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SUBSURFACE INVESTIGATION REPORT

LA'I'OPUA VILLAGE 4
AKAU AND HEMA SUBDIVISIONS

KEALAKEHE, HAWAII, HAWAII

for

ENGINEERS SURVEYORS HAWAII, INC.

by

FEWELL GEOTECHNICAL ENGINEERING, LTD.

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This report was prepared by
me or under my supervision.

By Timothy J. Cavanaugh, P.E.

March 22, 2012

Important Information about Your

Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual

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SUBSURFACE INVESTIGATION REPORT

La'i'opua Village 4
Akau and Hema Subdivisions
Kealakehe, Hawaii, Hawaii

INTRODUCTION

We have completed a subsurface investigation for the site of the proposed La'i'opua Village 4, Akau and Hema Subdivisions, in Kealakehe, Hawaii, Hawaii. This report summarizes our findings and presents geotechnical recommendations for the development of the site. This work has been completed in general accordance with our March 31, 2011 Proposal and your emailed notice to proceed dated August 16, 2011.

PROJECT HISTORY

The La'i'opua Village 4 site is an irregularly-shaped parcel covering an area of about 55 acres on the northwestern corner of the intersection of Keanalehu Drive and Manawalea Street in Kealakehe. The general area of the site is shown on the Project Location Map, Figure 1 in the Appendix. The subdivision was originally designed to support about 236 single family residential lots for the Department of Hawaiian Home Lands (DHHL).

A Soils Investigation Report, dated December 9, 2005, was completed for the project by Hirata & Associates, Inc. (HAI). The HAI report indicates that the site was originally underlain by a thin soil layer consisting of volcanic ash with gravel and cobbles, over intact basalt interbedded with up to 6-foot thick seams of Aa Clinker.

Mass grading operations for the subdivision were performed under the observation and testing of HAI personnel during the period between October 15, 2007 and October 22, 2008. The grading operations included fills up to 20 feet thick, and included layers of coarse rock fill which were to be choked off with 12-inch thick choke layers consisting of 6-inch minus granular fill. The individual lots were to be capped with at least 24 inches of 2-inch minus granular fill. In cut areas, the existing soils and rock were to be overexcavated to allow placement of the 24 inches of capping fill.

The site grading operations were discontinued in late 2008. We understand that most of the grading operations had been completed by this time. Most of the lots and roadways had reportedly been graded to their planned finish subgrade levels. However, the grading for several of the lots was reportedly not completed in accordance with the recommendations of the HAI report, due primarily to a shortage of capping fill material.

Copies of the field reports by HAI documenting their observations and test results during the construction were submitted to DHHL. However, we understand that a Final Grading Report for the subdivision was not completed since the grading work was not entirely complete at the time the work was discontinued.

We understand that based on their construction documents, DHHL is comfortable that the previous grading operations had been completed in conformance with the project requirements and that the previously placed fills are acceptable to DHHL up to their existing grades. We also understand that the graded slopes within the site are considered to possess adequate stability.

PURPOSE AND SCOPE

The construction of the La'i'opua Village 4 Subdivision is now scheduled to resume under a new set of design consultants. The work will be divided into 2 parts, designated as the Akau and Hema Subdivisions. Engineers Surveyors Hawaii, Inc. (ESH) will provide the civil engineering design services for the Akau Subdivision, including the remaining site grading and the design of the roadways, utilities, and related infrastructure improvements. Akinaka & Associates, Ltd. (AAL) will provide similar design services for the Hema Subdivision.

Geotechnical engineering services to assist ESH and AAL with the completion of the civil engineering design of both subdivisions was requested of Fewell Geotechnical Engineering, Ltd, (FGE) by ESH. The geotechnical engineering design services are based on our understanding with ESH that the existing fills at the site are considered to have been properly constructed in accordance with the recommendations of the 2005 HAI report to their current levels and are acceptable "as is" to DHHL. Additionally, we understand that the existing slopes at the site are considered to possess adequate stability such that no additional stability evaluation is required.

Our work included reviewing our available soil information on the site and the geotechnical construction records by HAI which were provided by ESH, and performing a site reconnaissance to observe and map the exposed surface conditions on the lots and roadways. The

reconnaissance included excavating 26 shallow test pits in selected lots to evaluate the thickness and quality of the surface capping fill.

Samples were obtained for laboratory classification and compaction testing, and field density tests were performed on the surface soils on up to 50 of the subdivisions' lots, to evaluate the general compaction levels currently exhibited by the capping fill. The field and laboratory data were evaluated in conjunction with the planned construction, and our findings and conclusions are presented in this report.

The scope of our work also included developing general recommendations for the project's preliminary drywell design and construction. The general recommendations for the drywells are based on the boring information included in the 2005 HAI Report and our experience with the drywells on the nearby La'i'opua Village 5 Subdivision. Except for the shallow test pits to investigate the thickness and quality of the surface capping fill, no subsurface explorations or test borings were included in our work to evaluate the quality and thickness of the thicker fills, the drainage characteristics of the on-site materials, or the natural subsurface materials for the drywell design. The drywell recommendations should be confirmed by FGE during construction.

We understand that the houses on the individual lots of the subdivision's will likely be designed and constructed using the design/build construction process. At the request of ESH, preliminary geotechnical recommendations for the foundations and concrete slab-on-grade floors of the future residences have been provided to assist the designer-builders with their preliminary designs and their preliminary cost estimating for the project. The final design of the new dwellings and their individual improvements should be the responsibility of the designer-builders and their own geotechnical engineers.

The results of the field exploration, including a Test Pit Location Plan and a summary of the materials encountered in the test pits are included in Appendix A. The results of the field density tests performed on various lots, together with the results of laboratory tests, are also included in Appendix A. The limitations of this investigation and report are included as Appendix B.

PROJECT CONSIDERATIONS

The La'i'opua Village 4 site is an irregularly-shaped parcel covering an area of about 55 acres on the northwestern corner of the intersection of Keanalehu Drive and Manawalea Street in Kealakehe. The site is bounded by Keanalehu Drive on the west and south, by Manawalea Street on the east, by existing residences and the Uhiuhi Preserve on the north.

The original site topography, prior to the previous grading, sloped down moderately toward the southwest at an average gradient of about 10 percent. The existing ground surface ranged from about Elev. 590 in the northeastern corner of the site, down to about Elev. 400 along its western edge. The previous grading which was discontinued in 2008 has resulted in a series of terraces which drop down in the east-to-west direction. The grade differences between the terraces are supported by graded 2 Horizontal to 1 Vertical (2H:1V) slopes up to 30 feet in height.

A 5-acre piece on the northern edge of the site, which is designated as a future park site, has been graded to provide a relatively level terrace within the interior portion of the site. Graded 2H:1V slopes between 10 and 20 feet high, with an 8-foot wide bench at approximately 10 feet below the top of the slope, elevate the adjacent residential areas outside the northern, edge of the park site. Similar 2H:1V slopes up to 20 feet high, with an 8- to 10-foot wide bench about 10 feet below the top of slope, support the grade difference between the park site and the Uhiuhi Preserve site above the eastern edge of the park, and Lots 67 and 68 of the Akau Subdivision outside the southern edge of the park. A 2H:1V slope up to 12 feet high drops down to the Akau Subdivision Lots 25, 26, and 54 along the western edge of the park area.

Currently, most of the lots in the northern and western portions of the site are covered with waist-high grass. The lots in the southeastern portion of the site are generally covered with tall grass and dense bushes with scattered clear areas. Five temporary silting basins, 4 along the lower, western and southern edges of the site, and 1 within its central area, are present within the site. The silting basins are generally 2 to 5 feet deep and covered with dense vegetation.

The Lot Numbering Plan, received from Engineers Surveyors Hawaii, Inc. (ESH) via email on September 1, 2011, indicates that the La'i'opua Village 4 Subdivision will now include 2 separate subdivisions, designated as the Akau Subdivision and the Hema Subdivision. The Akau Subdivision encompasses the northern portion of the La'i'opua Village 4 parcel, with the Hema Subdivision occupying the southern portion of the property.

The Akau Subdivision will be developed to support 118 single-family residential lots, a Clustered Mailbox Unit (CBU) lot, a Mini Preserve, and a 5-acre park. The Mini-Preserve is the size of an individual lot in which no grading is planned. Additional improvements in the Akau Subdivision will include 8 asphalt-paved residential roads, designated as Roads A through H, with a total of about 5,400 linear feet of roadway. Similar lengths of utility improvements, including sewer, water and electrical utilities are anticipated.

The Hema Subdivision will include 125 single-family residential lots and 5 asphalt-paved roads, designated as Roads B-1, F-1, G-1, H-1 and I. This results in a total of about 4,300 feet of road and a similar length of sewer, water, and electrical utilities for the Hema Subdivision.

Site drainage for each subdivision will be disposed of through a series of drywells. The preliminary information indicates that 27 drywells are anticipated for the Akau Subdivision and we have assumed a similar number of drywells will be necessary for the Hema Subdivision. We have assumed that the drywells will consist of the County of Hawaii's standard drywell and will be extended to depths of up to 25 feet below the lowest adjacent finish ground surface. Full-scale percolation tests are assumed to be required for selected drywells, randomly selected by the County during construction.

