Hawai'i Volcanoes National Park
Island of Hawai'i

Hilina Pali 2005

The Civilian Conservation Corps
An Archeological Inventory Survey of the Hilina Pali Erosion Control Project of 1940

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Pacific Island Network
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Executive Summary

The Hilina Pali Civilian Conservation Corps (CCC) survey project of which this report discusses was originally part of the 1998 archeological research conducted in the Kaʻu Desert to document the Footprints National Register parcel (Nakamura, 2003: ii). This area was nominated to the National Register of Historic Places in 1974 due to the "unique 'fossilized' human footprint impressions found in two separate layers of hardened desert ash" (Nakamura, 2003: 2). The footprints are commonly believed to be from an army of Native Hawaiians led by Chief Keōua during the 1790 pyroclastic explosion of Kīlauea and were first identified in 1920 (Nakamura 2003: 2). This survey covered approximately 4,284 acres and is located in the District of Kaʻu, on the Island of Hawaiʻi within the ahupuaʻa of Kapāpala (TMK #399001001 and 398001001) (see figure 5) (Nakamura 2003: ii). The original Footprints survey conducted by Warren Wulzen, B.A. in 1998 included the footprints, the features associated with the footprints as well as the historic erosion control features built by the Civilian Conservation Corps (CCC) in the 1940's (see figure 3 for original surveyed areas). These were originally all included into one project because of their close location to each other (see figure 5). It was later decided that these unique historic CCC features should be separated into their own report due to the fact that they were of a different era, different function, and only related to each other because they are in the same general location. Therefore, the Hilina Pali survey was separated into its own research project and report and includes the sites built by the Civilian Conservation Corps for erosion control purposes in the lower Kaʻu Desert as well as some prehistoric Ka'u Desert features. The Footprints and the associated features with these became their own report entitled *Keoneheleleleiʻ- The Falling Sands. Uncovering the Origin of Preserved Footprints and Associated Kaʻu Desert Features: A Historical Overview and Archeological Survey of the Kaʻu Desert* by Jadelyn Moniz-Nakamura, PhD.

The field surveys conducted to record the CCC erosion control features near Hilina Pali took place in three different years, by three different field crews. The original survey was part of the footprints in 1998, then resumed as a separate project in 2002, and finished in 2003. A total of 201 features were located and recorded mostly including retaining walls and dams. The majority of the features identified in the Hilina Pali survey are related to the CCC and their erosion control project of 1940. In this report the CCC features are the main focus and are separated out from the prehistoric Ka'u Desert features that were also recorded. Due to the fact that CCC features are of a unique type and of a specific time period they are discussed apart from the other features at the end of the report.

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Acknowledgements

This research was made possible through the funding of Hawai‘i Volcanoes National Park Cultural Resource Division with specific guidance and encouragement from Jadelyn Moniz-Nakamura. A special thanks goes to her for granting the opportunity to become involved in this project. Also, all the field members who worked on the feature recordation over the years deserve recognition which include; Taylor Houston, Chris Quiseng, Mara Durst, Sandra Arnold, Brandy Pang, and Nicole Thompson and possibly some others. Through all of their hard work the field portion of this project would not have been possible.

The report write up was completed with the tremendous amounts of help and input from Dennis Doughtery, Jessica Maxey, Kelly Luscomb, Jahkotta Burrell, and Kalena Blakemore as well as through the assistance of Tracey Laqua and Keola Awong. This report is the final product of everyone’s hard work and each person’s unique input is greatly appreciated.

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Chapter I. Introduction

What was the Civilian Conservation Corps?

The Civilian Conservation Corps (CCC) was a program developed by Franklin D. Roosevelt's New Deal (1933) at the end of the Great Depression. The goal of the CCC was to provide young men with jobs during a time when many were unemployed, times were hard and starvation was a concern. The program, also known as Emergency Conservation Work (ECW) employed men in many National and State Parks across the country from 1933-1942 and is looked upon as one of the most successful New Deal programs (Paige 1985:132). The program "brought together two wasted resources, the young men and the land, in an effort to save both" (http://www.cccalumni.org). During the time frame of the CCC, the enrollees became involved in developing and conserving the nations Parks and forests, of which had been neglected in previous years. Their projects were numerous and included road and building construction, erosion control, masonry, fire fighting, trail maintenance, vegetation and insect control among many others. One of the main goals of the CCC was to renew the nations decimated forests and during the programs existence an estimated 3 billion trees were planted throughout the country (http://www.cccalumni.org). The enrollees of the CCC did excellent and detailed work and the nations parks and forests became in part, what they are today through the labor of these dedicated men.

Within the Hawaii Volcanoes National Park (see figure 2) as well as many other parks and forests much of the work that the CCC did is still evident and still in use. From the research offices to the hiking trails, the CCC laid the foundations for what we see and use today in the Park. Although the CCC accomplished many great tasks, this particular project focuses on their work done near Hilina Pali which is within the then called Hawaii National Park (HNP). Due to flooding and massive erosion in this area the CCC undertook a project that required the quarrying of rocks to use in the construction of walls and dams in order to mitigate the problem. These structures can still be found today and many are still in excellent condition due to the skilled craftsmanship of the CCC enrollees. Many of the remaining walls and dams built in the early 1900s were relocated and recorded during the 1998 and 2002-2003 archeological inventory survey projects of which are included this report. The above photo shows an example of the daily life at the CCC camp in Hawaii National Park (see figure 1).

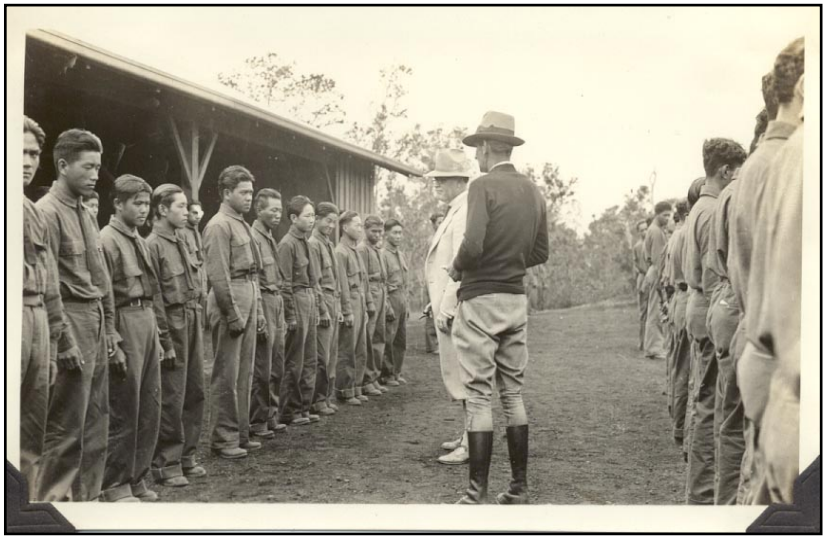

Figure 1. CCC Camp Inspection. Photo Courtesy of Hawai'i Volcanoes National Park Superintendent Reports HAVO Archives, 1940.

Scope of Work

The Scope of Work for the Hilina Pali Archeological Survey Project was originally a part of the survey of the 1790 Footprints National Register parcel. The National Register of Historic Places is the United States official list of cultural resources worthy of preservation due to their unique contribution to history, authorized under the National Historic Preservation Act of 1966. This National Register site is located in the Kaʻu Desert of the Hawaiʻi Volcanoes National Park (see figure 5) and was nominated to the Register of Historic Places in 1974 because of the numerous fossilized footprints left by Native Hawaiians that are found there (Nakamura 2003: 2). The footprints are commonly believed to be from members of the warrior party of Chief Keōua that perished while marching through the Kaʻu Desert during the pyroclastic explosion of Kīlauea in 1790 (Nakamura 2003: 2). The conduction of an archeological survey of this parcel was initiated at the request of the National Park Service (NPS) and the Research Corporation of the University of Hawaiʻi (RCUH) due to the damage of the footprints that was taking place (Nakamura, 2003: 5). Vandalism, human trampling, volcanism, and natural erosion were all taking a toll on this cultural resource that had never previously been systematically recorded by archeologists (Nakamura 2003: 5). In 1998 and 2000 detailed surveys of the 4,284 acre parcel took place which is located in the Kapāpala ahupuaʻa of the District of Kaʻu, Hawaiʻi Island (see figure 5).

During the Footprints survey the majority of the CCC erosion control features discussed in this report were identified although they were out of the original project area and not in compliance with the scope of work for the Footprints project (Nakamura 2003: 7). The CCC historic archeological site located during the Footprints survey was separated into its own project and report due to the fact that it is "spatially distinct" as well as "temporally and functionally divergent from the Footprint features" (Nakamura 2003: 7). The CCC features were not in any way associated with the feature types identified in the Footprints National Register parcel therefore the two areas were separated into their own projects (see figure 5 for the feature locations specific to each project).

Methodology

Starting with the Footprints field crew in 1998 under Warren Wulzen, BA a brief survey of the CCC features near the Hilina Pali Trail was conducted (see figure 3 for Wulzen's survey locations). Global Positioning System (GPS) was used to identify location of the features but no feature forms or photos were taken at this time and no report was completed regarding the CCC features. The project was then separated into its own and the field crew of 2002, which included Mara Durst, B.A., Brandee Pang, B.A., and Sandy Arnold B.A., conducted a more detailed recording of the previously found features by relocating them via GPS. Upon relocation each individual feature was described, photographed, and mapped. If the features were not relocated or, if new ones were found, new feature numbers were designated and added to the previous 1998 list. This project for the 2002 field crew was not a primary focus for the field season of this year as they were participating in another ongoing project. The surveys in the area were only conducted if the air quality or the weather was poor at their main field project in a different location of the Park. The detailed feature recordation was started but not completed at this time.

In 2003, the field crew, which included Summer Roper and Nicole Thompson, were handed the project to complete the feature recordation. The same methodology was utilized which included relocating features via GPS and recording them through mapping, photography, and written descriptions. Only the most impressive and intact features found were mapped. Both years of 2002 and 2003 fieldwork were organized, bound and filed into the archives of the Cultural Resource Management Office and can be used as a reference. This final report includes all previous archeological recording conducted by HAVO and ties it together with historical explanations for the archeological remains left in the area, historical photos of the features at the time of construction, and some example maps and photos of what can be seen there today.

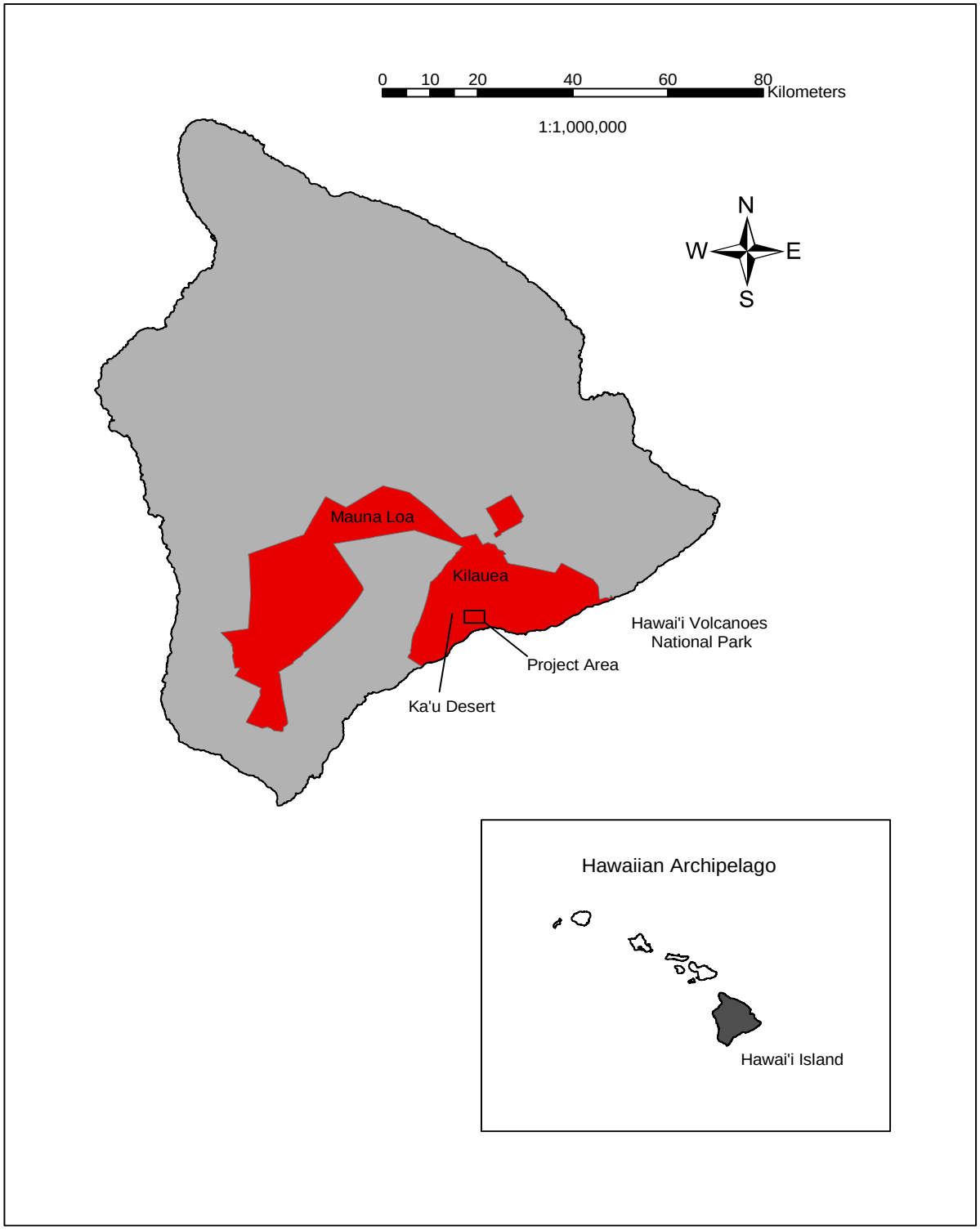

Figure 2. Location of Hawai'i Volcanoes National Park and the Project Area.

