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Lihue & Hanamaulu Water
Development Proj. Phase II

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QUALITY CONTROL

August 5, 1998

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Mr. Gary Gill, Director
Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu, HI 96813

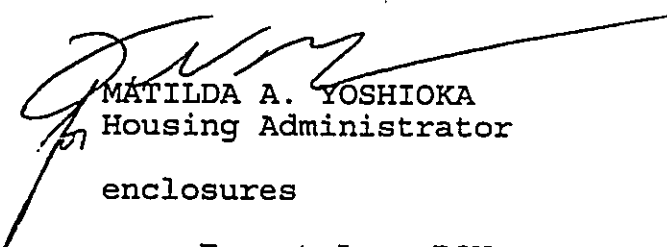
Dear Mr. Gill:

Subject: Finding of No significant Impact (FONSI) for
Lihue & Hanamaulu Water Development Projects, Phase II
T.M.K. 3-8-portion 4, 3-8-portion 2,3 and 6
Lihue, Kauai, Hawaii

The Kauai County Housing Agency has reviewed the comments received during the 30-day comment period which began on June 23, 1998. The agency has determined that this project will not have significant environmental effects and has issued a FONSI. Please publish this notice in the August 23, 1998 OEQC Environmental Notice. ✓

We have enclosed a completed OEQC Publication form and four copies of the final EA. Please call Dennis Alkire at 241-6814 if you have any questions.

Sincerely,


MATILDA A. YOSHIOKA
Housing Administrator


DENNIS ALKIRE
Project Coordinator

enclosures

c: Ernest Lau, DOW
(w/o enclosures)



AN EQUAL OPPORTUNITY EMPLOYER

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1998-08-23-KA-PEA-Lihue & Hanamaulu AUG 23 1998
Water Development Projects Phase II **FILE COPY**

FINAL RECEIVED
ENVIRONMENTAL '98 AUG 10 P2:42
ASSESSMENT

FOR

**LIHUE & HANAMAULU WATER
DEVELOPMENT PROJECTS
PHASE II - INSTALLATION OF
CONNECTING PIPELINES**

This environmental document prepared pursuant to Chapter 343, HRS

Prepared for:

County of Kauai
Housing Agency
4139 Hardy Street
Lihue, Hawaii 96766

August 1998

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I. EXECUTIVE SUMMARY

In a collaborative effort to provide a safe and reliable drinking water supply for the growing communities of the Lihue area, the Kauai County Housing Agency, with the support and assistance of the Department of Water, proposes to expand the existing water system. Two major projects known as the Hanamaulu and Lihue Water Development Projects are involved in this effort. The first phase of these projects involved well drilling, casing and testing of two wells, Hanamaulu Well No. 3 for the Hanamaulu Water Development Project and Pukaki Well for the Lihue Water Development Project. The purpose of the initial phase was to verify the feasibility of these wells for potable water production by obtaining yield and quality data from both wells.

The second phase of the water development projects focuses on the design and construction of water transmission mains that will connect the future production well facilities with the existing water system. Specifically, the Hanamaulu Water Development Project will involve the installation of approximately 20,500 lineal feet of 16-inch transmission main. The main will connect Hanamaulu Well No. 3 to an existing 12-inch main at the intersection of Maalo Road and Kuhio Highway.

Construction of the 16-inch transmission main will be divided into two increments. The first increment begins at the south end, in the vicinity of Kuhio Highway, and proceeds north on Maalo Road extending just past the proposed connection for the 12-inch transmission main for the Lihue Water Development Project. This portion covers approximately 10,200 lineal feet of 16-inch transmission main and includes a support structure for crossing Hanamaulu Stream near the existing Kapaia Bridge.

The second increment of this project continues where the first ends. This increment consists of approximately 4,700 lineal feet of 16-inch transmission main installed on Maalo Road in a northerly direction. From this point, the alignment heads west on a cane haul road for another 5,600 lineal feet to the location of Hanamaulu Well No. 3. The 16-inch main then extends an additional 1,000 feet west to the site of the proposed 100,000 gallon control tank.

As mentioned in the preceding paragraph, the transmission main for the Lihue Water Development project connects with the 16-inch main for the Hanamaulu Project. The Lihue project will require the installation of approximately 1,300 lineal feet of 12-inch water transmission main to connect Pukaki Well with the 16-inch transmission main along Maalo Road.

The third and final phases of the Hanamaulu and Lihue Water Development Projects will follow with the installation of pump facilities consisting of deep well pumps, a 100,000 gallon holding tank, a mainline control valve, site improvements and other appurtenances.

This Draft Environmental Assessment (DEA) covers the Phase II actions of both the Hanamaulu and Lihue Water Development Projects, which are essentially the installation of transmission mains. The EA is a preliminary document prepared to determine if a particular action has potentially significant environmental impacts. After a review of the EA by various governmental agencies and other interested organizations or individuals followed by a formal comment period, either the proposing agency or approving agency determines whether or not an Environmental Impact Statement (EIS) will be required.

Based on the findings of this DEA, it has been concluded that an EIS is not required at this time. Short term impacts such as the release of dust and noise can be expected as a result of construction activity. These impacts can be mitigated by strict adherence to applicable guidelines set by the State Department of Health.

II. SUMMARY INFORMATION

CHAPTER 343, HAWAII REVISED STATUTES (HRS) ENVIRONMENTAL ASSESSMENT

Project Name: Hanamaulu Water Development Project - Phase II
Lihue Water Development Project - Phase II

Proposing Agency: County of Kauai - Housing Agency
4139 Hardy Street
Lihue, Hawaii 96766

Approving Agency: County of Kauai - Housing Agency
4139 Hardy Street
Lihue, Hawaii 96766

Prepared By: ParEn, Inc. dba Park Engineering
567 South King Street, Suite 300
Honolulu, Hawaii 96813

Anticipated Determination: Finding of No Significant Impact (FONSI)

Project Description: Hanamaulu Water Development Project - Phase II
Installation of approximately 20,500 feet of 16-
inch water transmission main.
Lihue Water Development Project - Phase II
Installation of approximately 1,300 feet of 12-inch
water transmission.

Project Location: Lihue, Hawaii (See Figure 1)

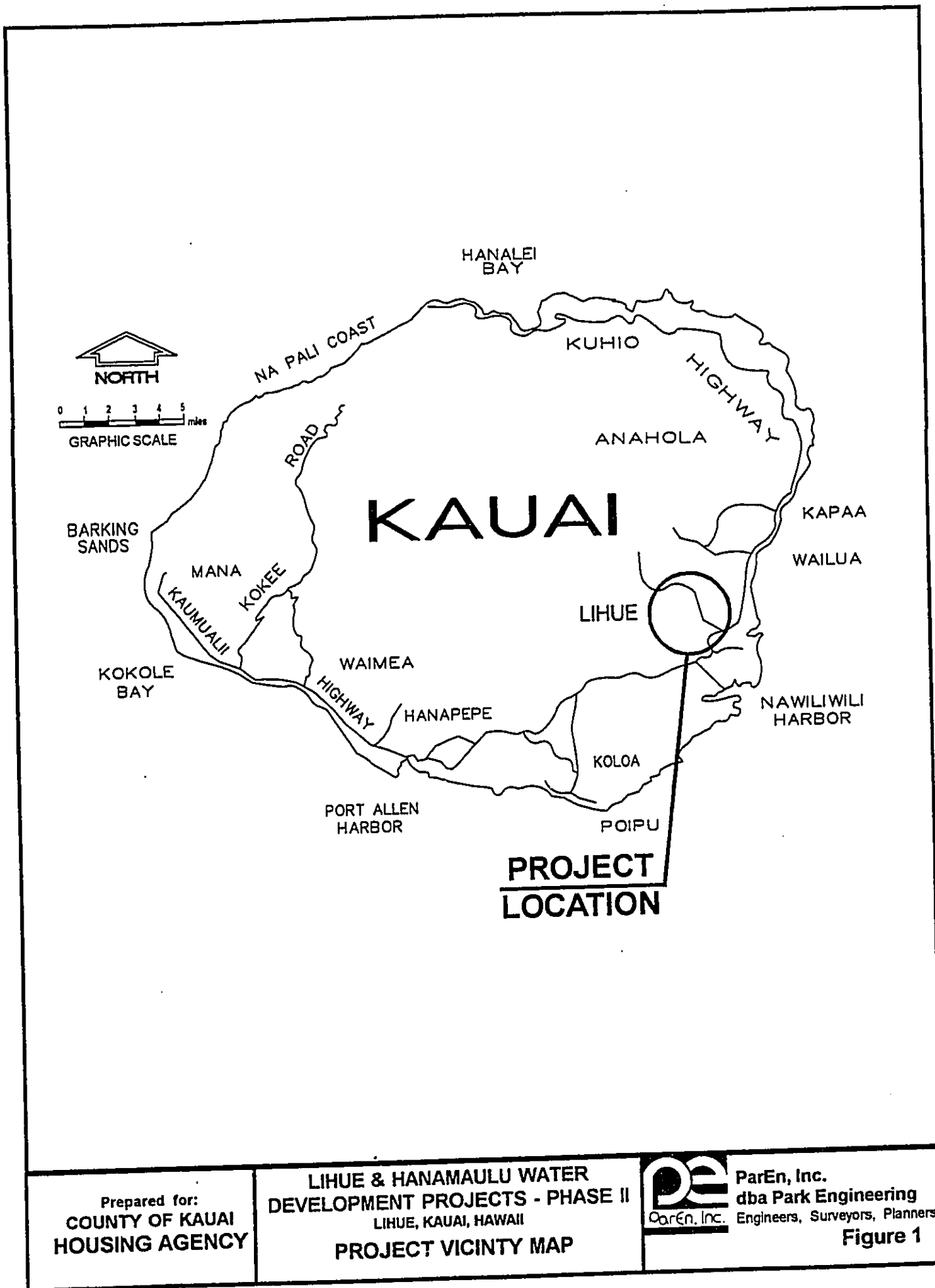
Tax Map Key: 3-8-Por. 4, 3-8-Por. 2, 3 and 6

Land Owner: State of Hawaii, AMFAC/JMB

Land Area: Hanamaulu Water Development Project - Phase II
410,000 square feet for waterline easement
Lihue Water Development Project - Phase II
19,500 square feet for waterline easement

State Land Use Designation: Agricultural

County Zoning: Agriculture, Open



Prepared for:
COUNTY OF KAUAI
HOUSING AGENCY

LIHUE & HANAMAULU WATER
DEVELOPMENT PROJECTS - PHASE II
 LIHUE, KAUAI, HAWAII
PROJECT VICINTY MAP



ParEn, Inc.
 dba Park Engineering
 Engineers, Surveyors, Planners

Figure 1

III. AGENCIES, ORGANIZATIONS & INDIVIDUALS CONSULTED

Federal:

- U.S. Army Corps of Engineers
- U.S. Department of Agriculture
- U.S. Department of Interior

State of Hawaii:

- Department of Land and Natural Resources
- Department of Health
- Department of Transportation - Highways Division
- University of Hawaii
- Office of Environmental Quality Control

County of Kauai:

- Department of Water
- Public Works
- Planning Department

Utility:

- Kauai Electric
- GTE Hawaiian Tel

Others:

- AMFAC/JMB, Lihue Plantation
- Mr. & Mrs. Richard Yano
- Mr. & Mrs. Buichi Yamasaki
- Kauai Memorial Gardens

IV. PROJECT DESCRIPTION

A. Background

Upgrading the Lihue Water System is a high priority for the County of Kauai Housing Agency and the Department of Water. Growth and expansion of the Lihue service area has generated potable water demands that exceed the capacities of existing well sources. Additionally, existing pumpage has been reduced by more than 20 percent due to dropping well water levels. As a result, the Department of Water has been restricting water requests for developments in the Lihue, Hanamaulu and Puhi areas until additional source and storage facilities are developed.

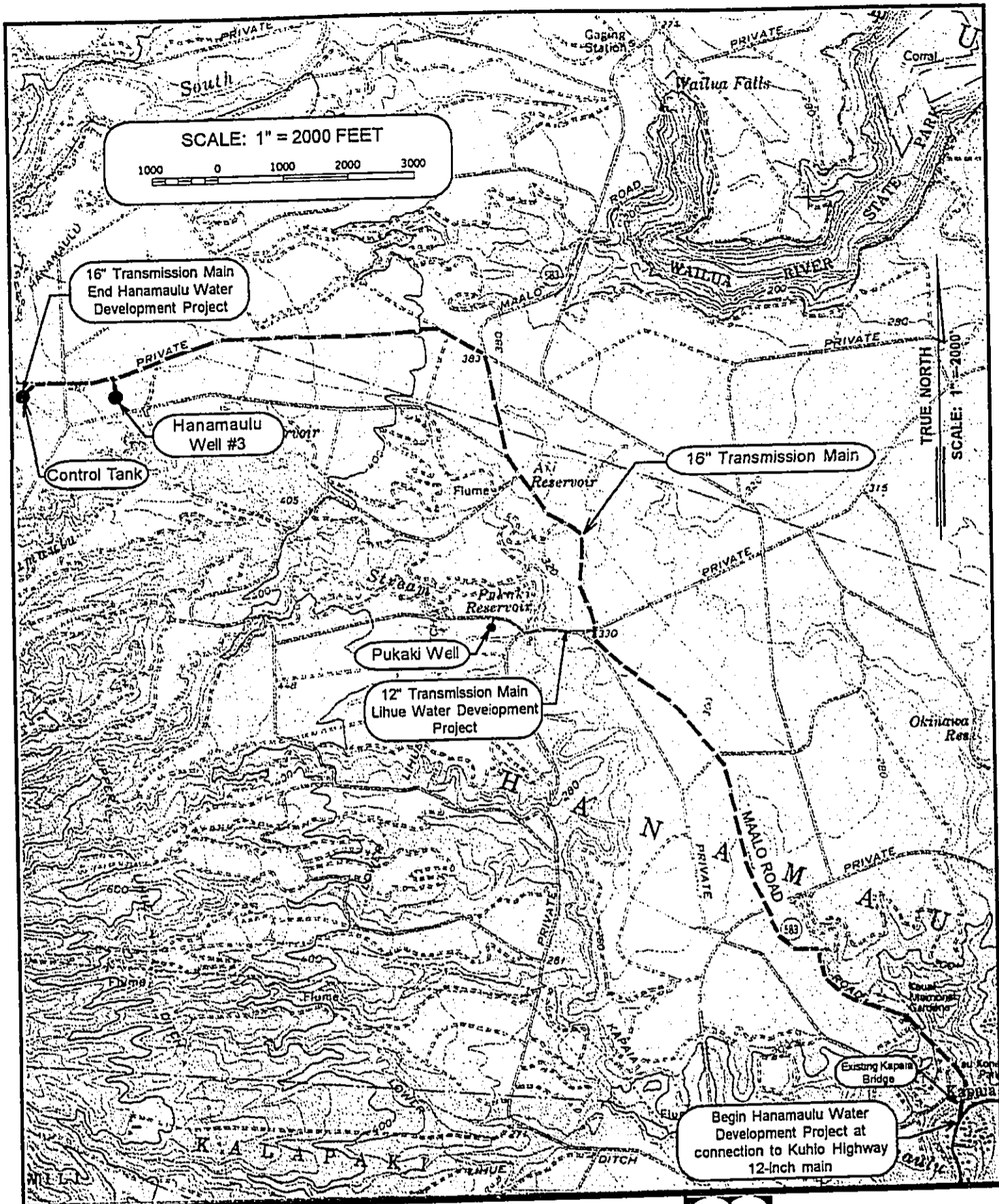
The second phases of the Lihue and Hanamaulu Water Development projects are part of the County's continuing effort to expand on its available sources to provide safe and reliable potable water to the Lihue and Hanamaulu systems. The proposed projects will supplement the 393-foot service zone of the Lihue Water System. This service zone is comprised of six deep wells at Kilohana, three one million gallon (MG) storage reservoirs including two tanks at Kilohana and one at Kalepa, and associated transmission and distribution mains.