Except for the previously graded 5-acre Park Site of the Akau Subdivision, we understand that no major site grading is planned at the site. Additional grading within the lots of the subdivisions is anticipated be limited to fills of up to 2 feet in thickness, to provide the desired gradients for drainage as well as to assure that the lots are overlain by sufficient thicknesses of capping fill material. Additional grading within the park site is anticipated to include cuts of up to 10 feet in depth and fills of up to 5 feet in thickness. The cuts are planned along the eastern edge of the park site, adjacent to the Uhiuhi Preserve, to extend the level area of the site while maintaining the current grade difference between the preserve and the park site. Graded slopes are planned to support the grade differences resulting from the additional site grading with no retaining walls currently anticipated.

SUBSURFACE INVESTIGATION

A total of 26 test pits were excavated on August 23 and 24, 2011 at the approximate locations shown on the Test Pit Location Plan, Figure 2 in the Appendix. The test pits were excavated with a Komatsu WB140 rubber-tired hopto to depths ranging from 1 to 3 feet to evaluate the capping

fill. The test pits were terminated once either the 6-inch minus fill or basalt underlying the capping fill was encountered, or at a depth of 3 feet, whichever was shallower. The materials found in the test pits are summarized in Table I in Appendix A.

Field density tests were performed on the exposed subgrade soils on 46 of the individual lots of the development. The tests were generally performed on lots were the exposed surface soils consisted of the 2-inch minus granular capping fill. No tests were performed on lots where the exposed surface materials consisted of the coarser, 6-inch minus fill, or basalt. The results of field density tests performed on the capping fill are summarized in Table II.

LABORATORY TESTING

Bag samples of the predominant materials found in the test pits were selectively obtained for laboratory testing. The rocky nature of the materials at the site generally limited the laboratory testing to index property tests such as gradation and Atterberg Limits tests. A Laboratory California Bearing Ratio (CBR) test was performed on a bulk sample obtained from the test pits. The results of the CBR, gradation and Atterberg Limits tests are graphically presented in Figures 3 through 7 in Appendix A.

GENERAL SUBSURFACE CONDITIONS

Eleven of the fourteen test pits excavated within the Akau Subdivision, Test Pits 2, 4 through 9, and 11 through 14, encountered capping fill which extended to depths of between 2 and 3 feet below the current ground surface. Test Pits 1, 3, and 10, encountered between ¼ and 1¾ feet of capping fill over 6-inch minus coarse granular fill which extended to the bottom of these test pits. Our field observations and laboratory testing indicate that about half of the capping fill consisted of 2-inch minus granular fill, with the remaining half of the capping fill consisting of 3-inch minus material.

Of the twelve test pits excavated within the Hema Subdivision, only two test pits, Test Pits 15 and 18, encountered at least 2 feet of the capping fill. Of the remaining ten test pits, seven test pits, Test Pits 16, 17, 20 through 23, and 26, encountered between 1 and 1½ feet of either 2-inch minus or 3-inch minus capping fill, over either the coarse 6-inch minus fill, or basalt. Test Pits 19, 24, and 25 encountered the 6-inch minus fill material at the ground surface.

Our field observations and laboratory gradation tests performed on the capping fill indicated that the capping fill material generally has a maximum particle size of 3 inches and contains between

48 and 59 percent gravel-sized rock fragments, between 34 and 42 percent sand-sized fragments, and between 7 and 9 percent silt. The fine-grained portions of the materials were non-plastic. A Laboratory CBR test indicated that the capping fill material exhibits a CBR of 99 with no swell.

The field density testing revealed variable compacted dry densities for the capping material between 109.9 pounds per cubic foot (p.c.f.) and 142.5 p.c.f., through generally between about 120 and 132 p.c.f. The variance in the dry densities appears to be due to the gradation of the material as the lower dry densities were indicated in fill which appeared "boney", i.e., contained little fine-grained soils. In general, the capping fill, as well as the underlying 6-inch minus fill exposed in the test pits, appeared to have been compacted into a dense configuration.

Groundwater or subsurface seepage was not observed in any of the test pits excavated during this investigation.

DISCUSSION

We believe that the proposed site of La'i'opua Village 4 can be adequately developed to satisfactorily support the planned dwellings and their related subdivision improvements provided the recommendations of this report are followed. However, based on the materials encountered in the test pits and our field observations, it appears that the southern Hema Subdivision will require significantly more additional grading work than the northern Akau Subdivision.

The subsurface investigation has revealed that the majority of the Akau Subdivision site is generally underlain by at least 2 feet of 2-inch minus or 3-inch minus low expansion capping fill over either coarse 6-inch minus granular fill material. Although about ½ of the capping fill encountered in the test pits or exposed at the ground surface in the Akau Subdivision appeared to consist of 3-inch minus granular fill, rather than the 2-inch minus granular capping fill material specified in the original project documents, we do not believe that the slightly larger-grained capping material should have significant adverse effects of the proposed construction. However, the future design/build house builder contractor should be advised of the larger grain sizes of the capping fill throughout both subdivisions.

Test Pits 1, 3, and 10, which were excavated along the lower, western row of lots, between the existing Keanalehu Drive and the future Road B of the Akau Subdivision, encountered between ¼ and 1¾ feet of the capping fill over the 6-inch minus coarse fill material. This insufficient capping

fill thickness appears to represent Lots 1 through 18. However, since the current grades on these lots are below the current grades along the adjacent Road B, it appears that additional capping fill still needs to be placed. If no additional fill is planned within these lots, the existing capping fill and underlying 6-inch minus material should be removed sufficiently to allow placement of at least 2 feet of 2-inch minus capping fill on these lots.

The subsurface investigation indicates that the grading work within the southern Hema Subdivision, had not progressed as far as the work on the Akau Subdivision. Ten of the 12 test pits excavated within the Hema Subdivision encountered less than the required 2-foot thickness of capping fill recommended in the HAI Report. Additionally, intact basalt or coarse granular fill with boulders up to 12 inches in diameter, were exposed at the ground surface in at least 32 of the 125 lots.

Based on the test pits and our field observations, it appears that, except for about 25 lots along the northern edge of the subdivision, most of the lots within the Hema Subdivision currently have less than the recommended 2-foot thickness of capping fill. The lots which appear to have the recommended capping fill in place are Lots 46, 47, 72 through 77, 98 through 104, 112 through 117, and 122 through 125.

If no additional grading is planned to attain the finish grades within the lots of the Hema Subdivision, extensive remedial earthwork will be required to provide the 2-foot thickness of capping fill. If these grades are at or near the planned finish grades, up to 2 feet of additional rock excavation and the subsequent backfilling with the 2-inch minus capping fill will be necessary to provide the recommended 2-foot thick capping fill thickness.

Where the coarse rock fill is exposed at the current subgrade levels, overexcavations of up to 3 feet would be required to allow placement of the 2 feet of capping fill over a 1-foot thick choke layer above the coarse rock fill. To reduce the amount of the additional site excavations, including hard rock excavation, it may be desirable to adjust the finish grading scheme for the Hema Subdivision to fill the existing subdivision by at least 2 feet to attain the finish pad grades. This will increase the amount of imported fill necessary to complete the grading but would reduce the additional site excavation and fill reconstruction.

The field density tests completed on the exposed capping fill indicated dry densities ranging from about 110 p.c.f. to over 140 p.c.f. The existing capping fill exposed at the subgrade level in all of

the lots and roadways should be proof-rolled with a heavy, smooth-drum vibratory compactor, to densify any loose pockets, prior to additional fill placement or future construction.

The 2005 HAI Soils Investigation Report indicates that the original ground surface at the site was underlain by intact basalt interbedded with seams of Aa clinker at shallow depths. Heavy rock excavating equipment, such as large, hoeram-equipped excavators, should be anticipated to facilitate the removal of the intact basalt encountered in utility trenches extending below the original ground surface. Large boulder-sized rock fragments generated by utility trenches extending into the basalt layers, will require crushing and segregation before they can be re-used as 2-inch minus trench backfill or in the shallow fills anticipated at the site.

We understand that the fill placed during the original mass grading included coarse rock fills which were choked off with 6-inch minus choke layers. Should the coarse rock fill be present above the invert of utility lines, overexcavation of the coarse rock fill will be required to allow reconstruction of the 1-foot thick choke layer beneath the utilities pipe bedding layer. Utility excavations in the fills will likely be ragged with significant over-breaks due to the crushed rock materials within the fills. Utility trench sideslopes within fill embankments will possess little or no binder, and raveling and sloughing of the sidewalls will likely occur. The contractors should be advised to anticipate these occurrences and provide for it in their excavation and backfilling work.

The park site grading will result in additional cuts of up to 10 feet in depth along its eastern edge, but will not increase the overall slope height of 20 feet in this area. The exposed slope appears to be a basalt formation consisting of intact basalt with thin interbedded layers of Aa Clinker. Our analysis indicates that cut slopes in the exposed basalt formation should be stable at an inclination of 1½H:1V for the existing heights of up to 20 feet, with factors of safety of at least 1.5 under static conditions, and at least 1.1 under the seismic conditions anticipated for this area under the 2006 International Building Code (IBC). These are the typically accepted minimum safety factors for this type of geotechnical analysis.

The above-recommended 1½H:1V cut slopes will result in relatively steep high slopes at the park site. We believe it would be prudent to prevent access to the top of these slopes to minimize the potential for residents falling down the slopes.

Drywells - The project will include up to 27 drywells in each of the 2 subdivisions to dispose of surface water runoff. We understand that it is desired to use 5-foot inside diameter (I.D.) wells,

rather than the County of Hawaii's Standard 6-foot I.D. drywells. Additionally, we understand that, where possible, it is desired not to use the concrete rings for the drywells.

