

# **NANAKULI DUST STUDY**

## **TECHNICAL EVALUATION AND RECOMMENDATIONS**

Prepared for:



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December 20, 2011

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## Acronyms and Abbreviations

$\mu\text{g}/\text{m}^3$	Micrograms per cubic meter
C&D	Construction and demolition
CUP	Conditional use permit
DOH	Hawaii Department of Health, Environmental Protection Division
EPA	U.S. Environmental Protection Agency
HECO	Hawaii Electric Company
MDL	Method detection limit
$\text{PM}_{2.5}$	Particulate matter less than 2.5 microns
$\text{PM}_{10}$	Particulate matter less than 10 microns
ppb	Part per billion
PVT	PVT Land Company
RCRA	Resource Conservation and Recovery Act
Tetra Tech	Tetra Tech Inc.
TSP	Total Suspended Particulate
USNETI	U.S. National Emissions Trends Inventory
WOA	West Oahu Aggregate

## 1.0 INTRODUCTION

On behalf of the State of Hawaii Department of Health (DOH), Solid and Hazardous Waste Branch, Tetra Tech EM Inc. (Tetra Tech) completed a dust study and evaluation of potential dust sources that may affect the Nanakuli community and surrounding areas. The study was focused on identifying potential sources of dust and providing recommendations regarding feasible and realistic alternatives to reduce the dust.

The Nanakuli area is located on the leeward side of Oahu and is prone to arid conditions, especially during the dry season. Historically, the area is home to a number of large-scale industrial facilities, including an electric generation facility, two landfills, a Navy base, service and retail businesses, restaurants, and several developed residential subdivisions. The weather and wind are significant factors in the formation and transport of fugitive dust. Furthermore, the complex terrain adds to the complexity of dust movement throughout the area.

As part of this study, Tetra Tech completed a comprehensive review of all available sources of air quality data and performed other field-related and research-oriented tasks in an effort to: identify and evaluate the level of dust in the area; evaluate potential health concerns related to dust; and, to compare dust concentrations with other areas on Oahu.

This study has specific limitations that must be identified and discussed. Dust on the leeward side of Oahu cannot be avoided altogether. Depending on the time of year and uncontrollable weather conditions, exposed areas of surface soil will result in airborne dust. As a result, the potential sources of dust that have been identified in this report focus on human activity that can be identified and addressed.

The scope of this study was specifically focused on reviewing existing air quality and meteorological data and other existing available information to provide conclusions. Collection of additional air quality or meteorological data was not within the scope of this study.

Background information related to this issue and a discussion of permitted facilities is presented in Section 2; a list of the technical documents reviewed for this study is provided in Section 3; air quality and meteorological data are presented in Section 4; a description of the on-site reconnaissance is provided in Section 5; homeowner interviews appear in Section 6; and a list of conclusions and recommendations is presented in Section 8.

## 2.0 BACKGROUND

The purpose of this section is to provide a general background, and the general scope of the Nanakuli dust study.

### 2.1 General Regional Background

The issue of dust on the Nanakuli coast has been an ongoing concern for many years. The area is located on the leeward side of Oahu and is prone to arid conditions during the dry season. This dust study is focused on the area generally bounded by Hakimo Road, Lualuailei Road, and Farrington Highway. Refer to Figure 1 – DOH Dust Assessment Area Map for a generalized location map. The neighborhoods are bordered on the east by the PVT Land Company, LTD, construction and demolition (C&D) landfill (PVT Landfill), beyond which is West Oahu Aggregate (WOA), which operates a stone and gravel crushing and processing operation. Both facilities operate under existing permits from DOH. The PVT Landfill has been in operation since July 1985, and WOA has been in operation since 2002. Refer to Figure 2-Nanakuli Dust Study Location Map for a more detailed illustration presenting the various neighborhoods and larger commercial/industrial facilities.

On May 5, 2011, DOH issued a Solid Waste Management Permit Modification and Renewal (Permit No. LF-0152-09) to PVT. The permit modification allowed PVT to begin mining and recycling of existing and incoming waste. The permit also allows PVT to continue to accept up to 2,000 tons of C&D waste per day, and up to 500 tons of asbestos-contaminated waste per week. No limits were imposed on the number of incoming trucks per day or week. The facility is prohibited from accepting municipal solid waste, commercial and industrial waste (excluding C&D waste from commercial/industrial generators), regulated hazardous waste, and Toxic Substances Control Act (TSCA)-regulated polychlorinated biphenyls (PCB)-contaminated materials.

The area has undergone significant growth and development over the last 20 years, which is evidenced by the volume of vehicle traffic on Farrington Highway. The area can be described as residential, surrounded by commercial business and light and heavy industrial facilities.

The weather and wind patterns affect the transport and deposition of windblown dust in the area. The daily onshore and offshore winds contribute to this transport. In addition, the arid climate in this region facilitates growth of low shrubs and dry grasses that do not provide complete ground cover on undisturbed ground surfaces.

As additional background, Tetra Tech notes that in September 2010, DOH conducted a public meeting to allow for comments related to a permit modification for the PVT Landfill. More than 100 residents attended the meeting. Several community members offered oral testimony, with concerns regarding levels of dust in their neighborhoods, with many suggesting that the origin of the dust affecting their neighborhoods was the PVT Landfill operation. Many of those offering testimony requested that action be taken to resolve the dust issue in the community. In addition, many residents who have lived in the neighborhood for many years described how the dust problem had steadily increased over the years. DOH acknowledged these concerns and began the process of working to address this issue.

The September 2010 testimony at this public meeting was effectively the impetus for DOH to request an objective dust study to evaluate potential sources of dust that may be affecting the surrounding Nanakuli neighborhoods.

On August 28, 2011, DOH again conducted a public meeting to inform the residents about the upcoming dust study. At this meeting, many residents reiterated the same concerns about the dust and air quality issues.

In response to the residents' concerns, and an ongoing dialogue with DOH regarding the dust issues, PVT Attorney Lisa Woods-Munger submitted a letter to DOH on August 23, 2011, listing specific steps PVT had completed over the last 10 years to address and reduce dust emissions from the PVT site. Ms. Woods-Munger indicated in her letter that these steps appear to have helped with the dust issues, stating that PVT did not receive any dust complaints during 2011. DOH has noted that their office has since received two additional dust complaints, on September 7, 2011 and November 4, 2011. Both complaints were investigated by DOH, but were not found to be a result of dust violations from any nearby facilities.

## **2.2 Scope of Dust Study**

Tetra Tech initiated the dust study in November 2010. At that time, Tetra Tech and DOH identified key tasks that would be completed in an effort to evaluate the presence of dust in Nanakuli, which would result in identification of potential specific actions that could be taken to reduce the impact of dust to the neighborhood.

The tasks completed by Tetra Tech to date to evaluate dust concerns in Nanakuli include the following:

- Reviewed all existing pertinent air quality data that has been collected near the Nanakuli area and the greater Oahu Island.
- Completed on-site reconnaissance of the neighborhood and areas with potential for dust emissions, including PVT WOA, Lualualei Road, and Farrington Highway.
- Worked with DOH to develop a questionnaire that would allow residents the opportunity to describe how they are affected by dust and their thoughts regarding the origin of the dust.
- Based on responses from the questionnaire, completed follow-up interviews with homeowners to hear their concerns and answer specific questions.
- Reviewed permits for nearby commercial/industrial sources to evaluate whether they are in compliance with applicable permits rules and requirements.
- Based on the information collected, provided recommendations to reduce dust impacts to the residents of the Nanakuli area.

Figure 2 contains a detailed aerial photo showing the project location, surrounding neighborhoods, surrounding facilities (including PVT and WOA), the locations of PVT and Hawaii Electric Company (HECO) air monitoring stations, and other areas of interest.

### 3.0 REVIEW OF TECHNICAL DOCUMENTS

As part of this dust study Tetra Tech reviewed numerous technical documents that may pertain to dust issues in the Nanakuli area. These documents included: state, city, and county permits, air quality monitoring data, human health risk assessments, and technical and regulatory correspondence between PVT and the City and County of Honolulu and DOH staff.

In addition, other technical documents were reviewed as necessary to gain insights to the nature of dust issues on Oahu and related to the PVT Landfill operations. The air quality data consisted of data collected by DOH, HECO, and PVT.

This list serves to document the level of review that was required for this study. A review of air quality data is presented in the following section.

#### Documents Reviewed by Tetra Tech

- State of Hawaii Department of Health Solid Waste Permit No LF-0152-09 PVT Integrated Solid Waste Management Facility, Including Landfill, Recycling, and Materials Recovery, Solidification Operations, Waianae, Oahu, Hawaii.
- Hawaii Department of Health Response to Comments PVT Land Company Integrated Solid Waste Management Facility Draft Solid Waste Management Permit, dated December 14, 2010.
- Letter from Stuart Yamada, P.E. Chief, Environmental Management Division, to the Honorable Dwight Takamine, Director, Department of Labor and Industrial Relations et al. RE: September 2, 2010, Public hearing and public comment period PVT Land Company Integrated Solid Waste Management Facility Draft Solid Waste Management Permit.
- State of Hawaii Department of Health Solid Waste Management Permit No RY-0029-10 Uncontaminated Concrete/Asphalt Recycling West Oahu Aggregate Company, Inc.
- State of Hawaii Department of Health Clean Air Branch 2009 Hawaii Air Quality Data Book.
- URS Traffic Impact Study, Nanakuli area on Farrington Highway and adjoining streets, dated July 20, 2007.
- Hawaii Department of Transportation Highways Division Highways Planning Survey Section Vehicle Classification Data Summary 2009; Farrington Highway.
- Air Monitoring PVT Land Company, LTD. Nanakuli, HI, Summary Report (monthly reports from November 2009 through November 2010).
- Limited Human Health Risk Assessment Construction Debris Recycling, PVT Landfill dated July 2010; prepared and submitted by AMEC Earth and Environmental, Inc.
- Letter from David Tanoue, Director Department of Planning and Permitting, City and County of Honolulu, dated March 24, 2011 RE: Minor Modification approval notice to PVT Land Company.



- Correspondence letter from attorney Lisa Woods Munger to Gary Gill, Deputy Director of DOH Environmental Health Administration, dated August 23, 2011, RE: dust control measure implemented b PVT Land Company from 2001 to 2011.
- Human Health Risk Assessment of Fugitive Dust and Surface Soils, PVT Landfill, dated June 2005; prepared and submitted by AMEC Earth and Environmental, Inc.
- PVT Landfill, Human Health Risk Assessment of AES Conditional Ash, dated February 2010; prepared and submitted by AMEC Earth and Environmental, Inc.
- Baseline Air Monitoring, PVT Land Company, Airborne Metals Analysis, October – November 2010 and May – June 2011.
- HECO ambient air quality data collected at the Waianae and Nanakuli monitoring stations from July 1, 2010, through June 30, 2011.

## 4.0 AIR QUALITY DATA

Tetra Tech completed a technical review of all available air quality and meteorological data to assess short- and long-term air quality trends. The air quality review was focused on particulate matter less than 10 microns (PM<sub>10</sub>) and total suspended particulate (TSP) data from PVT, HECO, and DOH. It is noted that the PVT and HECO are the only entities which actively perform air monitoring in the immediate area surrounding the Nanakuli neighborhoods.

