



# JAS. W. GLOVER, LTD.

GENERAL CONTRACTORS

License No. ABC-3

June 29, 2017

Michael Yee, Director  
Planning Department  
County of Hawaii  
101 Pauahi St., Suite 3  
Hilo, Hawaii 96720-4224

Subject: Special Use Permit No. SP14-404  
Jas. W. Glover, Ltd.  
Flora Study  
South Hilo, Hawaii  
Tax Map Key: (3) 2-1-013:004 (por.)

LAND USE COMMISSION  
STATE OF HAWAII  
2017 JUL - 2 A 10:39

Dear Mr. Yee,

Special Permit SP14-404 was issued by the State Land Use Commission to Jas. W. Glover, Ltd for a new quarry site on an 85.338 acre section of a 140.368-acre parcel of land identified as TMK (3) 2-1-013:004. Per condition No. 4 of SP14-404 requiring a flora study on unquarried land within the permit area, please find attached the report of a botanical study conducted by Geometrician Associates, LLC and completed this month. The previously unquarried portion is approximately 60 acres of land within the 85.338 acres of the permit. Details can be found in the report.

We are submitting this study for review and approval by the Planning Department in consultation with the U.S. Fish and Wildlife Service.

Thank you for reviewing this study and we look forward to your approval. Should you or any of our staff have any questions, please feel free to contact me or Mike Pearring at 808-935-0871.

Sincerely,

Byron Fujimoto  
Vice President

Cc: Maija Cottle, Planning Department  
Daniel E. Orodenker, Land Use Commission

# ***Botanical Survey of a 60-acre Portion of TMK (3<sup>rd</sup>.) 2-1-003:004 Honohonouui, South Hilo District, Island of Hawai'i***

By Ron Terry, Ph.D., Layne Yoshida, B.A. and Jen Johansen, B.A.  
Geometrician Associates, LLC  
June 2017

## *Introduction*

This botanical survey was prepared for Jas. W. Glover, Ltd. as part of compliance with conditions of Special Permit SP14-404, which was granted by the Hawai'i State Land Use Commission to allow quarry uses a 60-acre portion (the "subject area") of TMK 2-1-003:004 (Lot 47-D-3-B-2) (Figures 1-2). The subject area is currently mostly covered in forest.

## *Existing Vegetation Influences and Botanical Resources*

The climate in the area is mild and moist, with an average annual rainfall of about 130 inches and a mean annual temperature of approximately 75 degrees Fahrenheit (UH Hilo-Geography 1998:57). Geologically, the project site is located on the flanks of Mauna Loa Volcano, and the surface consists of 'a'a lava flows dated to 750 to 1,500 years before the present (Wolfe and Morris 1996). The U.S. Natural Resources Conservation Service classifies the soil at the subject area as Papai extremely cobbly highly decomposed plant material, 2 to 10 percent slopes.

Prior to human settlement of Hawai'i, the natural vegetation of parts of Hilo with this geologic setting was mostly lowland wet forest, dominated by 'ōhi'a (*Metrosideros polymorpha*), lama (*Diospyros sandwicensis*), kolea (*Myrsine lessertiana*), kopiko (*Psychotria hawaiiensis*), hala (*Pandanus tectorius*) trees, the climbing fern 'uluhe (*Dicranopteris linearis*), and various other trees, ferns, grasses, sedges and herbs (Gagne and Cuddihy 1990).

Most of the native forest within two miles of the coast in Hilo has been transformed through agriculture and development into non-native, human managed vegetation. Even where direct development has not occurred, wildfire and invasion by aggressive non-natives have changed the vegetation in ways subtle to profound. In such areas, non-natives including strawberry guava (*Psidium cattleianum*), gunpowder tree (*Trema orientalis*), bingabing (*Macaranga mappia*), Chinese banyan (*Ficus microcarpa*), shoebuttan ardisia (*Ardisia elliptica*), *Melastoma candida* and albizia (*Falcataria moluccana*), among others, usually dominate native species. The effect is most prominent near disturbed edges. Although some individual large trees, shrubs, herbs, vines and ferns may remain, the degree of native species diversity is usually low. Rare, threatened and endangered plants are rarely if ever found. For this reason, no critical plant habitat for this forest type in Hilo has ever been designated by the U.S. Fish and Wildlife Service.

