement and financial assistance actions.

PURPOSE AND NEED

The purpose and need for DOE's selections of awardees under the ICCS Program are to satisfy the responsibility Congress imposed on the Department to carry out a program to demonstrate technologies for the large-scale capture of CO₂ from industrial sources. Technology Area 2 of the Recovery Act funding opportunity DE-FOA-000015 is to carry out design, construction and testing of innovative CO₂ utilization technologies and processes at sufficient scale (e.g., pilot-scale) to generate reliable cost information and test data to assess the technical and economic viability of the concepts for implementation at future commercial scale. Technology Area 2 will determine possible pathways and novel approaches for reducing CO₂ emissions by developing beneficial uses for the CO₂, such as the conversion of CO₂ to useable products and fuels and other breakthrough concepts that will mitigate CO₂ emissions in areas where geologic storage may not be an optimal solution. This work focuses on increasing investment in CO₂ utilization projects by selecting projects that have progressed beyond the fundamental research and development stage and are ready for implementation at the pilot-scale level to evaluate the feasibility of the operations to result in a net reduction of CO₂ if it is implemented at commercial-scale. DOE intends to further this purpose and satisfy this need by providing financial assistance under cost-sharing arrangements for projects selected under this funding opportunity announcement.

Projects selected are needed to evaluate advanced technologies that capture carbon dioxide emissions from industrial sources and put it to beneficial use to inhibit or permanently prevent

CO₂ from entering the atmosphere. The projects would also meaningfully assist in the nation's economic recovery by creating jobs in the United States in accordance with the objectives of the Recovery Act.

ALTERNATIVES

DOE received eleven Phase II renewal applications out of the twelve projects selected for Phase I in, ICCS Technology Area 2, all of which were determined to have met the mandatory eligibility requirements listed in the FOA. The applications proposed projects located in twelve states (some projects involved operations at multiple locations). The criteria for evaluating applications received under ICCS Technology Area 2 were published in the FOA. Technical and financial evaluations represented the total evaluation scoring; however, the environmental evaluation, which was not point-scored, entered into the evaluation and selection process. Each applicant was required to complete and submit a standard environmental information volume for each site or alternative site included in its offer.

The evaluations of the applications focused on the technical description of the proposed project, financial plans and budgets, potential environmental impacts, and other information that the applicants submitted. Following reviews by technical, environmental, and financial panels and a comprehensive assessment by a merit review board, a DOE official selected those applications that best met DOE's purpose and need. By broadly soliciting proposals to meet the programmatic purpose and need for DOE action and by evaluating the potential environmental impacts associated with each proposal before selecting applicants, DOE considered a reasonable range of alternatives for meeting its purpose and need.

Applications were divided into four broad categories:

- Conversion of CO₂ to mineralized carbonates or plastics;
- Use of CO₂ in algal processes to produce or derive biofuels;
- Conversion of CO₂ to syngas or substitute natural gas; and
- Use of CO₂ in enhanced oil recovery (EOR) applications and geologic sequestration.

DOE received between one and four applications in each of the above groupings, and while applications were evaluated against the criteria contained in the FOA and not against other applications received, the above groupings provided DOE with a range of reasonable alternatives for meeting the Department's need to demonstrate new technologies that beneficially utilize CO₂ from industrial sources.

ENVIRONMENTAL REVIEW

DOE assembled environmental review teams to assess all applications that met the mandatory requirements. The review teams considered 20 resource areas that could potentially be impacted by the technologies and sites proposed under Technology Area 2. These resource areas consisted of:

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-
- | | | |
|-------------------------|---------------------------|------------------------------|
| • Aesthetics | • Floodplains | • Soils |
| • Air Quality | • Geology | • Surface Water |
| • Biological Resources | • Ground Water | • Transportation and Traffic |
| • Climate | • Human Health and Safety | • Utilities |
| • Community Services | • Land Use | • Wastes and Materials |
| • Cultural Resources | • Noise | • Wetlands |
| • Environmental Justice | • Socioeconomics | |