### 4.1 General Overview of Dust, EPA Regulations, and Air Monitoring Methods

Dust typically originates from large exposed earth surfaces that have low moisture content under conditions of elevated wind (typically in excess of 15 miles per hour). The wind blows across the surface and entrains the small and light fractions of soil particles. The dust that becomes airborne is commonly referred to as *fugitive dust*. Airborne dust originating from geologic material is typically deposited less than 1 mile from the source (EPA).

Dust particles from geologic sources typically range in size from 5 to 40 microns. Smaller particles can be formed from burning, fossil fuel combustion, and industrial sources. These particles can range in size from 0.1 to 10 microns. Additionally, combustion gases, such as nitrogen oxides and sulfur oxides, can undergo secondary reactions in the atmosphere that condense these gases, forming fine particulate matter that can range in size from 0.01 to 2.5 microns. A size distribution chart of typical particles that can become airborne is presented in Table 1.

**Table 1: Particle Size Range for Various Materials that can become Airborne**

Particle	Particle Size (microns)
dot (.)	615
Beach Sand	100 - 10000
Fertilizer	10 - 1000
Pollens	10 - 1000
Textile Fibers	10 - 1000
Atmospheric Dust	5 - 40
Fiberglass Insulation	1 - 1000
Dust Mites	100 - 300
Saw Dust	30 - 600
Ground Limestone	10 - 1000
Cement Dust	3 - 100
Combustion-related - motor vehicles, wood burning, open burning, industrial processes	0.1 to 2.5
Fly Ash	1 - 1000
Coal Dust	1 - 100
Asbestos	0.7 - 90
Metallurgical Dust	0.1 - 1000
Carbon Black Dust	0.2 - 10
Burning Wood	0.2 - 3

Particle	Particle Size (microns)
Tobacco Smoke	0.01 - 4

The U.S. Environmental Protection Agency (EPA) promulgated regulations in 1971 to address public health risks from airborne dust. EPA created a federal air quality standard for dust that was named TSP. Based on research and health-based studies, EPA created a daily 24-hour and annual weight-based standard for TSP. These standards were based on a mass measurement of TSP that would be collected on a substrate (a filter) that would be weighed by a standardized laboratory process.

Part of the creation of this standard included development of air monitoring methods and associated equipment that would be used to collect samples and compare the results with the standards. In 1987, EPA further promulgated regulations that focused on particles that were less than 10 microns in diameter, referred to as PM<sub>10</sub>. EPA determined that the smaller size particles presented a more significant health concern. Larger dust particles typically are filtered in the nose, whereas smaller particles less than 10 microns can be carried and deposited into the throat and lungs.

With implementation of the federal PM<sub>10</sub> standards, EPA phased out the TSP standards. The TSP data collected by EPA, states, and regulated industrial sources helped to characterize particulate concentrations in cities and rural areas. In 1997, EPA created new 24-hour and annual federal standards for fine particulate matter less than 2.5 microns in diameter. This standard is referred to as PM<sub>2.5</sub>.

Over the last 30 years, Hawaii DOH has collected TSP, PM<sub>10</sub>, and PM<sub>2.5</sub> data at sites across the state.

## 4.2 PVT Air Quality Data

On March 24, 2011, the City and County of Honolulu issued a Minor Modification of Conditional Use Permit (CUP) Number 85/CUP-6 to PVT. In May 2011, DOH issued Operating Permit Number LF-0152-09 to PVT, which is in effect from May 5, 2011, through May 4, 2016. This permit will allow “mining” and shredding of recyclable wood materials, which can be used as feedstock for energy production.

In an effort to characterize their dust mitigation measures, PVT voluntarily initiated a TSP sampling program in November 2009, which focused on collecting TSP samples at three sites along the fence line that abuts the Nanakuli neighborhood which is generally bounded by Mohihi Street, on the western boundary of the landfill. Refer to Figure 2 (inset) for the air monitoring station locations. The sample program was designed to collect 24-hour TSP samples at each of the three sites along the fence line, with each of the sample collection systems affixed near the top of the fence. The samples were collected on a frequency of once every 6 days (referred to as 1-in-6), from midnight to midnight, based on the EPA Monitoring Schedule (<http://www.epa.gov/ttnamti1/files/ambient/pm25/CALENDAR2009.pdf> and <http://www.epa.gov/ttnamti1/files/ambient/pm25/CALENDAR2010.pdf>).

Referring to Figure 2, PVT air monitoring Station #1 is located near the PVT entrance, immediately adjacent to Lualualei Road; Station #2 is located in the central portion of the fence boundary between PVT and the abutting the neighborhood, near Auyong Homestead Road;

and, Station #3 is located near the western boundary of fenced boundary between PVT, abutting the neighborhood near Mohihi Street.

The sampling program was continued through November 2010 as a result of negotiations with DOH. PVT also agreed to additional air monitoring requirements, as specified in the current permit.

The TSP sampling program that was stipulated in PVT's current permit was separated into two (2) phases, as follows:

- 1. One year of TSP sampling from November 2009 through October 2010 (Section C, Part 16, Subsection a, Subpart i).
- 2. One year of TSP sampling after landfill mining begins (Section C, Part 16, Subsection a, Subpart ii).

In addition to analyzing the samples for TSP, additional air samples were required to be analyzed for seven metal compounds that are contained in the Resource Conservation and Recovery Act (RCRA), consisting of arsenic, barium, cadmium, chromium, lead, mercury, and selenium.

The RCRA 7 Metals Sampling Program, as stipulated in PVT's current permit, was separated into four phases as follows:

- 1. Prior to landfill mining in Phase I, and secondary shredding, collect at least two multi-day samples covering at least 10 24-hour periods; completed October – November 2010, and May – June 2011 (Permit Section C, Part 16, Subsection b, Subpart i).
- 2. At or near the start of landfilling mining in Phase I, collect at least two multi-day samples covering at least 10 24-hour periods when landfill mining is occurring (Permit Section C, Part 16, Subsection b, Subpart ii).
- 3. After the start of secondary shredded feedstock production, collect at least two multi-day samples covering at least 10 24-hour periods when landfill mining is occurring (Permit Section C, Part 16, Subsection b, Subpart iii).
- 4. At the end of the first year of landfilling mining in Phase I, collect at least two multi-day samples, covering at least 10 24-hour periods when landfill mining is occurring (Permit Section C, Part 16, Subsection b, Subpart iv).

As of the date of this report, PVT has completed the following sampling requirements:

- Phase 1 of TSP sampling (Permit Section C, Part 16, Subsection a, Subpart i); and,
- Phase 1 of the RCRA 7 Metals Sampling Program (Permit Section C, Part 16, Subsection b, Subpart i).

A brief summary of each of phase of the air sampling program is presented below.

#### 4.2.1 PVT TSP Data

As discussed above, PVT completed TSP sampling on a 1-in-6 frequency from November 2009 through November 2010. The data were presented to DOH in monthly data reports, with statistical analysis and a description of wind patterns.

Tetra Tech reviewed 13 monthly reports and compiled a summary of results that is presented in Table 2.

**Table 2: Summary of PVT TSP Data, 24-Hour Samples November 2009 through November 2010**

PVT Station No.	Number of samples	Minimum Concentration ( $\mu\text{g}/\text{m}^3$ )	Maximum Concentration ( $\mu\text{g}/\text{m}^3$ )	Average Concentration ( $\mu\text{g}/\text{m}^3$ )
1 [nearest Lualualei Road and PVT entrance]	63	16.6	88.9	34.1
2 [central portion of fenced boundary between PVT and neighborhood]	63	9	55.4	24.8
3 [westernmost station]	63	7.3	42.7	19.1

$\mu\text{g}/\text{m}^3$  = micrograms per cubic meter (parts per billion [ppb] equivalent)

The data presented in Table 2 demonstrate that TSP concentrations over the 1-year monitoring period were well below the health-based 24-hour and annual standards for  $\text{PM}_{10}$  (a subset of TSP) of  $150 \mu\text{g}/\text{m}^3$  and  $50 \mu\text{g}/\text{m}^3$ . However, it must be noted that these samples were collected over a 24-hour continuous period. PVT operates from 7:30 a.m. to 5:00 p.m.; therefore, any emissions from the facility, as a result of active facility operations, are not occurring between the following times during each sample event: midnight to 7:30 a.m. and 5:00 p.m. to midnight.

During a review of the TSP data, it was observed that TSP concentrations at Site #1 (monitoring station nearest Lualualei Road) were consistently higher than Sites #2 and #3. On average, Site #1 TSP concentrations were approximately 38 percent higher than at Site #2, and approximately 78 percent higher than Site #3 (monitoring station furthest from Lualualei Road). It is suspected that this increase in TSP concentrations is caused by impacts from trucks entering and exiting the PVT facility, and road dust from Lualualei Road.

The results from the TSP sampling before landfill mining demonstrate that TSP concentrations are well below any health-based standards, and do not pose a health concern for residents of the Nanakuli area.

#### 4.2.2 PVT Metals Data

In November 2010 through December 2010, and again in May 2011 through June 2011, PVT completed particulate metals sampling. This sampling program was designed to collect air samples that would be analyzed for TSP, arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver, before landfill mining.

Samples were collected over a 5-day continuous period to accumulate enough particles on the filters to achieve a meaningful sample. In total, four samples were collected from each of the three air sample sites along the fence line. The samples were analyzed using standardized EPA methods, and results were reported in  $\mu\text{g}/\text{m}^3$ . The results from the sampling demonstrate that particulate metal emissions from PVT before landfilling are well below any health-based standards and do not pose a health concern for residents of the Nanakuli area.

In fact, the results from the May to June 2011 sampling event show that only chromium and lead were detected in measureable concentrations, marginally above the minimum laboratory method detection limit (MDL). The remaining five metals (arsenic, barium, cadmium, mercury, and selenium) were not detected on any samples.

The technical approach for the October to November 2010 sampling events appears to be somewhat different, but shows similar results to the May to June 2011 event. The sample event consisted of five 24-hour sample events, whereas the later event consisted of collecting one 5-day (or 120-hour) event. These results also show that arsenic and mercury were not detected in any samples and the remaining metals (chromium, selenium, cadmium, barium, and lead) were all detected at concentrations marginally above the MDL, well below any health-based standards, and do not pose a health concern for the residents of the Nanakuli area.

The metals concentrations recorded from PVT are similar to metals concentrations at air monitoring stations operated by the DOH. Figure 2 shows the location of the PVT TSP and metals air sampling locations.

#### 4.2.3 Future Air Sampling

As previously discussed, PVT will be required to complete several additional phases of air monitoring after landfill mining and secondary shredded feedstock production begin. Each of these phases of air sampling is designed to evaluate resultant emissions from each of these phases of PVT's operations.

Based on correspondence with PVT's contractor (Dr. Jim Morrow, DrPH), Tetra Tech was provided the following schedule:

- TSP Sampling, Phase 2 (Section 16.a, ii): 1 year of TSP sampling at or near the beginning of landfill mining in Phase I – expected to begin in early 2012.
- RCRA 7 Metals Sampling, Phase 2 (Section 16.b, ii): Collect multi-day samples for metals at or near the start of landfill mining in Phase I – expected to begin in early 2012.
- RCRA 7 Metals Sampling, Phase 3 (Section 16.b, iii): Collect multi-day samples for metals at or near the start of secondary shredded feedstock operations – no timeframe established, but will be completed after landfill mining starts.
- RCRA 7 Metals Sampling, Phase 4 (Section 16.b, iv): Collect multi-day samples for metals at the end of the first year of landfill mining in Phase I – no timeframe established, but will be completed after one year of landfill mining has been completed

As these different phases of the air sampling program begin, it is expected that PVT will notify DOH. At the conclusion of each phase, PVT will provide data to DOH for review and comment. DOH will thoroughly review and assess the data.