B. Project Location

Both proposed transmission main sites are located in east central Kauai, north of Lihue and are surrounded by sugarcane fields. The alignment follows portions of Maalo Road, which is also referred to as Wailua Falls Road, and various cane haul roads to connect the well sites with existing water system infrastructure. Figure 2 shows the alignment of the proposed transmission mains.

The Hanamaulu Well No. 3 site is located approximately four miles northwest of Lihue, near Kapaia Reservoir. The 16-inch transmission main connecting Hanamaulu Well No. 3 to both the existing main on Kuhio Highway and to the proposed 100,000 gallon tank will be placed mainly in the shoulder area of Maalo Road or to the edge of the cane haul road.

The Pukaki Well site is located approximately three miles northwest of Lihue, near the Pukaki Reservoir, half a mile south of Alii Reservoir, and about 1.3 miles south of the proposed Hanamaulu Well No. 3 well site. The 12-inch transmission main connecting Pukaki Well to the 16-inch transmission main will also be placed within the limits of the cane haul road.



Prepared for:
**COUNTY OF KAUAI
 HOUSING AGENCY**

**LIHUE & HANAMAULU WATER
 DEVELOPMENT PROJECTS - PHASE II**
 LIHUE, KAUAI, HAWAII
LOCATION MAP



ParEn, Inc.
 dba Park Engineering
 Engineers, Surveyors, Planners

Figure 2

C. Technical Characteristics

Class 52 ductile iron pipe will be specified for the 16-inch and 12-inch transmission mains for the Hanamaulu and Lihue Water Development Projects. Design of the water line shall take into account the limited existing underground utilities within Maalo Road. The water line will generally follow the slope of the roadway or cane haul road and have a minimum cover of three feet. This cover will adequately protect it from vehicular traffic as well as harvesting operations and heavy cane hauling traffic.

Transmission mains will generally be placed within the shoulder area of Maalo Road or to the edge of the cane haul road. In locations where an uphill or downhill slope bank exists along the roadway, a minimum distance of 4 feet between the bank and centerline of the water line shall be provided. In some sections the main will be placed within the existing roadway pavement to allow a minimum of 36 inches of lateral clearance with existing utility and power poles. During construction, utility poles shall be braced as a precautionary measure. Equipment or vehicles used under or near electrical power circuits must meet a 10 foot minimum clearance as required by Occupational Health and Safety Standards, or the lines must be guarded to prevent accidental contact.

The 16-inch transmission main crosses Hanamaulu Stream in the vicinity of the existing Kapaia Bridge. This crossing occurs at the south end of the Hanamaulu Water Development Project on Maalo Road, approximately 200 feet from the intersection with Kuhio Highway. Because the ability of the existing Kapaia Bridge to carry additional loads is unknown, a support structure independent of the existing bridge is proposed for the stream crossing. The pipe will be supported on a poured-in-place concrete beam supported by caissons. Construction of the foundations for this stream crossing is expected to occur behind the existing abutments for Kapaia Bridge and will not encroach into either the stream bed or bank areas. Neither a stream alteration permit nor a stream diversion permit will be required based on the proposed design of the stream crossing. The proposed elevation of the crossing will coincide with the existing bridge deck and will not reduce the cross sectional area currently available for flow from Hanamaulu Stream.

D. Socio-Economic Characteristics

An immediate economic impact of these projects is the estimated five million dollars of work for the construction industry, including contractors, suppliers and other support services. The two water development projects will provide an additional 1.5 million gallons per day (mgd) of drinking water to help meet existing and future water needs. The development projects will provide water for residents occupying between 500 to 700 existing housing units in the Lihue area and will not in itself induce urbanization that is not consistent with the County General Plan.

The proposed transmission mains will be installed within the shoulder area of Maalo Road or to the edge of the cane haul road and will not cross any cane fields. Cane Haul Roads and irrigation systems shall remain open and functional during construction so as not to adversely affect sugar operations.

E. Environmental Characteristics

Temporary disruptions to the environment may occur as a result of construction activities in the form of dust from excavation and noise from construction equipment. Environmental impacts caused by these projects will be mitigated to comply with applicable regulations, and will be discussed further in subsequent sections. No long-term impacts to the environment are anticipated as a result of this project.

F. Approvals and Permits Required

A preassessment consultation to help determine impacts of the proposed projects was conducted with affected and interested community groups and County agencies. The preassessment consultation letter sent to these groups and agencies as well as the responses received are contained in Appendix A. The approvals and permits required for this project are identified below:

APPROVALS

1. County of Kauai – Department of Public Works
 - a. Certification of a "No Rise" Determination for a Proposed Floodway Development
2. State Department of Transportation
 - a. Water pipeline easements

PERMITS

1. State Department of Health
 - a. Noise Permit from Noise and Radiation Branch
 - b. National Pollution Discharge Elimination System (NPDES) permit for Hydrotesting

G. Estimated Construction Schedule and Phasing

Installation of the 16-inch transmission mains for the Hanamaulu Water Development Project Phase II will be done in two construction phases starting in the fourth quarter of 1998. Duration of construction will be approximately one year from the start date. The first phase starts from the south end of the project at the Kuhio Highway-Maalo Road intersection and extends north on Maalo Road past the 12-inch transmission main connection to Pukaki well. This phase includes approximately 10,200 lineal feet of 16-inch transmission main and the water line support structure crossing near the Kapaia Bridge.

The second construction phase of the 16-inch transmission main continues along Maalo Road and a cane haul road up to its connection with the Hanamaulu Well No. 3. This phase consists of approximately 4,700 lineal feet of 16-inch transmission main to be installed along Maalo Road and another 5,600 lineal feet along the cane haul road. In addition, another 1,000 foot section of 16-inch transmission main will be laid during this phase to connect the proposed Hanamaulu Well No. 3 to a future control tank to the west of the well site.

The 12-inch transmission main for the Lihue Water Development Project Phase II will be installed in a single phase after the completion of the first construction phase of the Hanamaulu Water Development Project Phase II. The schedule for this project has not yet been determined.

H. Project Funding

Funding for these projects will be provided through Federal and County monies. Community Development Block Grant and Special Purpose Grant Funds for housing and public service projects will be utilized to provide a portion of the funding. Matching funds from the Department of Water will also be required to fully fund the project. Preliminary construction costs for Phase II of both projects are as follows:

Hanamaulu Water Development Phase II:	\$ 4.7 million
Lihue Water Development Phase II:	\$ 0.3 million

V. DESCRIPTION OF THE AFFECTED ENVIRONMENT

A. Topography

The 16-inch transmission main begins at the intersection of Kuhio Highway and Maalo road at elevation of 102 feet above mean sea level (msl). From there it follows Maalo Road and slopes downward to a sag in the roadway profile at the location of Kapaia Bridge. Elevation at the top deck of the bridge is just over 98 feet msl. After the bridge, the road begins a steep climb up grades ranging from 5% to 7% for roughly half a mile. The road grades beyond that decrease, with slopes varying between flat (0%) and 5%. At roughly 2.8 miles from Kuhio Highway, the alignment turns off Maalo road and veers west onto the right edge of an AC-gravel cane haul road. Elevation of Maalo road at this juncture is 383 feet above msl. The grades on the cane haul road vary from flat to 3.3% sloping up towards the proposed Hanamaulu Well No. 3 site.

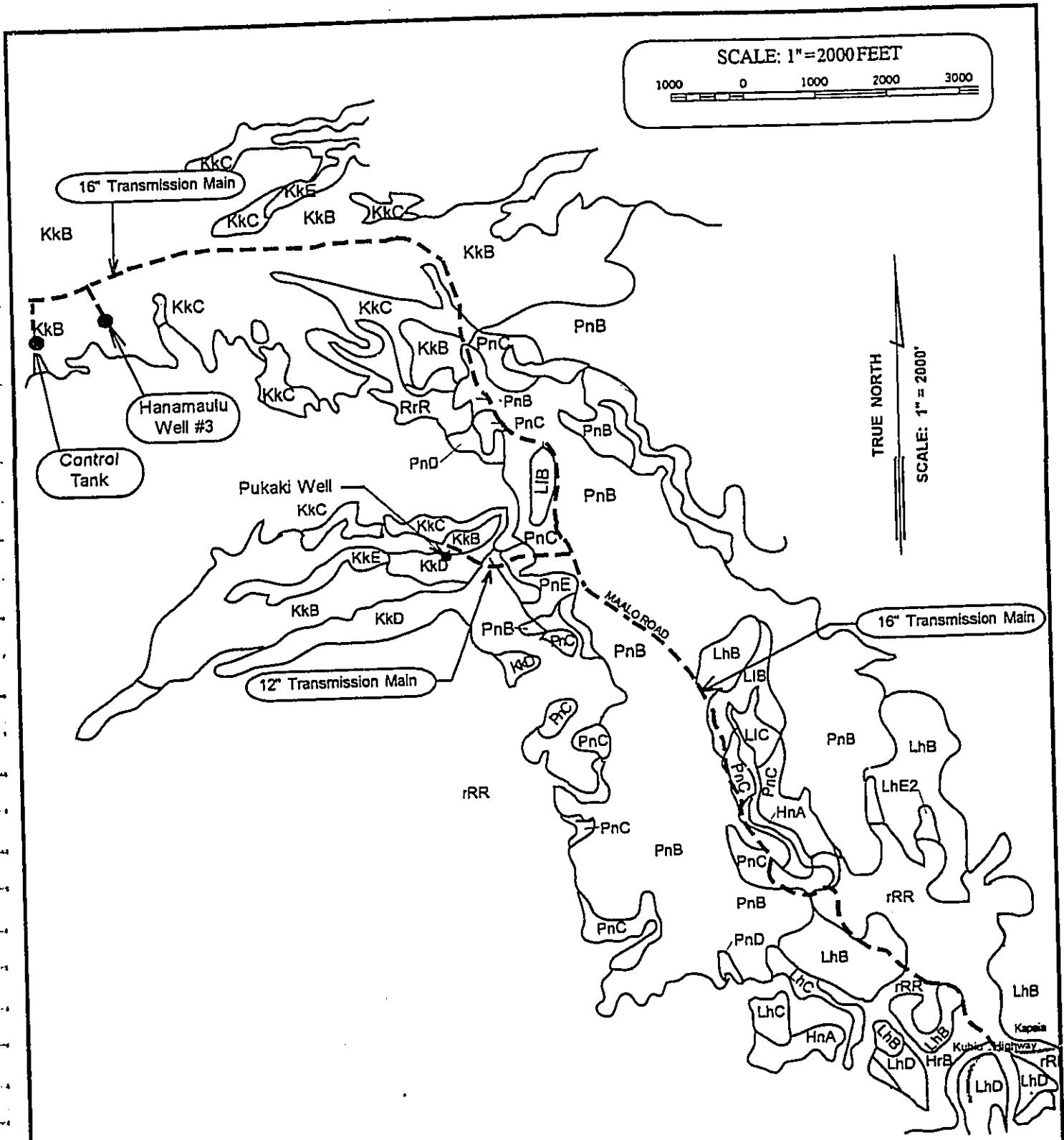
The 12-inch transmission main for the Lihue Water Development Project connects Pukaki well to the 16-inch transmission main on Maalo Road. Roadway elevation at the connection point on Maalo Road is approximately 330 feet above msl. The alignment for the main follows the existing cane haul road to the west, sloping down at 2% to 5% towards an existing box culvert with an invert at elevation 300 and a top of road elevation of 307 feet msl. From there, the road slopes up at 6% to the site of the future Pukaki Well. The well site is located on a knoll south of the cane haul road at elevation 344 msl.

B. Soils

According to the U.S. Department of Agriculture Soil Conservation Service (SCS) "*Soil Survey of Islands of Kauai, Oahu, Molokai, and Lanai, State of Hawaii*" the soil in the vicinity of the proposed transmission mains are classified as follows and is represented by figure 3:

The cane haul road leading to the proposed Hanamaulu Well No. 3 site is surrounded by soils designated KkB or KkC. These are Kapaa silty clays generally found on broad ridges in the uplands. KkB soils are found on slopes of 3 to 8 percent, while KkC soils are found on slopes of 8 to 15 percent. The SCS describes representative profiles as follows:

KkB - The surface layer is dark yellowish-brown silty clay about 14 inches thick. The subsoil, about 46 inches thick, is yellowish-red and reddish-brown silty clay that has subangular blocky structure. The substratum is soft, weathered rock. The surface layer is strongly acid. The subsoil is medium acid to very strongly acid.



Reference: Sheet 30 of "Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii", Soil Conservation Service, August 1972

<p>Prepared for: COUNTY OF KAUAI HOUSING AGENCY</p>	<p>LIHUE & HANAMAULU WATER DEVELOPMENT PROJECTS - PHASE II LIHUE, KAUAI, HAWAII SOILS MAP</p>	<p>PE ParEn, Inc. dba Park Engineering Engineers, Surveyors, Planners Figure 3</p>
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Permeability is moderately rapid. Runoff is slow, and the erosion hazard is slight.

KkC - Runoff is slow to medium and the erosion hazard is slight to moderate. Included in mapping were 202 acres on Kauai, south of Puu Kolo peak and southwest of Knudsen gap. This soil formed in volcanic ejecta. The surface layer and the upper part of the subsoil contain less gibbsite than is typical.

Soils along the dirt/gravel road adjacent to the Pukaki well are also comprised of Kapaa silty clays (KkB and KkC). In addition, KkD soils are found along the steeper sections of the road where slopes are 15 to 20 percent. On this soil runoff is medium and erosion hazard is moderate.

Along Maalo Road, other types of soils adjacent to the proposed alignment will be encountered. In addition to the Kapaa Silty Clays these soils are designated PnB, PnC, LhB, LIB, HrB and rRR. The SCS descriptions are included below.