The review teams were composed of environmental professionals having expertise in the resource areas considered by DOE and with experience evaluating the impacts of industrial facilities and energy-related projects. The review teams considered the information provided as part of each application, which included narrative text, worksheets, and the environmental information volumes for the sites proposed by the applicant. In addition, reviewers independently verified the information provided to the extent practicable using available sources commonly consulted in the preparation of NEPA documents, and conducted preliminary analyses to identify the potential range of impacts that would be associated with each application. Reviewers identified both direct and indirect potential impacts to the resource areas mentioned above, as well as short-term impacts that might occur during construction and start-up, and long-term impacts that might occur over the expected operational life of the proposed project and beyond. The reviewers also considered any mitigation measures proposed by the applicant, and any reasonably available mitigation measures that may not have been proposed.

Reviewers assessed the potential for environmental issues and impacts using the following characterizations:

- **Beneficial** – Expected to have a net beneficial effect on the resource in comparison to baseline conditions.
- **None (negligible)** – Immeasurable or negligible in consequence (not expected to change baseline conditions).
- **Low** – Measurable or noticeable but of minimal consequence (barely discernable change in baseline conditions).
- **Moderate** – Adverse and considerable in consequence but moderate and not expected to reach a level of significance (discernable, but not drastic, alteration of baseline conditions).
- **High** – Adverse and potentially significant in severity (anticipated substantial changes or effects on baseline conditions that might not be mitigable).

For cases in which an application failed to provide sufficient information to support a determination among the above characterizations, the reviewers assigned one of the following characterizations:

- **Limited Concern** – The potential for substantial adverse impacts would be negligible to low based on background information about the resource area with respect to the geographic location of the project.

- **Elevated Concern** – The potential for substantial adverse impacts would be moderate to high based on background information about the resource area with respect to the geographic location of the project.

Applications in Response to the FOA

Based on the technologies and sites proposed, none of the applications for the FOA were deemed to have a high potential for adverse impacts in nineteen of the twenty resource areas. However, one application could have a potential for high adverse impacts to floodplains. The following impacts by resource area were considered in the selection of candidates for award:

Aesthetics – Low impacts would be expected at all project sites. This is due to the fact that construction would primarily be occurring at existing industrial or developed sites.

Air Quality – Moderate impacts would be expected for one project due to emissions from the new source operations of a propane fired boiler, thermal oxidizer, and diesel engine. Low impacts would be expected for the remaining projects, with impacts resulting mostly from transportation-related emissions or fugitive dust from construction activities.

Biological Resources – No impacts would be expected from three of the projects. Protected species exist in the vicinity of the remaining sites, but these projects would likely produce low impacts due to siting on previously disturbed areas. Aquatic species and habitat may be slightly affected by either water depletion or intake for three projects.

Climate – Beneficial impacts would be expected for all projects as a result of greenhouse gas reductions.

Community Services – No impacts would be expected for seven projects. Low impacts would be expected from the remaining projects, two of which were rated with limited concern due to incomplete information. Generally, projects anticipating a larger temporary workforce during construction would be expected to place a higher demand on community services – particularly in smaller, more rural communities where currently existing community services are more limited.

Cultural Resources – Moderate impacts would be expected for three projects due to the potential for cultural resources within the region of influence, one of which was rated elevated concern due to lack of information. Low impacts would be expected for the remaining eight projects.

Environmental Justice – Low impacts would be expected for nine of the projects, with the remaining projects expected to produce no impacts.

Floodplains – High impacts would be expected for one project due to the entire project's location within a 100 year floodplain, while moderate impacts would be expected for another project due to its siting within a 500 year floodplain. Low to no impacts would be expected for eight of the projects. One project was rated with limited concern due to location within an 'area in which flood hazards are undetermined, but possible.'

Geology – No impacts would be expected for five sites. Low impacts would be expected for the remaining six sites, mostly due to siting in regions with potential for seismic activity and EOR operations associated with one proposal. No unique geological features or economic minerals would be affected by the proposed projects.

Ground Water – No impacts would be expected for two projects. Low impacts would be expected for the remaining projects.