### 4.3 HECO Air Quality Data

Tetra Tech was provided with data from the HECO Lualualei and Waianae air quality and meteorological monitoring stations. For reference, the Lualualei meteorological station is located approximately 2.9 miles south of the dust study area, and the Waianae meteorological station is located approximately 6.5 miles north of the dust study area. The meteorological station locations are indicated on the inset provided in Figure 2. Both datasets included data for PM<sub>10</sub>, wind speed, wind direction, temperature, and precipitation from July 1, 2010, through June 30, 2011.

The monitoring system used to collect PM<sub>10</sub> data at both HECO sites measures data continuously using EPA-approved monitoring systems. Therefore, a PM<sub>10</sub> concentration is measured each hour and reported in µg/m<sup>3</sup> and also averaged over a 24-hour period for comparison to air quality standards.

The PM<sub>10</sub> data from the Lualualei and Waianae air quality and meteorological stations help to establish the existing PM<sub>10</sub> concentrations that are present in the Nanakuli area, and evaluate whether emissions from other industrial sources demonstrated an increase in PM<sub>10</sub>. A statistical analysis was completed on this dataset and is summarized in Table 3, below.

**Table 3: HECO Lualualei Station PM<sub>10</sub> 24-Hour Data July 1, 2010 – June 30, 2011**

Number of Valid hours	Minimum Concentration (µg/m <sup>3</sup> )	Maximum Concentration (µg/m <sup>3</sup> )	Average Concentration (µg/m <sup>3</sup> )
7,560	6.00	62.05	21.36

The data presented in Table 3 show that no state or federal air quality standards were violated at the Lualualei meteorological station and that the overall concentration of PM<sub>10</sub> is similar to other air monitoring sites on Oahu.

The PM<sub>10</sub> data from the Waianae meteorological station help to establish the existing PM<sub>10</sub> concentrations at a site which is not in the immediate vicinity of Nanakuli and evaluate whether emissions from other industrial sources demonstrate an increase in PM<sub>10</sub>. A statistical analysis was completed on this dataset and is summarized in Table 4, below.

**Table 4: HECO Waianae Station PM<sub>10</sub> 24-Hour Data July 1, 2010 – June 30, 2011**

Number of Valid hours	Minimum Concentration (µg/m <sup>3</sup> )	Maximum Concentration (µg/m <sup>3</sup> )	Average Concentration (µg/m <sup>3</sup> )
8,638	4.75	47.96	12.38

The data presented in Table 4 show that the no state or federal air quality standards were violated at the Waianae meteorological station and that the overall concentration of PM<sub>10</sub> is

similar to other air monitoring sites on Oahu. Figure 2 (inset) shows the location of the two HECO sites in relationship to the dust study area.



## 5.0 METEOROLOGICAL DATA

Tetra Tech also reviewed meteorological data from the HECO Lualualei meteorological station and PVT to evaluate how wind patterns in the area may affect dust transport and deposition. Tetra Tech generated two wind rose plots from the HECO Lualualei and Waianae meteorological stations, which are provided in Figure 3 and Figure 4, respectively.

The wind rose from the Lualualei station illustrates that the predominant wind direction in the area near the station is from the south and west, with little wind coming from the north and east. This wind pattern appears to be directly affected by the complex terrain (adjacent steep mountain slope) in the immediate vicinity of this location.

The wind rose from the Waianae station illustrates that the predominant wind direction in the area near this station is from the east and west, with little or no wind coming from the north and south. This pattern is consistent with the more traditional fluctuating Hawaii offshore-onshore winds that are frequent in the leeward side of Oahu.

Please note that the meteorological data that were initially provided for the PVT site were contained in tables presented with the monthly TSP report. However, that format did not allow for direct comparison with the HECO dataset; therefore, Tetra Tech was not able to compare the data from the HECO meteorological stations to the PVT stations in this report.

Tetra Tech submitted a request to PVT's contractor (Dr. Jim Morrow, DrPH) for an electronic file containing the meteorological data, and on November 29, 2011, Dr. Morrow provided an electronic version of the PVT meteorological data collected between 2006 and 2011. This data, which requires significant formatting and manipulation to allow for evaluation and generation of a wind rose, will be reviewed by DOH to better understand wind patterns in the dust study area.

It is unclear how the exact dynamics of the wind in the Nanakuli area affect transport and deposition of dust. However, based on the HECO Waianae wind rose and discussions with residents, it appears that the majority of intense winds are from the east. If these patterns prevail near the community, it may help to explain how potential dust emissions from PVT, WOA, Lualualei Road, or other sources are transported to the neighborhood. However, additional wind data in the immediate area would be required to accurately confirm the manner in which the wind patterns facilitate dust transport.

## 6.0 ON-SITE RECONNAISSANCE

A key component of the dust study included a site visit to Nanakuli to evaluate the area and collect information for this evaluation. Tetra Tech completed reconnaissance of PVT, WAO, and the surrounding neighborhoods. Each of these site visits and observations is presented below. Figure 2 provides the locations of the areas discussed below.

### 6.1 PVT Land Company

On Tuesday, August 28, 2011, Tetra Tech accompanied DOH on a site visit and tour of the PVT Landfill. Tetra Tech met with Stephen Joseph (Vice President/General Manager) and Albert Shigemura (President) at the PVT office and discussed the nature of the site visit, reviewed aerial photos of the site, and discussed the PVT air monitoring program. Tetra Tech and DOH accompanied Mr. Joseph in his vehicle for a site tour. The tour began by driving along the access road adjacent to the facility's western fence line, which abuts the residential neighborhood. The PVT representatives showed the location of the three air monitoring stations and recent site improvements in this area.

The group then traveled up the newly paved access road to the active portion of the landfill. At the time of the site visit, crews were installing a white liner in a new cell near the easternmost portion of the landfill. The group was shown the materials recycling area and observed the various piles of sorted material and the sorting system itself. The tour then proceeded to the waste-receiving area. Mr. Joseph informed the group that the waste was be received and stored prior to sorting. Several trucks were observed offloading waste. While the trucks were unloading, PVT personnel were applying a large volume of water spray to the incoming waste, and a track-mounted compactor was re-working the waste. Several additional water trucks were driving slowly around the site applying water from mounted spray guns. The waste that Tetra Tech observed being unloaded appeared to consist of general C&D waste with metal, wood, and insulation.

The tour then proceeded up and over the top of the compacted and capped section of the landfill to an area where PVT accepts asbestos waste. Tetra Tech was informed that PVT accepts asbestos waste only on specific days of week; however, no asbestos waste was delivered on the day of the visit. Tetra Tech did not observe open or exposed areas containing asbestos waste. Tetra Tech observed the concrete crushing area, truck wheel wash station, and the scale area where trucks are weighed when they enter and exit the facility.

During the site visit, the site appeared to be well watered, and there was no visible dust coming from the roads or the waste debris. There is a 5 mile per hour speed limit on the facility, and trucks passing through the facility were observed to be adhering to slow speed restrictions. PVT reportedly uses a radar gun on site to maintain speed controls. Minimal dust was observed to be generated from vehicles passing through the facility during Tetra Tech's site inspection. Several clouds of visible fugitive dust were observed to be emanating from the eastern-facing slope of the capped sections of the landfill. The dust was not extreme, but was visible, and was being picked up by fairly low wind speeds.

The PVT site visit concluded with a follow-up meeting at the office. Tetra Tech met with Dr. Morrow, DrPH (Doctor of Public Health), an independent environmental management consultant who coordinates collection of air samples for PVT, maintains and calibrates the sampling equipment, and prepares the data analytical reports. Dr. Morrow discussed the technical aspects of the air monitoring program, and demonstrated the equipment programming and

operation. He also discussed sample handling procedures used for collecting the particulate and metals samples. Based on Dr. Morrow's presentation, it is Tetra Tech's opinion that Dr. Morrow follows sound scientific methods, in accordance with the professional standards of care that would provide representative air quality data.

Furthermore, the PVT samples were analyzed by Desert Research Institute (Reno, Nevada), which is a nationally recognized and certified laboratory for analysis of air samples.

## **6.2 West Oahu Aggregate**

On Thursday, August 30, 2011, Tetra Tech accompanied DOH on a site visit and tour of WOA. Tetra Tech met with Shelby Alvaro at the WAO front office who was managing the entrance area. Ms. Alvaro agreed to accompany Tetra Tech and DOH on a walking tour of the site. However, it was lunchtime, so no active crushing or loading and unloading operations were occurring during the site visit. Tetra Tech inspected the crushing operations and observed the various piles of crushed and sorted material. The access roads were still wet from a recent watering. The group then returned to the entrance and departed.

After Tetra Tech departed the site, Tetra Tech proceeded north, toward the entrance to the Lualualei naval base entrance, to observe conditions at the entrance. There was no visible dust along the road between the entrance to WOA and the base entrance. Tetra Tech then proceeded back down Lualualei road, toward WOA. When Tetra Tech approached the side fence of WOA, the crusher was observed to be in operation. Tetra Tech stopped along the fence line and observed that there was no visible dust emanating from the crusher or material piles. Several photos were taken from the vehicle to document the conditions. Shortly thereafter, Tetra Tech proceeded farther south on Lualualei Road, and just after the entrance to WOA, observed a water truck spraying Lualualei Road. The truck entered WOA; therefore, it was assumed the truck was operated by WOA.

Tetra Tech was informed that on a subsequent visit to WOA, DOH observed visible dust emissions coming from the site. It was unclear exactly where the dust was emanating from but appeared to be from materials handling or crushing within the facility.

## **6.3 Lualualei Naval Road and Dirt Shoulder**

The Lualualei Naval Road serves as a key access point to the PVT Landfill, WOA, and the Lualualei Navy Base. Traffic consists of heavy trucks containing C&D waste or other material headed to and from PVT or WOA, as well as vehicles that access the base. URS Inc. (URS) completed a traffic study in July 2007, and estimated that the average daily traffic volume is 8,950 vehicles per day on Lualualei Road. This is a two-lane road, with large unpaved areas (berms) on either side that extend from just east of Farrington Highway to the entrance of PVT. Vehicle access to and from Lualualei Road is from Farrington Highway. Beyond the entrance to the PVT Landfill and extending generally northerly, up to the Navy base entrance, the road berms have grass ground cover on either side of the road. This ground cover appears to help minimize dust and also helps to prevent vehicles from pulling off the road. As of the date of this report, Tetra Tech was unable to confirm who completed these improvements or maintains the roadway or shoulder.

The unpaved areas along either side of Lualualei Road between the entrance to PVT and Farrington Highway are commonly used for temporary parking, as evidenced by vehicle tracks up and down the either side of the road, and the lack of vegetation. This area appears to pose the potential for significant dust emissions based on the composition of the exposed soil (fine

grain silt and sand), the amount of vehicle tracks observed on the dirt, and volume of vehicles and trucks that access this Lualualei Road. Based on numerous site reconnaissance visits completed by Tetra Tech and DOH, as well as homeowner interviews, a significant volume of traffic along Lualualei Road between the PVT entrance and the strip mall near the intersection with Farrington Highway is heavy trucks.