We reviewed botanical surveys of areas near the proposed Glover quarry expansion. These included Whistler's (2003) survey of transect-based plots on 108 acres in the Keaukaha Military Reservation, Char's 23-acre survey for the Hilo Wastewater Treatment Plant, and various surveys conducted by Geometrician Associates for the Hawai'i County Department of Environmental Management in and around the South Hilo Sanitary Landfill, for the Sort Station, Vertical Landfill Expansion and miscellaneous other projects. Each of these surveys indicated a vegetation that generally conformed to

a pattern of substantial degradation, fairly low native species diversity, and an absence of rare or threatened or endangered plant species.

However, it is noteworthy that in a few very unusual locations, one endangered plant has persisted, if barely: *Cyrtandra nanawaleensis*, or haiwale. This inconspicuous low shrub in the African violet family (Gesneriaceae) plant was listed as endangered in 2015. At the time of its proposed listing in 2012, it was known only from a few locations in the lowland wet ecosystem of the Puna District on the island of Hawai‘i (Federal Register: October 17, 2012). There were four occurrences with approximately 140 individuals in Nanawale, Keauohana, and Malama Ki Forest Reserves. Conversion of areas within the Halepuaa section of Nanawale FR to papaya production over the past 25 years was thought to have contributed to the decline of the species in this area. Biologists cited in the Federal Register indicated that *C. nanawaleensis* was in decline throughout its already limited range. Since that time, the plant has been detected in a few other locations, including Conservation District land near Pu‘u Kaliu in Puna owned by Kamehameha Schools, where several patches with a few dozen plants were discovered by our firm during a botanical survey for a proposed quarry. A few small patches of *Cyrtandra* at the Keaukaha Military Reservation (KMR), assigned originally by botanist Art Whistler (2003) to the closely related species *C. paludosa*, were later determined to be *C. nanawaleensis*.

### *Methods*

The botanical survey of the subject area was conducted systematically by having botanists slowly walk zigzag transects spaced 15 meters apart, which allowed a view of the entire ground surface and canopy. The survey was conducted by Ron Terry, Layne Yoshida and Jen Johansen on four separate days in May 2017. Ron Terry also visited the nearby KMR to examine a patch of *Cyrtandra nanawaleensis* to gain an idea of its appearance, growth habit and condition in very similar forest. During the survey, plant samples were collected and later analyzed in the lab, as appropriate, to generate or confirm plant IDs.

### *Results: Vegetation and Flora*

The reader is referred to Figure 2 for photographs that illustrate the information presented below.

The vegetation was in general a closed-canopy forest dominated by the non-native species bingabing, albizia, gunpowder tree, strawberry guava and *Cecropia obtusifolia*. Jointly, they appeared to account for well over 75% of both cover and biomass. The only abundant native tree was ‘ōhi‘a, although hala and lapa also penetrated the canopy in a few places. A large variety of shrubs, ferns, herbs and vines made up the lower vegetation levels. Although dominated by non-natives, numerous native ferns (including two native tree ferns) as well as kopiko, lapa and the vining pandanus ‘ie‘ie (*Freycinetia arborea*) were also present. Unfortunately, the native component of the forest is clearly disappearing at a rapid rate. The vegetation still showed the effects of severe windfall from Tropical Storm Iselle, which hit the island in 2014.

Despite the domination by natives, 25 of the 115 species we identified were native (22%). Of these, 8 (7%) were endemic, i.e., found in Hawai‘i and nowhere else, and 17 (15%) were indigenous. All plants detected in the survey are relatively common in Hawai‘i. None are rare, threatened or endangered. No *Cyrtandra nanawaleensis* was detected, and the environment did not appear as conducive to its survival as it is at KMR. Inspection of KMR determined that rather than dominance by bingabing, which creates dense shade and cover the forest floor in the giant leaves shed by this plant, the non-

native canopy at KMR near the *Cyrtandra* patch is dominated by cecropia. These tall, rangy trees allow much more light penetration and do not shed and cover the native plants below as completely. No systematic determination of the presence or absence of wetlands, which requires examination of hydrology, soil, and vegetation, was performed as part of the biological survey. However, based on the authors' experience with jurisdictional wetlands and the climate and geology of the area, no wetlands appeared to be present and no wetlands vegetation was detected.