Human Health and Safety – Low to moderate impacts would be expected for all projects due to hazards associated with construction. The level of risk is generally related to the size and complexity of the planned construction. Low to moderate impacts would be expected during operations due to accidental release of hazardous gases or wastes, as some of the projects include usage of ammonia, syngas, chlorine gas, and other compounds. Higher impacts were typically a function of proximity to receptors.

Land Use – Low impacts would be expected for all projects due to construction within existing facilities or on a compatible nearby site.

Noise – Moderate noise impacts would be expected for two projects. One site would require monthly rock crushing during operation, while another would be located in close proximity to some residences. Low impacts would be expected during construction, but these impacts would be temporary.

Socioeconomics – Beneficial impacts would be expected for all projects. All projects would provide some additional employment during construction and operations, with most opportunities occurring within the local area.

Soils – No impacts would be expected for five projects. Low impacts would be expected for the remaining six projects as a result of either land disturbance or erosion. One site could experience problems with existing subsurface soil contamination. An additional site could experience disturbance of prime farmland; however, the proximity of this land to existing industrial sites would likely preclude any potential agricultural activity.

Surface Water – Moderate impacts would be expected for two locations due to water depletion, and one project was rated with elevated concern due to lack of an identified commercial host site. Low impacts would be expected for the remaining projects, with concerns mostly centered on increased runoff and low levels of water depletion. One project has the potential for subsurface CO₂ release.

Transportation and Traffic – No impacts would be expected for two projects. Low and manageable impacts would be expected during operations of the remaining projects. Temporary impacts from construction are likely; however, operations were not expected to result in any long-term traffic problems.

Utilities – Moderate impacts would be expected for two projects resulting from the need for new energy infrastructure and significant amounts of process water and electricity. One project was rated with elevated concern due to lack of an identified commercial host site. Low impacts would be expected for eight projects due to small increases in utility needs. No impacts would be expected for one project.

Wastes and Materials – One project was rated with elevated concern due to lack of an identified commercial host site. Low impacts would be expected for all other projects.

Wetlands – No impacts would be expected for all of the projects. ‘Limited Concern’ was assigned to one project due to insufficient data; however, it is projected this impact would likewise be negligible or low.

CONCLUSION

The alternatives available to DOE from applications received in response to the FOA for ICCS Technology Area 2 provided reasonable alternatives for accomplishing the Department's purpose and need to satisfy the responsibility Congress imposed on the Department to carry out a program to demonstrate technologies for the large-scale capture of CO₂ from industrial sources. The alternatives available to DOE would also meet the Department's goal of demonstrating advanced technologies that capture CO₂ emissions from industrial sources and either sequester the CO₂ in underground formations or put the CO₂ to beneficial use that permanently prevents it from entering the atmosphere. An environmental review was part of the evaluation process of these applications. DOE prepared a critique containing information from this environmental review. That critique, summarized here, contained summary as well as project-specific environmental information. The critique was made available to, and considered by, the selection official before selections for financial assistance were made.

DOE determined that selecting six applications in response to the FOA Technology Area 2 would meet the Department's purpose and need. DOE selected six projects for awards of financial assistance:

- Alcoa, Inc. (Alcoa Center, PA) project location in Point Comfort, TX. CO₂ capture from aluminum refining plant flue gas using in-duct scrubber, then coupled with alkaline clay mineralization to result in carbonate-rich alkaline clay media that could be used as construction fill, soil amendments, and green fertilizer. DOE has determined that a categorical exclusion is the appropriate level of environmental review for this conditional award and an additional review is pending for the proposed project;
- Novomer, Inc. (Ithaca, NY) project operations located at four sites including Rochester, NY; Baton Rouge, LA; Orangeburg, SC; and Ithaca, NY. Catalytic transformation of CO₂ into usable high- and low-molecular weight polypropylene-carbonate products. DOE has determined that a categorical exclusion is the appropriate level of environmental review for the proposed project;
- Touchstone Research Laboratory, Ltd. (Triadelphia, WV) project location in Wayne County, OH. Re-utilization of industrial flue gas CO₂ in algae production using a phase change material, for offsite conversion of algae biomass into biofuel. DOE has determined that a categorical exclusion is the appropriate level of environmental review for the proposed project;
- Phycal, LLC (Highland Heights, OH) two project locations in Oahu, Hawaii. Captured CO₂ from existing refinery emissions used to grow high-performance strains of algae, which would then be processed and converted to biofuels. DOE has determined that an environmental assessment is the appropriate level of environmental review for the proposed project;
- Skyonic Corporation (Austin, TX) project location in San Antonio, TX. Purification of captured flue gas CO₂ from coal-fired cement plant kiln, and conversion to food grade, saleable, solid bicarbonate of soda. DOE has determined that an environmental assessment is the appropriate level of environmental review for the proposed project;