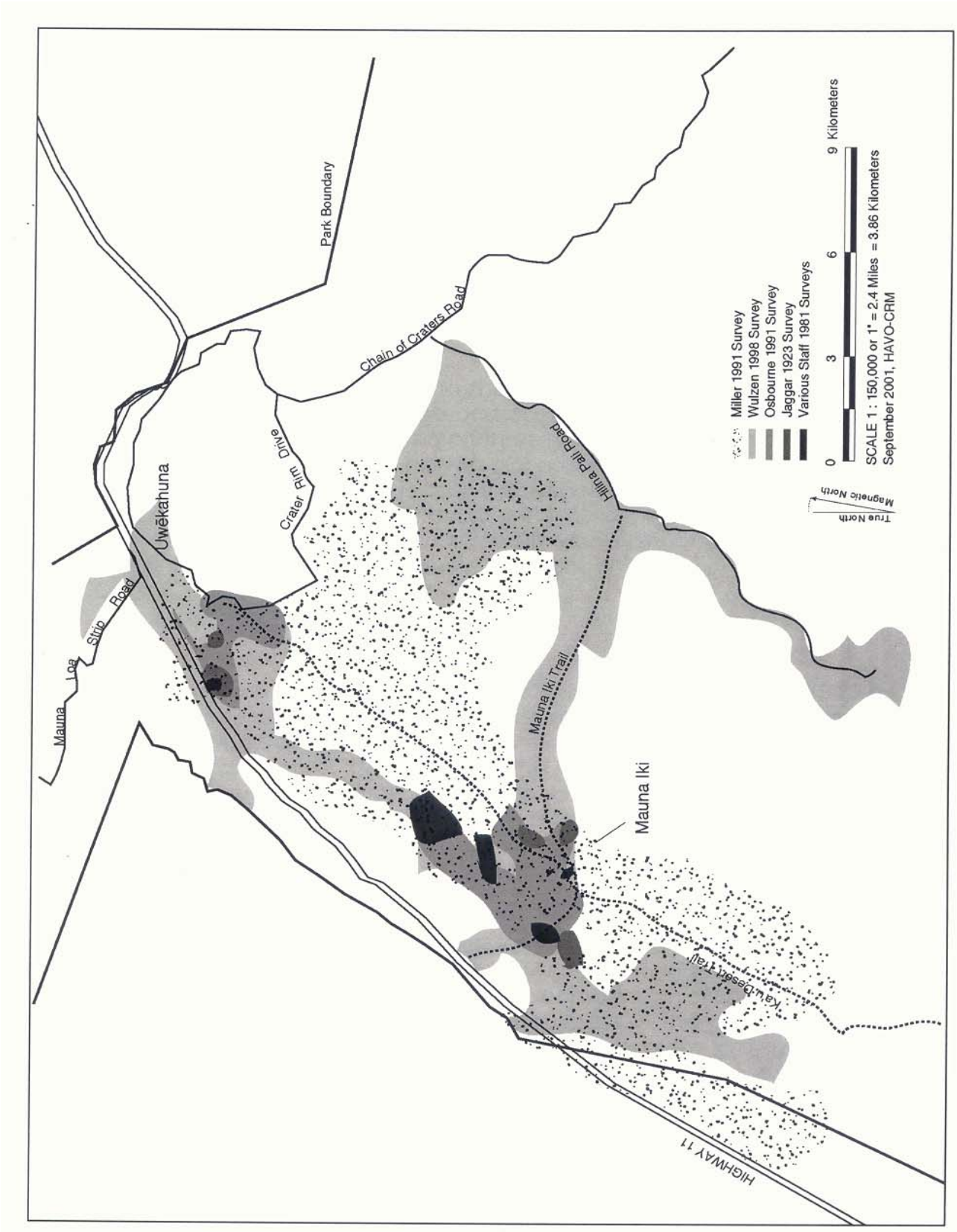

Figure 3. Previous Surveys Done in the Area (from Moniz Nakamura 2003).

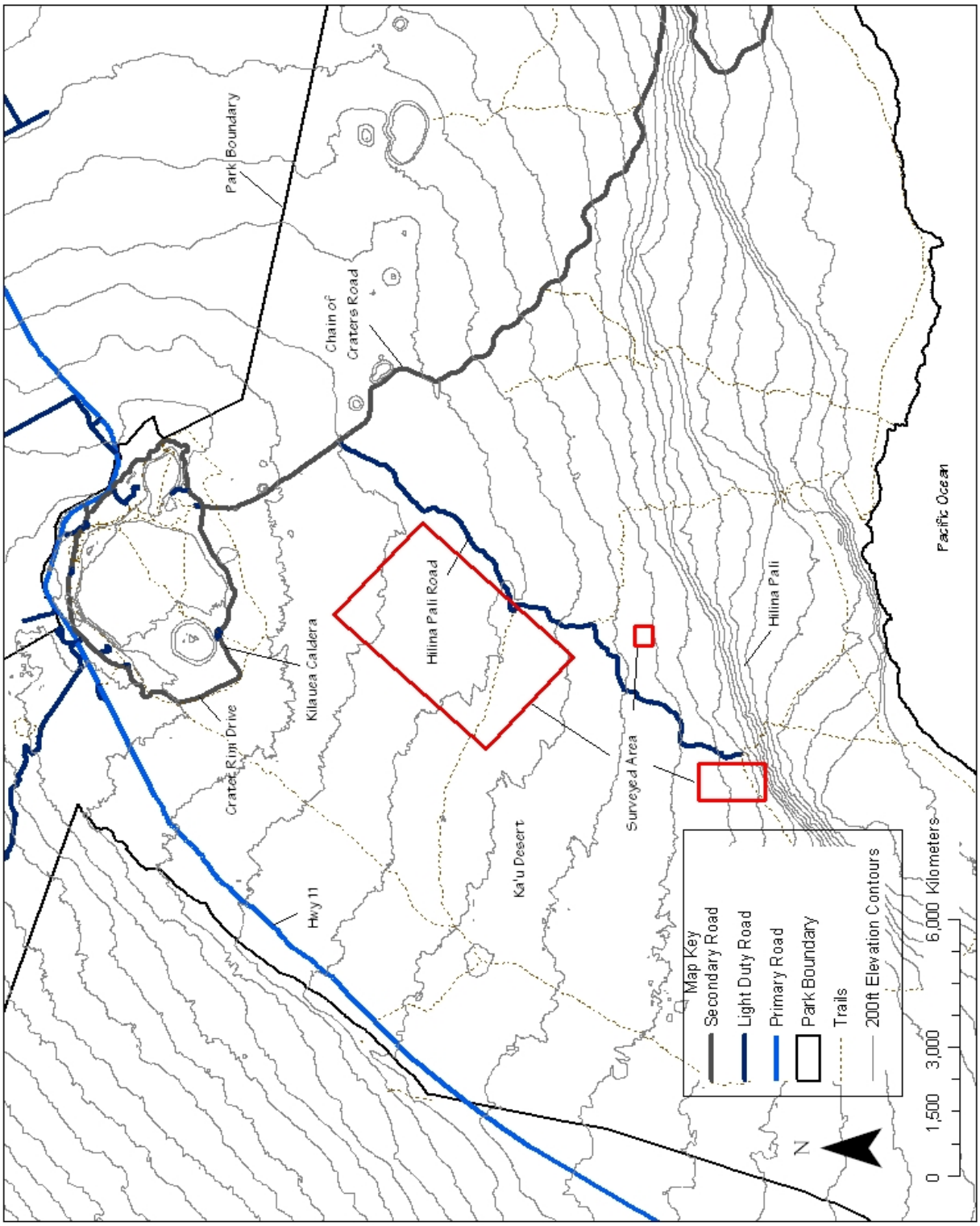

Figure 4. Area Surveyed for the 2005 Hilina Pali Project.

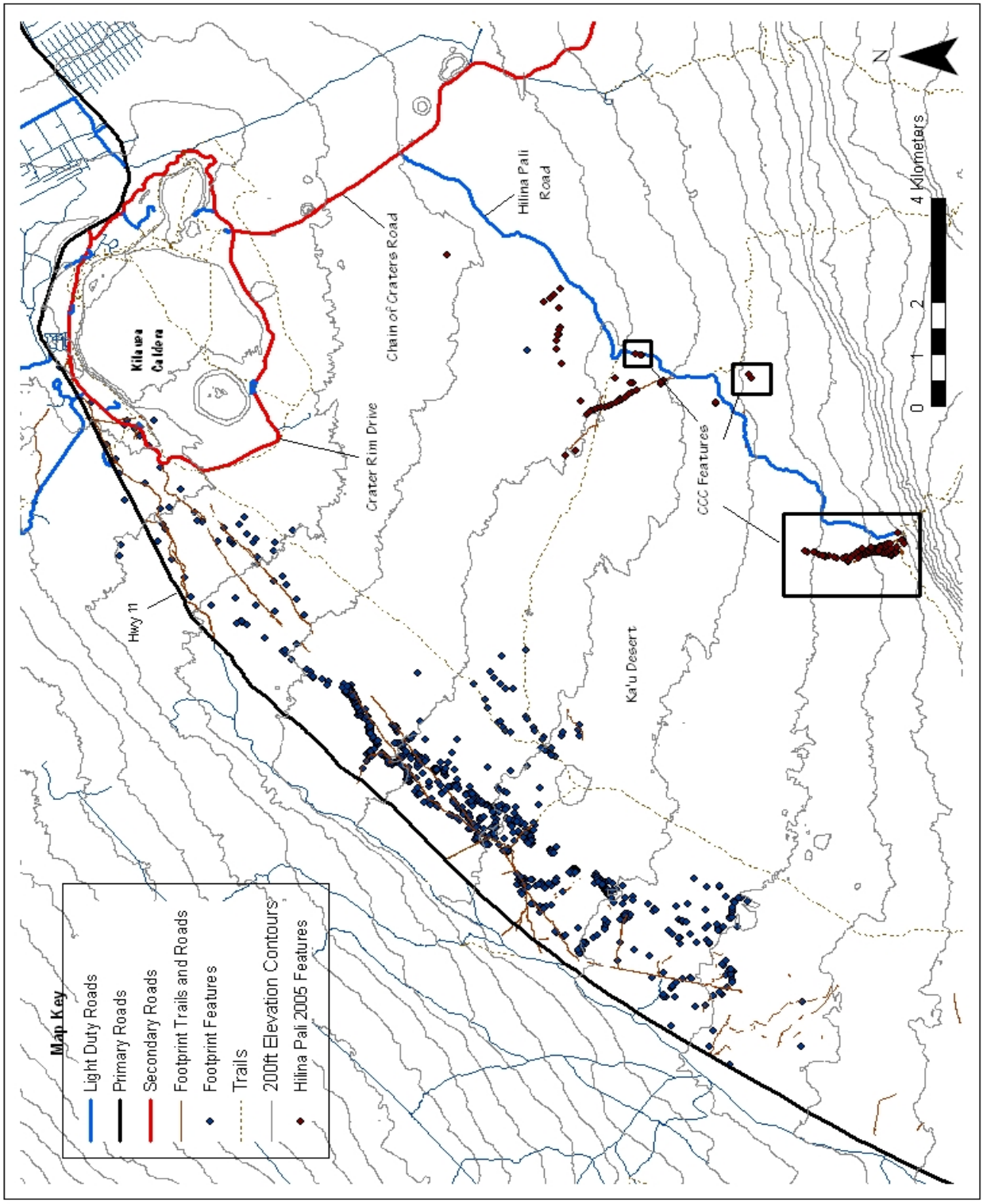

Figure 5. Location of Footprints Features in Relation to CCC Features.

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Chapter II. Natural History of the Project Area

Location

The project area is situated on the Southwest flank of Kīlauea Volcano within Hawai‘i Volcanoes National Park, and is adjacent and west of the Hilina Pali Road, (see figure 4).

The area of study is located directly above a scenic cliff or *pali* known as Hilina Pali and south of the Ka'u Desert, mainly between 2200 feet and 2600 feet in elevation (see figure 4). The upper part of the project is between 2700 feet to 3300 feet in elevation (see figure 4). The project area consists of approximately 164 acres and is located in the *ahupua‘a* of Kapapala.

The mean annual rainfall for the main project area is 75-100 cm (in the lower portion) and 150-200 cm per year (in the upper portion).

Geology

The project area is located on pāhoehoe lava flows from Kīlauea in the southern part of the Ka‘u Desert. The main portion of the features (the CCC features) located and recorded are on lava designated as a p3 flow, dating from 750-1500 before present (see figure 8). The flow is composed of Puna basalt from the Holocene period and is predominantly theoliitic basalt (see figure 8) (Parman and Wampler, 1977:4). The area is characterized by a reddish undulating pāhoehoe lava field with sparse vegetation and pockets of sand. The northern end of the survey area is characterized by sand dunes formed from Aeolian processes (Nakamura 2003: 12).

Figure 6. Aerial view toward the NE of Pu‘u Kapukapu fault scarp in the Hilina fault system, south flank of Kilauea Volcano, Hawai‘i.
Photo by Don Swanson June 24, 1971 USGS website.

The upper portion of the survey area is located on a p4 lava flow, dating from 400-750 (see figure 8). This flow is also made up of theoliitic basalt and characterized by reddish undulating pahoehoe also from the Holocene period.

The majority of the features identified for this project are located just north of the dramatic cliff named Hilina Pali. This type of cliff is known in geological terms as a "tangential fault" (see figures 6 and 7) (Ziegler 2002:46). The tangential fault of Hilina Pali is located on the southern

slope of Kīlauea and has a maximum height of 450 meters (Abbot, MacDonald, and Peterson 1983: 378). To the west it becomes lower and disappears beneath recent lava flows from the southwest rift zones (Abbot, MacDonald, and Peterson 1983: 378). To the east Hilina Pali merges with Poliokeawe Pali decreasing in height and disappearing approximately 6.5 meters west of Kalapana (Abbot, MacDonald,and Peterson 1983:379).

The formation process of a tangential fault such as Hilina Pali is debated but has been speculated that systems such as the Hilina fault is the "result of large scale gravitational slumping of the south flank of the Kilauea volcano" (Abbot, MacDonald, and Peterson 1983: 379). This occurs when there is a "forceful injection of magma into Kilauea's east and southeast rift zone" producing "substantial dilation of the rift zones" (Abbot, MacDonald, and Peterson 1983: 379). "As gravitational and magma-induced stresses build up, the entire south flank becomes unstable and periodically breaks loose along the Hilina fault system and slides seaward" (Abbot, MacDonald, and Peterson 1983: 379). Movements such as this form large and violent earthquakes which are only the latest events "in a long series of displacements that have produced the Hilina fault system" over time (Abbot, MacDonald, and Peterson 1983: 379). The massive cliff of Hilina Pali is a prime example of such geological events and since its formation it has been "largely mantled by later flows of lava pouring" over it (see figure 5) (Abbot, McDonald, and Peterson, 1983: 46).

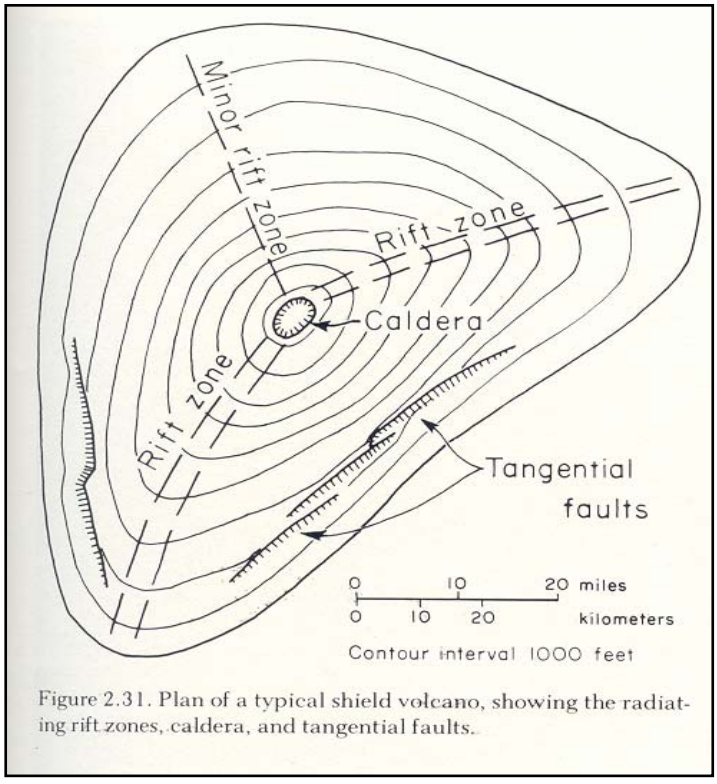

Figure 2.31. Plan of a typical shield volcano, showing the radiating rift zones, caldera, and tangential faults.