The 2005 HAI Report indicates that the La'i'opua Village 4 site is generally underlain by intact 3- to 8-foot thick layers of intact, massive basalt interbedded with 1- to 6-foot thick layers of Aa Clinker. The subsurface conditions of the HAI report are similar to those encountered by FGE at the nearby La'i'opua Village 5 site. Based on previous, full-scale percolation tests performed in the drywells for the La'i'opua Village 5 Subdivision, it appears that 5-foot diameter drywells may be sufficient for both subdivisions, provided the design flows do not exceed 2 c.f.s. However, extending the 5-foot I.D. drywells deeper than the standard 25-foot depth may be required should additional full-scale tests indicate inadequate drainage capacity.

Regarding the requirement for using the concrete rings within the drywells, the rings surrounded by filter gravel can resist caving and assist the drywell in maintaining its planned volume and drainage attributes. From a geotechnical standpoint, the need for the concrete rings depends primarily on the stability of the drywell shaft walls and is a function of the subsurface materials and the contractor's construction methods.

The concrete rings will be required for the upper portions of the drywell shafts which extend through the surface fill. Once the drywell shaft encounters the intact, massive basalt, the drywell shafts can generally be excavated vertically and still maintain adequate stability. Rings should still be anticipated where thick seams of Aa Clinker are encountered. The omission of the rings within the portion of the drywell extending through the intact basalt should be acceptable, provided the lack of filter gravel does not adversely affect the performance of the drywells.

We understand that lava tubes were encountered in previous utility excavations on Keanalehu Drive, near is intersection with Road C, and DHHL is concerned with lava tubes being encountered within the new drywell excavations. Where lava tubes showing evidence of transmitting water are encountered in the drywell excavations, an extension of the drywells and the inclusion of non-perforated concrete rings within the drywell down to the invert of the lava tube, may be required. Should lava tubes be exposed during construction, FGE should be notified for supplemental recommendations regarding the drywell construction.

Preliminary Dwelling Foundation and Slab Recommendations – The following preliminary recommendations are given to assist the designer- builders for the project with their preliminary

design and cost-estimating purposes for the dwellings and lot improvements during the house construction and individual lot development. The final design and construction of the dwellings and lot improvements should be the responsibility of designer-builders of the project and their own geotechnical engineering consultant.

Provided the grading recommendations of this report are followed, we believe that light residential dwellings can be supported on shallow individual spread footing, continuous foundations or a combination of these two types. The foundations should bear within the properly compacted 2-inch minus capping fill of the graded lots.

Individual spread footings should have a minimum base width of at least 18 inches. Continuous foundations should have a minimum base width of at least 12 inches. Foundations should be embedded at least 12 inches below the lowest adjacent compacted subgrade on level ground. Foundations on slopes or within 5 feet of the top of the slope should be founded such that there is at least 6 feet of horizontal setback from the lower outside edge of the foundation to the slope face.

Foundations should bear on the 2-inch minus crushed rock granular fill compacted in accordance with the grading recommendations of this report, where they may be designed for a maximum allowable capacity of 3,000 pounds per square foot (p.s.f.). This value may be increased by one-third for short-term wind or seismic loads.

The bottom of the foundation excavations should be cleaned of loose materials and compacted to at least 90 percent relative compaction prior to the placement of the steel and concrete. Soft areas found in the fills should be removed down to properly compacted fill or hard/dense natural ground, and the resulting depression backfilled with properly compacted fill.

Steel reinforcement of the foundations should be provided in accordance with the recommendations of the designer builder's Structural Engineer. Total and differential settlements exceeding ½ inch are not anticipated provided the site grading is completed in accordance with the recommendations of this report and the column and wall loads of 30 kips and 2 kips per foot, respectively.

Concrete slabs-on-grade may be used for the dwelling construction provided the grading recommendations of this report are followed. This will assure that the subgrades for the slabs

consist of at least 2 feet of 2-inch minus crushed rock fill material compacted to at least 90 percent relative compaction, placed over intact rock or previously compacted materials.

Concrete slabs-on-grade should be underlain by at least 4 inches of ASTM D448 No. 6 aggregate to provide a capillary break between the bottom of the slab and the subgrade materials. If a vapor barrier is desirable, it should be installed in accordance with the recommendations of the designer-builder's Structural Engineer. Steel reinforcing of the concrete slabs-on-grades should be provided as recommended by the designer-builder's Structural Engineer.

RECOMMENDATIONS

Site Preparation

1. Prior to the start of actual grading operations, the site should be cleared and grubbed of all vegetation (not marked to remain), existing rubble, debris, and other deleterious material in accordance with Section 201 of the Standard Specifications for Road and Bridge Construction (Standard Specifications) of the County of Hawaii.

   a. All surface vegetation and other cleared materials should be removed and wasted off-site. Due to the rocky nature of the surface materials, some difficulties in the clearing operations should be anticipated, and hand-removal of the brush, small trees and their roots should be anticipated.

   b. The actual depth of grubbing can best be determined in the field, but we believe that 4 to 6 inches will likely suffice. The grubbed materials are not suitable for use as fill and should be wasted off-site.

2. Areas to receive fill where the then-existing ground surface is steeper than 5H:1V should be benched prior to fill placement. Benches should extend through any loose slope materials into clinker or the intact basalt. Sliver fills should be avoided.

Site Grading

3. Once the site has been properly prepared, grading operations may begin to generate the design finish grades. The level building pads for the dwellings should be designed such that their top of slope extends at least 5 feet beyond edge of the dwellings, their foundations, lanais and similar structural attachments. Where this criteria cannot be met, deeper than normal foundations or deepened thickened edge slabs should be anticipated.

4. Except for Lots 1 through 18, which are the westernmost row of lots adjacent to Keanalehu Drive, the subsurface investigation suggests that the Akau Subdivision is generally underlain by at least 2 feet of 2-inch minus or 3-inch minus granular capping fill.

5. Lots 1 through 18 of the Akau Subdivision will require the placement of up to 2 feet of additional, 2-inch minus granular capping fill. Since these lots appear to be below their planned

finish subgrade level, the placement of the 2 feet of capping fill material should not result in significant excavations to allow placement of the capping fill material.

6. The investigation indicates that the majority of the lots of the Hema Subdivision are underlain by less than 2 feet of capping fill material, and on many lots no capping material at all. Where less than 2 feet of fill is planned within the Hema Subdivision lots, the currently exposed subgrade should be overexcavated sufficiently to allow the placement of at least 2 feet of 2-inch minus capping fill on the lots and roadways.

7. After the site has been cleared and grubbed, the exposed soil subgrade in areas designated to support new construction should be proof-rolled with at least 5 passes of a heavy, vibratory smooth drum compactor, such as a Caterpillar CS-533 or equivalent imparting at least 40,000 pounds of dynamic force, to densify the near-surface fill. Any loose spots encountered should be removed down to properly compacted fill or intact basalt and the resulting depression backfilled in accordance with these recommendations.

8. Where the then-exposed subgrade consists of either intact basalt or coarse rock fill, it should be track-rolled with at least 7 passes of a large dozer such as a D-8 dozer, or larger, to densify any near-surface loose clinker pockets, and to detect any near-surface voids, lava tubes, soft spots, or other defects in the rock.

9. Site excavations to provide a sufficient thickness of the 2-inch minus capping fill, will likely encounter either coarse rock fill or intact basalt which will require the use of heavy rock-excavating equipment. It is anticipated that the predominant excavated material will be boulder-sized fragments of up to 2 to 3 feet in diameter, which must be segregated, processed and crushed for use as 2-minus capping fill or utility backfill.

10. Fills and backfills, whether imported or generated on-site, used within depths of 2 feet of the finish subgrade level of the lots or roadways should be relatively well-graded, and should have a maximum size of no more than 2 inches (2-inch minus crushed rock material). It should exhibit a CBR of at least 25 with no more than 1 percent swell, when tested in accordance with ASTM D1883 under a 51 p.s.f. surcharge. Larger well-graded 6-inch minus crushed rock fill and backfill may be used below depths of 2 feet below the finish subgrade levels of future structures or roadways.

11. The 2-inch minus fine-grained fill and backfill should be placed in level lifts of no more than 8 inches in loose thickness, moisture-conditioned to within 3 percent of their optimum moisture content and uniformly compacted to at least 90 percent relative compaction as determined by Laboratory Compaction Test ASTM D1557. Fill placed within 2 feet of the finished subgrades within the street right-of-ways should be compacted to at least 95 percent relative compaction.

12. The 6-inch minus material should be placed in level lifts of no more than 8 inches in loose thickness and compacted into a dense, unyielding layer. Field density testing of fills consisting of the minus 6-inch crushed rock material is not practical due to the large rock sizes and must be visually monitored. Compaction of the minus 6-inch crushed rock should be accomplished by contractors experienced in rock fill construction and should be observed full-time by FGE to determine whether the fill has been compacted in accordance with the recommendations herein.

13. Fill slopes should be laterally over-constructed during the mass grading and subsequently trimmed back to the planned finished grades, such that the finish slope face consists of a tight, well-compacted surface. Where coarse rock fills have been used for the site grading, boulders on the slope face should be removed and the slopes should be tracked to form a tight face. The use of additional 6-inch minus crushed rock should be anticipated to fine grade the coarse rock fill slopes.

14. New fill slopes within the subdivisions may be constructed as steep as 2H:1V for heights of up to 5 feet without benches. New slopes exceeding this height are not anticipated at this time and should be individually evaluated, should they occur. Cut slopes in the existing fills of the subdivisions should be sloped no steeper than 2H:1V for slope heights of up to 5 feet.