PnB - Puhi silty clay loam, 3 to 8 percent slopes. This series consists of well-drained soils on uplands of the island of Kauai. In a representative profile the surface layer is brown silty clay loam about 12 inches thick. The subsoil, about 48 inches thick, is reddish-brown and dark reddish-brown silty clay loam and silty clay that has subangular blocky structure. The substratum is silty clay. The surface layer is very strongly acid. The subsoil is lightly acid to medium acid. This soil, runoff is slow and the erosion hazard is slight.

PnC - Puhi silty clay loam, 8 to 15 percent slopes. This soil is commonly used for sugarcane. It has slow runoff qualities and slight erosion hazard.

LhB - Lihue silty clay, 0 to 8 percent slopes. This series consists of well-drained soils on uplands and on tops of broad interfluvies. Included in the mapping were small areas of a soil that has very dark grayish-brown surface layer and a mottled subsoil. A representative profile has a surface layer of dusky-red silty clay about 12 inches thick. The subsoil is more than 48 inches thick, is dark-red and dark reddish-brown, compact silty clay that has subangular blocky structure. The substratum is soft, weathered rock. The surface layer is strongly acid. The subsoil is slightly acid to neutral. Permeability is moderately rapid. Runoff is slow, and the erosion hazard is no more than slight.

LIB - Lihue gravelly silty clay, 0 to 8 percent slopes. This soil is similar to Lihue silty clay (LhB), 0 to 8 percent slopes, except that it contains ironstone-gibbsite pebbles and has brighter colors in the B horizon. Included in mapping in the Eleele area and north of the town of Hanamaulu were small areas of soils that have a dark yellowish-brown, friable subsoil.

HrB - Hanalei silty clay, deep water table, 0 to 6 percent slopes. Soils of this classification are somewhat poorly drained to poorly drained soils on bottom lands of the islands of Kauai and Oahu. In a representative profile the surface layer, about 10 inches thick, is dark-gray and very dark gray silty clay that has dark-brown and reddish mottles. The subsurface layer is very dark gray and dark-gray silty clay about 3 inches thick. The subsoil, about 13 inches thick, is mottled, dark-gray and dark-grayish brown silty clay loam that has angular block structure. The substratum is stratified alluvium. The soil is strongly acid to very strongly acid in the surface layer and neutral in the subsoil. Permeability is moderate. Runoff is very slow, and the erosion hazard is no more than slight.

RrR - Rough Broken Land. Along the southern portions of the alignment, past the sugar cane road crossing, the main will cross very steep land broken by numerous intermittent drainage channels. In most places it is not stony, and has slopes between 40 and 70 percent. Runoff is rapid and geologic erosion is active. The surface soil depth varies from 20 inches to over 60 inches over soft, weathered rock. In most places some weathered rock fragments are mixed with the soil.

C. Climate

Average monthly temperature in the vicinity of the proposed transmission mains is approximately 73 degrees Fahrenheit. The annual rainfall ranges from 20 to 120 inches.

D. Geology

The project sites are situated in the "Lihue Depression", a large circular geologic feature in the eastern part of the island. They are bounded by the Waialeale-Kahili Mountains on the west, Makaleha Mountain on the north, Kalepa Ridge on the east and Haupu Ridge on the south. This depression was formed by the collapse of the eastern slopes of major shield volcanoes forming the island (Napali formation of Waimea Canyon series) more than two million years ago. This was followed by a long period of erosion in which the island became deeply eroded. Kalepa Ridge and Haupu Ridge are remnants of the thin bedded lavas of the Waimea Canyon lavas.

Volcanic activity following this period resumed with eruptions of the Koloa volcanic series in which massive lava flows, and less permeable lavas than the Napali formation buried most of the eastern part of the island. Within the Lihue Depression a small subsidiary shield volcano developed from Kilohana Crater. Lava flows and ash deposits gradually filled the southern half of the depression, flowing seaward around the southern edge of Kalepa Ridge and building the gentle ground slopes that today characterize the Lihue town area.

E. Land Use

State Land Use Designation for the project site is Agriculture. This has been confirmed by the Department of Land and Natural Resources who has determined that a Conservation District Use Application (CDUA) will not be required for this project.

Kauai County's General Plan is a policy document for the long-range comprehensive development of the County of Kauai. The plan designates urban uses such as commercial, industrial, multi-family and single-family residential and non-urban uses such as agricultural and open. Designation of the land on which the proposed transmission main alignments run is for agricultural use. The project site is not within the established boundary of the Special Management Area (SMA).

The Lihue Development Plan establishes long range designations for residential, commercial, industrial, and other land uses which will enable the Lihue area to grow in accordance with expressed goals and objectives.

F. Flora and Fauna

Both project sites are surrounded by sugarcane land that has long been in production. Because this land has been highly disturbed during cultivation periods, the possibility of rare or endangered species inhabiting the areas is highly unlikely. Animals found in the area include field mice, rats, lizards and small feral animals. Birds include various kinds of doves, mynahs, cardinals and pheasants. Amphibians such as toads and frogs are also found in the area.

G. Historic Sites and Archaeological Resources

Both water development project sites fall within State roadways and cane haul roads and are surrounded by land used for sugar cane production. These sites have undergone significant disturbance therefore, it is highly unlikely that historic artifacts will be uncovered. If, however, evidence of historic or archaeological significant conditions are found during construction, work shall be stopped in that area and a qualified archaeologist shall be contacted. The archaeologist shall gather sufficient evidence to evaluate their significance and submit his findings to the State Historic Preservation Division. A mitigation plan may need to be developed.

VI. POTENTIAL IMPACTS AND PROPOSED MITIGATION MEASURES

A. Impacts During Construction

Activities associated with construction and installation of the proposed transmission main improvements will be short-term, temporary impacts confined to the immediate vicinity of the project sites. Increased intermittent traffic, noise, dust, and vehicular and equipment emissions may be expected, however, these impacts will not be significant due to the limited size of the sites and the absence of residences at adjacent areas. To mitigate construction related impacts, the Contractor will be required to conform to the Department of Health's (DOH) standards and best management practices for air, noise and water quality. Equipment noise controls will be implemented according to DOH guidelines. To further mitigate any impact of noise from the construction site, all work will be done during normal construction hours, i.e. 7:30 a.m. to 3:30 p.m. Dust control will be maintained by sprinkling with water when needed. Waste materials associated with installation of the piping and appurtenances will be disposed of in an environmentally safe manner in accordance with applicable State and County requirements.

1. Best Management Practices (BMP) for construction of proposed project

a. Suitable excavated material for the water pipe trench and support structure shall be used for trench backfill. Any material used for backfill must consist of clean sediment or soil. Excess or unsuitable material shall be hauled to an approved disposal site.

b. Construction of the support structure shall not be conducted during heavy storm periods that could cause excessive erosion of the disturbed area and runoff into Hanamaulu Stream.

c. Heavy equipment used to install the proposed structures shall be inspected daily to ensure petroleum hydrocarbon leaks are not occurring from fuel or lubricating systems. Any accidental spills shall be properly and promptly removed.

d. Fueling, repair and other activities with potential to release pollutants shall be done far enough away from the water in such a manner to ensure that they have no effect on Hanamaulu Stream. Oil and debris shimmers (e.g.; sorbents, rakes) shall be kept onsite and be readily available for use to absorb localized areas of oil and grease spills and prevent these spills from entering the stream.

B. Long term impacts

Long-term impacts are those impacts related to the operation of the proposed water development projects. Operation of underground water transmission mains will generally have no impact and will barely be noticeable other than for valve covers and air relief valves. Any other impacts related to the presence of the transmission main can be best mitigated by proper construction methods and the use of quality materials in the installation of the water line.

VII. ALTERNATIVES CONSIDERED

A. No Action Alternative

Water system demands of the Lihue service area have surpassed existing capacities of the well sources. Without the proposed source and storage improvements the current restrictions on water requests for developments and subdivisions will continue. This is contrary to the County's long-range regional development plan, therefore, the "No Action" Alternative is not an acceptable alternative.

B. Alternative Alignments

The selected alignment for the Hanamaulu and Lihue Water Development Projects utilizes available corridors and rights-of-ways to connect the future wells with existing infrastructure. Alternative alignments are possible for connecting the sources to the distribution system, however, they will not be as efficient and cost effective as the proposed corridor. These alternative alignments will involve crossing and disrupting more lands currently used for sugar cane cultivation. This would be objectionable to the private landowner because it would place restrictions on his use of the land. Some of these alignments would also require additional stream crossings.

C. Water Conservation

Conservation efforts are useful in reducing a portion of the demand for new supplies, however, it will not be enough to ensure adequate drinking water supplies to meet the demands of an increasing population.

D. Alternative water source projects

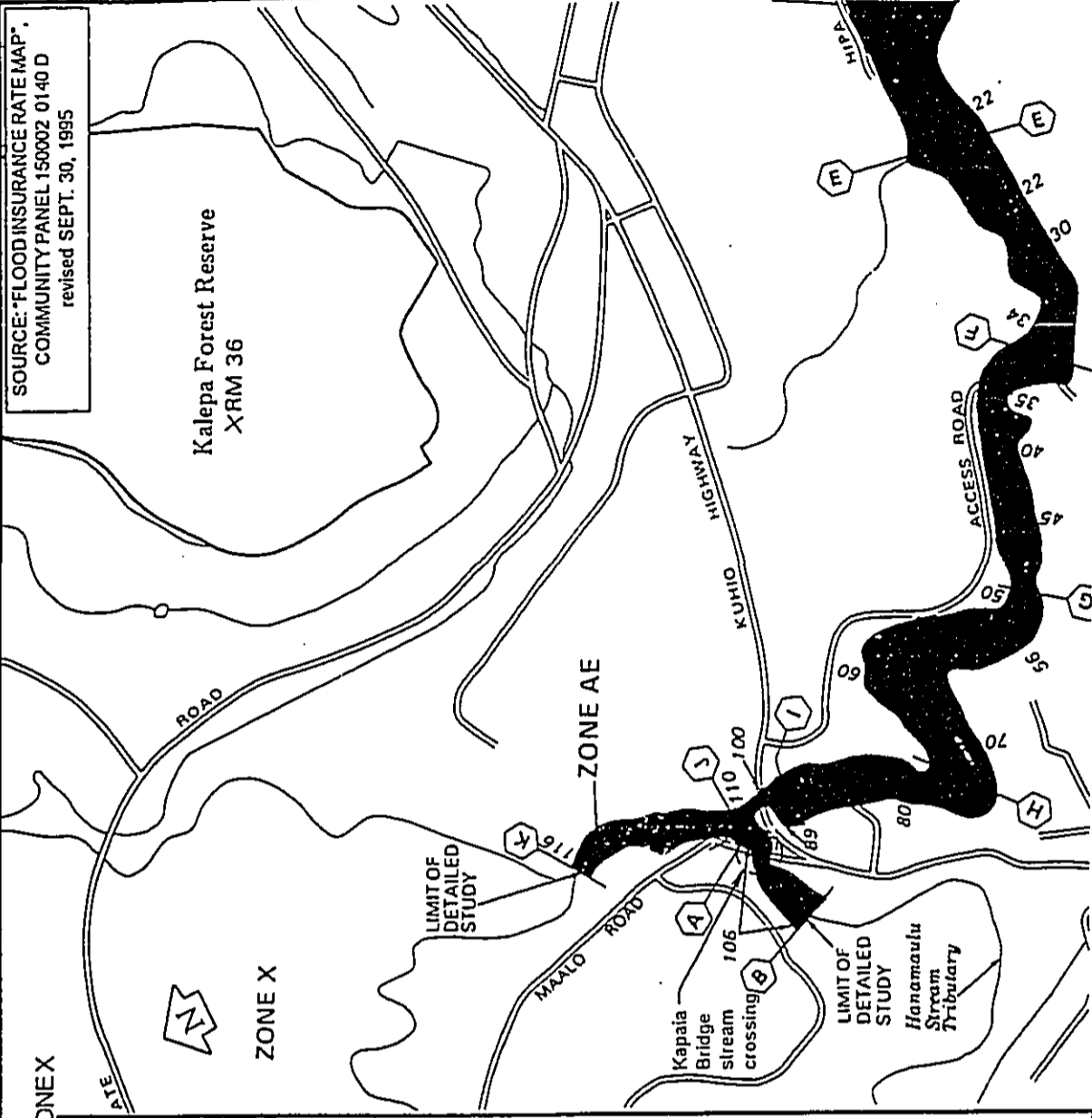
Alternative sources of water such as surface water, sea water or reclaimed water are possible, however, the cost of developing these water supplies into potable sources of water are much greater than for a pristine groundwater source. In addition, many of these alternative sources, although technologically possible, carry social and regulatory implications, which makes them difficult to implement and achieve.

VIII. DETERMINATION

After completing an assessment of the potential environmental effects of the proposed project and consulting with government agencies and interested parties, it has been determined that an Environmental Impact Statement (EIS) is not required. Therefore, this document is submitted with a Finding of No Significant Impact (FONSI). The reasons supporting this determination include:

1. The proposed actions do not involve irrevocable commitments to loss or destruction of any natural or cultural resource. There are no cultural resources associated with the project site. The project site, which is within a State road or cane haul roads, has been substantially altered from its natural condition.
2. The proposed action does not curtail the range of beneficial uses of the environment and will barely be perceptible as it is buried under existing roadways. The proposed project will be compatible with the uses of the surrounding area.
3. The proposed action does not conflict with the State's long-term environmental policies or goals and guidelines as expressed in Chapter 344, HRS, and any revisions thereof and amendments thereto, court decisions or executive orders. The proposed project is consistent with the State's Land Use Plan which is in concert with all applicable policies, goals and guidelines. No long-term environmental conflicts are foreseen.
4. The proposed action will substantially affect the economic or social welfare of the community by providing a more adequate and reliable water supply. Any impact on the economy will result from short-term, construction related activities. Cash infusion during the construction phase will be the primary short-term positive economic impact. Upon completion of the project, the economic situation should return to the existing condition.
5. The proposed action will substantially affect public health by improving health and safety conditions of the community's water system. Only the short-term impacts have the potential for affecting public health. Construction activities shall be regulated to minimize noise, dust and exhaust emissions.
6. The proposed action does not involve substantial secondary impacts, such as population changes or effects on public facilities. The proposed project does not directly result in an increase of population in the area. It will eliminate the restriction to growth due to the inadequacy of the existing system and allow development of lands in conformance with the County General plan.