Figure 7. Illustration of a Tangential Fault.
(Abbott, MacDonald and Peterson 1983)

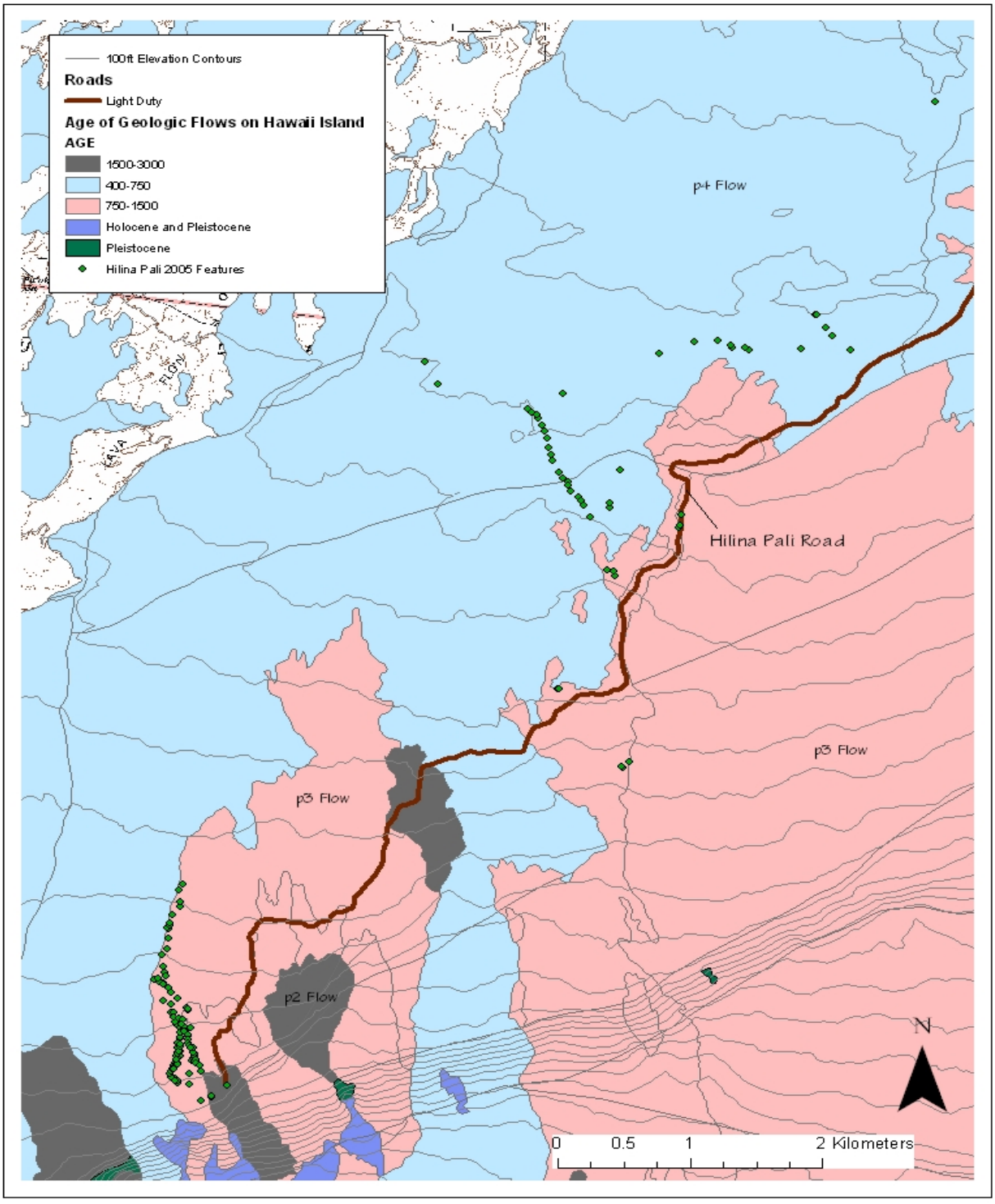

Figure 8. Lava Flow Dates in the Project Area.

As described above, the Hilina Pali fault scarp is still active, causing many small and occasionally large earthquakes (Abbot and McDonald 1970: 40). An example of this occurred in November of 1975 when the largest earthquake to be recorded in Hawaii over the last 100 years was created and registered as a 7.2 on the Richter Scale (Ziegler 2002:46). This earthquake "apparently resulted from seaward land slumping along the Hilina fault system" (Ziegler 2002:46). This in turn caused the Halape campground of HAVO (which is south of Hilina Pali along the coast) to drop 4m into the ocean. Immediately after the earthquake a tsunami hit killing two people and two horses out of the 32 people that were camping in the area (Ziegler 2002:46). From such events it is evident that the tangential fault formation is a long ongoing process that is currently taking place. Although this particular event was tragic it also provides an opportunity to better understand geological processes.

Although the Kaʻu Desert is considered a desert, it still receives up to 127 cm (50 inches) of rainfall annually (Nakamura 2003: 14). The topography of the area slopes gradually south from Kīlaeua Crater towards Hilina Pali and eventually to the Pacific Ocean. The vegetation in the area is very sparse and is interspersed with pockets of ash and sand (Nakamura 2003: 19). During periods of heavy rainfall the sand and ash deposits present in the area are subject to severe erosion due to the fact that there is not much vegetation to keep it in place. During times of heavy rains, intermittent streams form from the mass amount of water movement. Severe erosion occurs, moving the sand and ash and leaving bare exposed pahoehoe. Due to the erosion, natural drainages and gullies have been carved in the landscape. These intermittent streams can be seen on the United States Geological Survey map (see figure 9). The CCC built the retaining walls and dams during their 1940 erosion control project along these naturally formed gullies over the bare pahoehoe. The walls and dams abutt the soil and vegetation in order to retain the water flow within the drainage, keeping it flowing over the bare pahoehoe, and preventing further erosion. The distribution of these CCC features along the drainages can be observed when looking at the feature distribution maps (see figures 11, 12, and 13).

Vegetation

The area of study is characterized as a sparse, dry, shrubland located in the lowlands. The vegetation mainly consists of *aʻaliʻi* (*Dodonaea vicosa*), molasses grass (*Melinis minutiflora*), beardgrass (*Schizachryium condensatum*), broomsedge (*Andropogon virginicus*), *pūkiawe* (*Styphelia tameiameia*), natal redtop (*Rhyncheletrum repens*), ʻ*ākia* (*Wikstroemia phillyreifolia*), bracken fern (*Pteridium aquilinum*) and *ʻōhiʻa* (*Metrosideros polymorpha*). The vegetation grows in places where it will not get swept away during times of flooding. To help contain this water movement to certain areas (the intermittent streams) the CCC built retaining walls and check dams alongside and between the bare pahoehoe slopes or intermittent streams as discussed above (see figures 11, 12, and 13). The vegetation would then be retained to specific areas and the water flow directed over the bare pahoehoe which would decrease soil erosion. The area outside each drainage ditch is characterized by thick grasses and shrubs making the drainages very distinct and noticeable as can be seen in the photos (see figures 14 and 15).

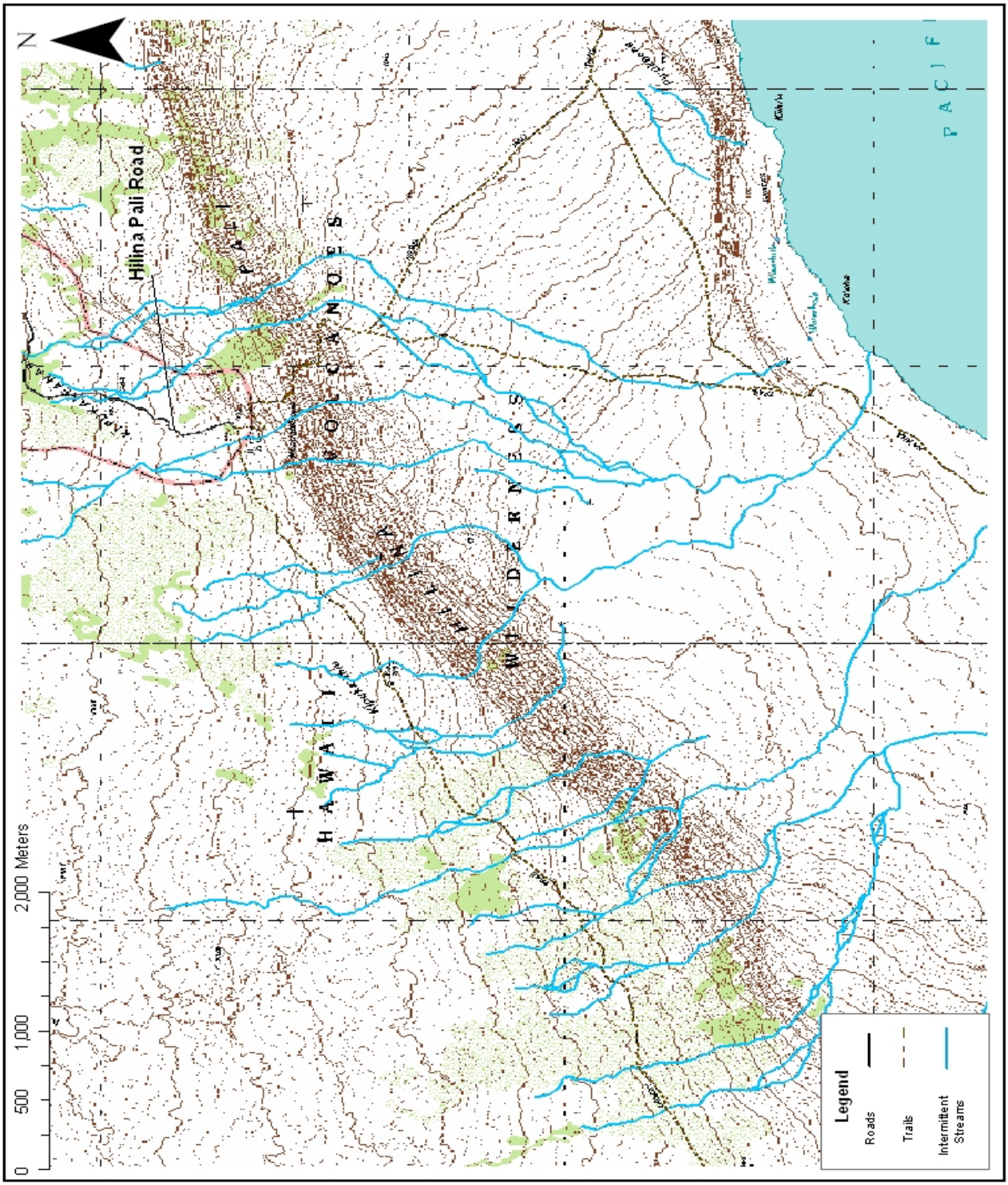

Figure 9. Intermittent steams that occur in the project area during flooding.

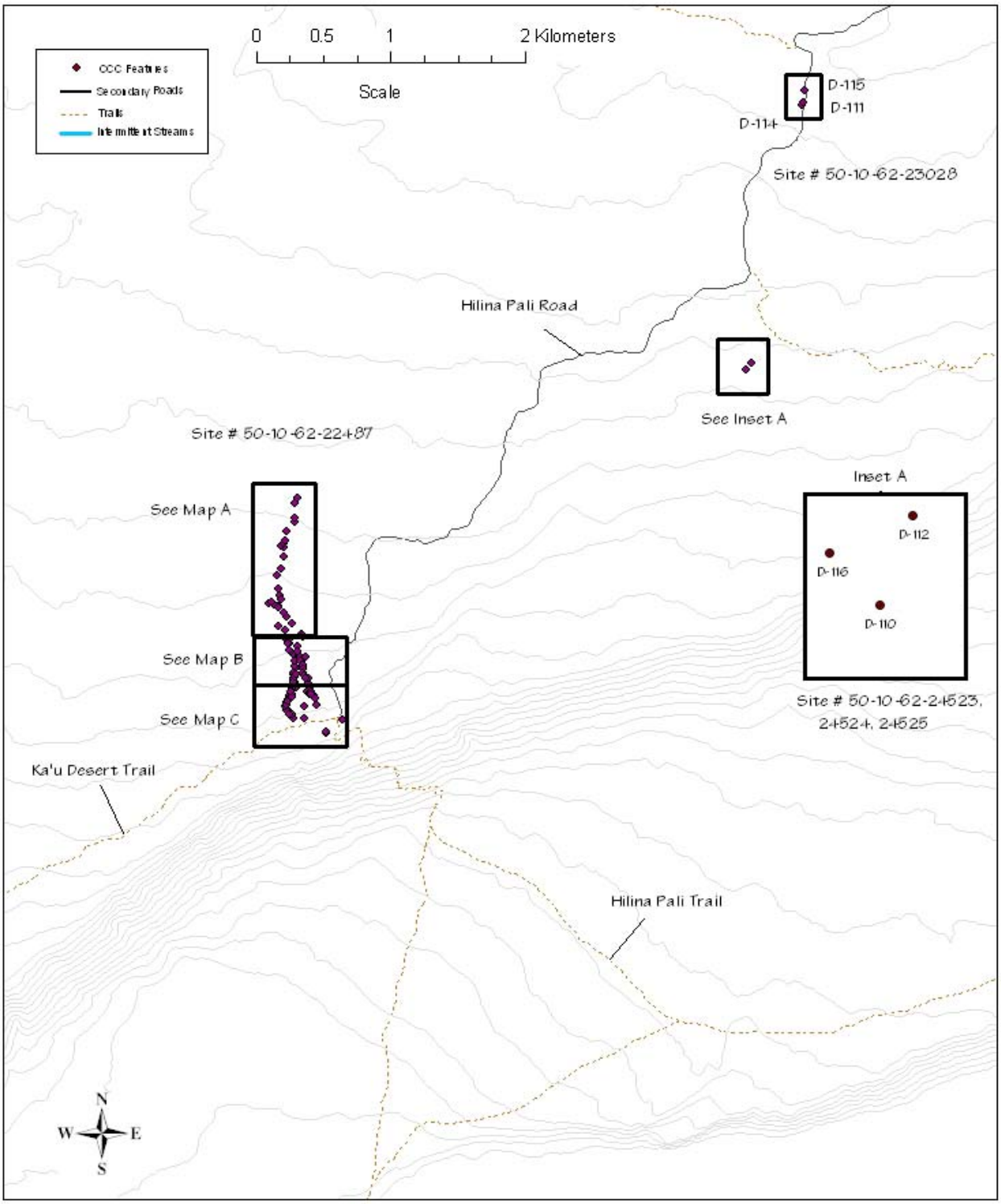

Figure 10. Overview of CCC Feature Distribution.

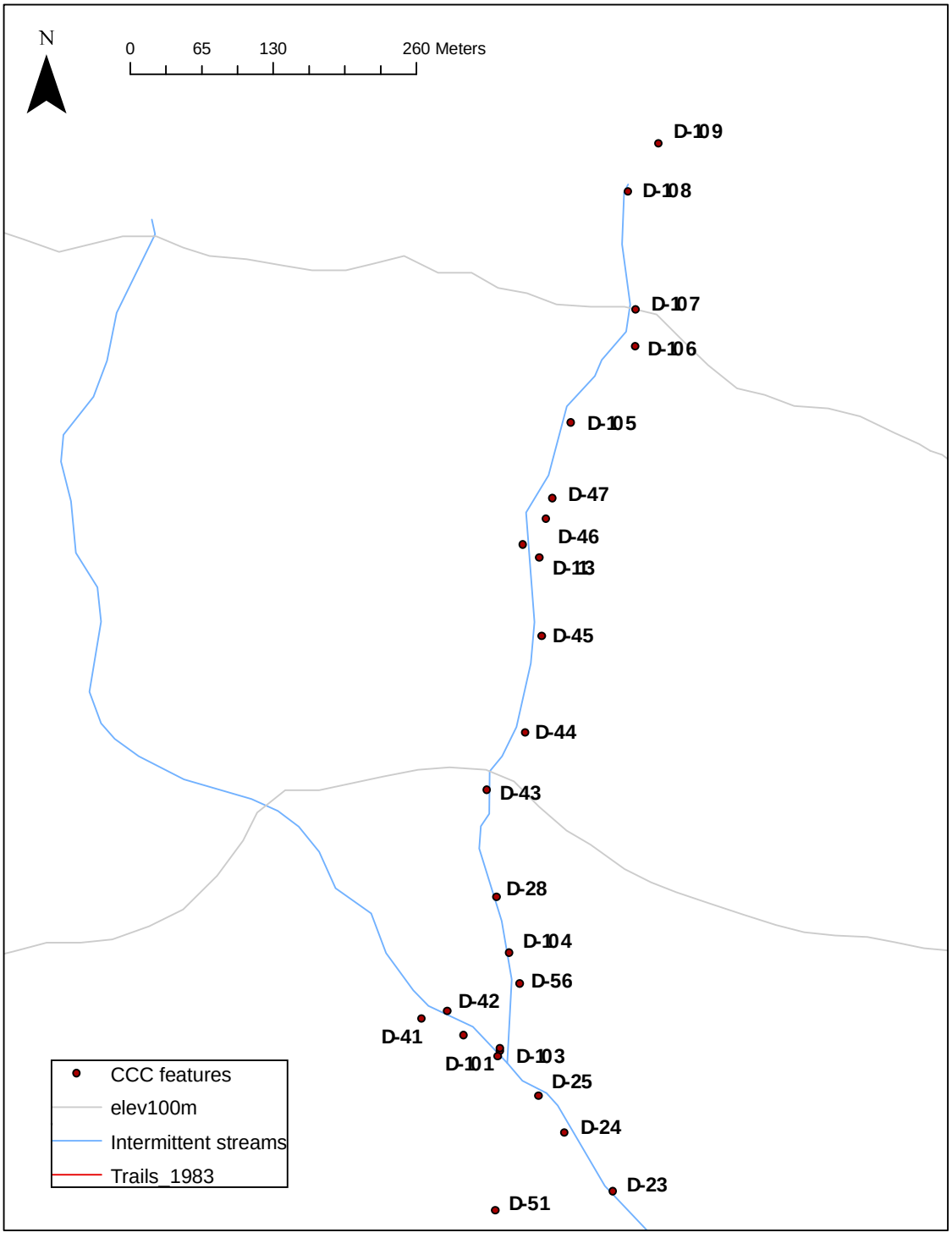

Figure 11. Map A- CCC Feature Distribution, Site Number 50-10-62-22487.