- Calera Corporation (Los Gatos, CA) project location in Rock Springs, WY. Carbon mineralization of power plant flue gas CO₂ by aqueous precipitation for conversion into building materials including cementitious materials and aggregates. DOE has determined that an environmental assessment is the appropriate level of environmental review for the proposed project.

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Appendix C

DOE and Phycal Reponses to Comments on Draft Environmental Assessment

APPENDIX C
DOE and Phycal Responses to Comments on Draft Environmental Assessment

| Comment Number | Public Comment on Phycal EA | DOE Response | Phycal Response |
|-----------------------|--|---|---------------------------------|
| 1. | <p>State of Hawaii, Department of Agriculture: One question we have is whether the pilot project will include research on and assessment of feasibility of by-products of algae processing, such as feed for livestock.</p> <p>As indicated on page 34 of the Draft EA, the Department did approve a permit on March 3, 2011 for the importation and local sourcing of non-genetically modified algae.</p> | <p>As indicated in Section 3.2.6 Solid and Hazardous Wastes, solid waste resulting from production outputs of the proposed project, such as biomass, gums, waxes, and sulfur, would be collected and placed into an anaerobic digester located on the site. After digestion, the material would be used as a soil amendment for compost and fertilizer within the proposed project site.</p> | <p>Agree with DOE Response.</p> |
| 2. | <p>State of Hawaii, Office of Hawaiian Affairs: By letter dated January 14, 2011, OHA concurred with your determination pursuant to the NHPA, this action would result in “no adverse effect” to historic properties, but expressed additional concern. OHA recognizes that the DOE and Group 70 have considered the concerns expressed in our January 14, 2011 letter relative to the devastating impacts the inadvertent release of any imported algae genera could have on our natural ecosystem in Hawaii. It is our understanding that the algae genera selected for cultivation at the farm are permissible by the State of Hawaii Board of Agriculture. A series of measures to control the accidental release of cultures and live organisms into the environment surrounding the farm are being incorporated into the facility.</p> <p>OHA has no objections to the summary of impacts described in the DEA (Table 2.7.1).</p> | <p>Comment Noted.</p> | <p>Agree with DOE Response.</p> |
| 3. | <p>U.S. Fish and Wildlife Service: In our letter dated January 18, 2011 (Service File 2011-I-0083), we concurred that this project may affect, but was not likely to adversely affect Hawaiian waterbirds based on the proposed conservation measures. However, in an email dated February 3, 2011, Mr. Jeff Overton, of Group 70 International, Inc. informed us that proposed conservation measures were altered and netting across all of the raceway ponds or retention basins would no longer be included. Based on this new information, we recommended that you reinstate consultation on the proposed project. We received your letter on June 24, 2011; however, after reviewing the project</p> | <p>As stated in Section 3.2.5 Vegetation and Wildlife, to mitigate potential effects to wildlife at the Poamoho project site, particularly endangered Hawaiian Waterbirds, BMPs would be implemented. With the proposed BMPs in place, the proposed project would not be likely to adversely affect federally threatened or endangered species. The letter from USFWS provided in Appendix C contains a detailed list of the BMPs.</p> | <p>Agree with DOE Response</p> |