In summary, no threatened or endangered plant species listed or proposed for listing by the U.S. Fish and Wildlife Service (2017) appear to be present on the subject area. The vegetation does not provide highly or uniquely valuable habitat for native fauna. No existing or proposed federally designated critical habitat is present on the subject area. The history of nearby and onsite disturbance coupled with heavily invaded conditions and lowland context indicates that the subject area has very limited value in terms of conserving threatened or endangered native plant species.

#### *Impacts and Mitigation Measures*

No substantially adverse impact to native flora or vegetation would be expected as a part of clearing and utilizing the subject area for a quarry, as no intact native vegetation and no threatened or species are present. Jas. W. Glover Ltd., may wish to consider salvaging native and non-native trees for wood, in consultation with landowner Kamehameha Schools.

#### *Report Limitations*

No botanical survey of a large and/or densely vegetated area can claim to have detected every species present. Some plant species are cryptic in juvenile or even mature stages of their life cycle. Dry conditions can render almost undetectable plants that extended rainfall may later invigorate and make obvious. Thick brush can obscure even large, healthy specimens. The findings of this survey must therefore be interpreted with proper caution; in particular, there is no warranty as to the absence of any particular species.

## REFERENCES

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**Figure 2. Subject Area Vegetation Photos**



2a. Dense canopy of bingabing and gunpowder tree ▲ ▼ 2b. ‘Ōhi‘a penetrates canopy in a few spots



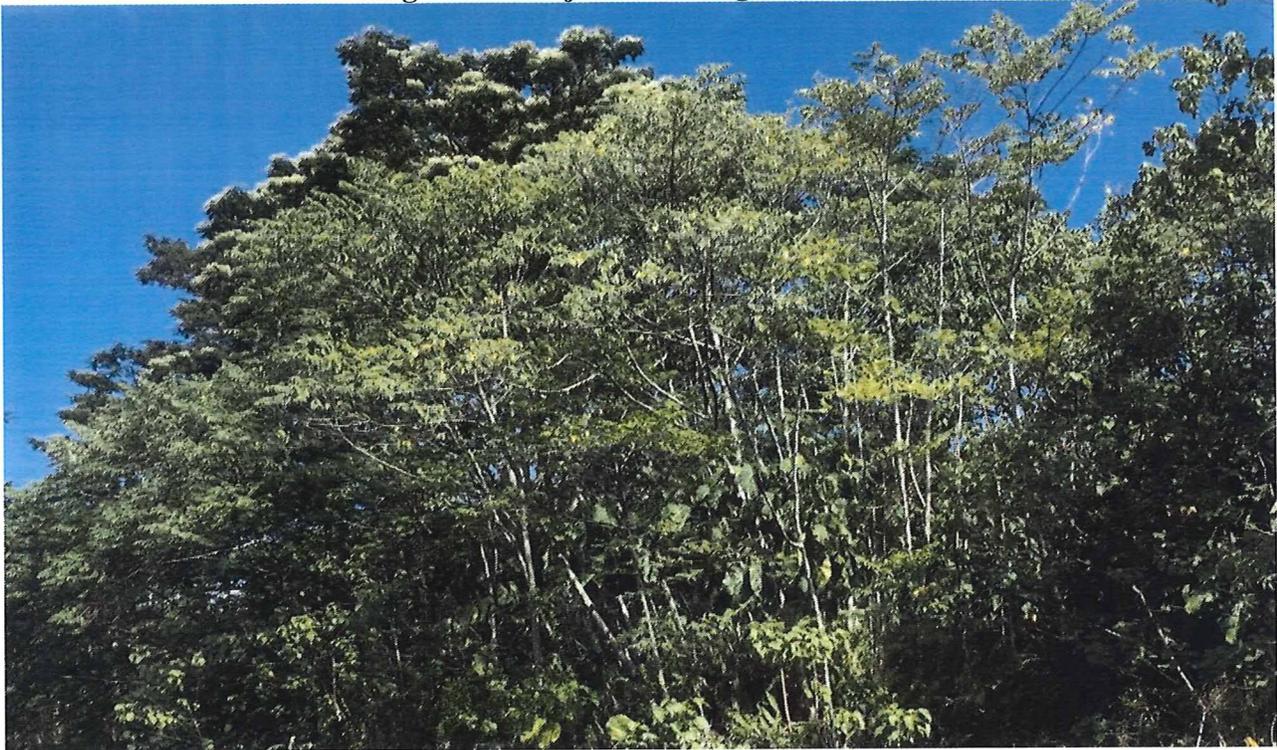
**Figure 3. Subject Area Vegetation Photos**