* The HAVO-2005 part of the feature number was dropped to conserve space on the maps

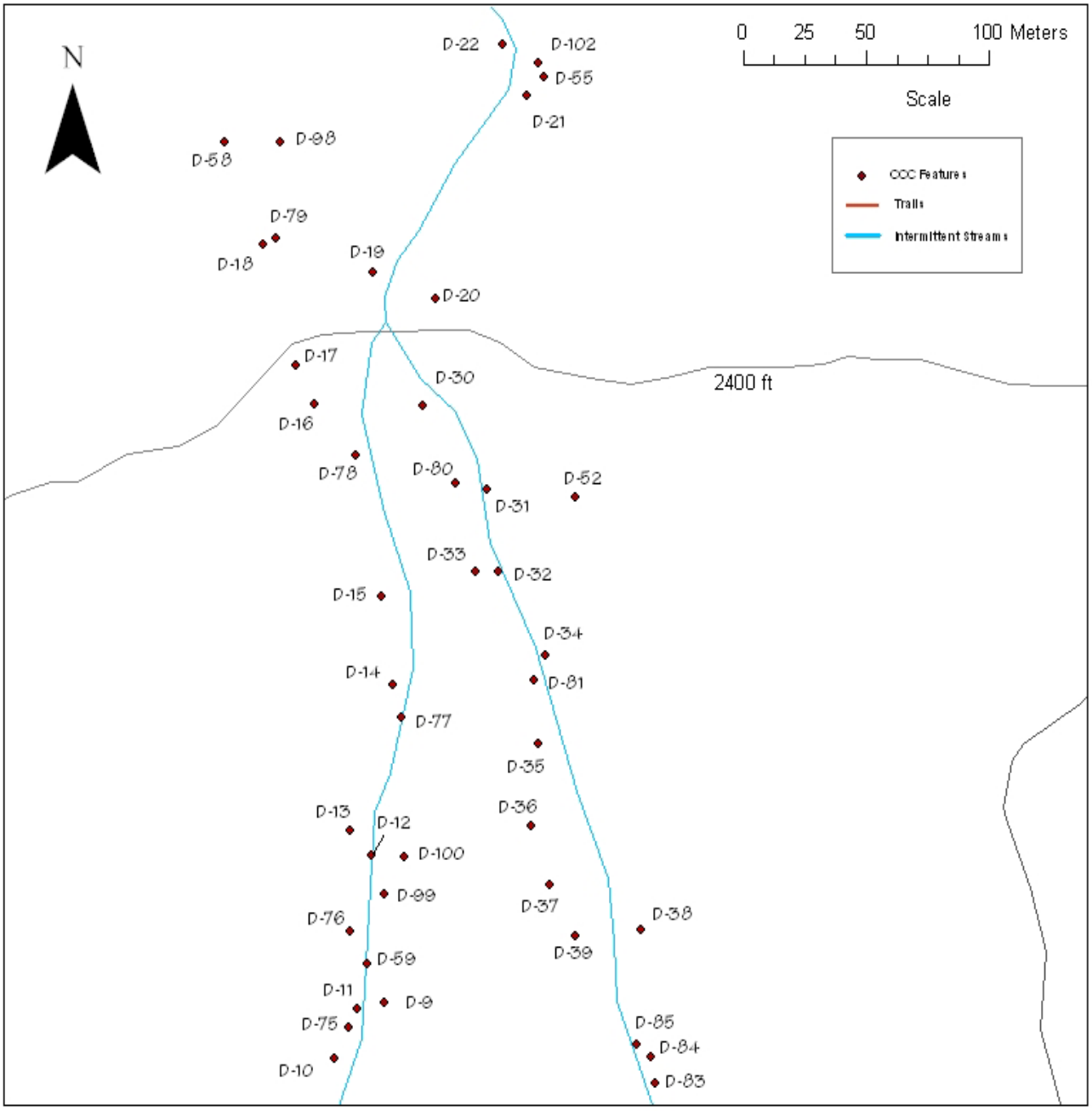

Figure 12. Map B- CCC Feature Distribution, Site Number 50-10-62-22487.

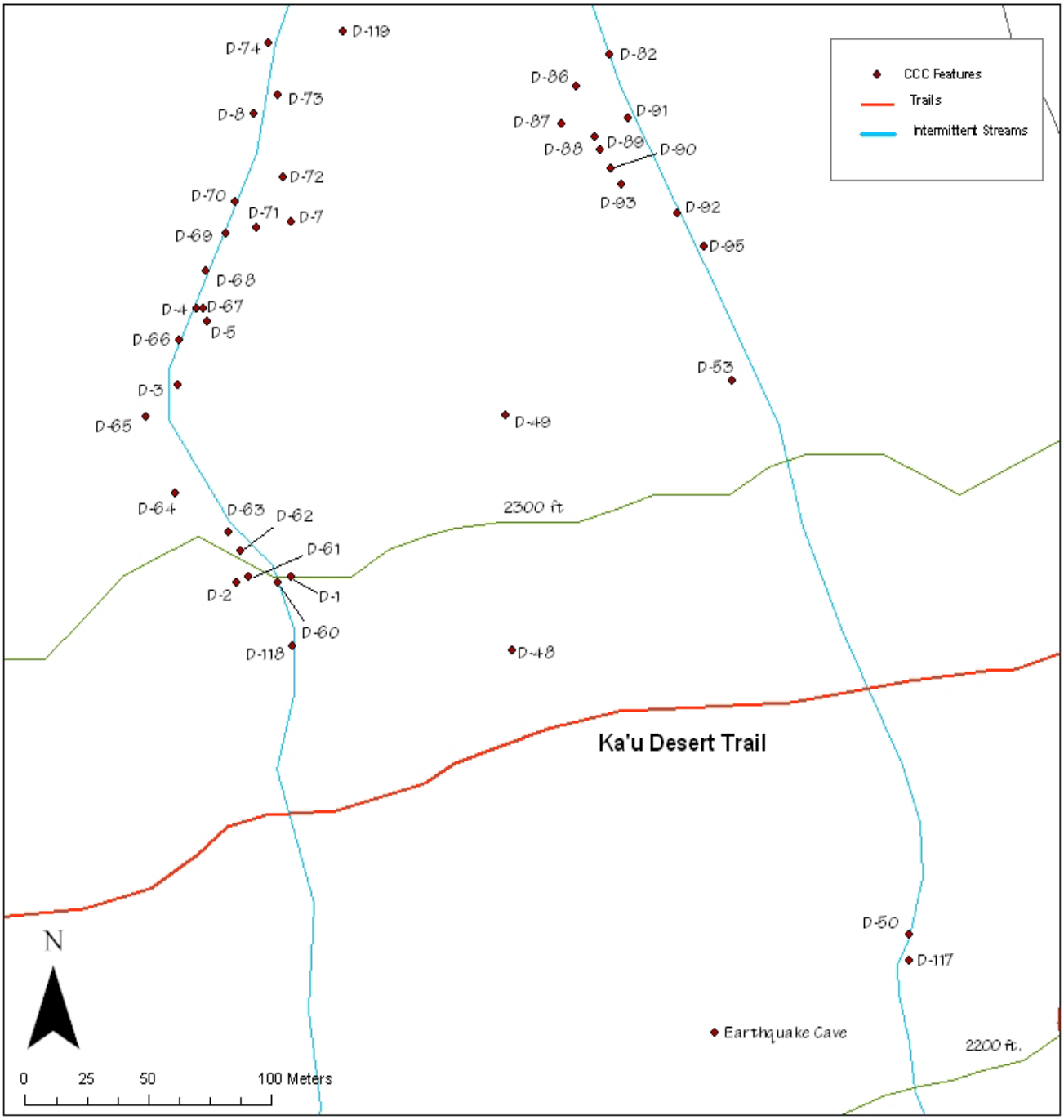

Figure 13. Map C- CCC Feature Distribution, Site Number 50-10-62-22487.

Learning all the components of the natural environment of the project area helps to provide a thorough understanding of why the CCC enrollees were there embarking on this erosion control project, why they built the features where they did, and the elements the workers were dealing with. The area is geologically significant, subject to a lot of seismic activity and located on an active fault scarp of a still forming tangential fault. The climate is dry despite significant rainfall levels due to the vesicular nature of the lava, the quick run off of the water through the intermittent streams, and the sloping topography. The vegetation is sparse and the lava flows are covered in pockets of sand and soil, all of which are subject to erosion, causing the vegetation and soil to be swept away resulting in damage to fences and trails. The erosion control they embarked on and completed was an effort to try and curb some of the negative effects of the natural processes of the area in order to save the vegetation and prevent further damage to infrastructure. Today we can observe the remains of this particular CCC project and see how their work helped to successfully slow the erosion processes.

Figure 14. Caption Reads: "Gully head at foot of bare pahoehoe slope. This gully is wide with banks becoming stabilized."
Photo Courtesy of the National Park Service, Superintendent Reports, HAVO Archives,1940

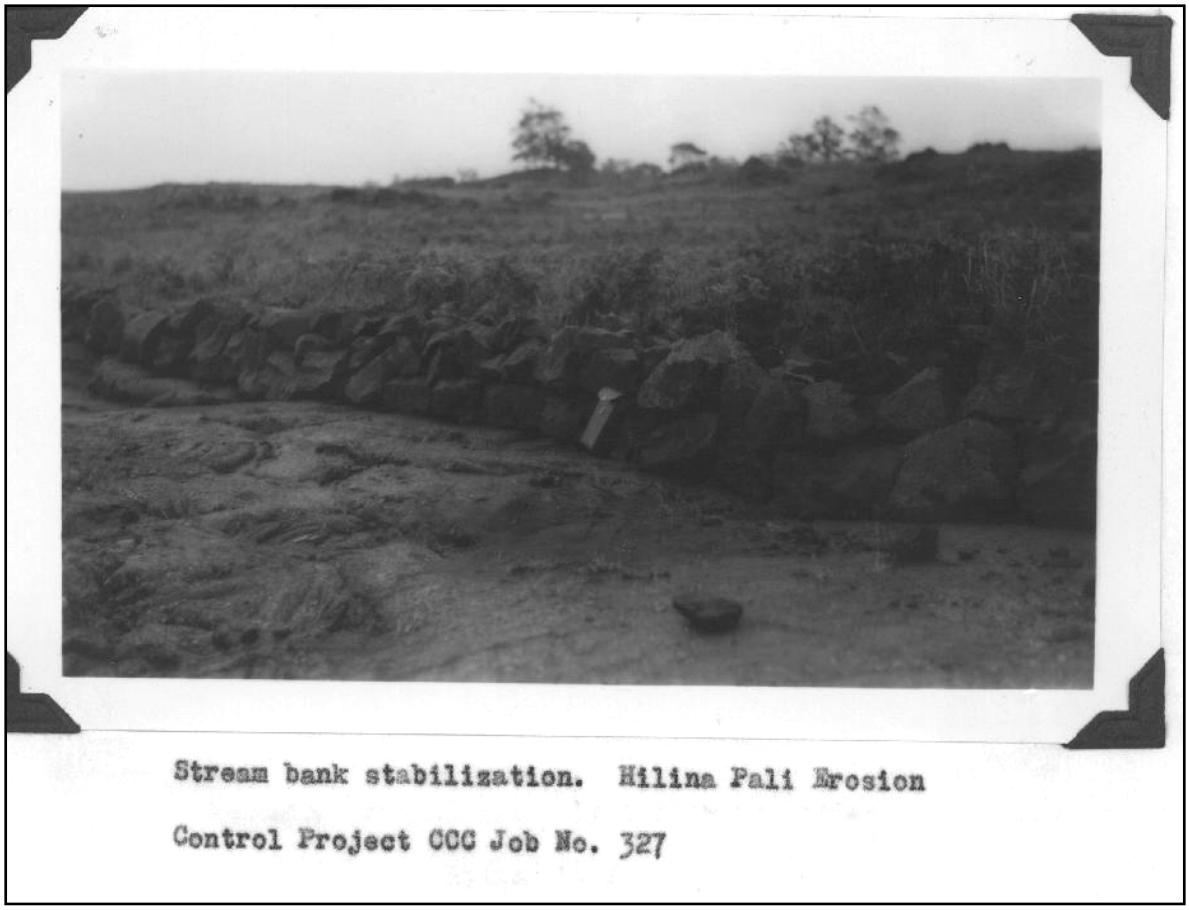

Figure 15. Retaining Wall.
Photo Courtesy of the National Park Service, Superintendent Reports, HAVO Archives, 1940

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Chapter III. Historical Background of the Civilian Conservation Corps

Looking back into history, an explanation and an understanding can be gained of where the walls and dams built at Hilina Pali came from and how these men came to do all this work in the area. The origin of the Civilian Conservation Corps dates all the way back to the 1850's with the ideas of the Scottish essayist Thomas Carlyle. His ideas were that unemployed men should be organized to work in wilderness areas for the "betterment of society" and to simultaneously provide jobs for those without (Paige, 1985:1). Eighty years later, in the United States, Carlyle's ideas were put into action with the birth of the Civilian Conservation Corps that rose from the circumstances of the Great Depression.

During the economic hardship of the Great Depression unemployment rose from 3% in 1929 to 25% in 1933, and out of those who were working, only 30% had full time jobs (Paige, 1985:2). Franklin D. Roosevelt was elected President in 1933 and part of his election campaign was an unemployment relief bill which called for the employment of men on public works projects and conservation tasks (Paige, 1985:3-4).