Tetra Tech was not able to obtain information from PVT or WOA on the actual number of trucks that travel to the facilities on a daily basis; however, the estimates would likely be in the hundreds. The volume of traffic, combined with the dynamics of the road, appear to contribute significantly to fugitive dust emissions. The unpaved road shoulder is commonly used as temporary parking for commercial trucks and other vehicles for various reasons.

There is evidence that when vehicles pull off of Lualualei Road, they may kick up dust immediately, or they carry dirt onto the road as they pull back onto the paved roadway. This dirt is further crushed and carried on vehicle tires and eventually kicked into the air as road dust.

Refer to the photographs provided in Appendix A for documentation regarding the berm conditions and evidence of mud tracking within Lualualei Road.

The posted speed limit on Lualualei Road is 25 miles per hour (mph). However, Tetra Tech observed numerous trucks and vehicles that appeared to be traveling well above the speed limit. In addition, DOH has observed trucks and vehicles which appear to be exceeding the speed limit on numerous occasions. It is suspected that that Lualualei Road is a source of road dust, and EPA AP-42 emission factor data shows that vehicle speeds are proportional to the rate of road dust emissions.

#### **6.4 Nanakuli Neighborhoods to the West and North of PVT**

During the period of August 28 to 30, 2011, Tetra Tech completed a reconnaissance of the neighborhoods west and north of PVT. An initial visit to the neighborhood west and immediately adjacent to PVT, generally bounded by Mohihi Street, was completed to obtain a visual perspective on the location of the neighborhood with respect PVT and to view the PVT Landfill from within the neighborhood (identified on Figure 2 as “Primary Neighborhood of Concern”). This neighborhood is subdivided with curb, gutter, and sidewalk construction. The homes primarily consisted of single-family dwellings with street access. Additional visits were conducted on August 29 and 30 while homeowners were interviewed. During the site visit, Tetra Tech observed a number of homes with bare ground yards (no grass or ground cover) that may serve as a potential source of fugitive dust.

A site visit to the neighborhood to the north of PVT (identified on Figure 2 as “Area of Mixed Use”), along Hakimo Road, was conducted on August 30. This is an area of mixed residential, commercial, and agricultural uses. The homes in this neighborhood were not part of a subdivision, and varied greatly in size and structure. Many homes appeared to be in varying states of disrepair, and may have some forms of commercial and non-commercial activities ongoing, such as livestock operations (pig and chicken farms), commercial agriculture, and materials storage, with much of the yard area on many properties consisting of bare ground (no grass or groundcover; notably the areas with livestock).

Several homes appeared to have large stockpiles of what appear to be junk or discarded materials and equipment. Tetra Tech notes that the area along Hakimo Road could also be a source of fugitive dust in the area, given the mixed commercial and agricultural uses, and significant unvegetated areas.

## 7.0 COMMUNITY OUTREACH

The scope of work for this project included assisting the DOH with development and distribution of a survey questionnaire that was mailed to residents in the Nanakuli focus study area. One of the survey questions asked if residents would be interested in participating in an interview with DOH and their consultant. Therefore, following the survey distribution, 10 respondents participated in an interview. This section also presents the results of the resident interviews.

### 7.1 Dust Survey and Summary of Results

DOH developed and mailed out 1,100 copies of a dust survey to residents living in the neighborhoods bounded by Lualualei Road, Hakimo Road, and Farrington Highway. DOH received 72 total responses (out of the 1,100 mailed), and the majority of respondents were from the two neighborhoods immediately west of PVT, with limited responses from the area of mixed use (see Figure 2). The survey questionnaire presented questions to residents in an effort to obtain information regarding the dust issue, and the responses were plotted on a figure showing the location of the respondent. The following nine (9) questions were presented with 4 possible answers for each question:

1. How long have you lived here?
2. Describe the amount of dust.
3. (has the dust) changed over time?
4. Side (of neighborhood) with more dust?
5. Time of day with more dust?
6. Wind direction?
7. See dust blowing onto property?
8. Interested in a visit?
9. Want updates?

A summary of the survey results is presented below. A summary sheet and series of eight (8) maps that detail the respondent survey results is provided in Appendix B.

#### Summary of Dust Survey Results

- 78% of respondents lived at site for more than 10 years.
- 44% describe their situation as a lot of dust, while 40% describe it as a greater than average amount of dust.
- 53% report that the amount of dust has increased over time.
- 44% report that the dust is from the Mauka side, while 46% report it is the same all over.
- 38% report that the dust is the same at all times of day, while 31% are not sure.
- 53% report that dust is worst with trade winds, while 36% are not sure.
- 60% report that dust can be seen blowing onto their property, and 38% report a source.
- 30 of the respondents were interested in a visit.
- 35 requested updates.

In addition to providing the dust survey questionnaire to residents, DOH also solicited a request for residents to participate in a photo brigade whereas any photos showing dust would be provided to DOH. It is noted that to date, one neighborhood resident has submitted photos to the DOH. These photos are also included in Appendix A.

## 7.2 Homeowner Interviews

DOH identified and confirmed 10 homeowners who agreed to meet, and discuss their concerns regarding dust issues and on August 29 and 30, 2011, Tetra Tech and DOH conducted these visits. Tetra Tech was unable to make contact with one homeowner; therefore, a total of nine interviews were conducted.

The length of time these residents lived in the neighborhood varied from just a few years to more than 40 years. The names of the individuals and their addresses will be kept confidential; however, information obtained from the site visits has been summarized below. The homes were all located in the neighborhood generally bounded by Hakimo Street, Lualualei Road, Farrington Highway, and the southwest boundary of the PVT Landfill.

Several generalized questions were presented to each of the homeowners, such as:

- Has the dust problem gotten worse, better, or remained unchanged over the past 10 (or so) years?
- Where is the dust coming from?
- Is dust worse at certain times of day?
- Is dust worse at certain times of the year?
- Any other concerns or questions?
- The responses and concerns provided by residents are presented below.

### **Resident #1**

- Length of time at this address – over 40 years.
- Described dust as coming from east side of house, and believes it is from truck traffic along Lualualei Road.
- Did not see any differences in dust during different times of the year.
- Described how dust was always getting into the carpet, so resident had it removed.

### **Resident #2**

- Length of time at this address – 37 years.
- Described always having dust in Nanakuli, and that it comes from the east side of the house from the direction of the PVT Landfill.
- Called a state agency 3 years ago to seek assistance cleaning house because of the overwhelming amount of dust. (Refer to Photo No.1, in Appendix A.)
- Described that dust seemed to have decreased some over “the last year or so”.
- Dust problem worse during daytime, when activity at PVT is occurring.



- Described traffic as not dramatically increased over the last few years, but there always seem to be a considerable number of trucks.
- Described how daughter has asthma and has difficulty breathing when dust is bad.

### **Resident #3**

- Length of time at this address – 20 years.
- Described that dust comes from trucks traveling on Lualualei Road, and is worse during PVT Landfill business hours.
- Dust problem has gotten worse over last 10 years.
- Every Sunday has to wash vehicles because there is so much dust on them.
- Described how son has asthma and wondered if it was caused by the dust.
- Expressed concern as to whether the dust particles are harmful.

### **Resident #4**

- Not at home.

### **Resident #5**

- Length of time at this address – 41 years.
- Described that the dust comes from trucks along Lualualei Road, and is worse during morning hours.
- Dust is “bad”, not better or worse.

### **Resident #6**

- Length of time at this address – more than 1 year.
- Described that dust comes from trucks traveling on Lualualei Road, and can see dust as the trucks enter and leave the PVT site (resident has a view of PVT from her property).
- Described how the red dust clogged the street drains.
- Described that when wind is blowing dust is bad in the afternoon; she can see dust coming from the trucks.
- Said neighbors always complain about how they have always had a problem with the dust.

### **Resident #7**

- Length of time at this address – 2 years.
- Described that dust is all over the house.

- Dust problem has gotten worse over the years.
- Does not know where dust is coming from because he cannot see PVT from his house.
- Described how wife was getting regular nose bleeds and eye irritation; wondered if it was from the dust.
- Expressed concern if the dust particles are harmful.

#### **Resident #8**

- Length of time at this address – 19 years.
- Dust problem has gotten worse over the years.
- Described that dust is coming from PVT Landfill in varying intensities depending on activities and wind.
- Described how dust is everywhere inside his home.

#### **Resident #9**

- Length of time at this address – 15 years; previously lived at other location in neighborhood for 32 years.
- Described how dust problem is getting worse.
- Dust blows from the east.
- Described that dust comes from trucks traveling on Lualualei Road, and within the PVT Landfill, and is worse during business hours.
- Described how Lualualei Road was watered in the past, but is not watered anymore (note: resident's property abuts Lualualei Road; therefore, has direct view of street).
- Believes that the trucks are a major source of dust and debris (blowout out of trucks).

#### **Resident #10**

- Length of time at this address – 16 years.
- Described how dust problem has gotten worse over last 10 years.
- Described how dust accumulates over time.
- Described how windows on east side of house (the side toward Lualualei Road) get a lot of dust accumulation.
- Concerned about what is in the dust and if it is harmful; grandson has asthma and wonders if dust is making it worse.



### **General Summary of Homeowner Interviews**

It was apparent from these interviews that the residents of the neighborhood feel that the dust is coming from the PVT Landfill and the trucks as they enter and exit the site, and as they travel along Lualualei Road. The opinions expressed by the residents could not be verified or confirmed. In addition, no medical records were provided to support any health-related claims.

Many of the residents are concerned because they do not know if the dust is harmful and have not been provided any information to support an argument as to whether the dust is or is not a potential health concern.

A summary of the primary concerns that were expressed by most residents includes the following:

- Dust appears to be worse during business hours, and has generally become worse over the past several years.
- Dust appears to be coming from the general direction of the PVT Landfill, and can be seen coming from trucks entering and exiting the site.
- Trucks traveling to and from the PVT Landfill, along Lualualei Road are a source of dust.
- Concern: Is the dust harmful?
- Concern: Several residents reported knowing someone who is sick, and are concerned whether the dust may be affecting their health.

## 8.0 CONCLUSIONS AND RECOMMENDATIONS

The section below presents Tetra Tech's conclusions and recommendations, resulting from the Nanakuli Dust Study.

### 8.1 Conclusions

Tetra Tech completed the tasks presented above in an effort to identify the potential sources of dust in the Nanakuli area and offer specific recommendations to reduce dust. Air quality data from the immediate and surrounding areas were reviewed to compare with EPA standards. A comprehensive document review was completed in an effort to understand the context and basis for this issue. Site visits and reconnaissance were completed in an effort to observe and document on-site conditions that may lead to the formation and transport of dust. A questionnaire and homeowner interviews were conducted so that residents had the opportunity to express their concerns, ask questions, and discuss this issue.

The study has identified the following potential sources of dust:

- Commercial and industrial sources, located along Lualualei Road, including PVT and WOA;
- Roadway sources, predominantly along Lualualei Road, between Farrington Highway and PVT Landfill;
- Residential yards which are unvegetated (bare dirt), including the focus neighborhood.
- Other commercial, agricultural, and residential areas with unvegetated properties in the mixed use area along Hakimo Road.