15. Cut slopes within the intact basalt and clinker along the eastern edge of the park site may be sloped as steep as 1½H:1V for heights of up to 20 feet. Unauthorized access to the tops of these slopes should be prevented.

16. The above-recommended slope inclinations should be adequately stable, but the surface will be subject to raveling. Should loose pockets in the existing fills, or defects in the rock be observed during construction, FGE should be notified such that additional recommendations can be provided. The remedial measures where this occurs will depend on the actual condition of the

formation, but may include guniting of occasional thick or loose clinker layers to minimize raveling and subsequent undermining of the slope.

Utilities

17. Utilities should be installed in accordance with Section 206 of the Standard Specifications and the applicable sections for each particular utility. Utility backfills should be placed and compacted utilizing the appropriate mechanical compactors around and above the pipes. Jetting and ponding as methods to compact the backfills should not be allowed.

18. Utilities may be founded in the compacted fill, Aa Clinker, or intact basalt. Where soft or loose spots are encountered at the bottom of utility excavations, they should be removed down to properly compacted fill, dense clinker, or intact basalt and the resulting depressions replaced with 2-inch minus fill compacted in accordance with the Grading recommendations.

19. It is anticipated that most of the deeper utilities will encounter intact basalt. The use of heavy rock-trenching equipment and hoe-rams should be anticipated for the excavations into the basalt.

20. Where utility trench excavations encounter coarse rock fill at the invert level, the trenches should be overexcavated sufficiently to allow placement of at least a 1-foot thick layer of 6-inch minus choke fill between the coarse rock fill and the pipe bedding.

21. At least 6 inches of pipe bedding or bed course should be provided below the utility pipes to provide uniform support to the pipes. Where intact basalt is encountered at the pipe invert levels, it should be over-excavated in accordance with the applicable section pertaining to each utility, but at least 6 inches below the bottom of the pipes, to allow the placement of granular pipe bedding or bed course.

22. The trench excavations in the fills should either be sloped back or shored in accordance with the applicable government safety regulations to prevent the granular fills from caving in, and to safeguard the workers within the trenches during the construction. The design of the shoring systems should be the responsibility of the contractor.

23. The trench excavations in the crushed rock fills and native clinker will likely be ragged with raveling and sloughing of the sidewalls due to the type of materials within the fills. Significant over-breaks should be anticipated. The contractors should be advised to anticipate these occurrences and make the appropriate provisions in their excavation and backfilling work.

24. The backfill for the utility trenches should meet the requirement of Structure Backfill A, or Trench Backfill A of Sections 703.20 and 703.21, respectively, of the Standard Specifications. Material conforming to Trench Backfill A, with a maximum size of 1 inch, should be used around and above the pipes to at least 12 inches above the pipes.

25. Utility trench backfill should be placed and compacted in accordance with the Grading recommendations of this report.

Pavements

26. Provided the Grading recommendations have been followed, the road subgrades should consist of fine-grained, relatively well-graded granular materials with a CBR of at least 25 and less than 1 percent swell. For this condition and the anticipated light residential traffic, we believe that a minimum pavement section consisting of 2 inches of Asphalt Concrete Paving, over 6 inches of Aggregate Base Course, placed over compacted subgrades should be sufficient.

27. The composition and placement of the Aggregate Base Course should conform to Section 703.06 of the Standard Specifications. The base course should be compacted to at least 95 percent relative compaction. The road subgrade should be shaped to drain to preclude the ponding of water adjacent to or beneath the pavements, and should similarly be compacted to at least 95 percent relative compaction for a minimum of 6 inches prior to the placement of the Aggregate Base Course.

28. The above pavement section is recommended for preliminary design purposes and should be verified by CBR tests on samples of the actual subgrade materials encountered during construction.

Quality Control

29. The site preparation and site grading, including the proof-rolling and track-rolling operations, should be observed by FGE to verify that the anticipated subsurface conditions have been encountered.

30. Samples of the proposed fill materials should be submitted to FGE no less than 7 working days prior to its intended job-site delivery to allow adequate time for testing, evaluation, and approval.

31. Intermittent field density tests should be taken to determine whether the specified levels of compaction are consistently obtained in the finer-grained fills and backfills. Field density testing of the minus 6-inch crushed rock fill and coarse rock fill is not feasible, and the construction of these layers should be visually monitored on a full-time basis by FGE.

32. Foundation excavations for the street improvements should be observed by FGE prior to the placement of reinforcing steel to determine whether the anticipated bearing materials have been encountered. The recommendations provided herein are contingent on adequate observation and testing of the geotechnical phases of the construction by FGE.

Miscellaneous

33. Adequate drainage provisions should be included in the design of the project to direct the surface water away from the slopes, and to preclude the ponding of water adjacent to or beneath the pavements, structures and embankments.

34. The graded slopes should be protected from erosion, as necessary, as soon as practical after the completion of the site grading.

35. Assuming that the materials described in the boring logs of the 2005 HAI report extend to depths of at least 100 feet below the existing ground surface, we believe that the site can be classified as Site Class C, "Very dense soil and soft rock" under the 2006 International Building Code (IBC).

Limitations

36. This report was prepared for the exclusive use of **Engineers Surveyors Hawaii, Inc.** for the proposed **La'i'opua Village 4, Akau and Hema Subdivisions** in Kealakehe, Hawaii, Hawaii. The limitations of this investigation and report are presented in Appendix B.

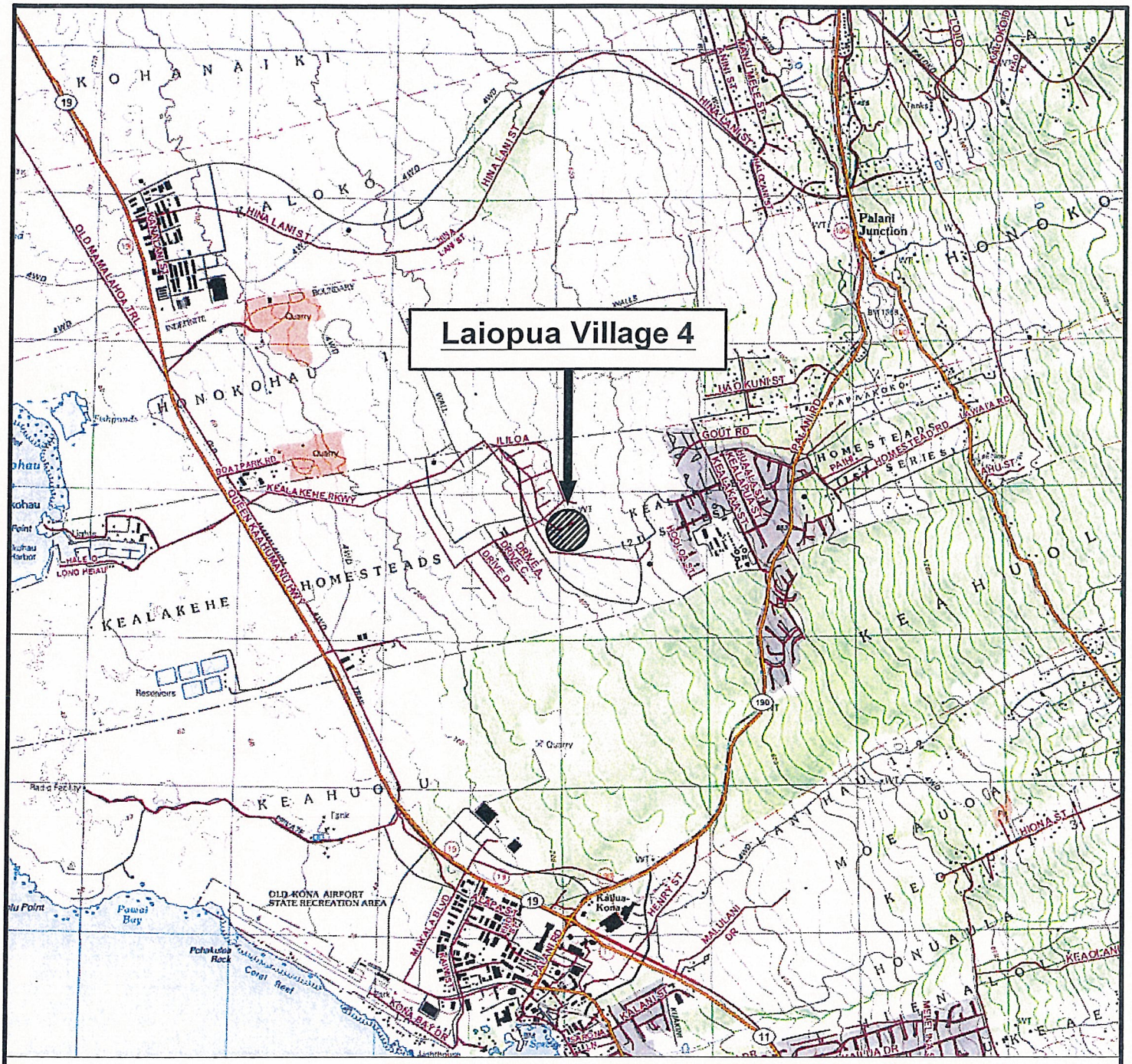
APPENDIX A

Subsurface Investigation Summary

Project Designation:	La'i'opua Village 4 Akau and Hema Subdivisions	**File:** 3067.01
Location:	Kealakehe, Hawaii, Hawaii	
Project Location Map:	Figure 1	
Test Pit Location Plan:	Figure 2	
Excavating Equipment:	Komatsu WB140	
Test Pit Summary		Table I
Field Density Test Summary		Table II

Laboratory Testing Summary

	Sample Number	Figure Designation
California Bearing Ratio Curves:	TP-15 (Hema Lot 124)	3
Gradation Charts:	TP-7 (Akau Lot 68)	4
	TP-9 (Akau Lot 93)	5
	TP-15 (Hema Lot 124)	6
Plasticity Chart:	TP-9 (Akau Lot 93)	7
	TP-15 (Hema Lot 124)	7



LEGEND:

PROJECT LOCATION

SCALE: 1:24000

GENERAL AREA:
KEALAKEHE, HAWAII, HAWAII

REFERENCE:
KAILUA QUADRANGLE
U.S.G.S. TOPOGRAPHIC MAP

F.G.E.