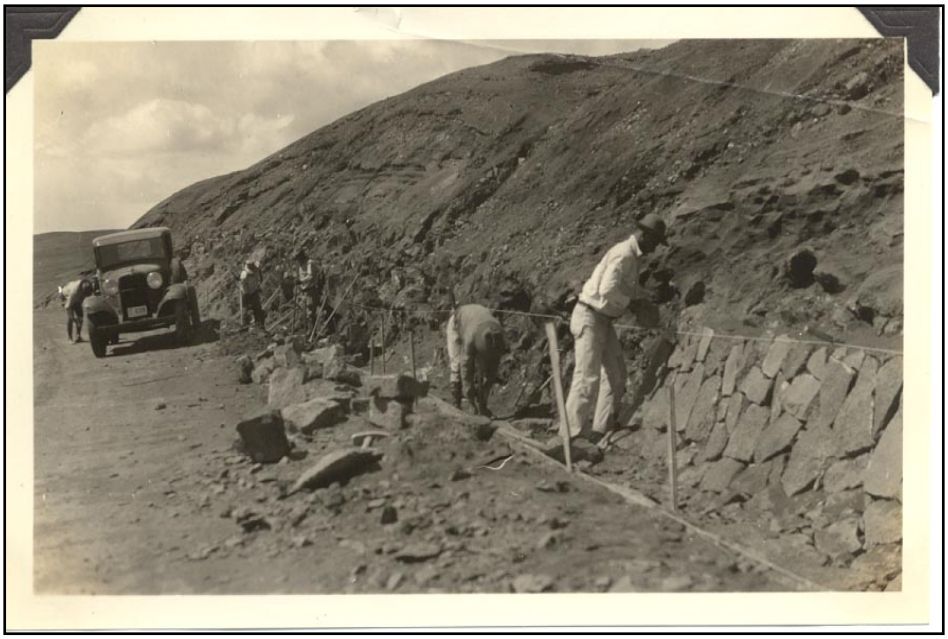

Figure 16. CCC Enrollees Hard at Work
Photo Courtesy of the Naional Park Service, Superintendent Reports, HAVO Archives 1940

On March 31, 1933, as a part of Roosevelt's New Deal Program the "Emergency Conservation Work" (ECW) was created to employ men in the "prevention of forest fires, soil erosion, flood control, removal of undesirable plants, insect control," and trail maintenance on public lands. This was to become known as the Civilian Conservation Corps (CCC) (Paige, 1985:8). In return, those enrolled in the program would be provided with "appropriate clothing, daily subsistence, medical attention, hospitalization, and a cash allowance" (Paige, 1985:8). The Department of Labor launched a nationwide recruiting program to employ men in the National Park Service and the Forest Service (Paige, 1985:10). The four departments – Labor, Agriculture, Interior, and the Army all worked together to "establish and operate the camps" (Paige 1985 14)). Robert Fechner, a former union official, was appointed as the director of the ECW (http://www.nps.gov/hfc/library/ccc.htm, 2). Within three months of its establishment, 250,000 men were organized and working in CCC camps, which became known as the "greatest

peacetime mobilization of American youth" due to the speed and efficiency that the CCC got underway (Paige, 1985:126).

Figure 17. Caption of photo reads: "Sheet erosion in Hilina Pali region. Country denuded by goats permitting scouring away of soil during heavy rains exposing underlying pāhoehoe. Several thousand acres have been destroyed in this section."
Photo Courtesy of the National Park Service, Superintendent Reports, HAVO Archives, 1940

Enrollment was limited to single men between the ages of 18 to 25 who were willing to send up to 25$ of the 30$ checks back home to their families (Paige 1985:11). Each camp had up to 200 men and each man would work at least six months and no more than two years (Paige, 1985:11). The Park Service was eventually allowed to hire a limited number of skilled local men known as "locally employed men" or LEM's (Paige 1985:12). These men were not required to be single or between the ages of 18 to 25 and were also given jobs (Paige 1985:12). In addition to the main CCC camps there were also "side camps" which were "small temporary camps to support work projects in remote areas"(Paige 1985:18). By June 29, 1933, 270,000 men were working in 1330 camps (http://www.nps.gov/hfc/library/ccc.htm, 2). On average, throughout the life of CCC there were 300,000 enrollees in 1500 camps with the most enrollees participating in 1936 with over 500,000 men (http://www.nps.gov/hfc/library/ccc.htm, 2).

In mid December 1933 the ECW program was extended to the Territory of Hawaii. In January of 1934 the Park Service enrolled men for Hawaii National Park (HNP) which included what is now Hawai'i Volcanoes National Park on the Big Island and Haleakala National Park on Maui (Kawaloa 2000). The Superintendent of Hawaii National Park Edward G. Wingate and the governor of Hawai'i Joseph B. Poindexter administered the ECW program for Hawai'i National Park (Paige 1985, 20). The man power of the CCC was much needed as the labor shortage was delaying the completion of critical projects and at all the sections of HNP despite the Superintendents lobbying for new project funding to alleviate the problem (Carey& Co.,

2002:20). Through the CCC program many of these projects could become completed (Carey & Co. 2002: 20). One 200 man camp was originally assigned to the Hawai‘i National Park and this was later increased to 250 men with 50 additional assigned to the Haleakala section (Jackson 1972:145). This first camp in Volcano was located at the Kīlauea Summer Camp property which is at the Byron Ledge Trail located south of the Volcano House (Carey & Co. 2002: 21). In 1938 the camp was moved to a new location to a site north of Kīlauea Iki and southeast of the Volcano

Figure 18. Caption Reads: "Erosion Control Project- Hilina Pali CCC Job 327, showing bank retaining wall and rock check dam"
Photo courtesy of the National Park Service, Superintendent Reports, HAVO Archives, 1940

House (Carey & Co 2002: 21). Facilities included within the main camp area a recreation hall, barracks buildings, a bath and laundry house, a mess hall, a dormitory, latrines, a garage, and water tanks (Carey & Co, 2002: 21).

After the establishment of the CCC in HNP many great accomplishments were achieved. In HAVO these included the Park Employee Housing Area, the Visitor's Center, road berms, retaining walls, interpretive museum structures, overlook stations, comfort stations, widening the lower portions of Mauna Loa Trail, goat eradication program, botanical restoration of Kipuka Puaulu, construction of a 26 mile long telephone line from Kīlauea to the summit of Mauna Loa amongst many others. Many of the structures built by the CCC still stand today and are a part of the infrastructure of the Park. Also, many of them have been listed in the List of Classified Structures (LCS) which is the NPS inventory of all historic and prehistoric structures of historical, architectural, or engineering significance that is or may be eligible for the National Register of Historical Sites (http://www.nps.gov/ncro/lrp/lcs/htm). These men were very productive during the era of the CCC program as is evident in all of their achievements.

Figure 19. Portable rock crushing plant utilized by the CCC.
Photo Courtesy of the National Park Service, Superintendent Reports, HAVO Archives, 1940

By 1937 the Park service started to slowly decrease the CCC camps and number of enrollees despite the many efforts of President Roosevelt to make the Civilian Conservation Corps a more permanent agency (Paige, 1985:27). Due to budget constraints, low morale in camps, poor quality of recruits, and personnel reductions, the CCC started to decline (Paige, 1985:28). Upon the onset of World War II the CCC was discontinued because of the need for young men to be involved in war activities (Paige:1985:33). By July 1, 1942, the CCC officially ended and all

CCC camps were dismantled and terminated by June 30, 1943 (Paige, 1985:37). After the CCC ended all Hawaiian Island CCC camps were transferred to military bases (Paige :1985, 33-34).

Throughout the duration of the CCC, enrollees were employed as Park fee collectors, guides and other operational tasks (Paige:1985, 27). After the discontinuation of the CCC, these jobs were recommended to be made into regular NPS positions and this conversion was made in 1943 (Paige 1985:28). These positions still remain as employment opportunities today.

During the era of the CCC a total of 2 million enrollees had worked in 198 camps in 94 national parks and monuments and 697 camps in 881 state, county and municipal areas (Paige 1985, 132). The work of the CCC was estimated by the Park Service to be valued at over 9 million dollars in permanent improvements for the National Parks and Monuments and over 27 million in the state parks in just the first two years. Many people look back on the CCC as one of the greatest and most successful New Deal Programs and the Parks would truly not be what they are today without the hard work of these men (Paige 1985:132).

Figure 20. CCC Camp
Photo Courtesy of the National Park Service, Superintendent Reports, 1934

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Chapter IV. Hilina Pali

The CCC at Hilina Pali

The original CCC erosion control project designated as number 327 stemmed from the extreme erosion and flooding that was identified and reported by rangers in 1939 in the Ka‘u Desert and Hilina Pali areas. The floods occurring during this time were causing mass erosion, washing out trails and causing extreme run off. During times of flooding naturally occurring eroded intermittent streams form during times of heavy rains and the sand dunes in the area would get washed away (see figure 22). To address the problem, the CCC enrollees were assigned a project to help prevent and slow erosion known as job “327”. This undertaking was developed and completed to help control the problem. To address the erosion the CCC boys built retaining walls and check dams to direct and encourage water flow over the drainages or intermittent streams of bare pahoehoe lava. By directing the water flow into the previously eroded and bare areas this would prevent more vegetation, soil, and sand from being swept away during floods and damaging infrastructure. The retaining walls also served the purpose of supporting and maintaining the banks of vegetation helping to keep them in place. To build the walls and dams the CCC boys quarried nearby rocks out of the pahoehoe bedrock (see figure 20). They likely used a portable rock crushing plant like the one in figure 18 which was used to build the Hilina Pali truck trail.

Figure 21. Example of a quarry site where the rocks where extracted for the construction of the rock walls
Photo Courtesy of the National Park Service

The work done by the CCC at Hilina Pali is impressive and many of the stone walls and check dams are still intact and in good condition. The sequences of events leading up to the project, during the project, and after the project are sporadically documented in the Superintendent’s Reports on file at Hawaii Volcanoes National Park. These reports give insight into all Park operations of the time.

The first documentation of the Hilina Pali erosion control project is mentioned in Superintendent Edward Wingate’s reports on April 3, 1939 after a large flood. In his report he states “…patrol hike made by ranger Jess and myself along Hilina Pali trail between Hilina Pali and Kipuka

Pepeiao. Trail was badly damaged by storms. Impossible to follow trail in some places due to storm, *ahu* markers being washed away, water had reached depth of 16 feet in some gulches". On the report dated April 4, 1939 it is mentioned the "heavy rains, run off from Ka'u Desert reached heights of 16 feet in some dry gulches near Pepeiao Kipuka" (southwest of Hilina Pali), which "resulted in erosion" (Superintendent Reports, 1939). On August 31, 1939 the report states that "heavy rains this spring evidently washed out all the support from under the steel wing fence below Hilina Pali" (Superintendent Reports, 1939). For such statements to be made, it is clear that the area needed attention due to the magnitude of flooding and erosion taking place at the time and the damage it was causing.

In October of 1939 the Superintendent mentions that he "went over areas west of Hilina Pali Shelter with Park Naturalist Fagerlund, CCC Project Superintendent Rennie and Landscape Foreman Mullenhoff, where erosion control project is to be undertaken" (Superintendent Reports, 1939). Therefore, by this time the project had not been started but planning was clearly in process. On November 10, 1939, the report states that it "was a rather quiet month, gave time for field study of two important projects- erosion control in the Hilina Pali, and protection for the footprints in Ka'u desert" (Superintendent Reports, 1939). And, on December 9, 1939, it is mentioned that "November was another very quiet month and the staff confined its activities to routine work. The lull, however gave time for more field studies of proposed projects, principally erosion control in the Hilina Pali region…" (Superintendent Reports, 1939). It is clear that the Hilina Pali project was secondary; to be worked on in times when other more important projects were not under way.

Figure 22. Caption Reads "All that remains of about 3 feet of good soil where floods in the Ka'u desert have swept large sections bare of all soil."
Photo courtesy of National Park Service Superintendent Reports, HAVO Archives, 1940

Throughout 1940 the Hilina Pali erosion project was in progress as it was mentioned several times in the Superintendent Reports. On February 1, 1940 the Superintendent's report states that 209 man days were used in "erosion control" with a "side camp" established at Hilina Pali. On February 18, 1940 the report of the Superintendent states that "attention was also given initial work by the CCC on the Hilina Pali erosion control project which is assuming greater importance as more study is given it" (Superintendent Reports, 1940). Following this statement the project is mentioned on four separate occasions from March, 1940 to June 1940 with a total of 1733 man days used working on the project (Superintendent Reports 1940). At this time the bulk of the Hilina Pali project must have been complete as it is not mentioned much more in the Superintendents Reports after this time period. On Aug 16, 1940 the Superintendent states that he did field inspections of the project and at the end of the year to monitor the success of the erosion control efforts. From the reports and pictures, and judging on how it looks today, it could safely be said that the efforts were successful and that the erosion process of the area was deterred through the construction of the walls and dams (see figure 24).

Figure 23. Caption Reads: " Scalping of sand dunes by torrential rains- Hilina Pali."
Photo Coutesy of the National Park Service, Superintendent Reports, HAVO Archives, 1940

Figure 24. "Hilina Pali erosion control project deposition and vegetation above check dam, 8 months after installation."
Photo Courtesy of the National Park Service, Superintendent Reports, HAVO Archives, 1940

Figure 25. CCC Job 327, wall construction
Photo Courtesy of the National Park Service, Superintendent Reports, HAVO Archives, 1940

WWII Impacts on the Hilina Pali Area

Other significant events in the Hilina Pali area during this time period are the effects of the military. The Territory of Hawai‘i played a large role in military training and the defense of the United States during the CCC time period and even up to the present day. Before and especially after the Japanese attack on Pearl Harbor on December 7, 1941 many military troops were being trained in Hawai‘i (Nakamura 2003: 52). As the country was on the brink of becoming involved in World War II the military was putting pressure on HNP to withdraw some of its land for defense purposes (Carey & Co Inc., 2002:22). This came to include the Hilina Pali cliffs as well as the surrounding areas. The military presence there had a major impact on the land.

Although the land in the National Park was set aside for preservation, during times of war the defense of the country took precedence over conservation activities. In 1938, a bombing range was needed for training of the Army Air Corps (Nakamura, 2003: 52). The Ka'u coast was chosen as a suitable place and negotiations with the National Park were started in order for the military to obtain control over this parcel of land. Superintendent Edward Wingate was opposed to this because he believed that this would "violate the fundamental philosophy behind the creation of the national parks" however, he did not want to be seen as opposed to the war (Carey & Co Inc, 2002:22). Wingate agreed for the military to obtain the land under two conditions: that no permanent structures were built and that the Army make every effort to locate another site for the bombing range that would suite there needs (Nakamura, 2003: 52). Although Wingate only wanted the Army to use six square miles of the Park, they had already applied for the use of nine square miles (Nakamura, 2003: 52). Despite efforts to negotiate in order to lessen the impact to the Park, the Army was not very responsive and was set on using the area for their purposes (Nakamura 2003: 52).

Many people outside the park had the same stance on the issue as Superintendent Wingate. They did not like the idea of removing park lands for military purposes and thought that it would start a "dangerous precedence" (Nakamura, 2003: 52). However, they did not want to oppose any needed national defense measures to protect the country (Nakamura 2003: 52).

Although there were some protests, Senator Sheppard proposed a bill in 1940 requesting that nine square miles (5,760 acres) as well as a number of park roads, trails and the Hilina Pali cliffs be removed from Hawai‘i National Park and be used by the Army (Nakamura, 2003: 53). The bombing range was named Nā Pu‘u O Nā ‘Elemākule and the withdrawal of the land took place on July 16, 1940, (see figure 26) (Nakamura 2003: 53). The final amount of land to exchange hands ended up to be only four and a half square miles (Nakamura 2003: 53). It was agreed by General Herron (the Commanding Officer of the Hawaiian Department) that if the land was never used by the Army then it would be returned to the Park (Nakamura 2003: 53).

The military held on to the Ka‘u parcel for ten years in which the Army did not use the land at all (Nakamura 2003: 53). The Navy did use the land for a bombing range in 1943 which did not go over well with the Park as this was not a part of the original agreement (Nakamura 2003: 53). Originally it was agreed that the area was only to be used by the Army and not the Navy (Nakamura 2003: 53). The Navy was illegally bombing outside of the designated bombing range and as a result of this injured a few fishermen (Nakamura 2003: 53).

In 1945 the Park Service requested for the Army to return the land and complaints were made concerning the misuse of the parcel and the damages accrued (Nakamura 2003: 54). As a result the Army returned two acres at ʻĀpua Point but the ʻElemākule range was not given back to the Park at this time (Nakamura 2003: 54). In the spring of 1946 the Acting Superintendent Baldwin requested retrieving the land from Army due to the fact that they were not using it and that NPS employees were routinely denied access to the area (Nakamura 2003: 54). Also, when the NPS employees did enter they were shot at (Nakamura 2003: 53). The Army responded and said they had no objections in returning the land; however the Navy wanted to continue training in the area (Nakamura 2003: 53). On September 30, 1948, the Navy bombed again with no warning to the Park service once again violating the original agreement (Nakamura 2003: 53).