As a result of these tasks and a review of the air quality data provided, Tetra Tech offers the following conclusions:

- Dust presents a nuisance for the residents of Nanakuli when wind conditions facilitate transport and deposition from potential dust sources. However, based upon a review of all available data, and a review of the on-site conditions, the dust does not pose a health concern.
- Some of the dust appears to be tied directly or indirectly to emissions from Lualualei Road, PVT, WOA, and commercial agriculture. Site visits performed during this study, including PVT and WOA, indicated that there are dust emissions as a result of these operations.
- As indicated in this report, air monitoring data provided by PVT indicates that dust in the vicinity of the fenced boundary between PVT and the abutting neighborhood to the west does not pose a health concern. Further, a review of the data and methods indicates that the data is collected in accordance with sound scientific principles, applicable EPA methods, and professional standards of care, resulting in representative air quality data.
- The current operations at PVT are focused on C&D waste disposal and recycling. However, in the near future, PVT plans to begin landfill mining and secondary shredding feedstock operations. The permit issued by DOH requires additional air monitoring at

the start of these operations to confirm that PVT's increased activities do not result in an increase in air pollution and emissions.

## **8.2 Recommendations**

The recommendations presented below are not directly tied to any permitting requirements, nor are they legally binding in any way. They are offered as steps to help reduce potential fugitive dust emissions, and allow the DOH to work closely with the Nanakuli community to begin addressing this issue through regular community outreach programs and ongoing technical input.

### **Recommendation #1 – Lualualei Naval Road Improvements and Maintenance**

Tetra Tech recommends that DOH work closely with the community in conjunction with PVT and the Navy base to initiate a plan to address the bare dirt pullout sections (berm) on either side of Lualualei Road. This area could be addressed by planting ground cover and installing obstructions, such as a curb or guardrail that will prevent trucks and cars from pulling off the road.

Based on the site visit and homeowner interviews, this area may be a significant source of dust resulting from trucks traveling to and from the PVT site along Lualualei Road. Trucks and vehicles may be directly emitting dust and debris from their vehicles as they drive onto and off the shoulder. In addition, the dirt may be tracked and deposited onto the roadway, where it they can then be emitted as road dust.

Homeowners stated that they observe dust coming from the trucks, and also on numerous occasions have seen trucks pulled over on the side of the road. All of these activities, combined with low soil moisture and high winds blowing from the east and southeast, may contribute to dust that is transported to the neighborhoods.

In addition, regular maintenance, such as street sweeping and cleaning of the road, will help to further reduce dust emissions.

### **Recommendation #2 – Enforcement of Speed Limit on Lualualei Naval Road**

Tetra Tech recommends that the Navy enforce the 25 mph speed limit. Based on a site visit and a review of the URS traffic study, on average more than 8,000 vehicles travel this road on a daily basis. EPA has developed emission factor data (AP-42) for road dust emissions, and numerous air quality studies have been completed on the rate of dust that is emitted from vehicles traveling on paved roads that contain varying amount of dirt. The U.S. National Emissions Trends Inventory (USNETI) for 1997 estimated that nearly two-thirds of all fugitive dust results from road dust (USNETI 1997).

The dynamics and formation of road dust result from small dirt particles that are deposited on public roadways. Vehicles traveling on the road further crush and entrain these dirt particles onto tires and kick them up into the air. Because of the small size fraction, these particles are easily transported with even low wind speeds. This problem is further exacerbated by large trucks with multiple-wheel axles and industrial-size tires.

Enforcing the speed limit on this stretch of roadway, along with reduced dirt tracking onto the roadway (from the shoulder), will help to reduce road dust.

This issue and hypothesis is supported by the 1 year of monitoring data collected by PVT at Station #1, which is located near the entrance to PVT, along Lualualei Road. On average, Station #1 TSP concentrations were 38 percent than at Station #2, and 78 percent higher than Station #3. It is suspected that this increase in TSP concentrations is the result of impacts from trucks entering and exiting the site, and road dust from Lualualei Road.

### **Recommendation #3 – Reduce Emissions at Entrance to PVT**

Tetra Tech recommends that PVT evaluate alternatives to better control dust emissions from vehicles near the site entrance.

Numerous residents described how they observed trucks and vehicles entering and exiting the PVT facility, and that these trucks were generating visible dust. This may be a result of trucks and vehicles traveling on the shoulder or other unpaved (or underpaved) sections of roadways near the entrance to PVT. Tetra Tech recommends that DOH work with PVT to identify if there are areas near the entrance that may have the potential for dust emissions and address this issue.

It is recommended that PVT take the following actions, including, but not limited to: prohibiting vehicles from driving on dirt shoulders; determine if unpaved areas can be paved; and, applying water to exposed areas on a routine basis which results in dust reduction.

### **Recommendation #4 – Reduce Emissions on Capped Landfill Sections at PVT**

Tetra Tech recommends that PVT evaluate alternatives to reduce dust emissions from the capped sections of the landfill, using either ground cover or a geo-membrane on the semi-permanent slopes. During the site visit, Tetra Tech and DOH observed that access roads and incoming waste were well watered.

However, several of the inactive and semi-permanent slopes were barren of any groundcover, and dust was observed blowing off the slope and becoming airborne. Clean Air Branch rules require reasonable dust control measure on visible dust. In addition, the PVT Permit Section A, Part 11, and Section B, Parts 23 and 43 require that PVT adequately address dust and erosion control on slopes and exposed areas of the landfill.

Dust control measures must be continually implemented PVT, and Tetra Tech recommends that DOH work closely with the facility to ensure that adequate measures are being taken on a daily basis to minimize dust emissions.

### **Recommendation #5 – Evaluate Reasonable Dust Controls on Other Surrounding Industrial, Commercial, and Agricultural Areas**

Tetra Tech recommends that the DOH work with the remaining surrounding commercial, industrial, and agricultural areas, to evaluate whether “reasonable controls” are in place with regard to fugitive dust emissions. This includes the WOA facility, as well as the mixed use area along Hakimo Road.

During a DOH site reconnaissance of WOA, dust emissions were observed to be coming from the facility. WOA’s permits with the Solid and Hazardous Waste Branch and Clean Air Branch require dust control measures. Dust control measures to address crushing

operations and fugitive dust from site operations must be continually implemented at the WOA facility, and Tetra Tech recommends that DOH work closely with the facility to ensure that adequate measures are being taken on a daily basis to minimize dust emissions.

Similarly, periodic DOH area reconnaissance is recommended for the area along Hakimo Road, to evaluate whether commercial and agricultural activities in that area are implementing “reasonable controls” to minimize dust emissions from their operations, which could be impacting surrounding neighborhoods. This would also include follow-up to any activities identified by neighborhood community members via reports of nuisance dust, or photo-brigade reports showing activities generating visible dust.

#### **Recommendation #6 – DOH Community Involvement**

Tetra Tech recommends that DOH continue to provide the Nanakuli residents with updates and new information on this issue through e-mail notices and flyer mailings. Based on resident interviews and attendance at the public meeting, it is clear that many homeowners do not understand the permitting process and available air quality data. Community outreach could include providing information on how to obtain available and relevant air monitoring and permit data, and guidance on understanding interpretation of available data and related information.

#### **Recommendation #7 – Review Recently Obtained Electronic Meteorological Data Provided**

On November 29, 2011, Dr. Morrow provided the PVT meteorological data in electronic format. Tetra Tech recommends that this data be reviewed and formatted to generate a wind rose for the area specific to PVT, to better understand the immediate local wind patterns.

The data that were obtained from the HECO Lualualei and Waianae meteorological stations present potentially conflicting data regarding the wind patterns in the immediate vicinity of the Nanakuli dust study area. The terrain at the HECO Waianae station is more consistent with the terrain at the dust study area, and appears to more closely reflect wind conditions at that location.

A detailed review of wind data from PVT will help DOH to assess the wind patterns and further assess dust transport and deposition.

#### **Recommendation #8 – Neighborhood Awareness and Improvement Plan**

Tetra Tech recommends that DOH and the local Nanakuli neighborhood evaluate whether a neighborhood awareness and improvement plan could be developed to help residents understand the importance of keeping their lots watered and maintained.

During the site reconnaissance, Tetra Tech observed a number of homes with bare dirt lots and no landscaping whatsoever. During the dry season or drought conditions, this lack of vegetation may contribute to fugitive dust within the immediate neighborhood.

In addition, a number of homes on the northwest end of Hakimo Road were observed having potentially unpermitted commercial activities that may be contributing to dust

emissions in the area. Tetra Tech recommends that DOH investigate this area to confirm whether any unpermitted activity is occurring that may contribute fugitive dust in the area.