7. The proposed action does not involve a substantial degradation of environmental quality. The existing physical qualities of the surrounding areas will be preserved.
8. The proposed actions are individually limited and cumulatively do not have a considerable effect upon the environment. There are other projects being worked on concurrently in support of upgrading the Lihue Water System.
9. The proposed actions will not affect any rare, threatened or endangered species or their habitats. There are no known, rare, threatened or endangered species or habitat associated with the project site, which has undergone significant disturbance for roadway use and sugarcane production.
10. The proposed action does not detrimentally affect the air or water quality or ambient noise levels. Any effect on environmental quality during the construction phase will be limited in area and for a short duration. These short-term impacts will be mitigated by normal construction practices and will be regulated by project plans and specifications.
11. The proposed actions do not affect an environmentally sensitive area, such as a flood plain (figure 4), tsunami zone, or erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters. The proposed project is not located in an environmentally sensitive area. However, the proposed pipeline will cross through an established floodway for Hanamaulu Stream at the Kapaia Bridge crossing. Design and construction of the water line will be conducted to minimize any impact on the floodway area by placing the water line within the bridge deck prism and locating any supports well outside the stream banks. No significant adverse impact on fresh or coastal waters is expected as a result of this project.
12. The proposed action does not affect scenic vistas and view planes identified in county or state plans or studies. The water transmission mains will be installed below the ground surface.
13. The proposed action does not require substantial energy consumption. During the installation of the transmission lines, diesel or gas powered construction equipment such as backhoes, trucks, compactors, and pavers will be used. No energy will be consumed by the completed water transmission line.



**SOURCE: "FLOOD INSURANCE RATE MAP",
COMMUNITY PANEL 150002 0140 D
revised SEPT. 30, 1995**

ZONE X

ZONE AE

ZONE NE

MAALO ROAD

KUHIO

ACCESS ROAD

**Kalepa Forest Reserve
XRM 36**

**Kapala
Bridge
stream
crossing**

**Hanamaulu
Stream
Tributary**

**LIMIT OF
DETAILED
STUDY**

**LIMIT OF
DETAILED
STUDY**

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IX. REFERENCES

1. *Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai and Lanai, State of Hawaii*, United States Department of Agriculture, Soil Conservation Service in cooperation with the University of Hawaii, Agricultural Experiment Station, August 1972.
2. *Draft Environmental Assessment - Hanamaulu Water Development Project Phase I - Hanamaulu Well no. 3*, Fukunaga and Associates, Inc., February 1997.
3. *Draft Environmental Assessment - Lihue Water Development Project Phase I - Pukaki Well*, Fukunaga and Associates, Inc., February 1997.
4. *Geology and Groundwater Resources of the Island of Kauai, Hawaii*, G.A. Macdonald, D.A. Davis, D.C. Cox, 1960.
5. *Technical Reference Document - Kauai Water Use and Development Plan*, R.M. Towill Corporation, January 1990.
6. *A General Plan for Domestic Water/Island of Kauai*, Department of Water, County of Kauai, 1972.

APPENDIX A

Correspondence from Agencies, Organizations & Individuals



DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, HONOLULU
FORT SHAFTER, HAWAII 96858-5440

RECEIVED
ATTENTION OF

July 2, 1998

Civil Works Branch

Mr. Keith S. Uemura
Project Manager
Park Engineering
567 South King Street, Suite 300
Honolulu, Hawaii 96813-3036

Dear Mr. Uemura:

Thank you for the opportunity to review and comment on the Draft Environmental Assessment (DEA) for the Hanamaulu and Lihue Water Development Projects, Phase II, Kauai. The following comments are provided in accordance with U.S. Army Corps of Engineers authorities to provide flood hazard information and to issue Department of the Army (DA) permits.

a. Based on the information provided, a DA permit may be required for the project. Please contact Mr. Peter Galloway of our Regulatory Section at 438-9258 (extension 15) and refer to file number 980000212.

b. The flood hazard information provided on page 16 of the DEA is correct.

Sincerely,

Paul Mizue, P.E.
Chief, Civil Works Branch



Suite 300, Kapaehaona Plaza II, 567 South King Street, Honolulu, Hawaii 96813-3036 Telephone (808) 531-1618 FAX (808) 536-5596

August 3, 1998

Mr. Paul Mizue, P.E., Chief
Civil Works Branch
Department of the Army
U.S. Army District, Honolulu
Fort Shafter, Hawaii 96858-5440

Attention: Mr. Peter Galloway

Dear Mr. Galloway:

Subject: Lihue and Hanamaulu Water Development Projects - Transmission Mains
Lihue and Hanamaulu, Kauai, Hawaii
TMK: 3-7 par. 4, 3-8 par. 2, 3, and 6
File no. 980000212

Thank you for the comments in your letter of July 2, 1998 regarding the Draft Environmental Assessment (EA) for the subject project. The following has been prepared in response to your comments:

The proposed transmission mains will generally be placed within the shoulder area of Maalo Road or to the edge of the cane haul road. The transmission main will cross a tributary of Hanamaulu Stream in the vicinity of the existing Kapaia Bridge and will be supported by a east-in-place concrete beam supported by caissons. Construction of the foundations for this stream crossing is expected to occur behind the existing abutments for Kapaia Bridge and will not encroach into either the stream bed or bank areas. Therefore, we feel that a Department of Army permit will not be required. Construction plans in the vicinity of the stream crossing will be forwarded to your office for your review.

We hope these comments adequately address your concerns for this project. If you have any further questions, please contact me at 531-1676.

Sincerely yours,

ParEn, Inc.
dba PARK ENGINEERING

Keith Uemura
Project Manager

c: Dennis Alkire (Kauai County Housing Agency)
Keith Fujimoto (Dept. of Water)

ENGINEERS, SURVEYORS, PLANNERS

STATE OF HAWAII
Department of Land and Natural Resources



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
P. O. BOX 831
HONOLULU, HAWAII 96809

May 4, 1998

TO: Mr. Dean Uchida, Administrator
Land Division

FROM: Edwin T. Sakoda, Acting Deputy Director
Commission on Water Resource Management (CWRM)

SUBJECT: Lihue and Hanamaulu Water Development Projects - Transmission Mains

FILE NO.: KCHAWR37.COM

MICHAEL D. NELSON
Chairman

ROBERT C. GRAY
Vice Chairman

LAVINIA H. JAMES
Member

ANDREW H. COE
Member

HAROLD M. ROBERTS, JR.
Member

EDWIN T. SAKODA
Acting Deputy Director

10 30 AM '98

Thank you for the opportunity to review the subject document. Our comments related to water resources are marked below:

In general, the CWRM strongly promotes the efficient use of our water resources through conservation measures and use of alternative non-potable water resources whenever available, feasible, and there are no harmful effects to the ecosystem. Also, the CWRM encourages the protection of water recharge areas which are important for the maintenance of streams and the replenishment of aquifers.

- We recommend coordination with the county government to incorporate this project into the county's Water Use and Development Plan.
- We recommend coordination with the Land Division of the State Department of Land and Natural Resources to incorporate this project into the State Water Projects Plan.
- We are concerned about the potential for ground or surface water degradation/contamination and recommend that approvals for this project be conditioned upon a review by the State Department of Health and the developer's acceptance of any resulting requirements related to water quality.
- A Well Construction Permit and/or a Pump Installation Permit from the Commission would be required before ground water is developed as a source of supply for the project.
- The proposed water supply source for the project is located in a designated water management area, and a Water Use Permit from the Commission would be required prior to use of this source.
- Groundwater withdrawals from this project may affect streamflows which may require an instream flow standard amendment.
- We recommend that no development site place affecting highly erodible slopes which drain into streams within or adjacent to the project.
- If the proposed project includes construction of a stream diversion, the project may require a stream diversion works permit and amend the instream flow standard for the affected stream(s).
- If the proposed project alters the bed and banks of a stream channel, the project may require a stream channel alteration permit.
- OTHER: The subject document does not provide sufficient information to determine whether a stream channel alteration permit will be required.

If there are any questions regarding wells, please contact Lenore Nishida at 587-0218 or if you have questions regarding streams, please contact David Higa at 587-0249.



300 Kalia Road, Suite 1000, Honolulu, HI 96813-2026
Tel: (808) 531-1678 Fax: (808) 536-5996

August 3, 1998

Mr. Edwin T. Sakoda, Acting Deputy Director
Commission on Water Resource Management
Department of Land and Natural Resources
P.O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Sakoda:

Subject: Lihue and Hanamaulu Water Development Projects - Transmission Mains
Lihue and Hanamaulu, Kauai, Hawaii
TMK: 3-7 por. 4, 3-8 por. 2, 3, and 6
File No.: KCHAWR37.COM

Thank you for your comments in your letter of May 4, 1998, regarding the Draft Environmental Assessment (EA) for the subject project. The following has been prepared in response to your comments:

1. This project is a collaborative effort with the Kauai County Housing Agency and the Department of Water and will be incorporated into the county's Water Use and Development Plan.
2. A Well Construction Permit has been obtained by the developers of the project.
3. The proposed project does not involve a stream diversion or any work in the bed and banks of the stream. Therefore, both the Stream Diversion Works and Stream Channel Alteration Permits should not be required.
4. The construction plans for this project will be sent to your office for review in order to verify the determination that no Stream Diversion Works and Stream Channel Alteration Permits are required.

We hope these responses adequately address your concerns for this project. If you have any questions, please contact me at 531-1676.

Sincerely yours,

ParEn, Inc.
dba PARK ENGINEERING

Keith A. Uemura
Keith Uemura
Project Manager

c: Dennis Alkire (Kauai County Housing Agency)
Keith Fujimoto (Dept. of Water)

ENGINEERS, SURVEYORS, PLANNERS

SEUNGMIN J. CAVETIAGO
CONTINUED



STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

June 30, 1998

KAZU HAYASHIDA
DIRECTOR

DEPUTY DIRECTOR
BRIAN K. LINDAL
CLEMENS ODOMOTO

IN REPLY REFER TO:
STP 8.8636

Mr. Larry Matsuo
Chief Executive Officer
ParEn, Inc. dba Park Engineering
Kawaihāo Plaza, Suite 300
567 South King Street
Honolulu, Hawaii 96813-3036

Attention: Mr. Keith Uemura

Subject: Draft Environmental Assessment (EA) for
Lihue and Hanamaulu Water Development Projects Phase II
- Construction of Transmission Mains
TMK: 3-7 por. 4, 3-8 por. 2, 3, and 6

Thank you for your transmittal of June 17, 1998, requesting our comments on the draft EA for the subject projects.

Construction plans for work within our highways right-of-way must be submitted for our review and approval.

We appreciate the opportunity to provide comments.

Very truly yours,

Kazu Hayashida

KAZU HAYASHIDA
Director of Transportation

1/2/98
pd



SEUNGMIN J. CAVETIAGO
CONTINUED

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

July 16, 1998

98-083A/epo

LAWRENCE BAKER
DIRECTOR OF HEALTH

IN REPLY, PLEASE REFER TO

Mr. Keith S. Uemura
Project Manager
ParEn, Inc.
dba Park Engineering
Kawaihāo Plaza, Suite 300
567 South King Street
Honolulu, Hawaii 96813-3036

Dear Mr. Uemura:

Subject: Draft Environmental Assessment
Hanamaulu and Lihue Water Development Projects,
Phase II
TMK: 3-7-por. 4 and 3-8-por. 6

Thank you for allowing us to review and comment on the subject project. We do not have any comments to offer at this time.

Sincerely,

Bruce S. Anderson

BRUCE S. ANDERSON, Ph.D.
Deputy Director for
Environmental Health

cc: KDHO

98-37-3571:15 HCS

BENJAMIN J. CAYETANO
Governor



GARY GILL
Director

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL

228 SOUTH KING STREET
SUITE 702
HONOLULU, HAWAII 96813
TELEPHONE 808/534-4185
FACSIMILE 808/534-4186

July 22, 1998

Ms. Mathilda Yoshioka
County of Kauai Housing Agency
4193 Hardy Street
Lihue, Hawaii 96766

Dear Ms. Yoshioka:

Subject: Draft EA for the Lihue and Hanamaulu Water Developments
Projects, Phase II, Kauai

Thank you for the opportunity to review the subject document. We have the following comments.

1. Please illustrate the visual impacts of the proposed 100,000 gallon tank from public places such as roads and lookouts. Photos of existing conditions taken from public view points are helpful in evaluating visual impacts. Renderings of future structures superimposed on photos of existing views should be provided. We recommend constructing and painting the tank with materials and colors that blend with the surroundings. We also recommend landscaping with native Hawaiian plants to reduce the visual impacts.
2. Construction activities near Hanamaulu Stream may cause adverse water quality impacts. Please provide details of the Best Management Practice (BMP) procedures that will be implemented to minimize water quality impacts.
3. Please consult with nearby groups and individuals who may be affected by the proposed project. Document the consultation in the final environmental assessment.

If you have any questions call Jeyan Thirugnanam at 586-4185.

Sincerely,

Gary Gill
Director



Suite 201 Kalaheo Plaza II 587 South King Street, Hanalei, Hawaii 96721-1678 ☐ Telephone: (808) 536-5994 ☐ FAX: (808) 536-5994

ParEn, Inc. dba park engineering

August 3, 1998

Mr. Gary Gill, Director
Office of Environmental Quality Control
220 South King Street, 4th floor
Honolulu, Hawaii 96813

Attention: Mr. Jeyan Thirugnanam

Dear Mr. Gill:

Subject: Lihue and Hanamaulu Water Development Projects - Transmission Mains
Lihue and Hanamaulu, Kauai, Hawaii
TMK: 3-7 por. 4, 3-8 por. 2, 3, and 6

Thank you for your comments in your letter of July 22, 1998 regarding the Draft Environmental Assessment (EA) for the subject project. The following has been prepared in response to your comments:

- This project involves the design and construction of water transmission mains connecting future well production facilities with the existing water system. The 100,000 gallon tank mentioned in the EA will be designed and constructed at a later date due to funding constraints. Design details for the tank such as color, landscaping and it's visual impact from public view points will be addressed at that time.
- Best Management Practice (BMP) procedures to minimize water quality impacts during construction of the Hanamaulu Stream crossing shall be added to the Final EA in Section VI, paragraph A - Potential Impacts and Proposed Mitigation Measures - Impacts During Construction.
- Individuals who may be affected by the project have been consulted and are included in Section III - Agencies, Organizations & Individuals consulted in the Final EA.