In a memo dated October 5, 1948, General Travis finally put an end to all military use of the ʻElemākule bombing range (Nakamura 2003: 54). The Army began clearing and restoring the Park areas of unexploded ordinances (Nakamura: 2003: 54). On June 14, 1950 the ʻElemākule range was officially returned to the Park.

Other parts of the Kaʼu Desert were used for military training during the outbreak of World War II (Nakamura 2003: 54). This area came to be known as the Kaʼu Desert and Impact Training Area (see figure 26.) (Nakamura 2003: 54). Although Park Officials protested the unauthorized use of this area the Army presence came there anyway without formal NPS or Congressional authorization (Nakamura 2003: 54). After the Japanese bombing of Pearl Harbor on December 7, 1941 the governor of the Hawaiʻi Territory Mr. Poindexter declared martial law therefore the Park had no choice but to allow the military presence there (Nakamura 2003: 54).

The Army did not stay within the boundaries of the training area and caused many safety violations (Nakamura 2003: 54). They set trip wires across patrol and public trails, endangering hikers as well as not clearing boulders from evacuation routes for volcanic eruptions (Nakamura 2003: 55). Superintendent Wingate started protesting the military presence in this area in April of 1943 (Nakamura 2003: 55). Martial law ended on October 24, 1944 and after this Superintendent Wingate strongly requested that the troops be removed from the Park (Nakamura 2003: 55). Despite the fact that martial law was over the military did not leave the area until January 1945 (Nakamura 2003: 55).

The training of troops in the area was had a large impact on the land (Nakamura 2003: 55). Koa groves were damaged, nēne nests were destroyed, the crust of the volcanic ash was destroyed and unexploded ordinances are still found in the area today (Nakamura 2003: 56). It is clear how damaging the military presence was in the Park and effects of their activities can still be seen there today.

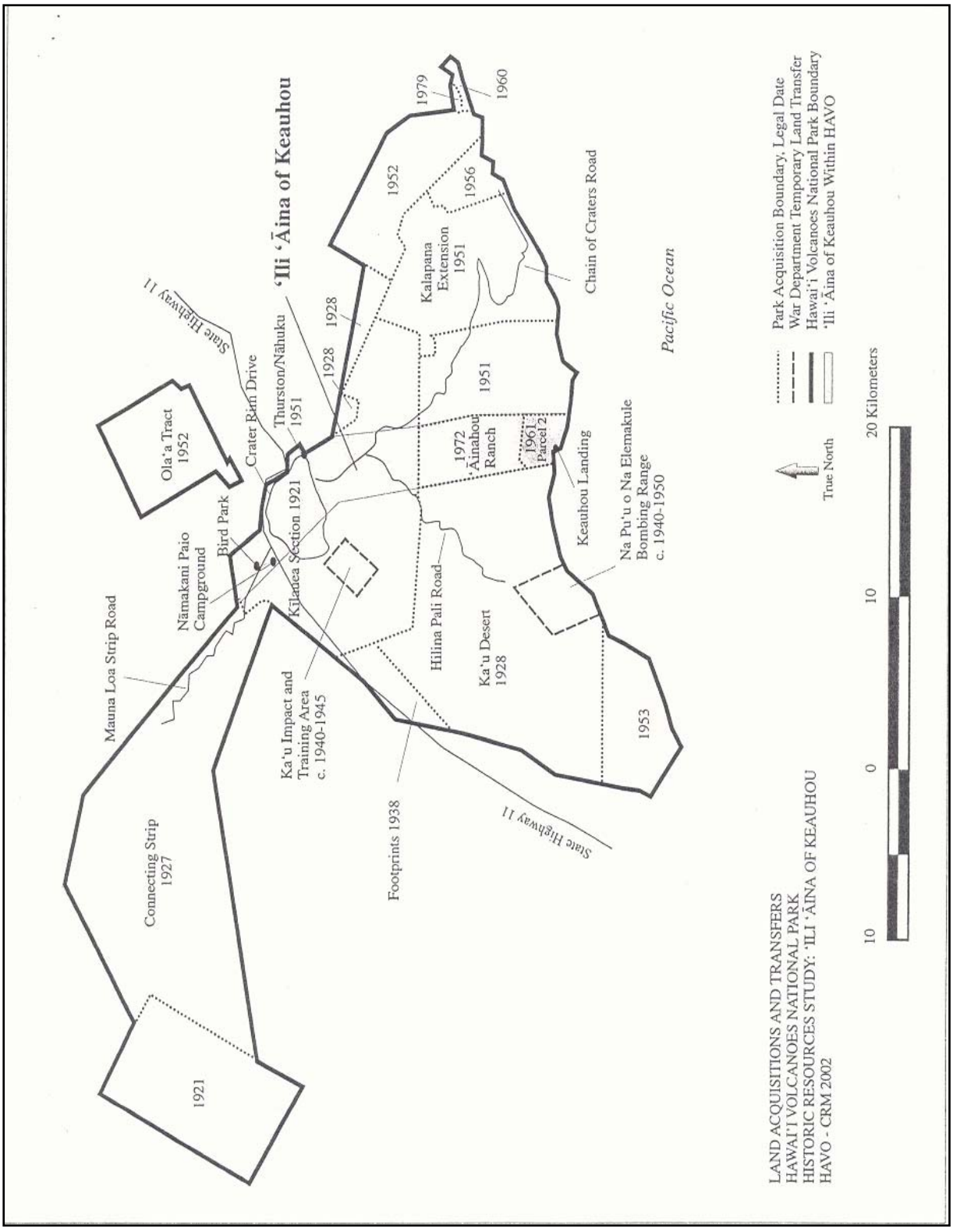

Figure 26. Military Land Acquisition of Hawai'i Volcanoes National Park

Summary

From the archeological remains in the Hilina Pali project area and the historical documents available, the purpose of the walls and dams that were built by CCC erosion control activities can be well understood. The walls and dams that remain in the area came from this erosion control effort and were built from locally quarried materials. The CCC enrollees did an excellent construction job and much of the remains that can be seen today are still in good functioning condition. Although some of the erosion still occurs there is no doubt that the CCC project helped to slow the process and that their efforts were successful. The CCC participated in many great conservation efforts all over the country, helping to shape the National and State Parks into what they are today. This archeological inventory survey documents a prime example of what remains of one of the many project undertakings of the CCC.

Recommendations

This phase of the survey is complete; however it would be interesting to locate the "side camp" mentioned in the Superintendent Reports that the CCC boys established while working on the erosion control project. The "side camp" was used so that the workers did not have to travel so far from the main camp to get the work site. Locating this could help to reconstruct the story of the men's daily lives and what it was like to be involved in the CCC program.

Another suggestion may be to survey for more dam and wall features in separate drainage areas from the ones already studied and recorded. There is a possibility that there may be more features built along other drainages. There are many other intermittent streams in the area according to the USGS map. The features recorded during this project run directly along the represented intermittent streams (blue lines) on the map. Due to the fact that there are many other intermittent streams nearby it is possible that there are more features built along these. One source reported observing some erosion control features south of the Kipuka Pepeiaou cabin. A field investigation or an aerial survey may be beneficial to determine whether or not there are more features other than the ones already recorded.

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Chapter V. Archeological Features

The features identified in the CCC part of the survey consist mostly of rock walls (61), dams (11) and quarries (41) of locally extracted pahoehoe rocks utilized to construct the rock walls and dams. These were built specifically to deter the erosion that was taking place in the project area during heavy rains. Other features identified associated with these features include 5 petroglyphs, 4 rock mounds, 1 rock shelter, 1 sign, 1 geological feature, 3 remnants of the Old Hilina Pali road, 1 cave and 1 cairn (see Table 1. for details).

Feature Types

The following feature types are descriptions of the kinds of feature found in the CCC section of the area of study:

Rock Walls are linear structures constructed of stacked cobble and boulder sized rocks and range in height, length, and shape varying from straight lines to C and L shaped walls. The variety in shape depends on the contour of the pahoehoe flow and the vegetation. The walls are typically much longer than they are wide. The walls in this survey are constructed of locally quarried rocks and are all built alongside or parallel to the drainages to guide and retain the water flow over the bare exposed pahoehoe to aid in the prevention of erosion. For this specific project the walls are referred to as retaining walls because they serve the function of containing the water flow into one drainage gully.

Dams are barriers built across or perpendicular over the bare pahoehoe drainage to help control and guide the water into the drainage. They are also constructed of stacked cobble and boulder sized locally quarried pahoehoe rocks.

Quarries are excavated areas of the exposed pahoehoe bedrock in which rocks were obtained for the construction of the walls and dams of the surveyed area.

Petroglyphs or "rock art" are "areas pecked or chiseled into the natural lava flow surface" (Nakamura 2003: 86). Often petroglyphs represent anthropormorphic (human) figures, symbols, or animals however, in this survey area all the petroglyphs found depict historical lettering

Overhangs are natural formations that provide shelter. These occur in both a'a and pahoehoe lava flows, although they predominately occur in a'a flows. Overhangs have limited interior development and the depth of overhangs are short, without a dark zone. Many overhangs have some type of modification in order to accommodate a few individuals.

Cairns (Ahu) are piled or stacked cobbles and boulders usually placed as a marker, often times to mark trails or some other significant feature of the landscape.

Mounds are free standing structures constructed of piled rocks and come in a variety of shapes (square, circular, round, or linear). Often they are convex in shape and are well defined.

Caves are lava tubes formed from pahoehoe lava flows when a river of pahoehoe crusts over and develops a tunnel. Unlike overhangs, caves have a dark zone. Many caves have modifications in order to accommodate a few individuals or groups of individuals. Modifications can include interior and exterior wall constructions, platforms, petroglyphs, terraces and human burials.

Feature and Site Numbering

All of the CCC features are located within five separate site numbers designated as 50-10-62-22487, 50-20-62-24543, 50-10-62-24524, 50-10-62-24525, and 50-10-62-23028 (see figure 10). The prehistoric and historic Ka'u Desert features in the upper part of the survey area are located within five separate site numbers which are detailed in the "Additional Features" section of this report and includes the sites 50-10-62-23026, 50-10-62-23027, 50-10-62-23028, 50-10-62-23030, and 50-10-62-23031 (see figure 74). The project has a total of nine site numbers (three CCC features located in site 23028 overlap with the non CCC features) (see figures 10 and 74).

Site number 50-10-62-22487 contains the majority of the features consisting mostly of retaining walls and check dams lining the pahoehoe drainages/ intermittent streams (see figure 10). All these features are included into one site due to close relation to each other, that they were built within the same year, and that they all were built to serve the same function (erosion control). This site number was designated by Wulzen in 1998.

Site Number 50-10-62-24523 (feature HAVO-2005-D-110) consists of a petroglyph with the intials "J.M" and underneath these initials "CCC Camp" was pecked and is located in the upper portion of the survey area (see figure 10). This site number was designated by Summer Roper in 2005 and was found by chance during a separate field expedition.

Site number 50-10-62-24524 (feature HAVO-2005-D-116) is a rock shelter which has been utilized by people as is evident in the "table" constructed from a pahoehoe slab and some pahoehoe rocks. This site is also located in the upper portion of the survey area and was designated by Summer Roper in 2005 (see figure 10). This site was also identified by chance during a separate field expedition.

Site number 50-10-62-24525 (feature HAVO-2005-D-112) is another petroglyph with the words "Red Denison, CCC 1940 pecked into the pahoehoe bedrock. This is also located in the upper portion of the survey area and was designated by Summer Roper in 2005 (see figure 10). This site, along with the previous two sites was also identified by chance on a separate field expedition.

Site numbers 24523, 24524, and 24525 are in close proximity to each other (within 150 meters), are related to each other and to CCC activities (see figure 10). This is not included in the first site due to fact that they are spatially distant from each other.

The original numbering of the features was started in 1998 with temporary field numbers starting with the prefix 98- #. The second portion of the number is in somewhat numerical order however, there are some gaps in the number order for unknown reasons. Once the project was resumed in 2002 the prefix of the temporary field number changed to 02-#. The second portion

of the number is also in somewhat numerical order with gaps in the sequence. The last numbers have the prefix 03-# due to the fact that these features were recorded in 2003. The second portion of the hyphenated numbers are in numerical order. The features with the prefix WPT were designated by volunteers and do not follow the other numbering systems.

After the field portion of the project was completed and the report was started, permanent feature numbers were designated under the Cultural Resource Management alpha-numeric project and feature numbering system. The Hilina Pali Project was designated as project D for the year 2005 (year in which report was written) and the feature number starts with 1 and end with 153 due to the fact that there are 153 individual features identified. Therefore it can be understood that HAVO-2005-D-# refers to the fourth report (D) written for the Cultural Resource Management Division of Hawai‘i Volcanoes National Park in the year 2005 and the number will refer to a specific feature associated with this project.

Site # 50-10-62-22487

Site number 22487 is an historic site and the features it includes were built by the CCC in 1940. The job was originally referred to as CCC project number 327. The site spans about 2 kilometers lengthwise and is located along the intermittent streams of the area. The CCC was working here to deter the erosion in the area that occurs during heavy rains. To complete this task the CCC locally quarried the pahoehoe bedrock of the area and used the rocks to construct walls along the drainages. These retaining walls were built to help contain the water flow into these gullies and by doing this the soil and vegetation would not be washed away and eroded. The CCC also used these rocks to construct dams to help guide the water flow down the drainages.

The site is located at the end of the Hilina Pali Road *mauka* of the *pali* and the Ka‘u Desert Trail. The site consists of a total of 78 walls, 2 historic petroglyphs, 4 mounds, 13 dams, and 2 cairns. All of these features are associated with erosion control. Many of the features remain in good condition and the walls and dams were well constructed. It is clear by observing the current state of these features that the erosion control effort was successful.

Archeological Features

HAVO-2005-D-1 (Feature 98-801) is a 91.5 m X 1.5 m X 57 cm high wall constructed of stacked blocky pāhoehoe cobbles and small boulders. The wall is long and shallow and rests on pāhoehoe bedrock and currently serves as a boundary blockade to the overgrowth in vegetation adjacent to the NE. The area immediately W and SW is relatively free of vegetation. This area to west is slightly lower in elevation and the area is about 9-12 m wide overall. This appears to be drainage. The wall feature is constructed of many tabular and several blocky pāhoehoe large cobbles and small boulders . The wall features extend 1-4 rocks wide and1-3 rocks high and it is stacked and faced. Several base stones are small tabular boulders placed on edge (upright). The wall is linear in sections and is curved or jagged in others and the wall appears to follow the top slope of a drainage. The wall is nicely constructed though the technique indicates a late historic

period. The technique applied: some areas are of well fitted stones where a flat surface meets flat surface and jagged surfaces interlocks with facing stones jagged surface. The wall exhibits areas of disturbance where the wall height is shorter and rubble is adjacent or downslope to the west or southwest. The sandy sediments have built up on the northeast or east side and the vegetation is growing over the wall. A bullet artifact was found that has the dimension 5.2 cm X 1.3 cm in diameter. The vegetation includes grasses, *pūkiawe*, *a'ali'i,* ferns, and partridge pea. The impacts on the feature include vegetation, weathering, erosion, deposition of sediment, and wind. The feature is in good condition.

HAVO-2005-D-2 (Feature 98-802) is a 7.3 m x 1 m x 37 cm high wall. It is constructed with basalt cobbles, slabs and boulders stacked to a height of 2 to 4 rocks high. Wall is located on a gradual slope of ashy soil in the east direction and abuts a pāhoehoe outcrop on the east side. The slabs are used as the foundation and are embedded into the matrix. The cobbles are placed on the slabs with the boulders in the south portion of the feature without stacking. The impacts are seismic, weathering, and vegetation. The vegetation is dense with *a'ali'i,* molasses grass, *pūkiawe*, and fern. This feature is in good to fair condition.