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## FIGURES









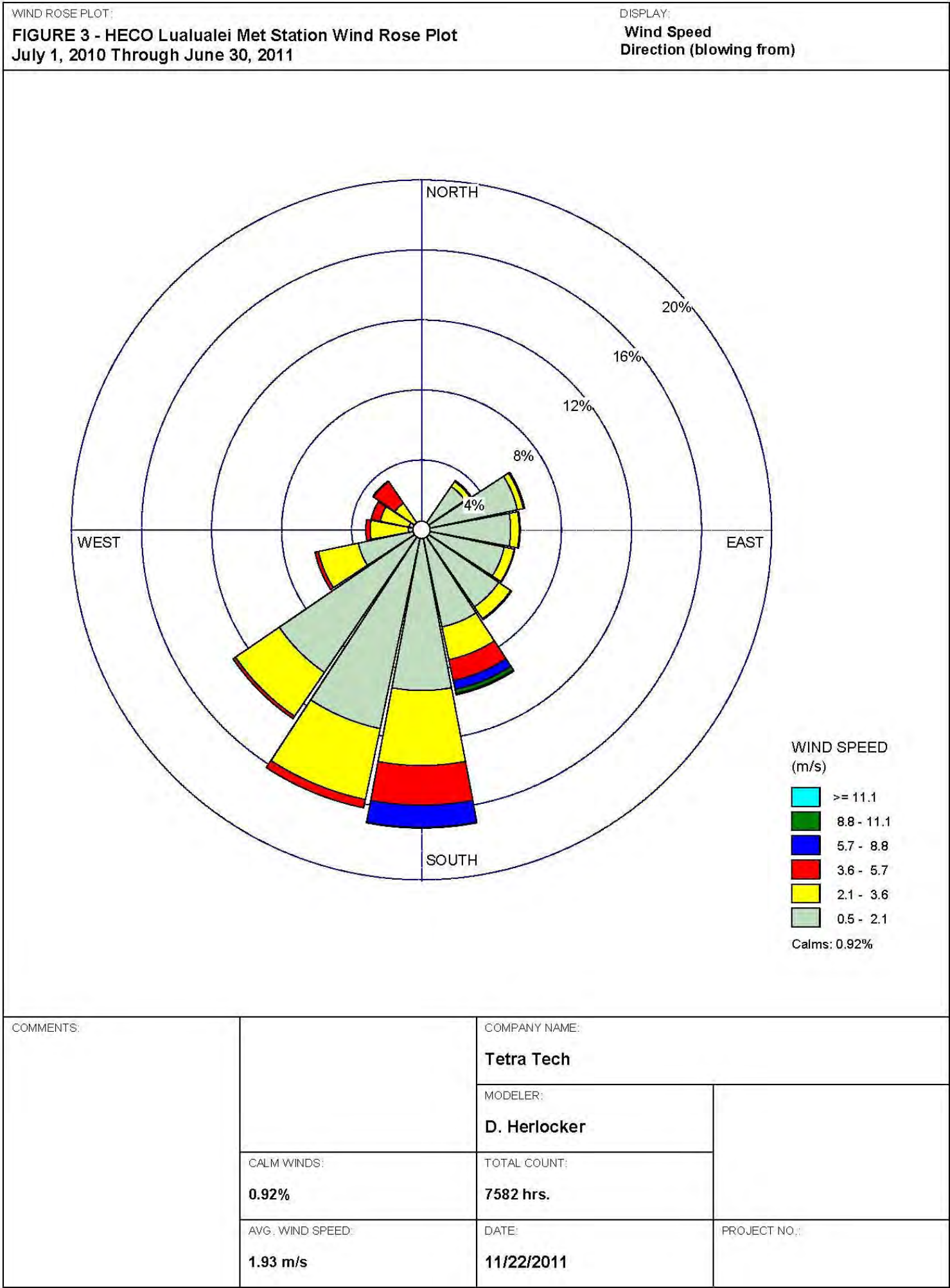
HECO AIR QUALITY MONITORING STATIONS

State of Hawaii Department of Health  
Solid and Hazardous Waste Branch

FIGURE 2  
NANAKULI DUST STUDY  
LOCATION MAP







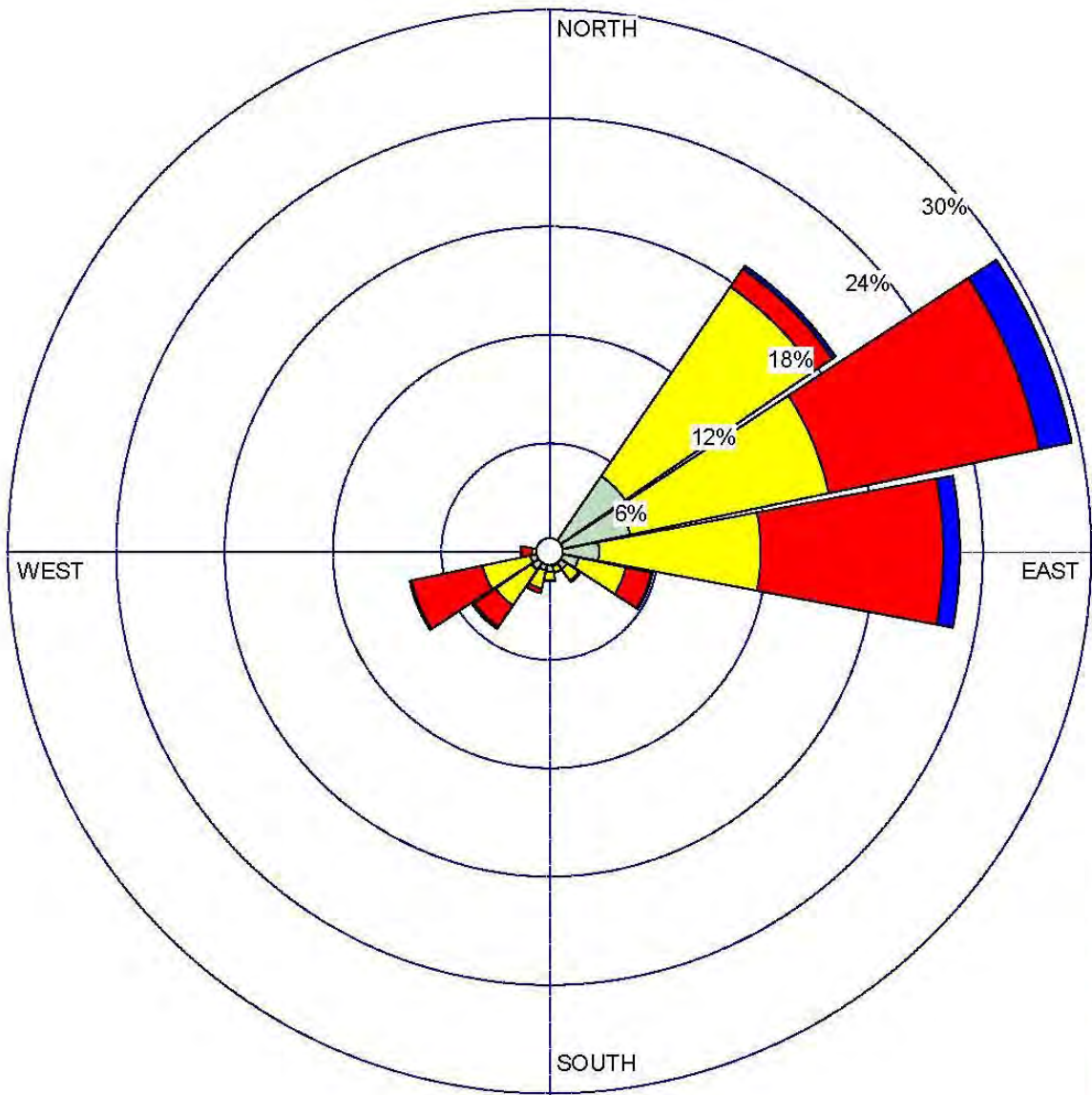
WRPLOT View - Lakes Environmental Software

WIND ROSE PLOT:

FIGURE 4 - HECO Waianae Met Station Wind Rose Plot  
July 1, 2010 Through June 30, 2011

DISPLAY:

Wind Speed  
Direction (blowing from)



COMMENTS:

COMPANY NAME:

Tetra Tech

MODELER:

D. Herlocker

CALM WINDS:

0.05%

TOTAL COUNT:

8663 hrs.

AVG. WIND SPEED:

3.11 m/s

DATE:

11/22/2011

PROJECT NO.:

WRPLOT View - Lakes Environmental Software

State of Hawaii Department of Health  
Solid and Hazardous Waste Branch

FIGURE 4  
NANAKULI DUST STUDY  
HECO WAIANAE MET STATION WIND  
ROSE

## **APPENDIX A PHOTOGRAPHIC LOG**



**Photo No. 1.**

**Date:** August 29, 2011

**Description:**

East side of house in Nanakuli neighborhood showing evident of dust staining on siding.



**Photo No. 2.**

**Date:** August 30, 2011

**Description:** Side view of West Oahu Aggregate Facility facing north.



**Photo No. 3.**

**Date:** August 30, 2011

**Description:** Lualualei Road near entrance to West Oahu Aggregate looking west; truck watering roadway.



**Photo No. 4.**

**Date:** October 31, 2011

**Description:** View of Lualualei Road near entrance to PVT Land Company looking east.





**Photo No. 5.**

**Date:** October 31, 2011

**Description:** View of dirt shoulder along Lualualei Road looking west; evidence of vehicle tracks and dirt being carried onto roadway.



**Photo No. 6.**

**Date:** October 31, 2011

**Description:** View of dirt shoulder along Lualualei Road looking east; evidence of vehicle tracks and dirt being carried onto roadway.





**Photo No. 7.**

**Date:** October 31, 2011

**Description:** View of dirt shoulder along Lualualei Road looking east; evidence of vehicle tracks and dirt being carried onto roadway.



**Photo No. 8.**

**Date:** October 31, 2011

**Description:** View of grass shoulder along Lualualei Road east of entrance to PVT, facing east.





**Photo No. 9.**

**Date:** October 31, 2011

**Description:** View of dirt shoulder along Lualualei Road looking east adjacent to West Oahu Aggregate; evidence of dust emissions blowing off-site.



**Photo No. 10.**

**Date:** October, 2011

**Description:** View of dirt shoulder along Lualualei Road facing west; evidence of vehicle tracking dirt onto roadway



**Photographs on following 2 pages were provided by a Nanakuli resident living in the neighborhood adjacent to PVT. Photos were taken on August 8, 2011.**





Aug 8th 2011  
8:30 AM





Aug 8th 2011  
8:20 AM

**APPENDIX B**  
**DOH SUMMARY SHEET AND MAPS OF DUST SURVEY**  
**QUESTIONNAIRE RESPONSES**

ADDRESS	Respon se	Mail	1. How long have you lived here?				2. Describe the amount of dust				3. Changed over time?								4. Side with more dust							5. Time of day with more dust?						6. Wind direction?				7. See dust blowing onto property?			Interested in a visit?				8. Want updates?
	Date	Return ed	<1 yr	1-5 yrs	5-10 yrs	> 10 yrs	A lot	> Average	Average	Little	Yes	No	Increase	Decrease	Within yr	1-5 yrs	5-10 yrs	> 10 yrs	Not sure	Mauka	Makai	Ewa	Dhead	Same	None	Morning	Afternoon	Night	All the time	Not sure	None	Trades	Kona	Not sure	No	Yes	No	From where	Yes	No	Contact name	Pho ne	Email addres s
TOTAL RESPONSES	72	157	0	6	10	56	32	29	8	2	46	17	38	3	9	10	7	6	11	32	6	6	7	33	1	10	19	2	27	22	1	38	11	26	1	43	27	27	30	1	30	31	35
% TOTAL RESPONSES	7.63%		0.0 %	8.3 %	13.9 %	77.8 %	44.4 %	40.3 %	11.1 %	2.8 %	63.9 %	23.6 %	52.8 %	4.2 %	12.5 %	13.9 %	9.7 %	8.3 %	15.3 %	44.4 %	8.3 %	8.3 %	9.7 %	45.8 %	1.4 %	13.9 %	26.4 %	2.8 %	37.5 %	30.6 %	1.4 %	52.8 %	15.3 %	36.1 %	1.4 %	59.7 %	37.5 %	37.5 %	41.7 %	1.4 %	41.7 %	43.1 %	48.6%

Summary:

DOH mailed out 1,100 surveys in July 2011

1. Surveys were due July 31, 2011
2. 157 were undeliverable by the post office
3. 72 responses, 7.63% response rate

Results

1. 78% of respondents lived at site for more than 10 years
2. 44% describe their situation as a lot of dust, while 40% describe it as a greater than average amount of udst
3. 53% report that the amount of dust has increased over time
4. 44% report that the dust is from the Mauka side, while 46% report it is the same all over
5. 38% report that the dust is the same at all times of day, while 31% are not sure
6. 53% report that dust is worst with tradewinds, while 36% are not sure
7. 60% report that dust can be seen blowing onto their property, and 38% report a source
8. 30 of the respondents were interested in a visit
9. 35 requested updates.