PROJECT LOCATION MAP

La'i'opua Village 4
Akau and Hema Subdivisions
Kealakehe, Hawaii, Hawaii

File: 3067.01

March 2012

Figure 1

VILLAGE 4 AKAU

VILLAGE 4 HEMA

TP-1 TP-2 TP-3 TP-4 TP-5 TP-6 TP-7 TP-8 TP-9 TP-10 TP-11 TP-12 TP-14 TP-15 TP-16 TP-17 TP-18 TP-19 TP-20 TP-21 TP-22 TP-23 TP-24 TP-25 TP-26

121 PARK SITE LOT

120 (USPS) LOT

108 Mini Uhiuhi Preserve Lot

BOAT PARKIR

MAUA PLACE (44' R/W) (ROAD "A")

KANELU PLACE (44' R/W) (ROAD "F")

'OHELOKAI PLACE (44' R/W) (ROAD "E")

NANEA PLACE (44' R/W) (ROAD "D")

'OHEMAKAI ST. (44' R/W) (ROAD "B")

KO'OKO'OLAU STREET (50' R/W) ROAD "C"

KOA'A STREET (44' R/W) (ROAD "G")

'ILIEE PLACE (44' R/W) (ROAD "H")

MANAWALEA STREET

PUAKA PL. (44' R/W) (ROAD "I")

KANELU PL. (44' R/W) ROAD "F-1"

KOA'A ST. (44' R/W) ROAD "G-1"

'ILIEE PL. (44' R/W) ROAD "H-1"

'OHEMAKAI ST. (44' R/W) ROAD "B-1"

KEAHALEHU DRIVE

KEAHALEHU DRIVE

PLAN PROVIDED BY ENGINEERS SURVEYORS HAWAII, INC. MARCH 2012

LEGEND

N

APPROXIMATE FGE TEST PIT LOCATION

APPROXIMATE SCALE IN FEET

200 100 0 200

FEWELL GEOTECHNICAL ENGINEERING, LTD.

TEST PIT LOCATION PLAN

La'i'opua Village 4
Akau and Hema Subdivisions
Kealakehe, Hawaii, Hawaii

March 2012 | File: 3067.01

Figure 2

96-1416 Waihona Place Pearl City Hawaii 96782-

TABLE I

Test Pit Summary

Akau Subdivision

Test Pit Number	Lot Number	Ground Surface Elevation	Depth Interval	Material
1	18	402'	0 - 1½' 1½' - 2'	2"-minus well-graded silty gravel, dense 6"-minus gravel and cobbles, dense
2	25	448'	0 - 2½'	3"-minus well-graded gravel, boney, dense
3	9	425'	0 – 1¾' 1¾' – 2½'	3"-minus, poorly-graded gravel, boney, dense 6"-minus gravel and cobbles, dense
4	38	427'	0 – 3'	2"-minus well-graded silty gravel, dense
5	29	445'	0 – 2½' 2½' – 3'	3"-minus, well-graded gravel, dense 6"-minus gravel and cobbles, dense
6	55	459'	0 – 2' 2' – 2½'	3"-minus, well-graded gravel, dense 6"-minus gravel and cobbles, dense
7	68	487'	0 – 2½' 2½' – 3'	3"-minus, poorly-graded gravel, dense 6"-minus gravel and cobbles, dense
8	91	510'	0 – 2½' 2½' – 3'	3"-minus, well-graded gravel, dense 6"-minus gravel and cobbles, dense
9	93	589'	0 – 2½' 2½' – 3'	3"-minus, well-graded gravel, dense 6"-minus gravel and cobbles, dense
10	3	430'	0 –¼' ¼' – 1½'	2"-minus, well-graded gravel, dense 6"-minus gravel and cobbles, dense
11	45	455'	0 –¼' ¼' – 2½'	2"-minus, poorly-graded gravel, boney, dense 3"-minus well-graded gravel, dense
12	61	474'	0 – 2¼' 2¼' – 3'	2"-minus, well-graded gravel, dense 6"-minus gravel and cobbles, dense
13	85	503'	0 – 2½' 2½' – 3'	2"-minus, well-graded gravel, dense 6"-minus gravel and cobbles, dense
14	103	534'	0 – 2' 2' – 3'	2"-minus, well-graded gravel, dense 6"-minus gravel and cobbles, dense

TABLE I (Continued)

Test Pit Summary

Hema Subdivision

Test Pit Number	Lot Number	Ground Surface Elevation	Depth Interval	Material
15	124	435'	0 – 2½'	3"-minus, well-graded silty gravel, dense
16	119	468'	0 – 1½' 1½' – 2'	2"-minus, well-graded silty gravel, dense 6"-minus gravel and cobbles, dense
17	7	446'	0 - 1'	2"-minus poorly-graded silty gravel, dense Basalt at 1'
18	104	490'	0 – 2½'	2"-minus, well-graded silty gravel, dense
19	94	493'	0 - 1'	6"-minus gravel and cobbles, dense Basalt at 1'
20	68	516'	0 – 1'	2"-minus well-graded silty gravel, dense Basalt at 1'
21	49	547'	0 – 1' 1' – 1½'	2"-minus, well-graded silty gravel, dense 6"-minus gravel and cobbles, dense
22	45	556'	0 – 1' 1' – 2½'	3"-minus, poorly-graded gravel, dense 6"-minus gravel and cobbles, dense Basalt at 2½'
23	17	468'	0 – 1¼' 1¼' – 2'	2"-minus, well-graded silty gravel, dense 6"-minus gravel and cobbles, dense
24	54	529'	0 – 2'	6"-minus gravel and cobbles, dense
25	34	518'	0 – ½'	6"-minus gravel and cobbles, dense Basalt at ½'
26	26	490'	0 – 1 ½'	2"-minus well-graded silty gravel, dense Basalt at 1½'

TABLE II

Field Density Test Summary

Akau Subdivision

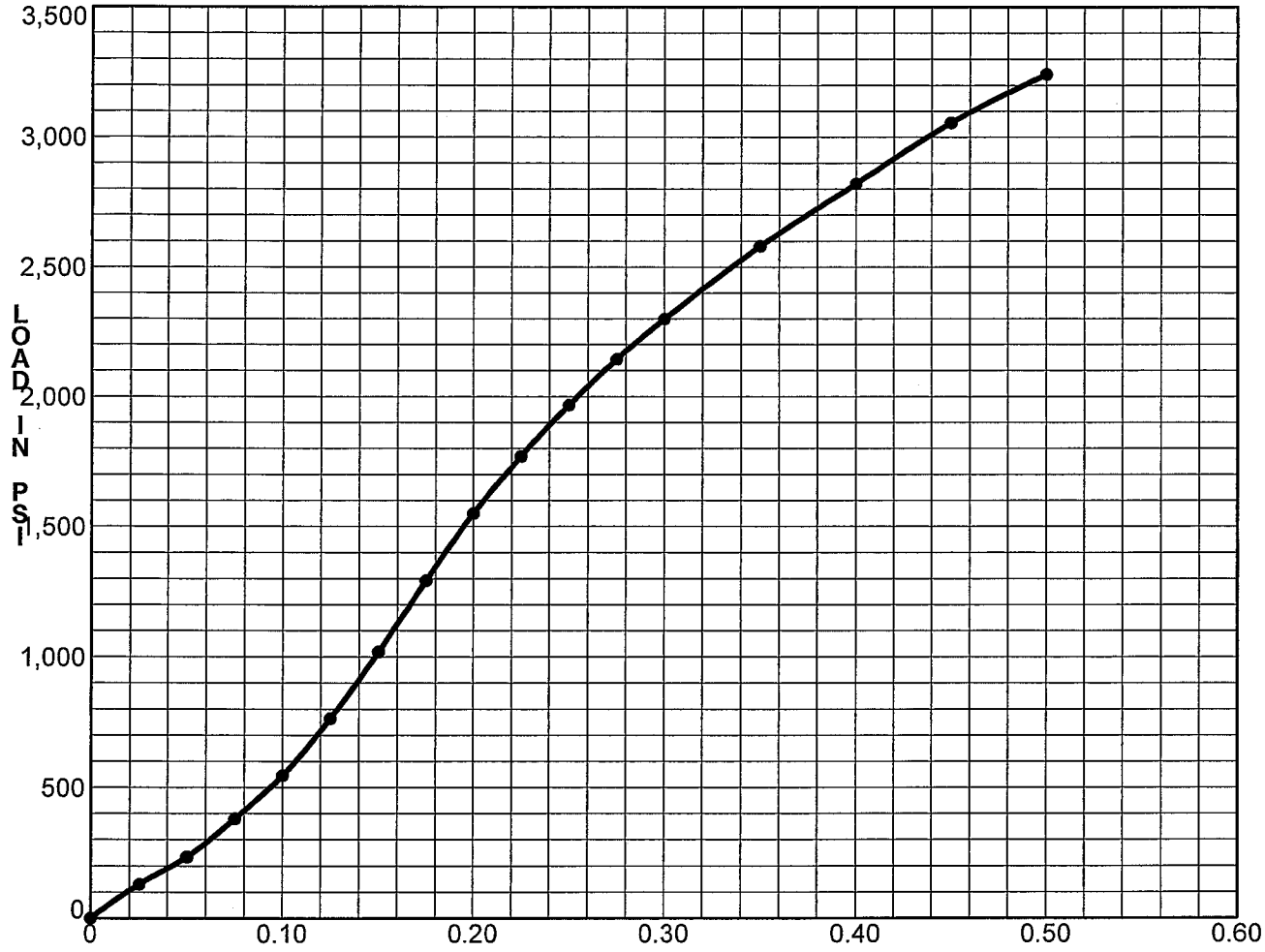
Density Test Number	Lot Number	Ground Surface Elevation	Density	Content	Comments
1	18	403'	142.5	0.6	
2	25	447'	132.9	1.2	
3	29	445'	136.9	0.5	
4	9	425'	126.3	0.7	
5	21	430'	132.1	0.6	
6	14	421'	126.8	1.1	
7	34	424'	124.3	0.8	
8	38	429'	124.8	0.8	
9	5	429'	120.9	0.5	Boney
10	3	430'	120.4	0.4	Boney
11	43	433'	117.1	0.4	Boney
12	48	457'	132.4	0.7	
13	58	457'	122.5	0.9	
14	52	459'	131.4	0.3	
15	55	459'	122.4	0.6	
16	61	474'	131.1	1.1	
17	64	480'	129.9	1.0	
18	67	486'	125.3	1.2	
19	68	487'	122.2	1.6	
20	75	477'	118.7	0.9	Boney
21	85	503'	120.0	0.7	Boney
22	80	509'	117.7	0.7	Boney
23	81	511'	119.7	0.5	Boney
24	103	534'	121.4	0.2	
25	89	542'	120.9	1.2	
26	91	544'	127.9	0.8	
27	99	543'	124.1	0.6	
28	93	589'	125.9	0.8	
29	107	560'	132.8	1.0	