HAVO-2005-D-3 (Feature 98-803 a, b) is a 15.25 m x 1 m x 67 cm high wall. Sub-feature is located on a gradual slope in the north-northeast direction. It abuts a pāhoehoe outcrop in the north-northeast direction. The slabs are laid as a base with the top surface consisting of cobbles used to fill in the gaps. The rocks are stacked to a height of 2 to 3 rocks high. The vegetation is moderate with a few large shrubs, grasses, and ferns surrounding the feature. The sub-feature is in good to fair condition. 98-803b is a 7.5 m x 1 m x 40 cm high wall. The wall has evidence of collapse in the south portion. Sub-feature is made up of basalt slabs stacked to a height of 2 to 3 rocks high and deeply embedded into a matrix of ashy soil. The vegetation is dense to moderate in places. The vegetation consists of mostly grasses. The sub-feature is in fair to poor condition. The impacts of the feature are seismic activity, weathering, and vegetation. The vegetation consists of *a'ali'i,* fern, molasses grass, partridge pea, and *pūkiawe.*

HAVO-2005-D-4 (Feature 98-804 a, b, c, d) is a 9.3 m x 3 m x 66 cm high L-shaped wall. It is constructed from blocky pāhoehoe boulders stacked to a height of up to 4 rocks high. Large boulders create facing along the exterior edge. It is located on pāhoehoe bedrock with a trend of west-northwest to east-southeast and a slope in the west-southwest direction. The west-northwest corner turns 90 degrees into the L-shape. The interior of the L-shape is filled with soil accumulation. The vegetation is dense. 98-804b is a 1.6 m x 60 cm x 40 cm high wall. It is constructed with cobbles and boulders stacked 2 to 3 rocks high with a trend from the southwest to northeast. It is located on a pāhoehoe outcrop that slopes to the southwest on a shallow rise. Soil accumulation occurs on the northwest side. 98-804c is a 2.8 m x 60 cm x 41 cm high wall. It is constructed with blocky pāhoehoe boulders stacked from 2 to 3 courses high. It is located on a pāhoehoe outcrop. Portions of the wall exhibit collapse and the vegetation is very dense. 98-804d is a 2.6 m x 1 m x 50 cm high wall. It is constructed with blocky pāhoehoe boulders and cobbles trending roughly N/S. The stacking height is up to 4 rocks high with facing along the west. The wall has some rubble and the vegetation is dense. The impacts include vegetation, seismic activity, and weathering. The vegetation includes *pūkiawe, a'ali'i*, fern, lantana, and grasses. This feature is in good to fair condition.

HAVO-2005-D-5 (Feature 98-805) is a 3.5 m x 1 m x 97 cm high wall. It is constructed with basalt slabs stacked to a height of 2 to 4 rocks high. It is located on a moderate slope in the west direction abutting a pāhoehoe outcrop on the northeast side and embedded in a matrix of ashy soil. The wall utilizes the outcrop height. The slabs are lying flat in places and upright in others. 98-805b is a 15 m x 80 cm x 55 cm high wall. It is constructed of tabular pāhoehoe cobbles and boulders. The top has flat lying rocks with some base stones upright. The southeast edge has sediment build up. The impacts are seismic activity and weathering. The

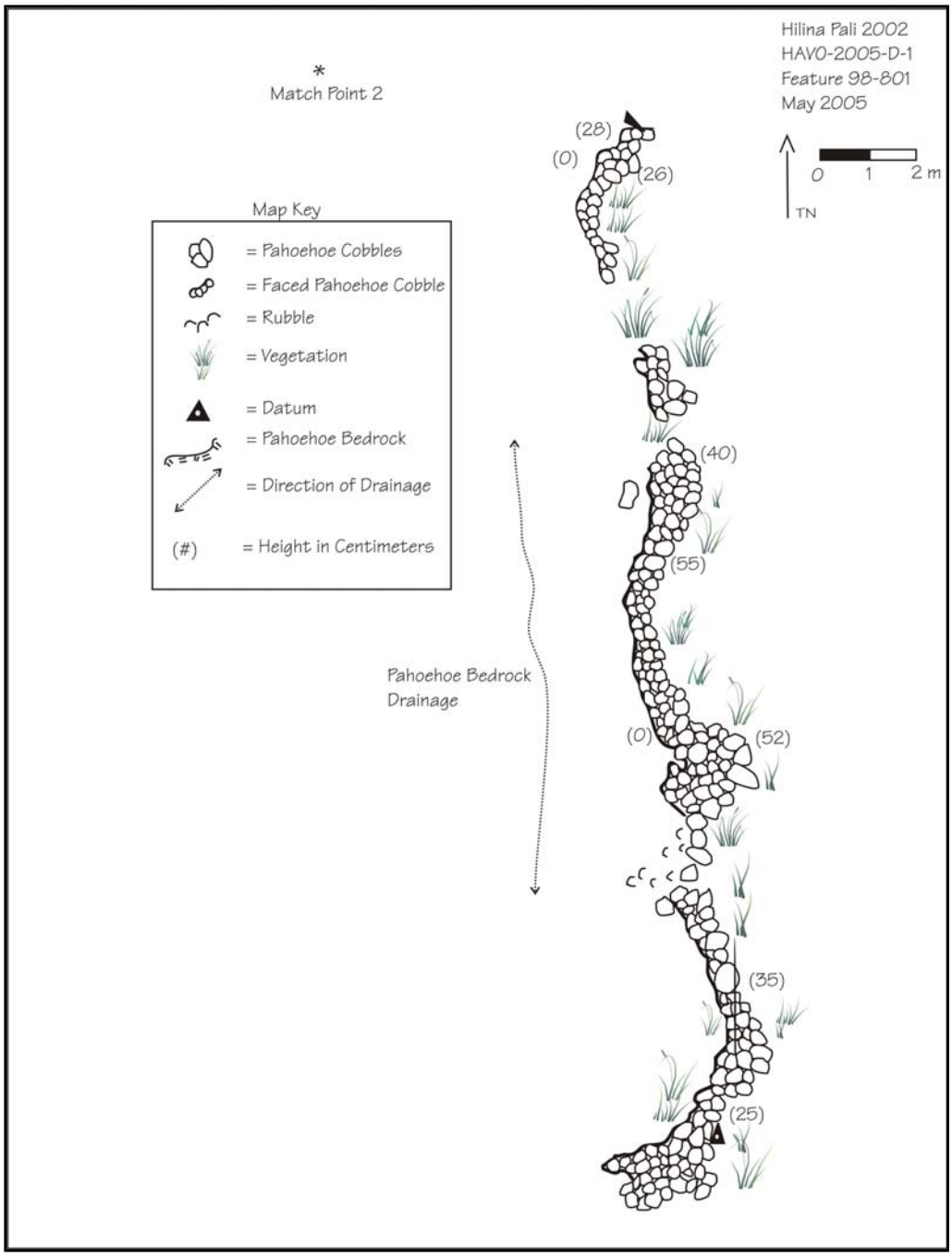

Figure 27. Feature HAVO-2005-D-1, Rock Wall

vegetation is sparse to moderate with *a'ali'i,* ferns, molasses grass, and *pūkiawe*. This feature is in excellent to good condition.

Figure 28. HAVO-D-2005-5, Rock Wall
Photo Courtesy of the National Park Service

HAVO-2005-D-6 (Feature 98-806a) is a 9.6 m x 1 m x 86 cm high wall. It is constructed with blocky boulders stacked up to 4 rocks high. Facing is visible on the east side, with boulders at the base and smaller cobbles on top. Soil accumulation occurs on the west side. The vegetation consists of *pūkiawe*, *a'ali'i*, fern, and grasses. This feature is in fair condition. 98-806b is a 8.4 m x 80 x 64 cm high wall. It is constructed with pāhoehoe boulders stacked to a height of 4 rocks high. Facing is visible on the west side with soil accumulation on the east side. Some rubble is evident on the west edge of the bedrock. 98-806c is a 8.7 m x 7.2 m x 38 cm high mound. It is a concentration of pebbles, cobbles, boulders, and soil. It is located in the center of the drainage, and could be a natural feature. Impacts are vegetation, seismic activity, and weathering. The vegetation consists of *pūkiawe*, *a'ali'i*, fern, and grasses. This feature is in fair condition.

HAVO-2005-D-7 (Feature 98-807 a, b) is a 3.5 m x 2 m x 88 cm high arc-shaped wall. It is constructed of basalt slabs placed upright. Wall is stacked to a height of 2 to 3 rocks high with facing on the west edge. The vegetation growth is moderate. 98-807b is a 2 m x 1.5 m x 60 cm deep quarried edge of pāhoehoe outcrop. The C-shaped opening opens to the east-southeast. The vegetation is sparse. The impacts include seismic activity, weathering, and vegetation. The vegetation includes *a'ali'i*, bracken fern, grasses, and *pūkiawe*. Feature is in good to fair condition.

HAVO-2005-D-8 (Feature 98-808 a, b) is a 40.75 m x 1.5 m x 87 cm high wall. It is constructed with upright slabs along the base and flat lying throughout the wall. Stacking is to a height of 3 to 4 rocks high and wall is embedded in ashy soil. The vegetation is dense. 98-808b is a 2.75 m x 1.5 m x 32 cm deep quarry. It is constructed with the removal of pāhoehoe outcrop. Impacts are seismic activity, weathering, and vegetation. The vegetation consists of *a'ali'i*, bracken fern, grass, *pūkiawe*, and a *'ākia*. This feature is in good to fair condition.

HAVO-2005-D-9 (Feature 98-809 a, b) is a 26 m x 1.1 m x 82 cm high wall. It is constructed with large boulders stacked to a height up to 6 rocks high with facing on the west. Some evidence of collapse is noted on the north end. 98-809b is a 9.7 m x 1.6 m x 95 cm high V-shaped wall. It is constructed with boulders stacked to 4 courses high on bedrock. Collapse is visible in the medial portion due to vegetation. The types of impacts are vegetation, seismic activity, and weathering. The vegetation consists of *pūkiawe*, *a'ali'i,* fern, and grasses. This feature is in fair to poor condition.

HAVO-2005-D-10 (Feature 98-810 a, b) is a 17.50 m x 1.1 m x 88 cm high wall. It is constructed from boulders stacked up to 3 courses high on bedrock. The east side of the wall has well defined facing. 98-810b is a 3.2 m x 35 cm deep quarry. It is constructed with quarried out rocks from the pāhoehoe outcrop. The quarry opens to the west. Impacts include vegetation, seismic activity, and weathering. The vegetation consists of *pūkiawe*, *a'ali'i,* fern, and grasses. This feature is in good to fair condition.

HAVO-2005-D-11 (Feature 98-812 a, b) is a 16.8 m x 1.25 m x 1.04 m high C-shaped wall. The wall opens to the northeast. It is constructed with slabs along the base placed upright. The stacking occurs to the height of 3 to 4 rocks high. The vegetation is dense. 98-812b is a 6.4 m x 1 m x 67 cm high wall. It is constructed with upright and flat lying slabs. The stacking is from 2 to 4 rocks high. The vegetation is dense. Types of impacts are weathering, seismic activity, and vegetation. The vegetation includes *a'ali'i*, bracken fern, grasses, and *pūkiawe.* The feature is in good condition.

Figure 29. HAVO-2005-D-11 Rock Wall
Photo Courtesy of the National Park Service

HAVO-2005-D-12 (Feature 98-813 a, b) is a 16.10 m x 1.3 m x 71 cm high C-shaped wall. It is constructed with boulders and cobbles stacked 2 to 5 rocks high. The wall is slightly collapsed. The feature opens to the east. 98-813b is a 2.8 m x 1.6 m x 47 cm high paving. It is constucted with pebbles piled 3 rocks high with some facing on the west side. The impacts include vegetation, seismic activity, and weathering. The vegetation consists of *pūkiawe*, *a'ali'i*, grasses, and fern. This feature is in good to fair condition.

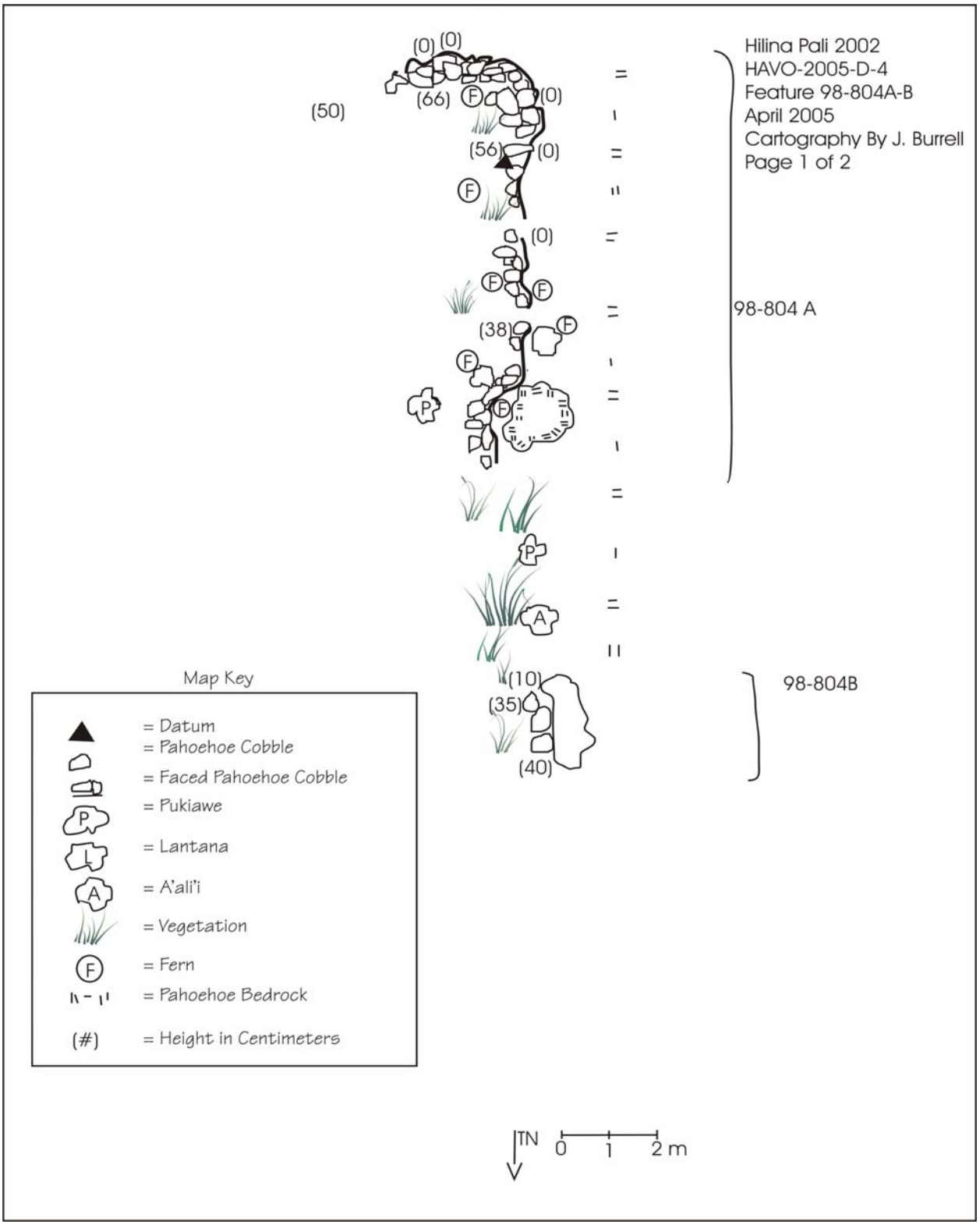

Figure 30. Feature HAVO-2005-D-4, Rock Walls

HAVO-2005-D-13 (Feature 98-814) is a 7.15 m x 1 m x 73 cm high wall. It is constructed with boulders and cobbles stacked to a height of 2 to 4 courses high. There is some evidence of collapse on the south end. The types of impact are vegetation, seismic activity, and weathering. The vegetation includes *pūkiawe*, *a'ali'i,* fern, and grasses. This feature is in fair to poor condition.