2c. Typical floor under bingabing canopy ▲ ▼ 2d. 'Ie'ie vines on 'ōhi'a



**Figure 2. Subject Area Vegetation Photos**



2e. Northern area with dominant albizia ▲ ▼ 2f. Patch of 'ōhi'a and kopiko



**Table 1. Plant Species Observed in Subject Area**

<b>Scientific Name</b>	<b>Family</b>	<b>Common Name</b>	<b>Life Form</b>	<b>Status*</b>
<i>Ageratum conyzoides</i>	Asteraceae	Ageratum	Herb	A
<i>Ageratum houstonianum</i>	Asteraceae	Ageratum	Herb	A
<i>Alistonia macrophylla</i>	Apocynaceae	Alistonia	Tree	A
<i>Alyxia stellata</i>	Apocynaceae	Maile	Vine	I
<i>Andropogon virginicus</i>	Poaceae	Andropogon	Herb	A
<i>Archontophoenix alexandrae</i>	Arecaceae	King Palm	Tree	A
<i>Ardisia elliptica</i>	Primulaceae	Shoebottom Holly	Shrub	A
<i>Arundina bambusifolia</i>	Orchidaceae	Bamboo Orchid	Herb	A
<i>Asplenium nidus</i>	Aspleniaceae	Ekaha	Fern	I
<i>Athyrium microphyllum</i>	Athyriaceae	Akolea	Fern	E
<i>Begonia hirtella</i>	Begoniaceae	Begonia	Herb	A
<i>Bidens alba</i>	Asteraceae	Bidens	Herb	A
<i>Bidens pilosa</i>	Asteraceae	Beggar's Tick	Herb	A
<i>Blechnum appendiculatum</i>	Blechnaceae	Blechnum	Fern	A
<i>Buddleia asiatica</i>	Buddleiaceae	Buddleia	Shrub	A
<i>Cassytha filiformis</i>	Lauraceae	Kauanoa pehu	Vine	I
<i>Castilleja arvensis</i>	Orobanchaceae	Indian paintbrush	Herb	A
<i>Cecropia obtusifolia</i>	Urticaceae	Cecropia	Tree	A
<i>Cestrum nocturnum</i>	Solanaceae	Night Jasmine	Shrub	A
<i>Chamaecrista nictitans</i>	Fabaceae	Chamaecrista	Herb	A
<i>Chloris barbata</i>	Poaceae	Chloris	Herb	A
<i>Christella cyatheoides</i>	Thelypteridaceae	Kikawaio	Fern	E
<i>Cibotium chamissoi</i>	Dicksoniaceae	Hapu'u meu	Tree	E
<i>Cibotium menziesii</i>	Dicksoniaceae	Hapu'u i'i	Fern	I
<i>Clidemia hirta</i>	Melastomataceae	Clidemia	Herb	A
<i>Clusia rosea</i>	Clusiaceae	Autograph Tree	Tree	A
<i>Cocculus orbiculatus</i>	Menispermaceae	Huehue	Vine	I
<i>Commelina diffusa</i>	Commelinaceae	Honohono	Herb	A
<i>Cordyline fruticosa</i>	Agavaceae	Ti	Shrub	PI
<i>Crotalaria spp.</i>	Fabaceae	Rattlepod	Herb	A
<i>Cuphea carthagenensis</i>	Lythraceae	Tarweed	Herb	A
<i>Cyperus polystachyos</i>	Cyperaceae	Pycreus Sedge	Herb	I
<i>Desmodium sandwicense</i>	Fabaceae	Tickfoil	Herb	A
<i>Desmodium triflorum</i>	Fabaceae	Desmodium	Herb	A
<i>Dicranopteris linearis</i>	Gleicheniaceae	Uluhe	Fern	I
<i>Dioscorea pentaphylla</i>	Dioscoreaceae	Five-leaf Yam	Vine	PI
<i>Diospyros sandwicensis</i>	Ebenaceae	Lama	Tree	E
<i>Dissotis rotundifolia</i>	Melastomataceae	Dissotis	Vine	A
<i>Elaphoglossum pellucidum</i>	Dryopteridaceae	Hoe a Maui	Fern	E
<i>Emilia fosbergii</i>	Asteraceae	Pualele	Herb	A
<i>Emilia sonchifolia</i>	Asteraceae	Pualele	Herb	A
<i>Epidendrum sp.</i>	Orchidaceae	Epidendrum	Herb	A
<i>Eragrostis sp.</i>	Poaceae	Eragrostis	Herb	A
<i>Euphorbia hirta</i>	Euphorbiaceae	Garden Spurge	Herb	A
<i>Euphorbia hypericifolia</i>	Euphorbiaceae	Graceful Spurge	Herb	A
<i>Falcataria moluccana</i>	Fabaceae	Albizia	Tree	A