| Comment Number | Public Comment on Phycal EA | DOE Response | Phycal Response |
|-----------------------|--|---------------------|------------------------|
| | <p>details, we requested additional information to assist us in our determination. We received the requested details on September 14, 2011.</p> <p>Biological surveys, conducted in 2010, have concluded that waterbirds do not currently use the project site. However, once the raceway and retention basins are constructed and have water, it is likely that Hawaiian coots, Hawaiian ducks, and Hawaiian stilts will be attracted to the project site. We conclude that it is unlikely that Hawaiian stilts will be attracted to the project site. We conclude that it is unlikely that Hawaiian moorhen will be attracted due to the lack of vegetation cover. To minimize potential impacts to Hawaiian waterbirds, and ensure the site does not become an attractive nuisance, measures relating to Facility Operations, Predator Control Program, and Avian Protection Plan – Awareness Training will be included in the implementation of this project.</p> <p>Based on the avoidance and minimization measures, the Service concurs with your determination this proposed project may affect, but is not likely to adversely affect the Hawaiian moorhon, Hawaiian coot, Hawaiian stilt, and Hawaiian duck. Should project plans change, or if additional information becomes available, we recommend you contact our office so that we may assist you in re-assessing project impacts. If take of listed species cannot be avoided, it may be necessary to consult with us pursuant to section 7(a)(2) of the ESA or apply for an incidental take permit under section 10(a)(1)(a) of the ESA.</p> | | |

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

September 19, 2011

Mr. Jesse Garcia
U.S. Department of Energy
National Energy Technology Laboratory
3610 Collins Ferry Road
P.O. Box 880
Morgantown, West Virginia 26507-0880

Dear Mr. Garcia:

Subject: Phycal EA Comments

The Department of Agriculture has reviewed the subject Draft Environment Assessment and offers the following comments which are limited to the Poamoho project site.

The proposed use of the 34-acre project site situated at the corner of Kaukonahua Road and Kamehameha Highway is a pilot scale algae farm and processing area. The growth of the algae is to be enhanced by application of captured carbon dioxide from refinery emissions. The final product produced is algal oil. The property is within the State Agricultural District and is zoned by the City as AG-1 (Restricted Agriculture) and was cultivated in pineapple up until 2005 and is now unused. The refining of the algal oil will take place at a facility to be built within the Campbell Industrial Park with the finished products being biodiesel, jet fuel, fuel oil blends, and other products. The production of biofuels from algae appears to be in consonance with Hawaii's initiatives to achieve energy self-sufficiency.

One question we have is whether the pilot project will include research on and assessment of feasibility of by-products of algae processing, such as feed for livestock.

As indicated on page 34 of the Draft EA, the Department did approve a permit on March 3, 2011 for the importation and local sourcing of non-genetically modified algae.

Should you have any questions, please contact Earl Yamamoto at (808) 973-9466, or email at earl.j.yamamoto@hawaii.gov.

Sincerely,

A handwritten signature in black ink, appearing to read "Russel S. Kokubun".

Russel S. Kokubun
Chairperson, Board of Agriculture

c: Plant Quarantine Branch, Plant Industry Division





STATE OF HAWAII
OFFICE OF HAWAIIAN AFFAIRS
711 KAPI'OLANI BOULEVARD, SUITE 500
HONOLULU, HAWAII 96813

HRD11/4806C

September 20, 2011

Jessie Garcia, Document Manager
National Energy Technology Laboratory
United States Department of Energy
3610 Collins Ferry Road
P.O. Box 880
Morgantown, WV 26507

RECEIVED**SEP 27 2011****GROUP 70 INTL**

**Re: Draft Environmental Assessment
Phycal Algae Pilot Project
Wahiawa and Kalaeloa, Island of O'ahu**

Aloha e Jessie Garcia,

The Office of Hawaiian Affairs (OHA) is in receipt of your August 9, 2011 letter seeking comments on a draft environmental assessment (DEA) prepared pursuant to the Council on Environmental Quality's National Environmental Policy Act (NEPA) implementing regulations (40 CFR Parts 1500-1508) and the Department of Energy's (DOE) NEPA implementing regulations (10 CFR Part 1021).

The DOE anticipates providing financial assistance through the American Recovery and Reinvestment Act of 2009 to Phycal, Inc. under a cooperative agreement to support a DOE initiative (the action). Phycal, Inc. will develop a pilot algae farm (farm) and processing facility (facility) that will utilize carbon dioxide to cultivate algae, extract oil from algal biomass and evaluate the oil as a renewable biofuel (DEA, page 4). The farm will be developed on 34.117 acres of land in Wahiawa and the facility will be constructed on 0.9 acres of land at the James Campbell Industrial Park in Kalaeloa.