HAVO-2005-D-14 (Feature 98-815 a, b, c) is a 14 m x 1.4 m x 77 cm high wall. It is constructed with cobbles and boulders stacked to a height of 2 to 4 rocks high with facing on the east-southeast side. The vegetation is sparse to moderate with *pūkiawe, a'ali'i*, bracken fern, and grasses. This feature is in good condition. 98-815b is a 1.8 m x 1.6 m x 30 cm high rock pile. The pile is constructed with pebbles and cobbles in a low spot in the drainage. The rocks are piled to a height of 1 to 2 rocks high and might be natural. This feature is in fair condition. 98-815c is a 2.1 m x 40 cm x 19 cm high rock alignment. It is constructed with cobbles and follows the natural contour of the bedrock and soil. This feature is in good condition. Feature impacts include weathering and vegetation.

Figure 31. HAVO-2005-D-15, Retaining Wall
Photo Courtesy of the National Park Service

HAVO-2005-D-15 (Feature 98-816) is a 7.4 m X 1.2 m X 91 cm wall constructed of stacked blocky pāhoehoe boulders and cobbles. The wall lining is the west side of a N/S running drainage. The wall is not strictly linear, but built for the most part along a NW/SE axis. The facing along the NE edge is constructed from large boulders that are stacked three courses high. The feature interior consists of smaller boulders and large cobbles. The SW facing is not visible due to accumulated sand that reaches the height of the wall on its SW side. The wall's NW end is built on top of a pāhoehoe bedrock rise, while the middle and southeast portions rest on a shallow sand matrix that is uneven and sloped with the natural topography, gently to the south-southwest. There is no rubble surrounding feature. The vegetation of the area includes *pūkiawe*, *a'ali'i,* ferns, and grasses. The impacts on the feature include vegetation, weathering, and soil accumulation. The feature is in good condition.

HAVO-2005-D-16 (Feature 98-817) is a 3.65 m x 1.6 m x 62 cm high wall. It is constructed of cobbles and boulders stacked 1 to 4 rocks high. Some rubble is noted in the northwest of feature.

The impacts include vegetation and weathering. The vegetation consists of *pūkiawe, a'ali'i*, bracken fern, and grasses. This feature is in good condition.

HAVO-2005-D-17 (Feature 98-818) is a 7.6 m x 2.3 m x 86 cm high wall. It is constructed of cobbles and boulders with a height of 2 courses high. The base is constructed with larger rocks with the top consisting of smaller rocks. This wall has facing and is an excellent example of a retaining wall. The impacts include vegetation, sedimentation, and weathering. The vegetation is sparse with ʻōhiʻa, pūkiawe, a'ali'i, grasses, and other dead vegetation. This feature is in excellent condition.

HAVO-2005-D-18 (Feature 98-819 a, b) is a 7.8 m x 80 cm x 56 cm high wall. It is constructed with boulders stacked from 2 to 3 courses high. The smaller boulders are used to fill the interior. The south end of the feature is covered with a sandy matrix. 98-819b is a 3.5 m x 50 cm x 56 cm high wall. It is constructed with boulders that are stacked 2 to 3 courses high. The base is composed of larger boulders and the rest of made up of smaller boulders and cobbles. Collapse is noted at the southwest end. The impacts include vegetation, seismic activity, and weathering. The vegetation includes is in good to fair condition.

HAVO-2005-D-19 (Feature 98-821) is a 8.5 m x 7 m x 77 cm high wall. It is constructed across the width of a drainage with boulders on the exterior and cobbles on the interior stacked to a height of 1 to 3 rocks high. The impacts include weathering and vegetation. The vegetation consists of *pūkiawe*, *a'ali'i,* grasses, bracken fern, and *ʻākia.* This feature is in good condition.

HAVO-2005-D-20 (Feature 98-822) is a 11.65 m x 2 m x 89 cm high wall. It is constructed with cobbles and boulders stacked to a height of up to 4 rocks high. The wall has facing on the east side, with portions of the wall collapsed. The types of impact are vegetation, seismic activity, weathering, and fallen snags. The vegetation includes *pūkiawe*, *a'ali'i,* fern, and grasses. This feature is in fair condition.

HAVO-2005-D-21 (Feature 98-823) is a 11.4 X 2.6 X 1.7 m high J shaped wall constructed of stacked blocky pāhoehoe boulders and some cobbles. The wall is built along an E/W facing axis with the west end of the wall hooking towards the north. The west face consists of large upright standing pāhoehoe slabs with the smaller ones stacked 2 slabs high to reach the height of the larger slabs. The arrangement of slabs creates a nice smooth facing. The largest standing slab located towards the middle of the north facing measures 1.7 X 2.15 X .28 m. *pūkiawe*, *a'ali'i*, fern, and grasses. There are historic petroglyphs decorating the north face of the slab. The slab is highly weathered and difficult to read, but there is still a well defined "E" and something similar to "GI" which was carved into the center of the slab. Near the slabs base are a series of initials, including "M" and "HK." Another slab lining the features north face contains the petroglyph "CCC," "E.K.," and "HNP," which are carved into a smaller standing pāhoehoe slab measuring 82 cm high X 90 cm wide X 27 cm thick. These petroglyphs are clearer, carved approximately 1-1.5 cm deep into the slab. There are other possible vague traces of petroglyphs on the other slabs lining.

The wall interior, behind the north facing, is constructed from mostly large blocky pāhoehoe boulders that are piled up to the height of the north facing. There are some smaller boulders and

a few cobble sized rocks incorporated into the construction of the feature interior, but overall this feature was created with very large rocks. The feature surface is uneven with rocks loosely piled together while there is a small level area of the feature surface at the feature's east end. The rest of the surface slopes downhill to the west, following the natural contouring of the topography. While the feature interior for the E/W running portion of the J shape is built up to the height of the tallest north face standing slab, the part of the J shape that hooks to the north is much shallower. The boulders are piled only approximately 2 rocks high to a height of 52 cm behind a standing slab of the same height (slabs line the east face for this portion of the feature). This N/S running part of the J shape appears disturbed and mostly collapsed, with boulders in dense concentrations and strewno the SW. This is likely because this part of the J was constructed across a drainage, while the E/W running intact portion of the feature was built to line the east side of an overall N/S running drainage. One of the slabs lining the east face of the N/S running section has "Joey" carved into the stone. This petroglyph is deeply grooved into the slab.

The old 1998 survey datum was located toward the middle of the E/W running section of the feature, on the south side of one of the slabs lining the north face. Sand has accumulated to the height of the feature along its south side, and has shallowly accumulated along the north side so that the pāhoehoe bedrock is no longer visible. The vegetation includes *a'ali'i*, *pūkiawe*, ferns, pili, and other grasses. The feature is impacted by vegetation, seismic, weathering, water flow, and soil accumulation. The feature is in fair condition.

Figure 32. HAVO-2005-D-21 Pecked Petroglyph on Rock Wall
Photo Courtesy of the National Park Service

HAVO-2005-D-22 (Feature 98-824) is a 38m X 35-60 cm X 35-60 cm high wall constructed of dry stacked pāhoehoe boulders and cobbles. The long rock wall trends N to S and parts of it are collapsed. The wall is 3-4 courses high and built by the CCC as a retaining wall for a drainage. To the east of the wall is vegetation and to the west of the wall is a pāhoehoe outcrop, which

makes up the drainage. The rock wall is constructed on the east side of this pāhoehoe outcrop. The vegetation of the area includes *pūkiawe*, *a'ali'i,* and grasses. The impacts on feature include seismic, water erosion, and vegetation.

Figure 33. HAVO-2005-D-21, Rock Wall.
Photo Courtesy of the National Park Service

HAVO-2005-D-23 (Feature 98-825) is a 3.8-m long X 1.2 m wide X .8 m high dam constructed of large pāhoehoe boulders. The dam is built on the western side of channel or drainage built by the C.C.C. The dam is invaded with vegetation including *pūkiawe*, *a'ali'i,* and *'ōhi'a*. The dam appears to be impacted and disturbed by flooding. The feature is in fair condition.

HAVO-2005-D-24 (Feature 98-826) is a 7.2-m long X 1.6 m wide X .5m high wall remnant constructed of pāhoehoe cobbles and boulders. This feature appears as if it as endured a lot of water activity due to the deposition of small pebbles and sand within the existing structure of the wall. Approximately eight meters south of this wall remnant there is another wall remnant. Flooding and vegetation may impact this feature. The vegetation that surrounds the feature includes *a'ali'i*, lantana, molasses grass, and *pūkiawe*. The feature is in poor condition.

HAVO-2005-D-25 (Feature 98-827) is a 3.5-m long X 2.7 m wide X 7-m high dam constructed of large pāhoehoe boulders and cobbles. The feature has three large upright boulders on the northwest portion of the dam and is reinforced with pāhoehoe cobbles and boulders stacked two to three courses high, forming the southwest portion of the dam. Ferns and molasses grass grow

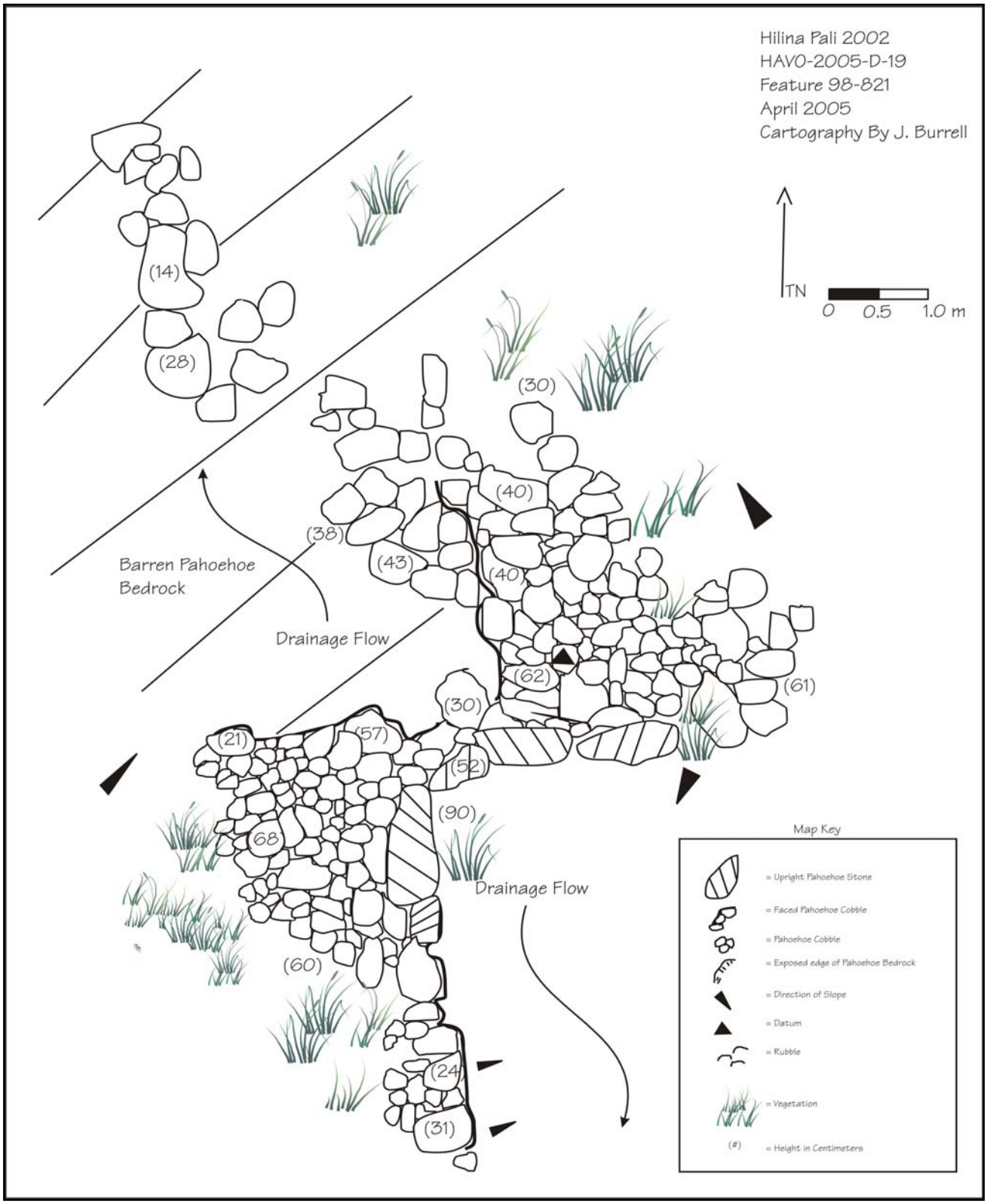

Figure 34. Feature HAVO-2005-D-19, Dam

within the feature and it is also surrounded by *a'ali'i* and broomsedge. The feature could potentially be impacted by vegetation and flooding and is in good condition.

HAVO-2005-D-26 (Feature 98-829) is a 3.3-m long X 1.3 m wide X .5 m high wall constructed of large pāhoehoe boulders and cobbles. The feature is a small wall dry stacked 2-3 courses high. This wall makes a slight L shape and is across the drainage from WPT 124 to the southwest. To the south is an excavated channel about 2 meters (feature 03-02). This feature (98-829) could potentially be impacted by flooding and vegetation and is surrounded by *pūkiawe, a'ali'i*, and broomsedge. It is in good condition.

HAVO-2005-D-27 (Feature 98-830) is a 6.8 m long X .8 m wide X .8 m high dam constructed of large pāhoehoe boulders and cobbles and is stacked 2-3 courses high. There are some large pāhoehoe boulders placed upright on the west side of the dam with reinforcement one to three courses high on the eastern side of the dam. The feature is being impacted by flooding, vegetation, and down slope erosion. It is surrounded by *a'ali'i,* molasses grass, *pūkiawe, 'ohi'a*, and ferns. The feature is in good condition.

HAVO-2005-D-28 (Feature 98-831) is a dam wall constructed of pāhoehoe boulders and cobbles. There are two walls, one on the east side of drainage and one on the west side. These two walls make up the dam. The west wall has the dimension of 3.5 m X 2.3 m x 1.5 m in height. The east wall has the dimensions 5.2-m X 4 m X 7 m in height. The east side is constructed of pāhoehoe bedrock with rocks stacked two to three courses high. The west side is constructed on a soil layer and also stacked two to three courses high. The feature could potentially be impacted by vegetation and flooding and is surrounded by *pūkiawe,* ferns, molasses grass, and *a'ali'i.* It is in poor condition.

HAVO-2005-D-29 (Feature 98-834) is a 3.6 m long X 51 cm wide X 50 cm long rock wall constructed of pāhoehoe cobbles and some boulders dry stacked two to three courses high and running north to south. To the west of the feature is a pāhoehoe outcrop in which the wall is constructed along the east side, forming a drainage. To the east of the wall is vegetation. The rock wall functions as a retaining wall for the drainage's constructed by the C.C.C. Twenty meters to the west of wall on the other side of drainage it appears as if there was some quarrying activity in which the wall could have been constructed from. The potential impacts on the feature include erosion, seismic activity, and vegetation. *A'ali'i*, grasses, and *pūkiawe* surround the feature and it is in good condition.

HAVO-2005-D-30 (Feature 98-835) is a 900 x 775 x 68 cm high wall. It is constructed with basalt upright slabs stacked to a height of 2 to 3 rocks high with a few flat lying slabs. The impacts are seismic activity, weathering, and vegetation. The vegetation is moderate with *a'ali'i*, grasses, *pūkiawe,* partridge pea, and fallen snags. This feature is in poor condition.

HAVO-2005-D-31 (Feature 98-836 a, b) 6.2 X 0.5 X0.6 m high is a wall built along a N/S axis to line the east side of a N/S running drainage. The wall is built on top of a relatively flat area of the pāhoehoe bedrock. The vegetation is encroaching upon and beginning to completely cover the feature. The wall has a slight curve to it that opens to the west. The west facing is the only part of a wall that is visible The wall is constructed of a combination of blocky pāhoehoe large