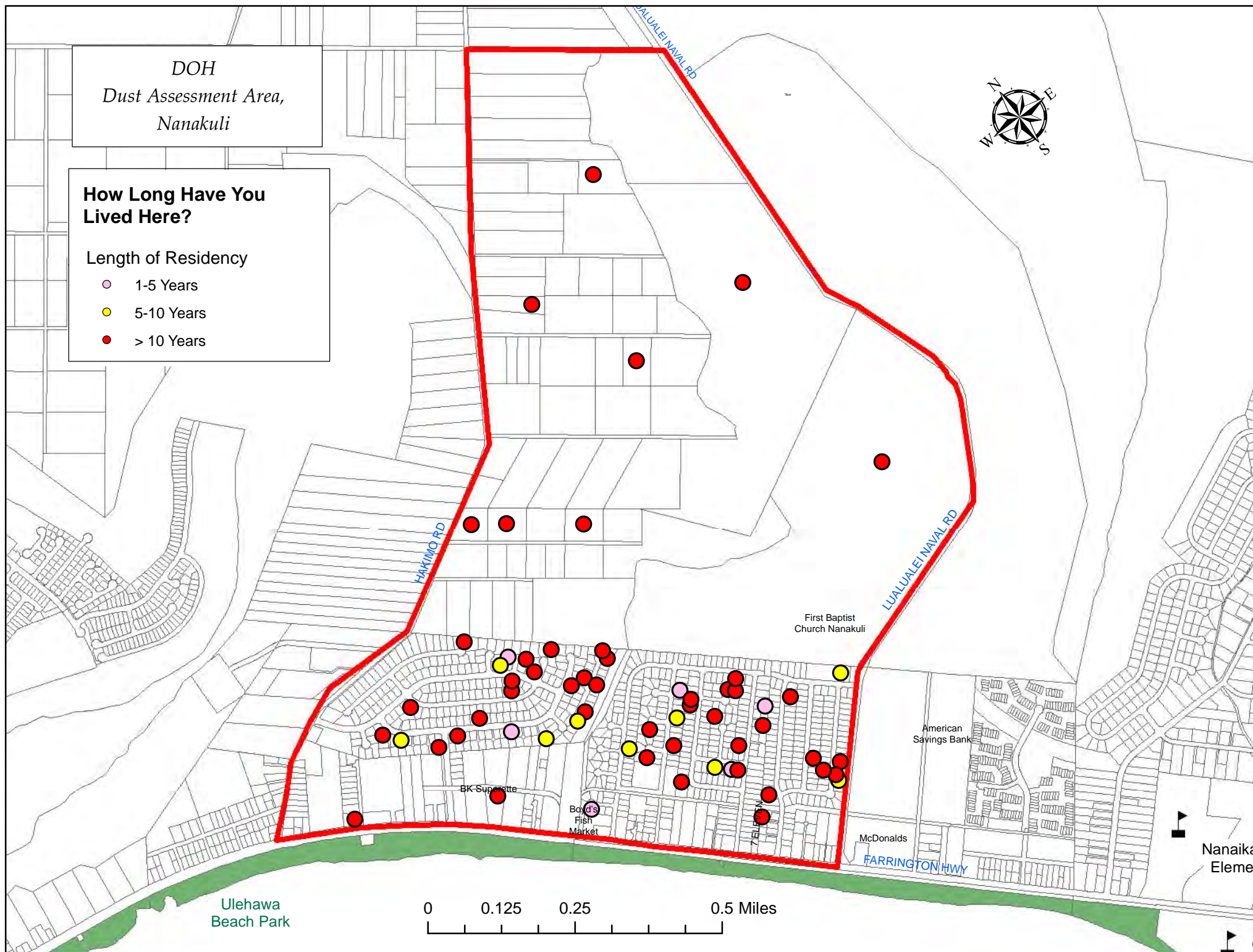
DOH

Dust Assessment Area,  
Nanakuli

### How Long Have You Lived Here?

Length of Residency

- 1-5 Years
- 5-10 Years
- > 10 Years









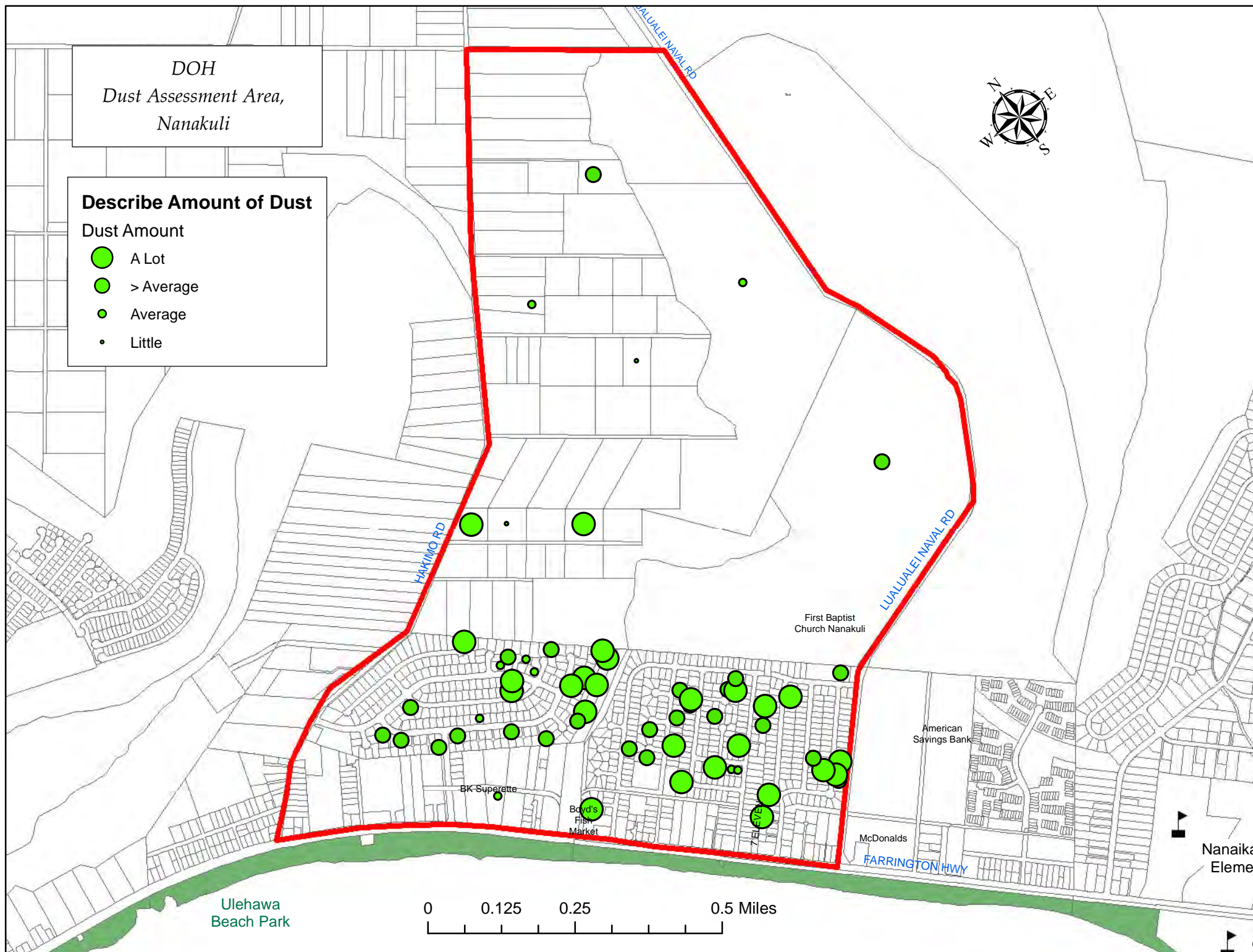
DOH

Dust Assessment Area,  
Nanakuli

**Describe Amount of Dust**

Dust Amount

-  A Lot
-  > Average
-  Average
-  Little

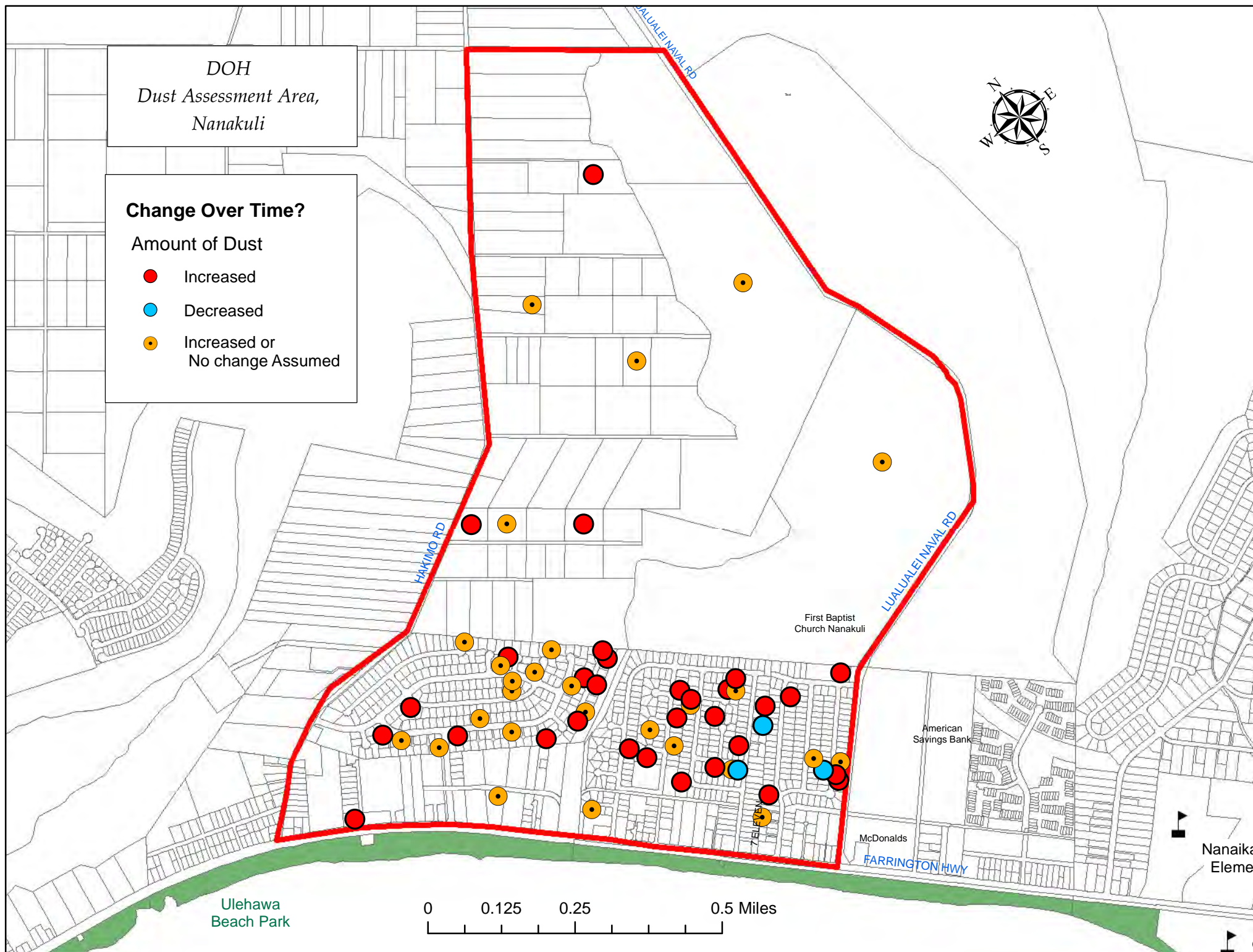


DOH  
Dust Assessment Area,  
Nanakuli

**Change Over Time?**

Amount of Dust

- Increased
- Decreased
- Increased or No change Assumed



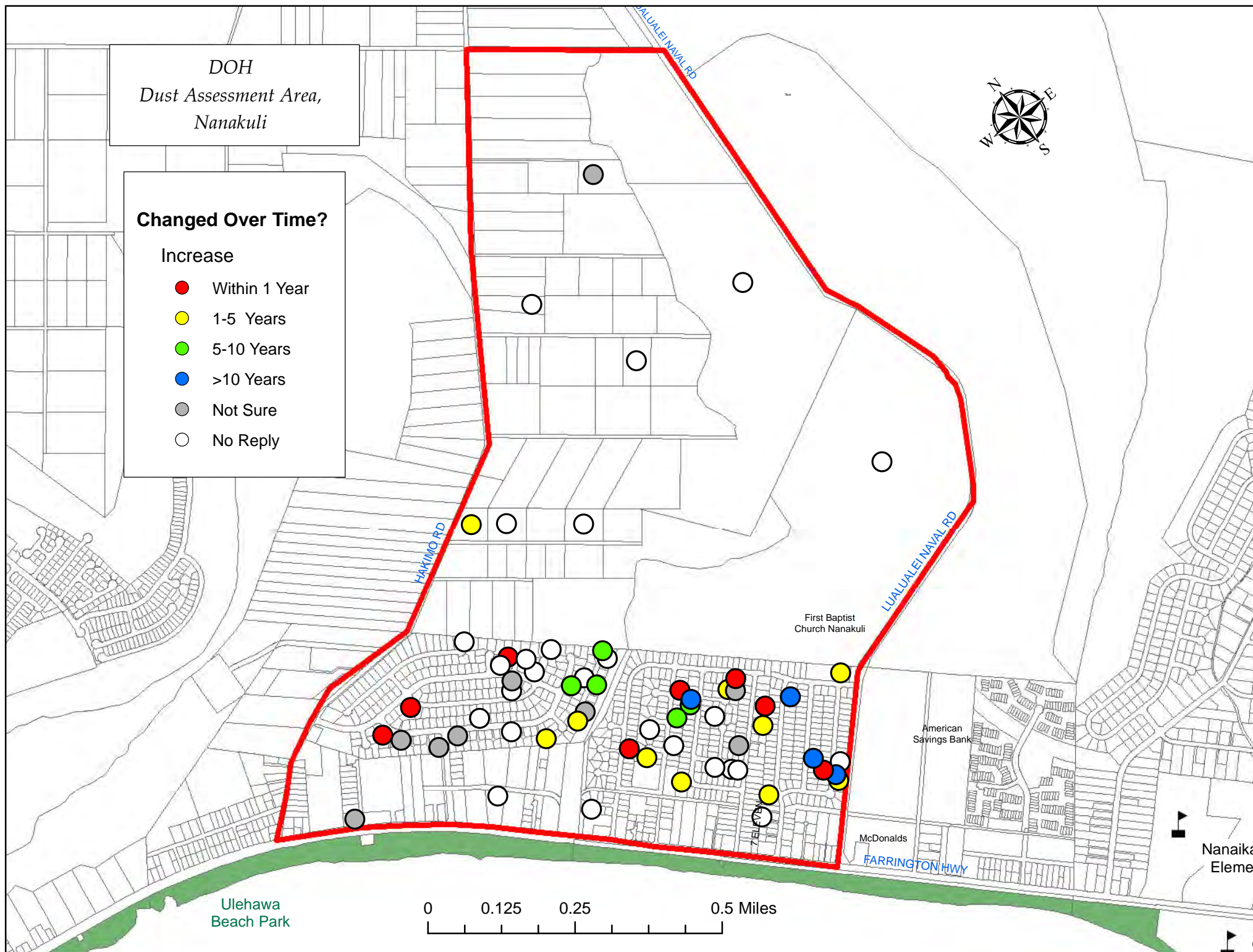


DOH  
Dust Assessment Area,  
Nanakuli

Changed Over Time?

Increase

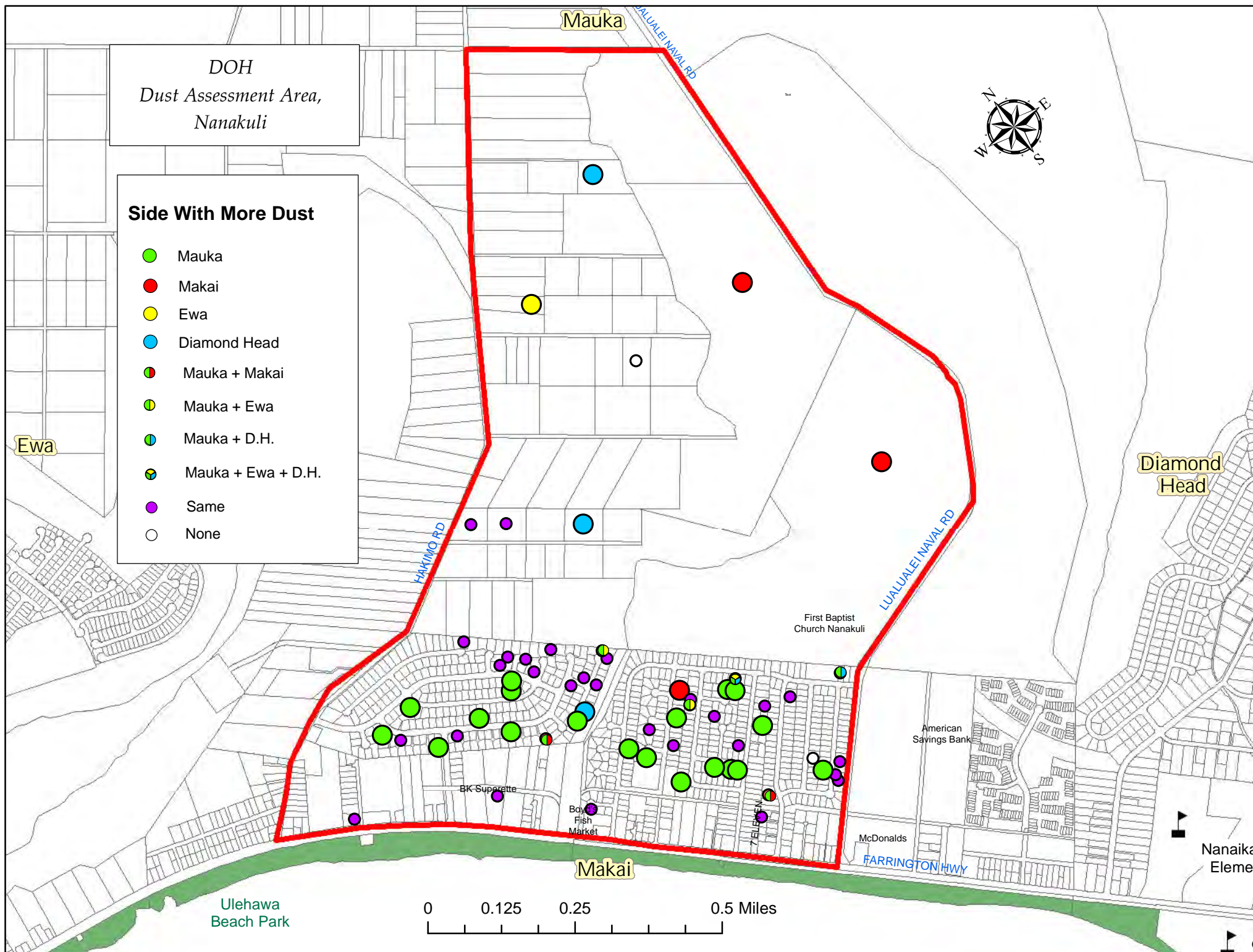
- Within 1 Year
- 1-5 Years
- 5-10 Years
- >10 Years
- Not Sure