Table 1, continued				
Scientific Name	Family	Common Name	Life Form	Status*
<i>Ficus microcarpa</i>	Moraceae	Chinese Banyan	Tree	A
<i>Fimbristylis dichotoma</i>	Cyperaceae	Fimbristylis	Herb	I
<i>Freycinetia arborea</i>	Pandanaceae	'Ie 'Ie	Vine	I
<i>Gonocormus minutus</i>	Hymenophyllaceae	Gonocormus	Fern	I
<i>Haplopteris elongata</i>	Vittariaceae	'Ohe'ohe	Fern	I
<i>Hedychium sp.</i>	Zingiberaceae	Ginger	Herb	A
<i>Hedyotis biflora</i>	Rubiaceae	Hedyotis	Herb	A
<i>Heterocentron subtriplinervium</i>	Melastomataceae	Pearl Flower	Herb	A
<i>Hyptis pectinata</i>	Lamiaceae	Hyptis	Herb	A
<i>Ipomoea indica</i>	Convolvulaceae	Morning Glory	Vine	I
<i>Kyllinga brevifolia</i>	Cyperaceae	Kyllinga	Herb	A
<i>Lantana camara</i>	Verbenaceae	Lantana	Shrub	A
<i>Lepisorus thunbergianus</i>	Polypodiaceae	Lepisorus	Fern	I
<i>Lygodium japonicum</i>	Schizaeaceae	Japanese Climbing Fern	Fern	A
<i>Macaranga mappia</i>	Euphorbiaceae	Bingabing	Tree	A
<i>Macaranga tanarius</i>	Euphorbiaceae	Macaranga	Tree	A
<i>Machaerina mariscoides</i>	Cyperaceae	Uki	Herb	I
<i>Mangifera indica</i>	Anacardiaceae	Mango	Tree	A
<i>Megathyrsus maximus</i>	Poaceae	Guinea Grass	Herb	A
<i>Melinis repens</i>	Poaceae	Natal Red Top	Herb	A
<i>Melinis minutiflora</i>	Poaceae	Molasses Grass	Herb	A
<i>Melochia umbellata</i>	Sterculiaceae	Melochia	Tree	A
<i>Metrosideros polymorpha</i>	Myrtaceae	'Ōhi'a	Tree	E
<i>Michelia sp.</i>	Magnoliaceae	Michelia	Tree	A
<i>Miconia calvescens</i>	Melastomataceae	Miconia	Tree	A
<i>Mimosa pudica</i>	Fabaceae	Sleeping Grass	Herb	A
<i>Morinda citrifolia</i>	Rubiaceae	Noni	Tree	A
<i>Myrsine lessertiana</i>	Myrsinaceae	Kolea	Tree	E
<i>Nephrolepis cordifolia</i>	Nephrolepidaceae	Sword Fern	Herb	I
<i>Nephrolepis exaltata</i>	Nephrolepidaceae	Sword Fern	Fern	I
<i>Nephrolepis multiflora</i>	Nephrolepidaceae	Sword Fern	Fern	A
<i>Ophioderma pendulum</i>	Ophioglossaceae	Ophioderma	Fern	I
<i>Oplismenus hirtellus</i>	Poaceae	Basket Grass	Herb	A
<i>Paederia foetida</i>	Rubiaceae	Maile Pilau	Vine	A
<i>Pandanus tectorius</i>	Pandanaceae	Hala	Tree	I
<i>Paspalum conjugatum</i>	Poaceae	Hilo Grass	Herb	A
<i>Paspalum urvillei</i>	Poaceae	Paspalum	Herb	A
<i>Passiflora edulis</i>	Passifloraceae	Lilikoi	Vine	A
<i>Pennisetum purpureum</i>	Poaceae	Elephant Grass	Herb	A
<i>Phaius tankervilleae</i>	Orchidaceae	Chinese Ground Orchid	Herb	A
<i>Philodendron sp.</i>	Araceae	Philodendron	Herb	A
<i>Phlebodium aureum</i>	Polypodiaceae	Golden Polypody	Fern	A
<i>Phyllanthus debilis</i>	Euphorbiaceae	Phyllanthus	Herb	A
<i>Phymatosorus grossus</i>	Polypodiaceae	Laua'e	Fern	A
<i>Pityrogramma calomelanos</i>	Pteridaceae	Silver Fern	Fern	A
<i>Pluchea carolinensis</i>	Asteraceae	Pluchea	Shrub	A
<i>Polygala paniculata</i>	Polygalaceae	Milkwort	Herb	A