We appreciate that you and your contracted consultant, Group 70 International, Inc. (Group 70) took the time to outreach to OHA by telephone on Wednesday, September 14, 2011 to discuss the findings of the DEA and the concerns we expressed during National Historic Preservation Act consultation for the action. By letter dated January 14, 2011 OHA concurred with your determination pursuant to the NHPA, this action would result in "no adverse effect" to historic properties, but expressed additional concerns.

OHA recognizes that the DOE and Group 70 have considered the concerns expressed in our January 14, 2011 letter relative to the devastating impacts the inadvertent release of any imported algae genera could have on the natural ecosystem in Hawai'i. It is our understanding

that the algae genera selected for cultivation at the farm are permissible by the State of Hawai'i Board of Agriculture. A series of measures to control the accidental release of cultures and live organisms into the environment surrounding the farm are being incorporated into facility designs.

OHA has no objections to the summary of impacts described in the DEA (Table 2.7.1). Thank you for the opportunity to provide comments. Should you have any questions or concerns, please contact Keola Lindsey at 594-0244 or keolal@oha.org.

'O wau iho nō me ka 'oia'i'o,



Clyde W. Nāmu'o
Chief Executive Officer

C: Tracy Furuya, Group 70 International, Inc.
925 Bethel Street,, Honolulu, Hawaii 96813



United States Department of the Interior



FISH AND WILDLIFE SERVICE
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122, Box 50088
Honolulu, Hawaii 96850

In Reply Refer To:
2011-R-0378

RECEIVED

OCT 04 2011

Mr. Jesse Garcia
NEPA Document Manager
U.S. Department of Energy
3610 Collins Ferry Road
P.O. Box 880
Morgantown, West Virginia 26507

OCT - 6 2011

GROUP 70 INTL

Subject: Reinitiation of Consultation for the Development of the Phycal Algae Farm and Processing Production Facility, Oahu

Dear Mr. Garcia:

The U.S. Fish and Wildlife Service (Service) received your letter, dated June 22, 2011, requesting our concurrence with your determination that the proposed Phycal Algae project is not likely to adversely affect federally listed species, including the federally endangered Hawaiian moorhen (*Gallinula chloropus sandvicensis*), Hawaiian coot (*Fulica alai*), Hawaiian stilt (*Himantopus mexicanus knudseni*), and Hawaiian duck (*Anas wyvilliana*) (collectively referred to as Hawaiian waterbirds). This response is in accordance with section 7 of the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C. 1531 *et seq.*).

We understand that the U.S. Department of Energy is proposing to offer financial assistance to Phycal, LLC, for the development of an algae farm located in Wahiawa and a processing production facility located at Kaleloa, both on the island of Oahu [TMK (1) 7-1-007:011, 030, 031 and TMK (1) 9-1-084:032]. The proposed project will consist of the construction and maintenance of several shallow raceway ponds, two stormwater retention basins, greenhouses, visitor and employee trailers, a processing building, an outdoor storage area, and a water conditioning unit. The funding provided for this project comes through the American Recovery and Reinvestment Act (ARRA).

In our letter dated January 18, 2011 (Service File 2011-I-0083), we concurred that this project may affect, but was not likely to adversely affect Hawaiian waterbirds based on the proposed conservation measures. However, in an email dated February 3, 2011, Mr. Jeff Overton, of Group 70 International, Inc. informed us that proposed conservation measures were altered and netting across all of the raceway ponds or retention basins would no longer be included. Based on this new information, we recommended that you reinitiate consultation on the proposed project. We received your letter on June 24, 2011; however, after reviewing the project details, we requested additional information to assist us in our determination. We received the requested details on September 14, 2011.