- No Reply



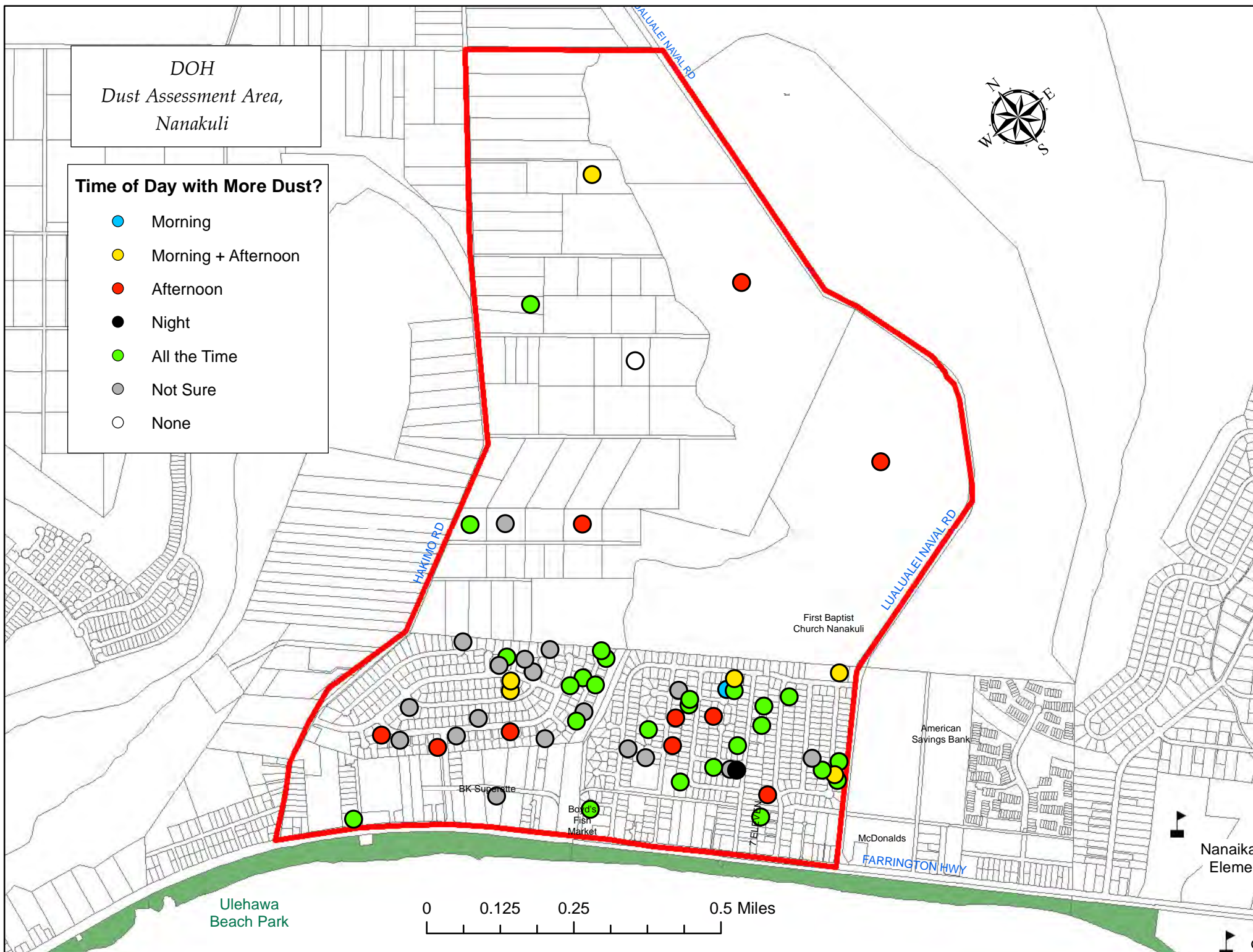
DOH  
Dust Assessment Area,  
Nanakuli

Side With More Dust

- Mauka
- Makai
- Ewa
- Diamond Head
- Mauka + Makai
- Mauka + Ewa
- Mauka + D.H.
- Mauka + Ewa + D.H.
- Same
- None







DOH

*Dust Assessment Area,  
Nanakuli*

**Wind Direction?**

- Trades
- Trades, Kona
- Kona
- Not Sure
- No

**Trade Winds**  
Accounting for 70% of all winds in Hawaii, trade winds are the most common winds over Hawaiian waters. These persistent winds blow from a NE to ENE direction,

**Kona**  
Kona, a resort town on the leeward side of Hawaii's Big Island, is a Hawaiian term for the stormy, rain-bearing winds that blow over the islands from the SW or SSW, in the opposite direction of trade winds.