TABLE II (Continued)

Field Density Test Summary

Hema Subdivision

Density Test Number	Lot Number	Ground Surface Elevation	Density	Content	Comments
30	43	553'	119.6	1.1	
31	26	490'	121.8	1.0	
32	21	479'	119.4	0.9	
33	17	468'	121.0	0.8	
34	12	457'	118.8	0.7	Boney
35	9	450'	119.5	0.6	Boney
36	7	446'	120.4	0.7	Boney
37	2	430'	117.2	0.5	Boney
38	75	532'	120.7	1.9	
39	79	526'	121.0	0.5	
40	74	533'	131.7	1.1	
41	68	516'	125.8	0.7	
42	98	501'	122.4	0.4	
43	102	498'	118.0	0.7	Boney
44	99	499'	109.9	0.1	Boney
45	104	490'	119.3	0.7	Boney
46	125	433'	120.2	0.6	Boney



Sample Identification	Classification	CBR	% Comp.	Max Den.	Opt. % MC	% Swell	LL	PI
● TP-15	Well Graded GRAVEL with Silt (GP-GM)	99.0	96	141.0	4.5	0.0	NP	NP

F.G.E. Ltd.

CALIFORNIA BEARING RATIO

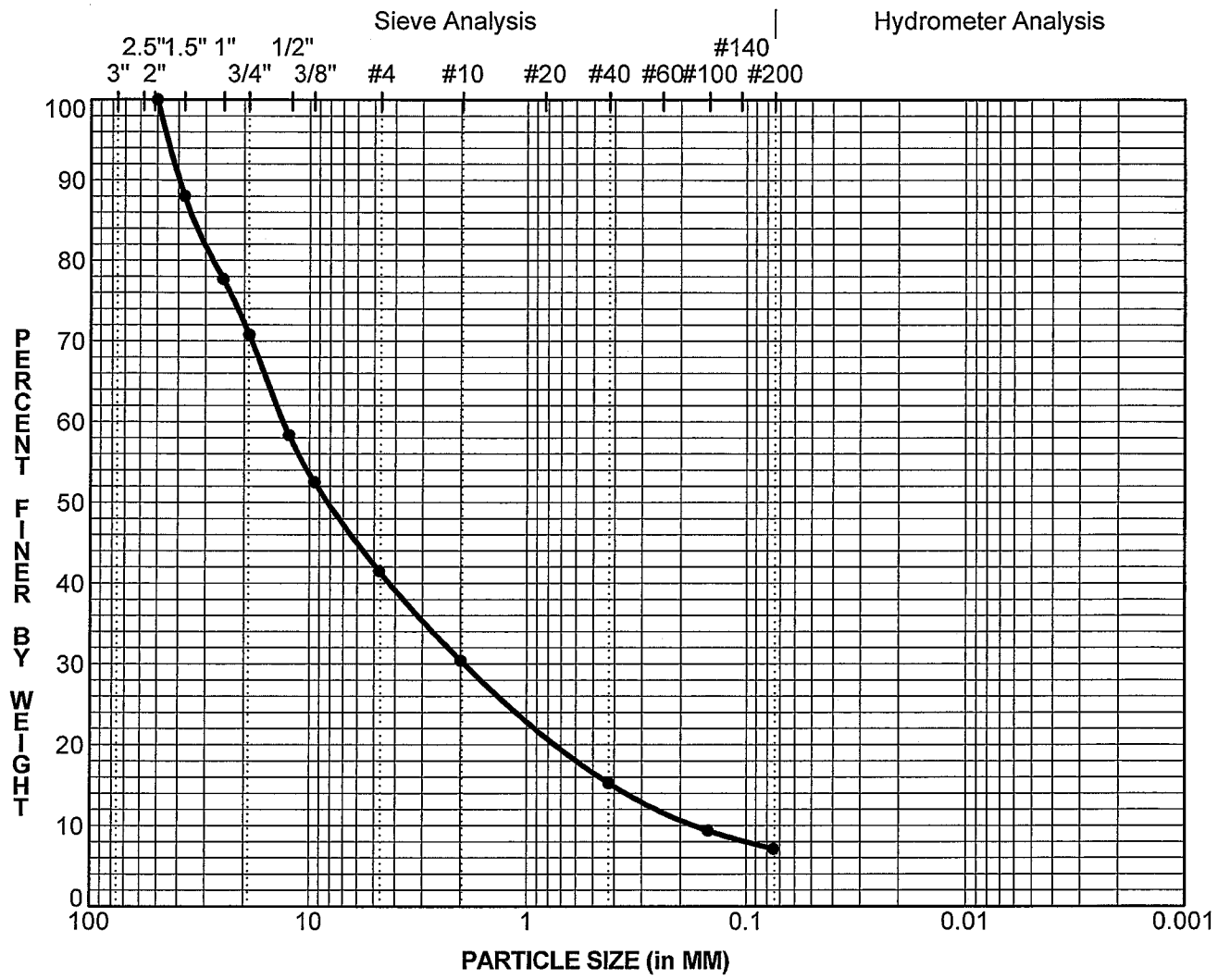
La'i'opua Village 4, Akau and Hema Subdivisions

Kealakehe, Hawaii, Hawaii

File: 3067.01

March 2012

Figure 3



Gravel		Sand			Silt and Clay
coarse	fine	coarse	medium	fine	

Sample ID	Depth	Classification	MC %	LL	PL	PI	Cc	Cu
● TP-7	0.0	Poorly Graded GRAVEL with Silt (GP-GM)					2	79

Sample ID	Depth	D100	D60	D30	D10	%Gravel	%Sand	%Silt & Clay
● TP-7	0.0	50.0	13.2	1.92	0.167	59	34	7

F.G.E. Ltd.