TAKE PRIDE[®]
IN AMERICA 

Hawaiian waterbirds

The Hawaiian duck, Hawaiian coot, Hawaiian moorhen, and Hawaiian stilt were federally listed as endangered under the Endangered Species Conservation Act of 1968, later replaced by the ESA. The primary causes of the decline of the Hawaiian waterbirds are the loss of wetland habitat, predation by introduced animals, hunting in the late 1800s and early 1900s, disease, and environmental contaminants. Currently the most important threat to the Hawaiian duck population is hybridization with feral mallards (*Anas platyrhynchos*). Breeding and foraging waterbirds are often attracted to artificial habitats, such as drainage ditches or retention ponds. However, these sites, known as “attractive nuisances” or “population sinks” often result in low breeding success due to increased disturbance and risk of predation.

Biological surveys, conducted in 2010, have concluded that waterbirds do not currently use the project site. However, once the raceways and retention basins are constructed and have water, it is likely that Hawaiian coots, Hawaiian ducks, and Hawaiian stilts will be attracted to the project site. We conclude that it is unlikely that Hawaiian moorhen will be attracted due to the lack of vegetation cover. To minimize potential impacts to Hawaiian waterbirds, and ensure the site does not become an attractive nuisance, the following measures will be included in the implementation of this project:

Facility Operations

- Habitat in the vicinity of the raceways and retention ponds will not be managed for suitable nesting waterbird habitat. Therefore, while waterbirds may be attracted to the site, it is unlikely that they will attempt to nest given the lack of vegetation.
- The proposed raceways will be elevated above ground level, reducing the potential for Hawaiian waterbird chicks to enter the water and become stuck, which would result in drowning.
- A 15 mile per hour speed limit will be implemented and drivers will be advised to ensure waterbird species are not underneath or behind their vehicles when backing up.
- Pets will not be allowed on the facility property.
- Employees will be informed of regulations stating that wildlife, including waterbirds, are not to be fed on the property.
- If a Hawaiian waterbird nest is observed on the project site, all work within 100 feet of the nest will stop and the Service will be notified for further recommendations.

Predator Control Program

- The Phycal Algae facility will be entirely enclosed with a chain-link perimeter fence to curtail entry of dogs, feral pigs, cats, and unauthorized human pedestrians.
- If waterbirds are found to be attracted to the site, live traps will be deployed and checked daily for cats and mongoose. Any trapped animals will be delivered to the Hawaii Human Society.
- Baited rodent traps will be deployed throughout the project site. Traps will be baited and used in a manner that is consistent with existing regulations and labeling.

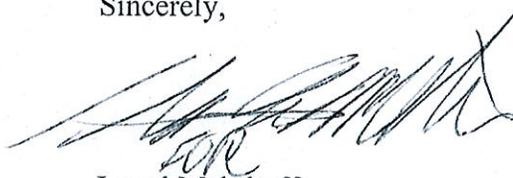
Avian Protection Plan – Awareness Training

- Phycal Algae has designed a module to teach employees and managers about the potential presence of Hawaiian waterbirds and measures to avoid or minimize impacts to these species. Employees will be required to take the training module annually. Training will cover species identification, protocols and procedures, federal regulations, and response to injured or dead waterbirds.
- All sick, injured, or dead Hawaiian waterbirds will be handled according to developed procedures and immediately reported to the Project Manager and our office.

Based on the above avoidance and minimization measures, the Service concurs with your determination this proposed project may affect, but is not likely to adversely affect the Hawaiian moorhen, Hawaiian coot, Hawaiian stilt, and Hawaiian duck. Should project plans change, or if additional information becomes available, we recommend you contact our office so that we may assist you in re-assessing project impacts. If take of listed species cannot be avoided, it may be necessary to consult with us pursuant to section 7(a)(2) of the ESA or apply for an incidental take permit under section 10(a)(1)(a) of the ESA.

We appreciate your efforts to conserve endangered species. If you have questions regarding this consultation, please contact Michelle Bogardus or Aaron Nadig, Fish and Wildlife Biologists (phone: 808-792-9400; fax: 808-792-9581).

Sincerely,



Loyal Mehrhoff
Field Supervisor

cc: Mr. Jeffery H. Overton, Group 70 International, Inc.
Mr. Reginald David, Rana Biological Consulting, Inc.