Sincerely yours,

ParEn, Inc.
dba PARK ENGINEERING

Keith Uemura
Project Manager

c: Dennis Aikire (Kauai County Housing Agency)
Keith Fujimoto (Dept. of Water)

ENGINEERS, SURVEYORS, PLANNERS

MARYANNE W. KUSAKA
MAYOR



CESAR C. PORTUGAL
COUNTY ENGINEER
TELEPHONE 241-3000

RUSSELL SUGANO
ACTING DEPUTY COUNTY ENGINEER
TELEPHONE 241-9051

AN EQUAL OPPORTUNITY EMPLOYER

COUNTY OF KAUAI
DEPARTMENT OF PUBLIC WORKS
400 S. KING STREET
HONOLULU, HAWAII 96813
PHONE 535-2725
FAX 535-2726

June 23, 1998

Paron, Inc.
Kawaihau Plaza, Suite 300
567 South King Street
Honolulu, HI 96813

ATTENTION: MR. KEITH UEMURA

Gentlemen

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT FOR HANAMAULU AND
LIHUE WATER DEVELOPMENT PROJECTS, PHASE II,
PW 6.126

We completed our review of the subject draft environmental
assessment and offer the following comments in regards to
flooding:

A. Flood

1. We are concerned with the 16-inch water main crossing at Hanamaulu Stream. Statement is made that the proposed elevation of the waterline crossing will coincide with the existing Maalo bridge deck and will not reduce the cross-sectional area currently available to convey the storms flows from the Hanamaulu tributary. Our aerial photo map shows a spot elevation of 101 feet MSL on the Maalo Bridge while the firm map shows a flood elevation of 106 feet MSL. The water line crossing is considered to be a development within the floodway limits of the Hanamaulu tributary and will require a "no-rise" determination which needs to be approved by our office. The no-rise determination should consider the pipe crossing as well as the pipe supports at both ends of stream embankment.

Paron, Inc.
June 23, 1998
Page (2)

2. The plan and profile sheet for the 16-inch water between Station 0+00 to 9+00 is incomplete. The vertical datum should be based on the mean sea level. The site plan is reduced and we are unable to read the spot elevations at the water line crossing the Hanamaulu tributary area.

Enclosed is a copy of the subject draft environmental assessment with our red-marked comments.

Thank you for allowing us to review and comment on the subject draft environmental assessment. Should you have any questions, please feel free to contact Wallace Kudo of my staff at (808) 241-6620.

Very Truly Yours,


CESAR C. PORTUGAL
County Engineer

WK/ja
attachment



Park Engineering, Inc. dba park engineering

Suite 200, Kalaheo Plaza D, 541 South King Street, Kalaheo, Hawaii 96851-2006 O Telephone (808) 531-1638 O FAX (808) 536-3790

August 3, 1998

Mr. Cesar C. Portugal, County Engineer
Department of Public Works
County of Kauai
444 Rice Street
Mo'eikeha Building, Suite 275
Lihue, Hawaii 96766

Attention: Mr. Wallace Kudo

Dear Mr. Portugal:

Subject: Lihue and Hanamaulu Water Development Projects B Phase II

Thank you for your comments in your letter of June 23, 1998 regarding the Draft Environmental Assessment for the subject project. We offer the following responses to your comments:

A.1 We understand your concern with the 16-inch transmission main crossing the Hanamaulu Stream Tributary. We have reviewed the FEMA maps and study information and confirm the 100-year flood elevation at Kapaia Bridge at 106 feet mean sea level (MSL). However, the flood profile for this section of tributary stream identifies a 500 foot section of tributary from the confluence of the main Hanamaulu Stream which is subjected to backwater effects from Hanamaulu Stream. This section encompasses Kapaia Bridge at Maalo Road and extends more than 200 feet upstream of the bridge. The 106 feet MSL flood elevation in the tributary stream is controlled by the water surface elevation at the confluence and does not represent the conveyance capacity of the tributary stream based on normal depth calculations. In essence, tailwater condition governs and minor changes to conveyance will not impact the flood elevation in the area. For the same reason, increasing the conveyance will not reduce the flood elevation experienced in the area. I have included a copy of the flood profile from FEMA for your information. We will be submitting information for a "No-Rise" determination for your review and approval.

Additionally, the topographic survey of the area shows the top deck elevation of the bridge at 98.4 feet MSL and the intersection of Maalo Road and Lihue Highway at approximately 102 feet MSL. The limits of the 100-year flood as shown on the FEMA map do not appear consistent with the topography of the area.

A.2 The plan and profile sheet between Stations 0+00 and 9+00 was not complete at the time the Draft EA was submitted. A revised plan and profile sheet showing the location of the transmission main will be provided in the Final EA. The vertical datum shown on the sheets are referenced from mean sea level.

ENGINEERS, SURVEYORS, PLANNERS

Mr. Cesar C. Portugal
Page 2
August 3, 1998

We hope these responses adequately address your concerns for this project. If you have any further questions, please contact me at 531-1676.

Sincerely yours,

Pat En, Inc.
dba PARK ENGINEERING

Keith S. Uemura

Keith S. Uemura
Project Manager

Enclosure

cc: Dennis Alkire (Kauai County Housing Agency)
Keith Fujimoto (Dept. of Water)

Kauai Electric
A Division of Citizens Utilities Co. UTILITIES

"Powering Kauai's Future"

443 Park Street
Honolulu, HI 96814-3033
Phone (808) 944-4300

July 24, 1998

In reply, refer to:
File #98-05-302FP

ParEn Inc.
dba Park Engineering
567 South King Street, Suite 300
Honolulu, HI 96813-3036

Attention: Mr. Keith S. Uemura, Project Manager

SUBJECT: Draft Environmental Assessment for Hanamaulu and Lihue Water
Development Projects, Phase II

Dear Mr. Uemura:

In response to your letter dated June 17, 1998 requesting our review and comments on the Draft Environmental Assessment (DEA), Kauai Electric (KE) has reviewed this project and site location maps and have these concerns:

- In the project areas where the proposed water transmission main is located on the same side of the roadway as our existing overhead facilities, KE requires that the water line be 36 inches from our existing facilities.
- According to The State of Hawaii, Public Utilities Commission General Order No. 6, Section III, 31.4; KE must be notified of any work being performed in the close vicinity of our facilities.
- Equipment or vehicle use under or near electrical power circuits must meet a 10 foot minimum clearance, noted in The State of Hawaii, OSHA Standards, Part 3, Section 12-141-3 d 6(c); or lines must be guarded from accidental contact. Scheduling needs to be made with Kauai Electric prior to construction if guarding is required.

At Equal Opportunity Employer



567 South King Street, Honolulu, Hawaii 96813-3036
Telephone (808) 531-1474
Fax (808) 536-5966

ParEn, Inc. dba park engineering

August 3, 1998

Debra L. Santiago, Distribution Engineer
Kauai Electric
4463 Pahee Street
Lihue, Hawaii 96766

Dear Ms. Santiago:

Subject: Lihue and Hanamaulu Water Development Projects - Transmission Mains
Lihue and Hanamaulu, Kauai, Hawaii
TMK: 3-7 par. 4, 3-8 par. 2, 3, and 6
File #98-05-302FP

Thank you for your comments in your letter of July 24, 1998, regarding the Draft Environmental Assessment (EA) for the subject project. In response to your comments we offer the following responses.

1. Water lines have been designed with a 36" minimum clear distance from existing utility poles.
2. The construction notes sheet of the construction plans have been modified to include the following statements:
 - The Contractor shall notify Kauai Electric of any work being performed in the vicinity of their facilities.
 - The Contractor shall comply with the State of Hawaii, OSHA Standards Part 3, Section 12-141-3 d 6(c) by maintaining a minimum of 10' clearance from electrical power circuits when performing any work under or near the power lines. If a 10' minimum clearance cannot be maintained the contractor shall schedule for Kauai Electric to guard the lines from accidental contact prior to construction.

We hope these responses adequately address your concerns for this project.

Sincerely yours,

ParEn, Inc.
dba PARK ENGINEERING

Keith S. Uemura

Keith Uemura
Project Manager

c: Dennis Alkire (Kauai County Housing Agency)
Keith Fujimoto (Dept. of Water)

ENGINEERS, SURVEYORS, PLANNERS

ParEn Inc.
July 24, 1998

File #98-05-302FP
Page Two

As previously stated in our May 19, 1998 letter, KE will serve the Pukaki and Hanamaulu Wells off an extension of the existing overhead electrical line on Maalo Road. In addition, the existing 7.2 KV single-phase line will need to be upgraded to three-phase 12.47 KV in order to service the wells.

Please have the consultants submit the plans to KE for our approval prior to construction. Topography maps may also be required to assist us in our review.

Kauai Electric looks forward to working with you on this project. If there are any questions regarding this project, please call Mr. Fred Pascual at (808) 822-9404 or myself at (808) 246-8273.

Sincerely,



Debra L. Santiago
Distribution Engineer

DLS:do

GTE Hawaiian Tel

PO Box 591
Lihue, Hawaii 96766
Telephone (808) 245-6795

June 26, 1998

Mr. Keith S. Uemura
Project Manager
ParEn, Inc. dba Park Engineering
567 South King Street, Suite 300
Honolulu, HI 96813

Dear Mr. Uemura:

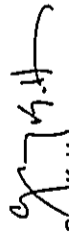
**Subject: DRAFT ENVIRONMENTAL ASSESSMENT FOR HANAMAULU AND
LIHUE WATER DEVELOPMENT PROJECTS, PHASE II**

Thank you for your letter of June 17, 1998 and the Draft Environmental Assessment (DEA) concerning the subject projects. Our May 6, 1998 fax to your office mentions that we have no underground facilities in the project vicinity that will be affected. We also said that the aerial facilities along Maalo Road could be affected by the transmission main alignment. Aid-To-Construction charges will apply should any of GTE facilities require relocation for the transmission main.

We would also like to add that special construction charges may apply should there be a need for telephone control circuits at any well, reservoir, or pump sites.

Should you have any questions, call our Project Designer, Jimmy Sone, at 241-5052.

Sincerely,


Gary K. Heu
Section Manager
Access Design-Kauai

c: File
J. Sone



ParEn, Inc. dba park engineering
Suite 300, Kalaheo Plaza □ 567 South King Street, Hanalei, Hawaii 96721-3038 □ Telephone (808) 531-1676 □ FAX (808) 536-3795

August 3, 1998

Gary K. Heu, Section Manager
Access Design-Kauai
GTE Hawaiian Tel
P.O. Box 591
Lihue, Hawaii 96766

Attention: Jimmy Sone

Dear Mr. Heu:

**Subject: Lihue and Hanamaulu Water Development Projects - Transmission
Mains
Lihue and Hanamaulu, Kauai, Hawaii
TMK: 3-7 por. 4, 3-8 por. 2, 3, and 6**

Thank you for your comments in your letter of June 26, 1998, regarding the Draft Environmental Assessment (EA) for the subject project. In response to your comments we offer the following responses.

1. The proposed alignment provides sufficient clearance from existing utility poles, therefore, we do not anticipate the need to relocate any of your facilities.
2. This project involves the design and construction of water transmission mains connecting future well production facilities with the existing water system. The need for telephone circuits at the well, reservoir or pump sites will be addressed by the designers of those facilities.

We hope these responses adequately address your concerns for this project.

Sincerely yours,

ParEn, Inc.
dba PARK ENGINEERING



Keith Uemura
Project Manager

c: Dennis Alkire (Kauai County Housing Agency)
Keith Fujimoto (Dept. of Water)

ENGINEERS, SURVEYORS, PLANNERS



Amfac Land Company, Limited • Kauai Division

2970 Kele Street • Lihue, Kauai, Hawaii 96766

June 22, 1998

Keith Uemura
Park Engineering
567 S. King Street, Suite 300
Honolulu, HI 96813-3036

Re: Transmission mains for Hanamaulu Well #3 and Pukaki Wells

Dear Mr. Uemura:

Thank you for providing us with a copy of the environmental assessment for the above project. We would like to provide some general comments now. The proposed plans are being reviewed in detail, after which we will provide more specific comments as needed.

Our primary concern is that the pipelines do not go through our cane fields, but rather stay within the boundaries of existing cane haul roadways or public road rights-of-way.

Other concerns are:

- That the cane haul roads and irrigation system remain open and functional during construction so as to not adversely impact sugar operations.
- That the plans provide that any ditches, pipelines or other improvements in the area of the pipeline be preserved.
- That the security of the plantation be maintained.
- That there is adequate cover over the pipeline to protect it from harvesting operations and heavy cane hauling traffic.

I can be reached at 245-7687 if there is anything you would like to discuss.

Very truly yours,
AMFAC LAND COMPANY, LTD.,
Agent for AMFAC SUGAR KAUAI

Dorothy A. Bekeart

Dorothy A. Bekeart
Land Manager

c: Tamara Edwards
Lyle Tabata, Amfac Sugar Kauai
Chris Tacushi by facsimile

Telephone: 808-245-8788 • Facsimile: 808-246-9549



ParEn, Inc. dba park engineering

August 3, 1998

Suite 300, Hanalei Pali #1, 547 South King Street, Hanalei, Hawaii 96713-2024 □ Telephone: (808) 531-1676 □ FAX: (808) 536-1366

Ms. Dorothy Bekeart, Land Manager
AMFAC-JMB
2970 Kele Street
Lihue, HI 96766

Dear Ms. Bekeart:

Subject: Lihue and Hanamaulu Water Development Projects - Transmission Mains
Lihue and Hanamaulu, Kauai, Hawaii
TMK: 3-7 por. 4, 3-8 por. 2, 3, and 6

Thank you for your comments in your letter of July 22, 1998 regarding the Draft Environmental Assessment (EA) for the subject project. The following revisions have been made in the EA in response to your comments:

- Paragraph IV.D. Socio-Economic Characteristics: "The proposed transmission mains will be installed within the shoulder area of Maalo Road or to the edge of the cane haul road and will not cross any cane fields. Cane Haul Roads and irrigation systems shall remain open and functional during construction so as not to adversely affect sugar operations."
- Paragraph IV.C. Technical Characteristics: "The water line will generally follow the slope of the roadway or cane haul road and have a minimum cover of three feet. This cover will adequately protect it from vehicular traffic as well as harvesting operations and heavy cane hauling traffic."
- The General Notes of the plans includes a provision requiring the Contractor to restore any improvements to their original condition that becomes damaged as a result of his construction. This includes ditches or utilities in the area of the proposed water main.
- The proposed project will have no effect on the security of the plantation.

We hope these responses adequately address your concerns for this project. If you have any further questions, please contact me at 531-1676.