GRAIN SIZE DISTRIBUTION

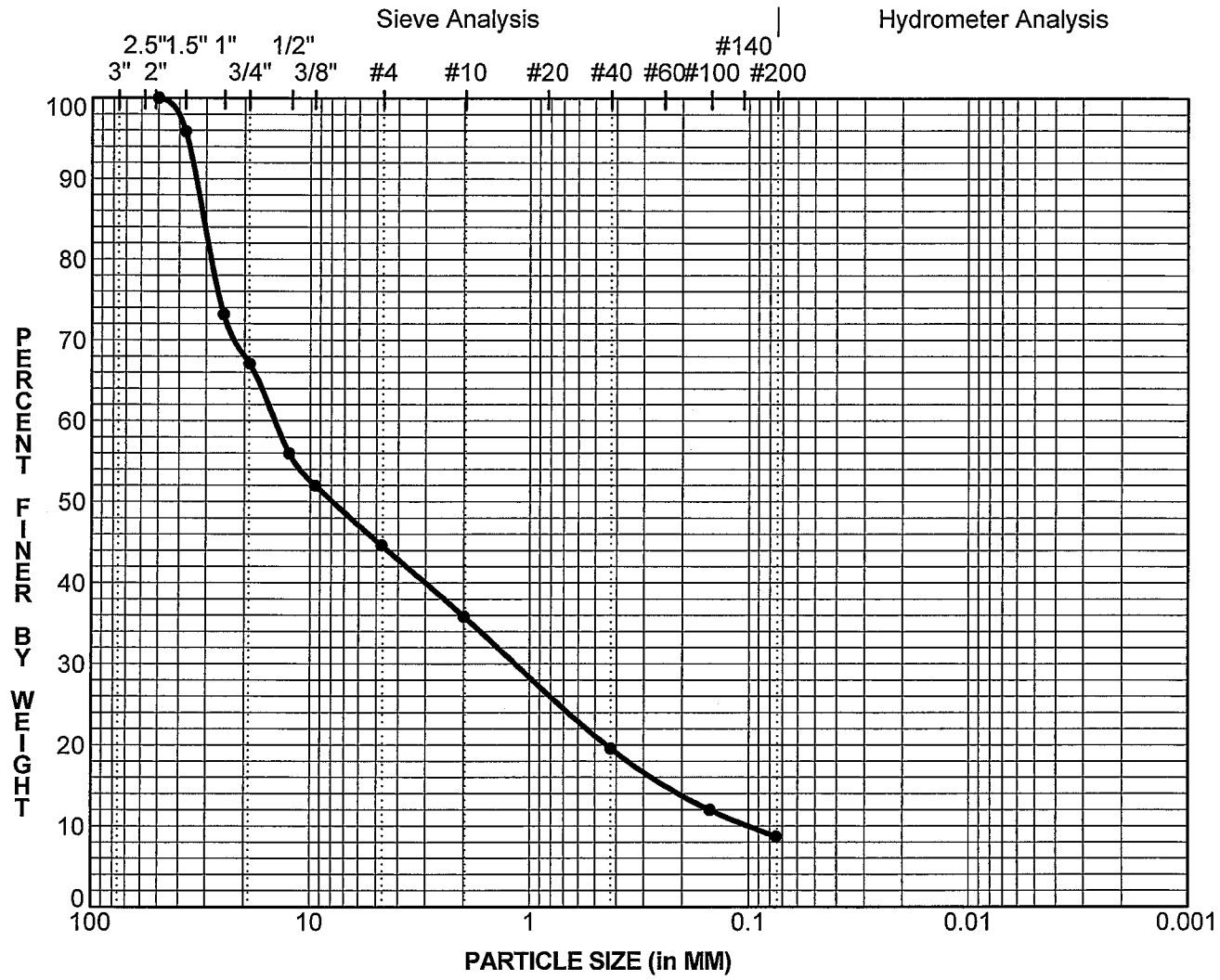
La'i'opua Village 4, Akau and Hema Subdivisions

Kealakehe, Hawaii, Hawaii

File: 3067.01

March 2012

Figure 4



Gravel		Sand			Silt and Clay
coarse	fine	coarse	medium	fine	

Sample ID	Depth	Classification	MC%	LL	PL	PI	Cc	Cu
● TP-9	0.0	Well Graded GRAVEL with Silt (GP-GM)	6	NP	NP	NP	1	147

Sample ID	Depth	D100	D60	D30	D10	%Gravel	%Sand	%Silt & Clay
● TP-9	0.0	50.0	14.5	1.15	0.099	55	36	9

F.G.E. Ltd.

GRAIN SIZE DISTRIBUTION

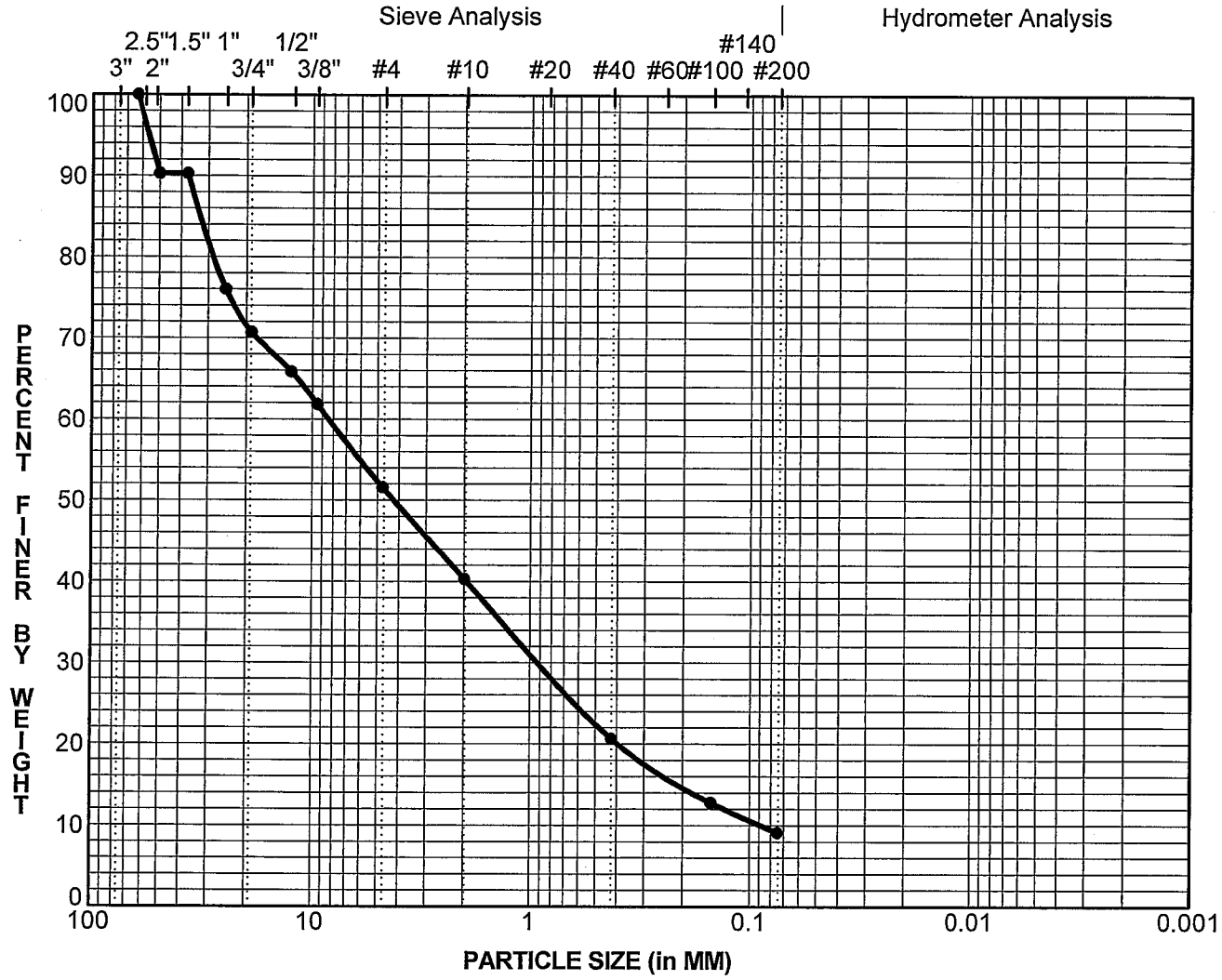
La'i'opua Village 4, Akau and Hema Subdivisions

Kealakehe, Hawaii, Hawaii

File: 3067.01

March 2012

Figure 5



Gravel		Sand			Silt and Clay
coarse	fine	coarse	medium	fine	

Sample ID	Depth	Classification	MC%	LL	PL	PI	Cc	Cu
● TP-15	0.0	Well Graded GRAVEL with Silt (GP-GM)	5	NP	NP	NP	1	95

Sample ID	Depth	D100	D60	D30	D10	%Gravel	%Sand	%Silt & Clay
● TP-15	0.0	63.0	8.4	0.89	0.088	48	42	9

F.G.E. Ltd.

GRAIN SIZE DISTRIBUTION

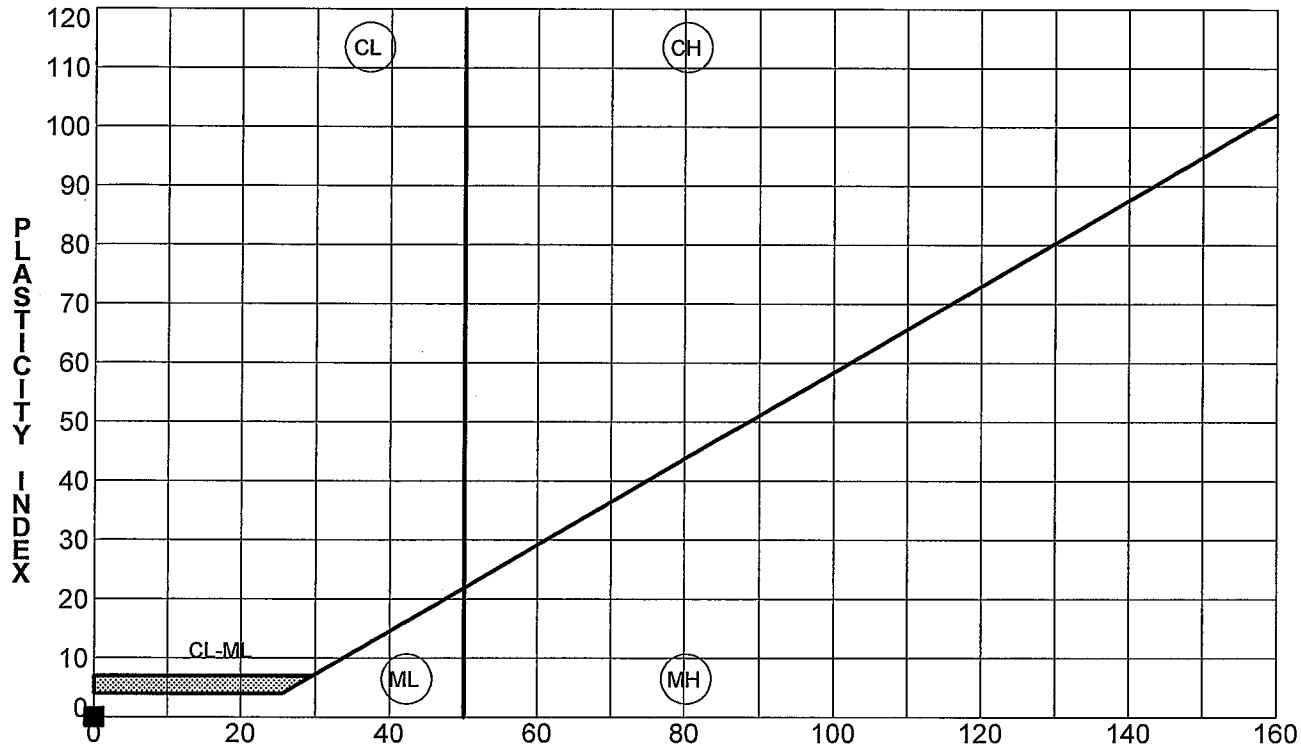
La'i'opua Village 4, Akau and Hema Subdivisions