Table 1, continued				
Scientific Name	Family	Common Name	Life Form	Status*
<i>Psidium cattleianum</i>	Myrtaceae	Strawberry Guava	Tree	A
<i>Psilotum nudum</i>	Psilotaceae	Moa	Fern ally	I
<i>Psychotria hawaiiensis</i>	Rubiaceae	Kopiko	Tree	E
<i>Pteridium aquilinum subsp. decompositum</i>	Hypolepidaceae	Bracken Fern	Fern	E
<i>Pteris cretica</i>	Pteridaceae	‘Oali	Fern	I
<i>Rhynchospora caduca</i>	Cyperaceae	Beak Rush	Herb	A
<i>Rubus rosifolius</i>	Rosaceae	Thimble Berry	Herb	A
<i>Sacciolepis indica</i>	Poaceae	Glenwood Grass	Herb	A
<i>Sadleria cyatheoides</i>	Blechnaceae	Ama‘u fern	Fern	E
<i>Schefflera actinophylla</i>	Araliaceae	Octopus Tree	Tree	A
<i>Schizachyrium condensatum</i>	Poaceae	Beardgrass	Herb	A
<i>Scleria testacea</i>	Cyperaceae	Scleria	Herb	I
<i>Spathoglottis plicata</i>	Orchidaceae	Philippine Ground Orchid	Herb	A
<i>Sphenomeris chinensis</i>	Lindseaceae	Pala‘a fern	Fern	I
<i>Spermacoce assurgens</i>	Rubiaceae	Spermacoce	Herb	A
<i>Stachytarpheta jamaicensis</i>	Verbenaceae	Jamaican Vervain	Shrub	A
<i>Syzygium cumini</i>	Myrtaceae	Java Plum	Tree	A
<i>Themeda villosa</i>	Poaceae	Lyon’s Grass	Herb	A
<i>Trema orientalis</i>	Ulmaceae	Trema	Tree	A
<i>Urochloa mutica</i>	Poaceae	California Grass	Herb	A

A=Alien PI=Polynesian Introduction E=Endemic I=Indigenous END= Listed Endangered (none)