Sincerely yours,

ParEn, Inc.
dba PARK ENGINEERING

Keith S. Uemura

Keith S. Uemura
Project Manager

c: Dennis Aikie (Kauai County Housing Agency)
Keith Fujimoto (Dept. of Water)

ENGINEERS, SURVEYORS, PLANNERS

APPENDIX B

Hanamaulu Water Development Project – Increment 1

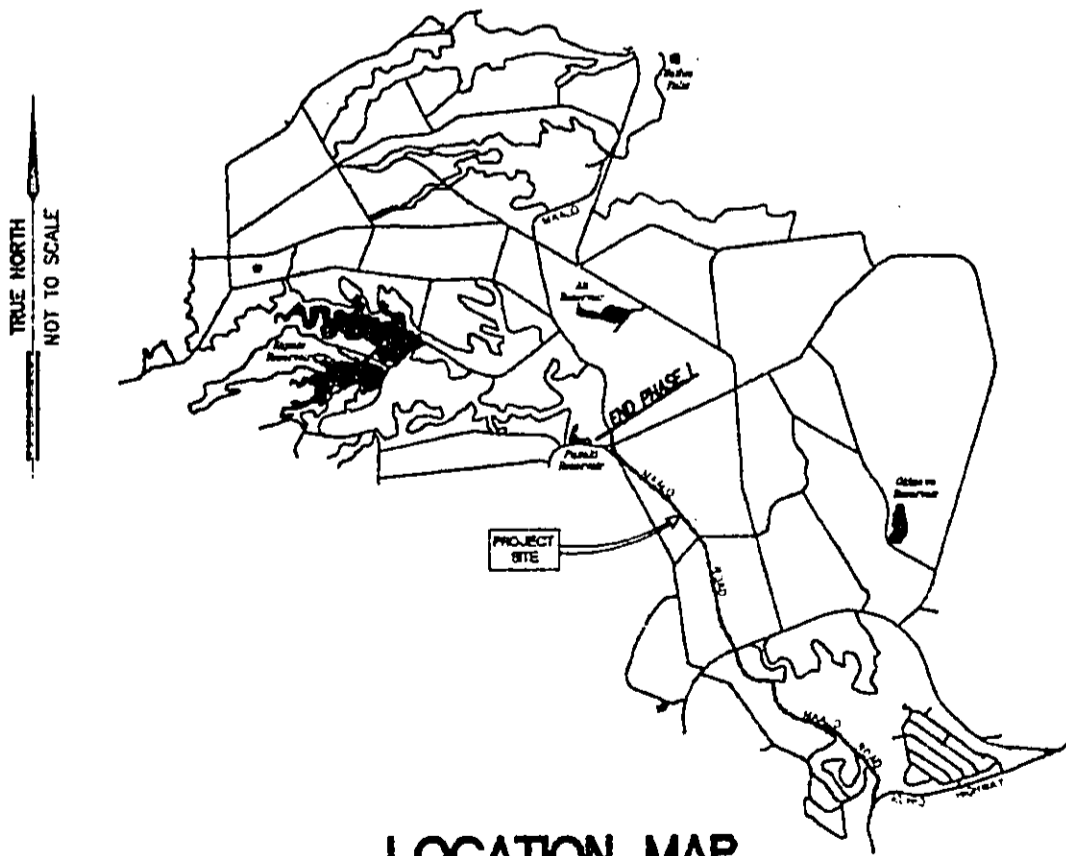
KAUAI COUNTY HOUSING AGENCY
 COUNTY OF KAUAI
 THIS PROJECT IS FUNDED BY
 UNITED STATES DEPARTMENT OF HOUSING AND URBAN AFFAIRS
 COMMUNITY DEVELOPMENT BLOCK GRANT

HANAMAULU WATER DEVELOPMENT PROJECT PHASE II

Connecting Waterline for Hanamaulu
 Increment 1, Sta. 0+00 to 101+84.17

TMK: 3-7-POR. 4, 3-8-POR. 2, 3, 6
 HANAMAULU, KAUAI, HAWAII

Prepared By: 
 ParEn, Inc.
 dba Park Engineering
 587 South King Street #300
 Honolulu, Hawaii 96813
 (Contract No. 5700)



LOCATION MAP

NOT TO SCALE

INDEX OF DRAWINGS

DESCRIPTION

DESCRIPTION	DESCRIPTION
TITLE SHEET
GENERAL NOTES
MISCELLANEOUS DETAILS
PLAN AND PROFILE
18" D.I. WATER (STA. 0+00 TO STA. 9+00 "MAALO")
18" D.I. WATER (STA. 9+00 TO STA. 18+00 "MAALO")
18" D.I. WATER (STA. 18+00 TO STA. 27+00 "MAALO")
18" D.I. WATER (STA. 27+00 TO STA. 36+00 "MAALO")
18" D.I. WATER (STA. 36+00 TO STA. 45+00 "MAALO")
18" D.I. WATER (STA. 45+00 TO STA. 54+00 "MAALO")
18" D.I. WATER (STA. 54+00 TO STA. 63+00 "MAALO")
18" D.I. WATER (STA. 63+00 TO STA. 72+00 "MAALO")
18" D.I. WATER (STA. 72+00 TO STA. 81+00 "MAALO")
18" D.I. WATER (STA. 81+00 TO STA. 90+00 "MAALO")
18" D.I. WATER (STA. 90+00 TO STA. 99+00 "MAALO")
18" D.I. WATER (STA. 99+00 TO STA. 101+84.17 "MAALO")
TRAFFIC CONTROL PLAN - PHASE I & II
TRAFFIC CONTROL PLAN - PHASE III
TRAFFIC CONTROL PLAN - PHASE IV & V
TRAFFIC CONTROL PLAN - PHASE VI & VII
TRAFFIC CONTROL PLAN - PHASE VIII & IX
TRAFFIC CONTROL PLAN - PHASE X & XI
TRAFFIC CONTROL PLAN - PHASE XII & XIII
KAPAA BRIDGE CROSSING - GENERAL NOTES, TYPICAL DETAILS & ELEVATION
KAPAA BRIDGE CROSSING - DETAILS & SECTIONS

APPROVED:

 DIRECTOR OF TRANSPORTATION, DEPARTMENT OF TRANSPORTATION
 STATE OF HAWAII

 COUNTY ENGINEER, DEPARTMENT OF PUBLIC WORKS
 COUNTY OF KAUAI

 MANAGER AND CHIEF ENGINEER, DEPARTMENT OF WATER
 COUNTY OF KAUAI

 HOUSING ADMINISTRATOR
 KAUAI COUNTY HOUSING AGENCY

HOUSING AGENCY
OF KAUAI
FUNDED BY THE
HOUSING AND URBAN DEVELOPMENT (HUD)
BLOCK GRANT (CDBG) PROGRAM

WILU WATER PROJECT PROJECT CASE II

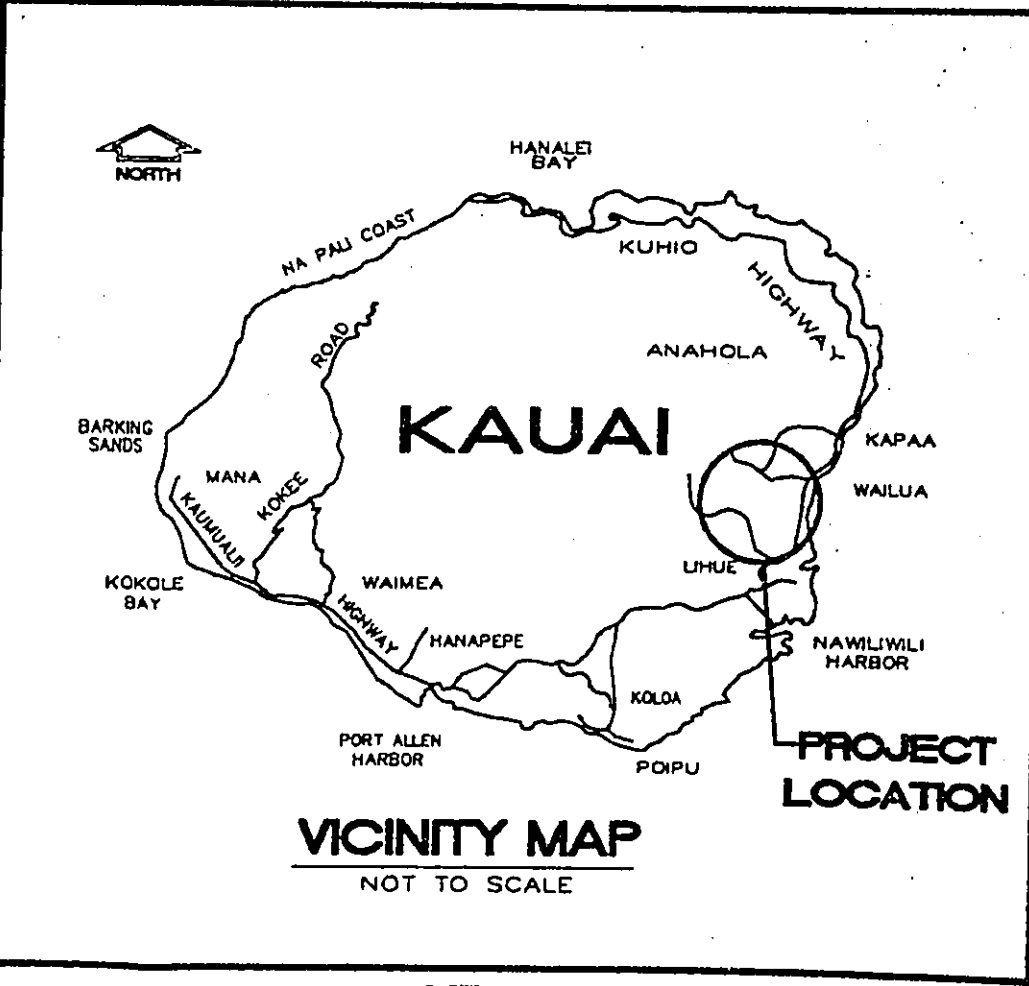
for Hanamaulu Well #3
100 to 101+84.17 (Maalo)
4, 3-8-POR. 2, 3, 6
KAUAI, HAWAII

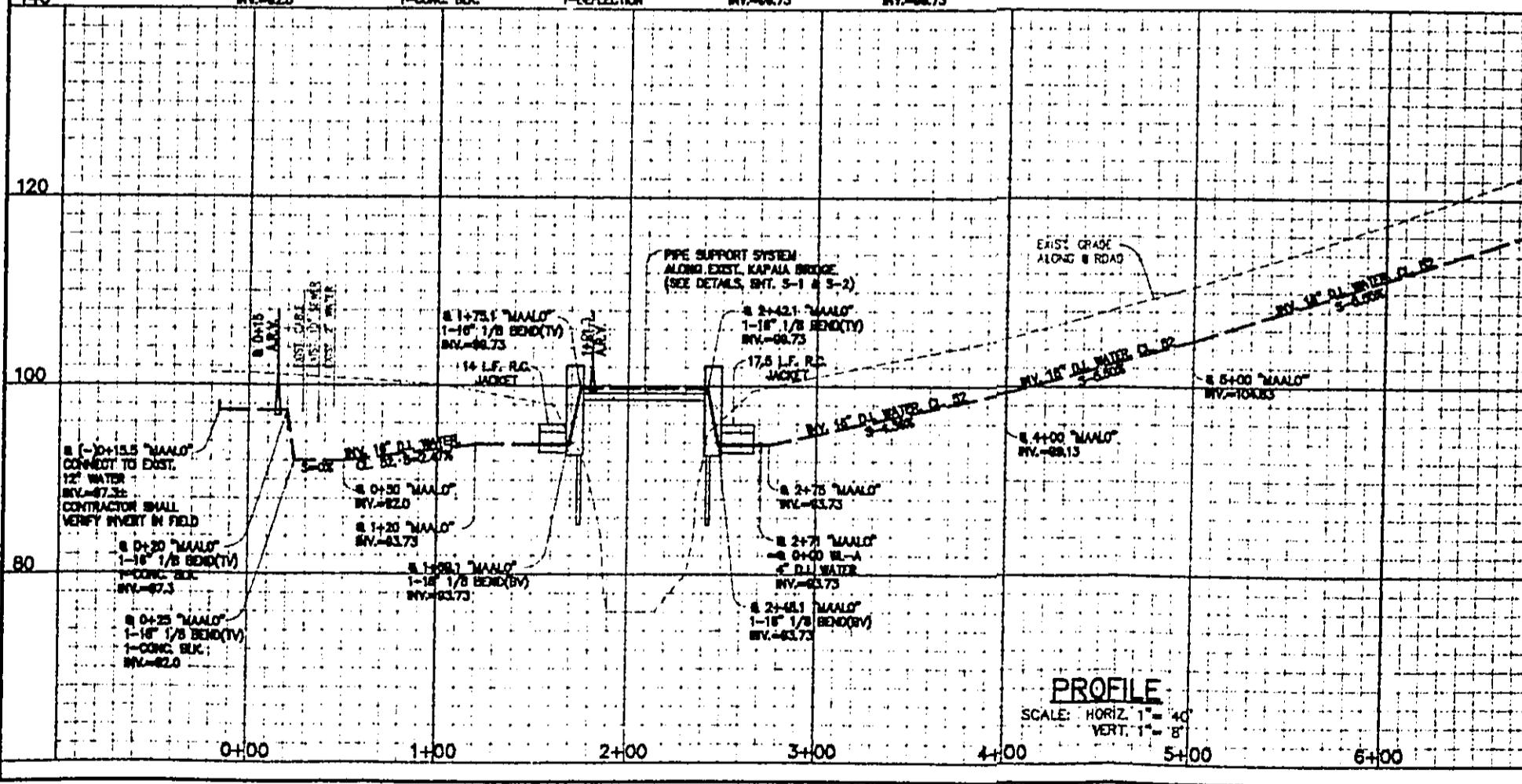
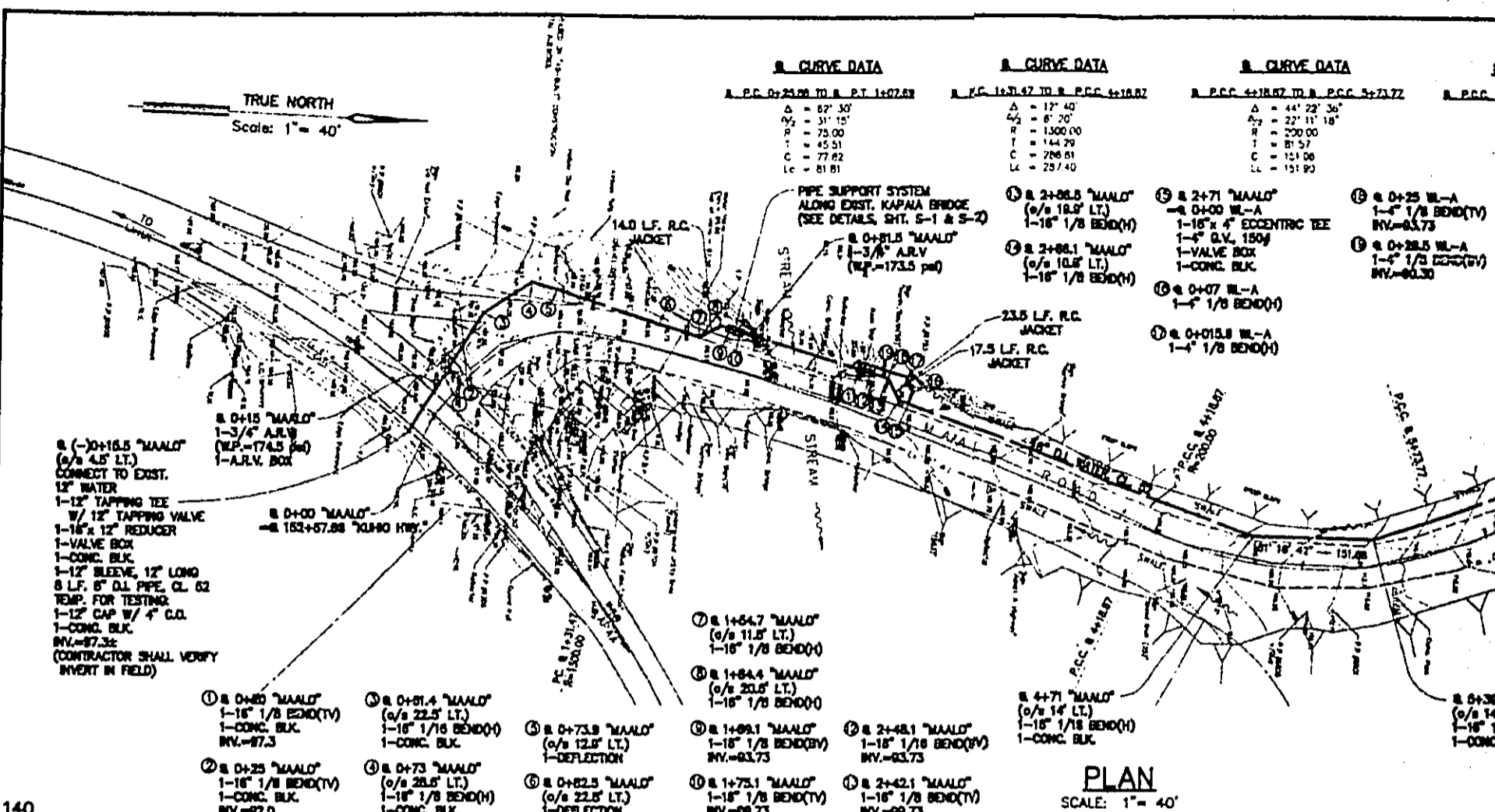
PE
ParEn, Inc.
dba Park Engineering
567 South King Street #300
Honolulu, Hawaii 96813
(cl No. 5700)