Kealakehe, Hawaii, Hawaii

File: 3067.01

March 2012

Figure 6



	Sample ID	Depth (ft)	LL	PL	PI	Classification
●	TP-9	0.0	NP	NP	NP	Well Graded GRAVEL with Silt (GP-GM)
■	TP-15	0.0	NP	NP	NP	Well Graded GRAVEL with Silt (GP-GM)

F.G.E. Ltd.

PLASTICITY INDEX CHART

La'i'opua Village 4, Akau and Hema Subdivisions

Kealakehe, Hawaii, Hawaii

File: 3067.01

March 2012

Figure 7

APPENDIX B

Limitations

This report has been prepared for the exclusive use of **Engineers Surveyors Hawaii, Inc.** for the proposed **La'i'opua Village 4 Akau and Hema Subdivisions** in Kealakehe, Hawaii, Hawaii. In the performance of our work and the completion of this report, we have endeavored to perform our services in a manner consistent with that level of care and skill ordinarily exercised by members of the geotechnical profession practicing under similar conditions in Hawaii. No other warranty, expressed or implied, is made.

The analysis, conclusions and recommendations submitted in this report are based in part upon the data obtained in the test pits, and upon the assumption that the soil conditions do not deviate from those observed. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that planned at the present time, Fewell Geotechnical Engineering, Ltd. (FGE) should be notified so that supplemental recommendations can be given. The conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the conclusions of this report modified or verified in writing.

The preliminary geotechnical recommendations for the design and construction of the foundations and concrete slab-on-grade floors of the future residences have been provided to assist the designer-builders with their preliminary designs and their preliminary cost estimating for the project. The final design of the new dwellings and their individual improvements should be the responsibility of the designer-builders and their own geotechnical engineers.

Unanticipated soil conditions are commonly encountered and cannot be fully determined by soil samples, test borings, or test pits. Such unexpected conditions frequently require that additional expenditures be made to attain a properly constructed project. Some contingency funds are recommended to accommodate such potential extra costs.

The site investigation for this report may not have disclosed the presence of underground structures, such as cesspools, drywells, storage tanks, etc. that may be present at the site.

Should these items be encountered during construction, FGE should be notified to provide recommendations for their disposition. The cost for these services was not included within the fee for this investigation.

The scope of work for this investigation was limited to conventional geotechnical services and did not include environmental assessments or evaluations. Silence in the report regarding any environmental aspects of the site does not indicate the absence of potential environmental problems.

The test pit locations were staked out in the field based on measurements from existing physical features. The ground surface elevations were estimated based on the Topographic Plans provided by Engineers Surveyors Hawaii, Inc.. The location and elevation of the test pits should be considered accurate only to the degree implied by the methods used.

Groundwater was not encountered in any of the test pits excavated during this investigation. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall and other factors not present at the time the measurements were made.

FGE should be provided the opportunity for a general review of the final design drawings and specification to verify that the earthwork recommendations have been properly interpreted and implemented in the design and specification. If FGE is not accorded the privilege of making this recommended review, it can assume no responsibility for misinterpretations of the recommendations.

FGE should also be retained to provide periodic soil engineering services during construction. This is to observe compliance of the design concepts, specifications and recommendations and to allow design changes in the event the subsurface conditions differ from that anticipated prior to construction. The recommendations contained herein are contingent upon adequate construction monitoring of the geotechnical phases of the construction by FGE.

DAVID Y. IGE
GOVERNOR OF HAWAII

VIRGINIA PRESSLER, M.D.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HI 96801-33785

In reply, please refer to:
EMD/CWB

R10F282.FNL.17

August 24, 2017

The Honorable Jobie Masagatani
Chairperson
Department of Hawaiian Home Lands
P.O. Box 1879
Honolulu, Hawaii 96805

Attention: Mr. Jeffrey Fujimoto
Project Manager

Dear Ms. Masagatani:

Subject: NOTICE OF GENERAL PERMIT COVERAGE (NGPC)
National Pollutant Discharge Elimination System (NPDES)
Laiopua Village 4 Subdivision Phase 2 - Hema
Kailua-Kona, Island of Hawaii, State of Hawaii
File No. HI R10F282

This letter is to notify you that the **DEPARTMENT OF HAWAIIAN HOME LANDS** (hereinafter PERMITTEE) is now covered under the NPDES General Permit authorizing discharges of storm water associated with construction activities. Coverage under this general permit authorizes you to discharge only storm water to the receiving State waters discharge point(s) from the project location(s) identified in the revised Notice of Intent (NOI), dated August 4, 2017 (received August 16, 2017), **provided that you comply with Hawaii Administrative Rules (HAR) 11-54; HAR 11-55; HAR 11-55, Appendix A; HAR 11-55, Appendix C; and the information submitted in the Notice of Intent (NOI).** Discharges of non-storm water, toxics, and other water pollutants to State waters are not authorized by this NPDES General Permit. HAR 11-54 and 11-55 are available on the DOH-CWB website at: http://health.hawaii.gov/cwb/.

This NGPC will take effect on the date of this notice. This NGPC will expire at midnight, December 5, 2018, or when amendments to HAR, Chapter 11-55, Appendix C, are adopted, whichever occurs first. Failure to comply with HAR 11-54; HAR 11-55; HAR 11-55, Appendix A; HAR 11-55, Appendix C; and information provided in the NOI is an enforceable violation and your NGPC may be terminated. If you violate Hawaii Revised Statutes (HRS), Chapter 342D, you may be subject to penalties of up to $25,000 per violation per day and up to two (2) years in jail.

Falsification of information, including providing information in the NOI that does not match what is actually occurring at the project site/facility and failure to prepare the Storm Water Pollution Prevention Plan (SWPPP) prior to NOI submission, may result in criminal penalties for the Permittee and their authorized representative as provided in Clean Water Act, Section 309 and HRS, Section 342D-35.

As a reminder, this general permit requires the Permittee to:

1. Notify DOH of the construction start date within seven (7) calendar days before the start of construction activities.
2. Complete and submit the Solid Waste Disclosure Form for Construction Sites to the DOH, Solid and Hazardous Waste Branch, Solid Waste Section, as specified on the form at least 30 calendar days before the start of the construction activities. The form can be downloaded at: http://health.hawaii.gov/shwb/files/2013/06/swdiscformnov2008.pdf.
3. Implement the SWPPP in accordance with HAR 11-55, Appendix C. The Director of Health reserves the right to require the Permittee to modify the SWPPP.
4. Submit a new NOI with filing fee and obtain a new NGPC for any revisions to the information submitted in the NOI (with the exception of changes to contact person information for non-transfer of ownerships and changes to the SWPPP). This NGPC cannot be modified.
5. Complete and submit the Notice of Cessation (NOC) within seven (7) calendar days after the end of the month that the subject project was completed.

All NGPC compliance submittals, including the NOC shall be submitted on the CWB Compliance Submittal Form for Individual NPDES Permits and NGPCs. This form shall be completed on the e-Permitting Portal located at: https://eha-cloud.doh.hawaii.gov/epermit.

The Permittee is responsible for obtaining other Federal, State, or local authorizations as required by law.

Please complete the DOH Customer Satisfaction Survey regarding your request for General Permit coverage. This brief survey is available on the e-Permitting Portal located at: https://eha-cloud.doh.hawaii.gov/epermit. Please use the Application Finder button and search for the “Customer Satisfaction Survey.”

If you have any questions, please contact the Enforcement Section or Mr. Darryl Lum of the Engineering Section, CWB, at (808) 586-4309.

Sincerely,

for

VIRGINIA PRESSLER, M.D.
Director of Health

c: Mr. Jeffrey Fujimoto, DHHL [via e-mail Jeffrey.Y.Fujimoto@hawaii.gov only]
Ms. Joni Tanimoto, Akinaka & Associates, Ltd. [via e-mail jct@akinaka.com only]
(w/Receipt No. 51500 for $500 Filing Fee only)
CWB, Hawaii District Health Office [via e-mail only]