INDEX OF DRAWINGS

	SHEET NO.
.....	1
.....	2
.....	3
.....	4
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.....	20
.....	21
.....	22
.....	23
.....	24
.....	(5-1)
.....	(5-2)

TRANSPORTATION	DATE
	DATE
WATER	DATE
	DATE





CURVE DATA

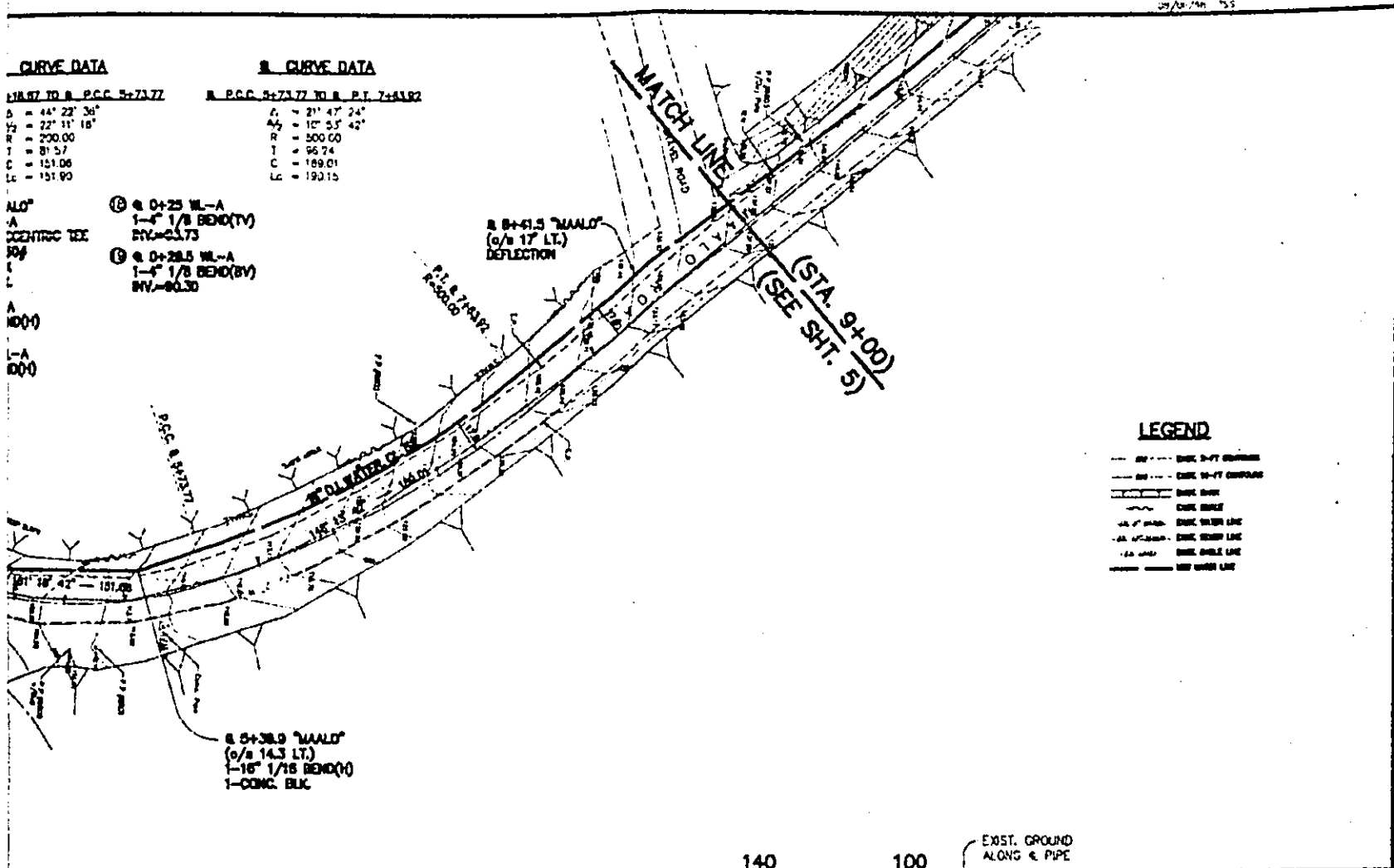
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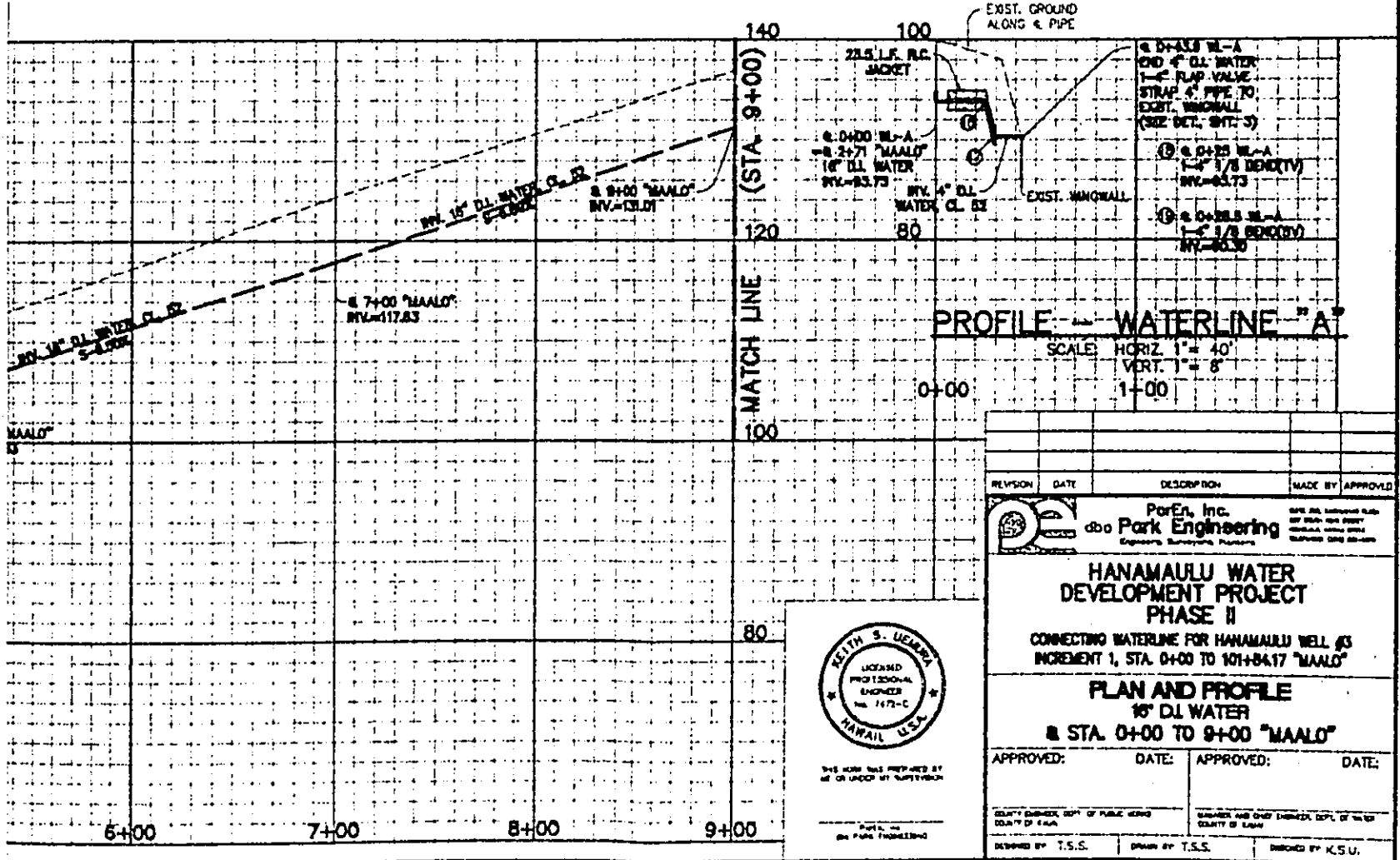
ALOT
 A
 CENTRIC TEE
 104
 A
 100+0
 L-A
 000

- ⓐ @ 0+25 WL-A
 1-1/2" 1/8 BEND(TV)
 INV.=83.73
- ⓑ @ 0+28.5 WL-A
 1-1/2" 1/8 BEND(BV)
 INV.=83.30




LEGEND

- 16" DL WATER
- 12" DL WATER
- 8" DL WATER
- 4" DL WATER
- 2" DL WATER
- EXIST. GROUND
- EXIST. MANHOLE
- EXIST. PIPE
- EXIST. CURB
- EXIST. SIDEWALK
- EXIST. DRIVE
- EXIST. ROAD



REVISION	DATE	DESCRIPTION	MADE BY	APPROVED


Park Engineering, Inc.
 dba Park Engineering
 Engineers, Surveyors, Planners

HANAMAULU WATER DEVELOPMENT PROJECT PHASE II
 CONNECTING WATERLINE FOR HANAMAULU WELL #3 INCREMENT 1, STA. 0+00 TO 101+04.17 "MAALO"

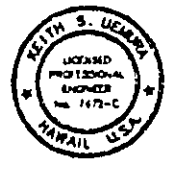
PLAN AND PROFILE
16" DL WATER
@ STA. 0+00 TO 9+00 "MAALO"

APPROVED:	DATE:	APPROVED:	DATE:

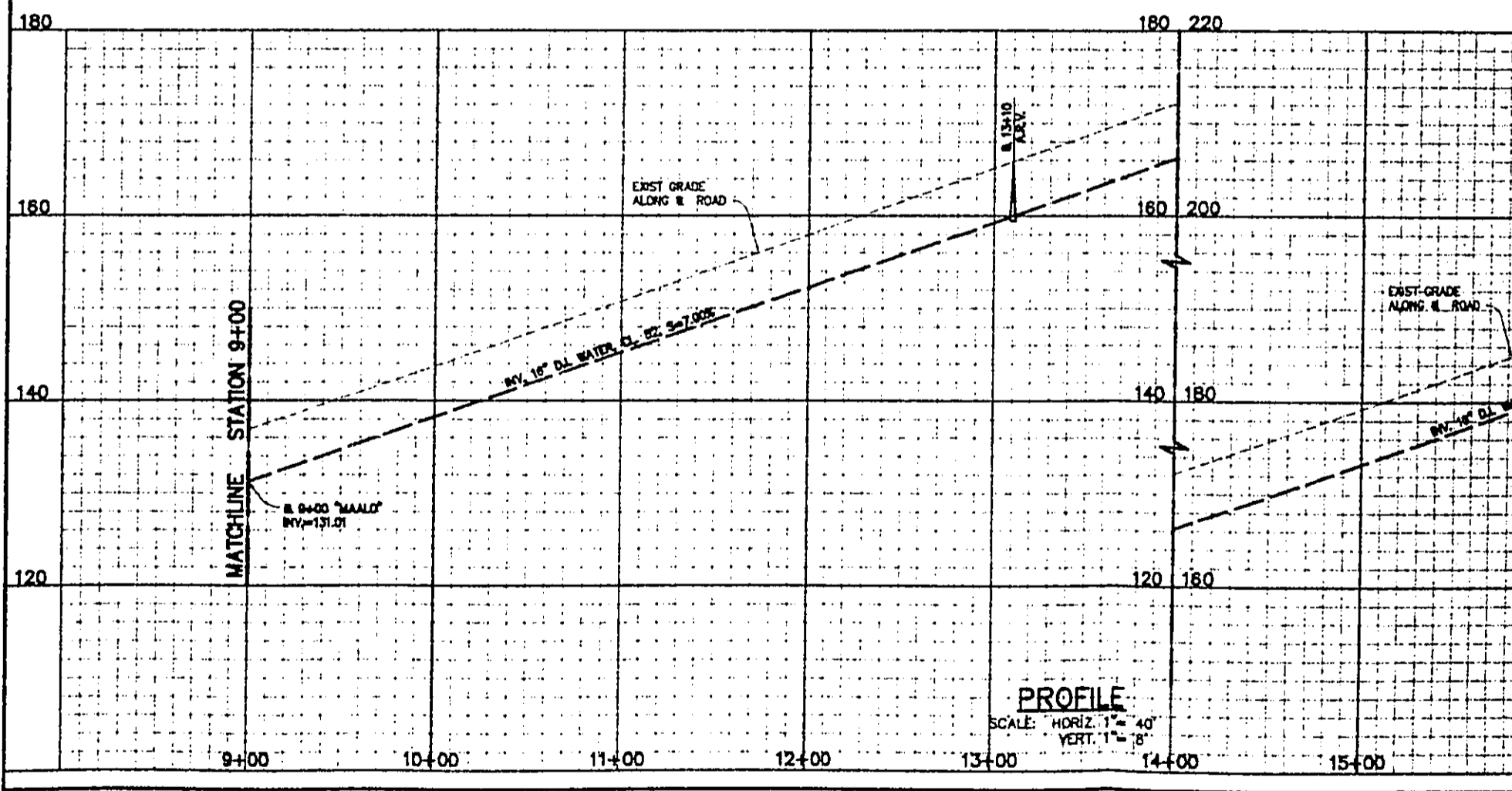
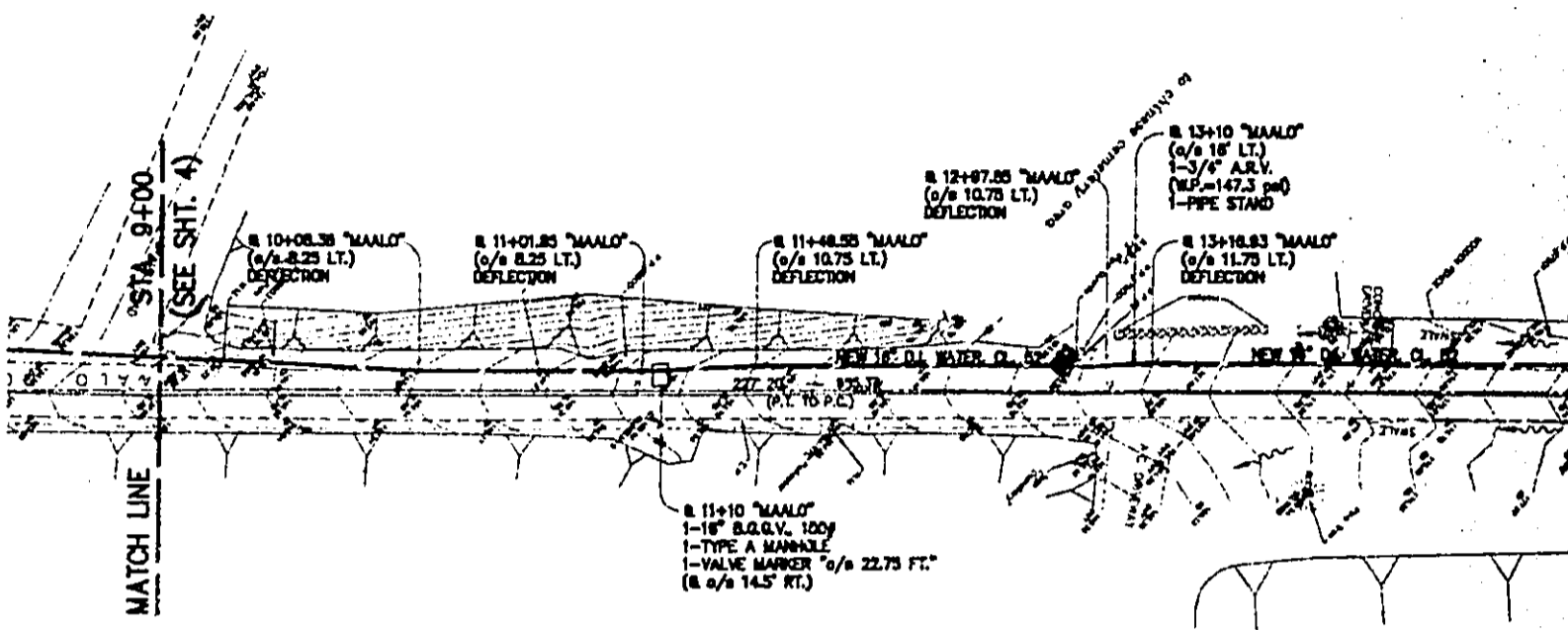
COUNTY ENGINEER, DEPT. OF PUBLIC WORKS
 COUNTY OF HAWAII

COUNTY ENGINEER, DEPT. OF WATER
 COUNTY OF HAWAII

DESIGNED BY T.S.S. DRAWN BY T.S.S. CHECKED BY K.S.U.



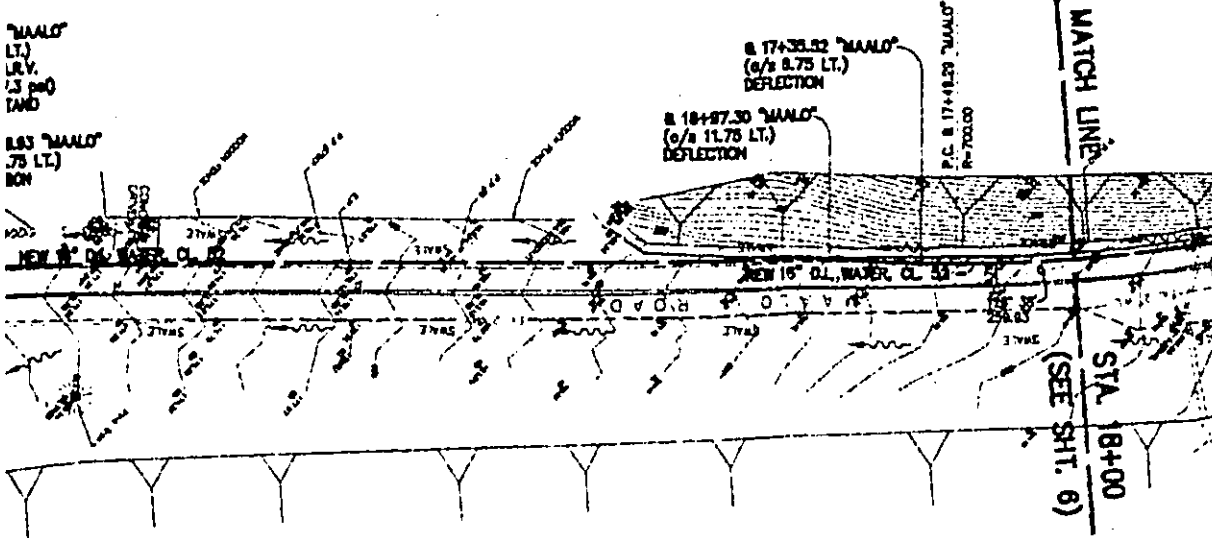
TRUE NORTH
Scale: 1" = 40'



B CURVE DATA

B.P.C. 17+48.29 TO B.P.T. 20+10.74

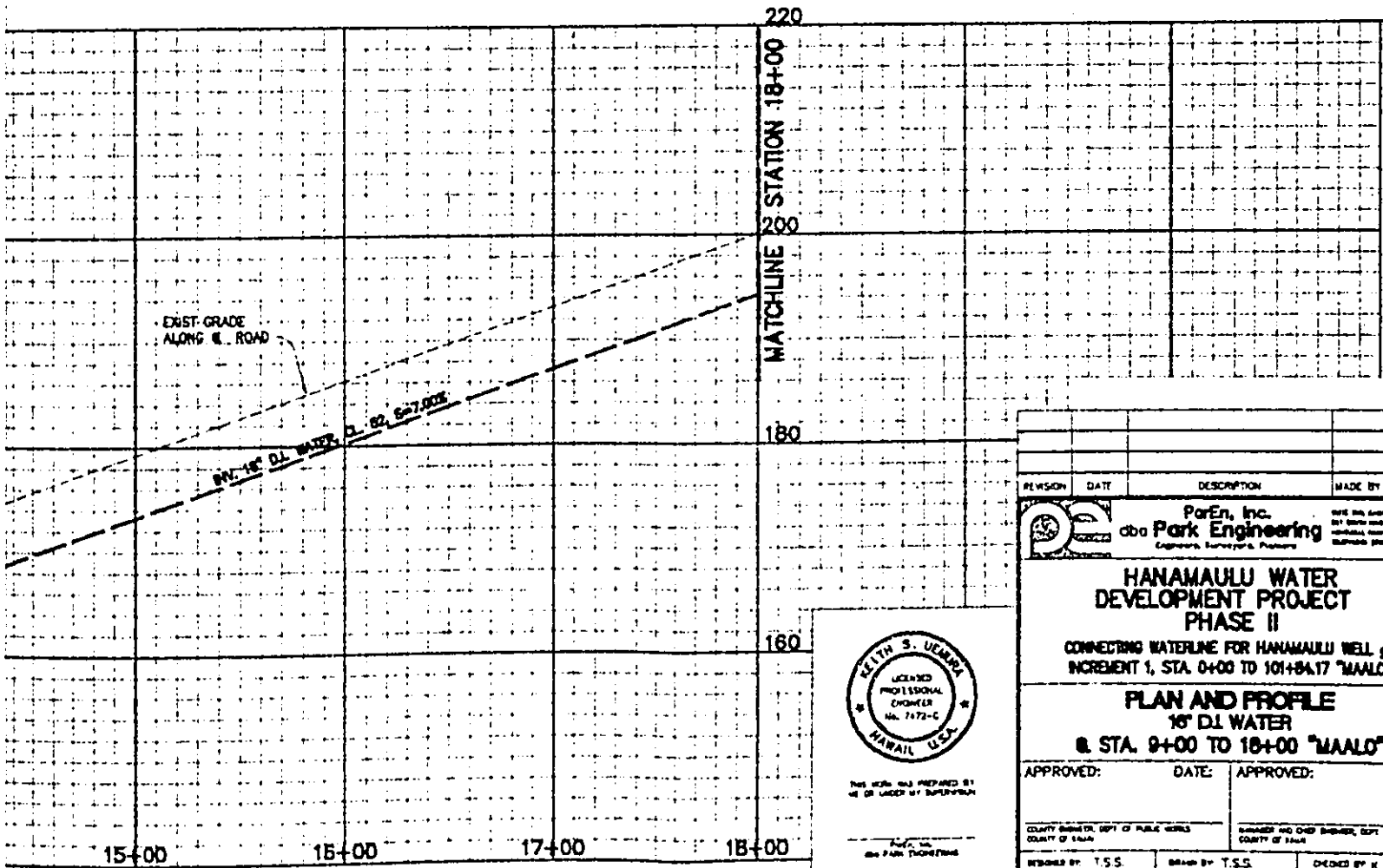
- Δ = 21° 24'
- 9/2 = 10' 42"
- T = 700.00
- L = 132.37
- C = 256.83
- E = 281.45



PLAN
 SCALE: 1" = 40'

LEGEND

- 16" DI WATERLINE
- 12" DI WATERLINE
- 8" DI WATERLINE
- 6" DI WATERLINE
- 4" DI WATERLINE
- 3" DI WATERLINE
- 2" DI WATERLINE
- 1" DI WATERLINE



THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

REVISION	DATE	DESCRIPTION	MADE BY	APPROVED
 ParEn, Inc. dba Park Engineering Engineers, Surveyors & Planners <small>ONE ONE LUMBER PLACE SUITE 200 HONOLULU, HAWAII 96813 (808) 531-1111</small>				
HANAMAULU WATER DEVELOPMENT PROJECT PHASE II CONNECTING WATERLINE FOR HANAMAULU WELL #3 INCREMENT 1, STA. 0+00 TO 101+84.17 "MAALO"				
PLAN AND PROFILE 16" DI WATER @ STA. 9+00 TO 18+00 "MAALO"				
APPROVED:		DATE:	APPROVED: DATE:	
COUNTY ENGINEER, DEPT. OF PUBLIC WORKS COUNTY OF HAWAII		MANAGER AND CHIEF ENGINEER, DEPT. OF WATER COUNTY OF HAWAII		
DESIGNED BY: T.S.S.	DRAWN BY: T.S.S.	CHECKED BY: K.S.U.		

■ CURVE DATA

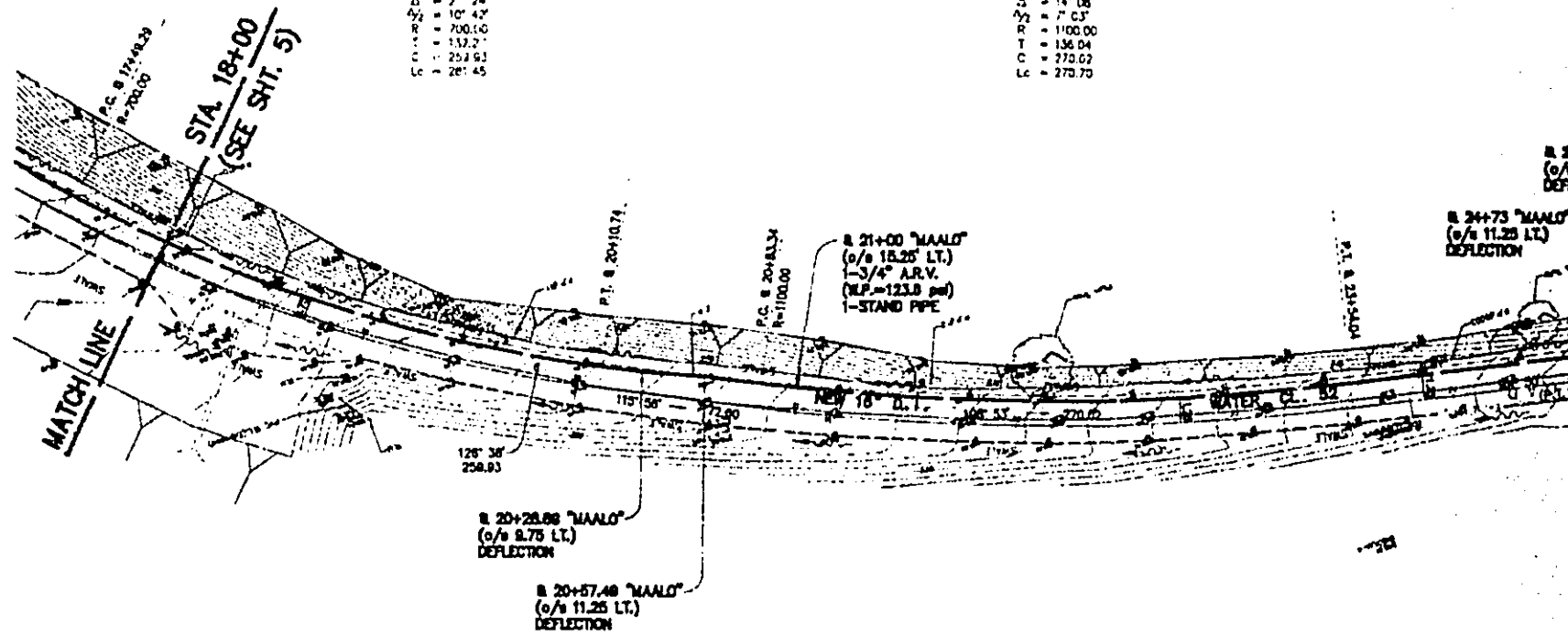
■ P.C. 17+48.79 TO ■ P.T. 20+10.74

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 Lc = 28' 45"

■ CURVE DATA

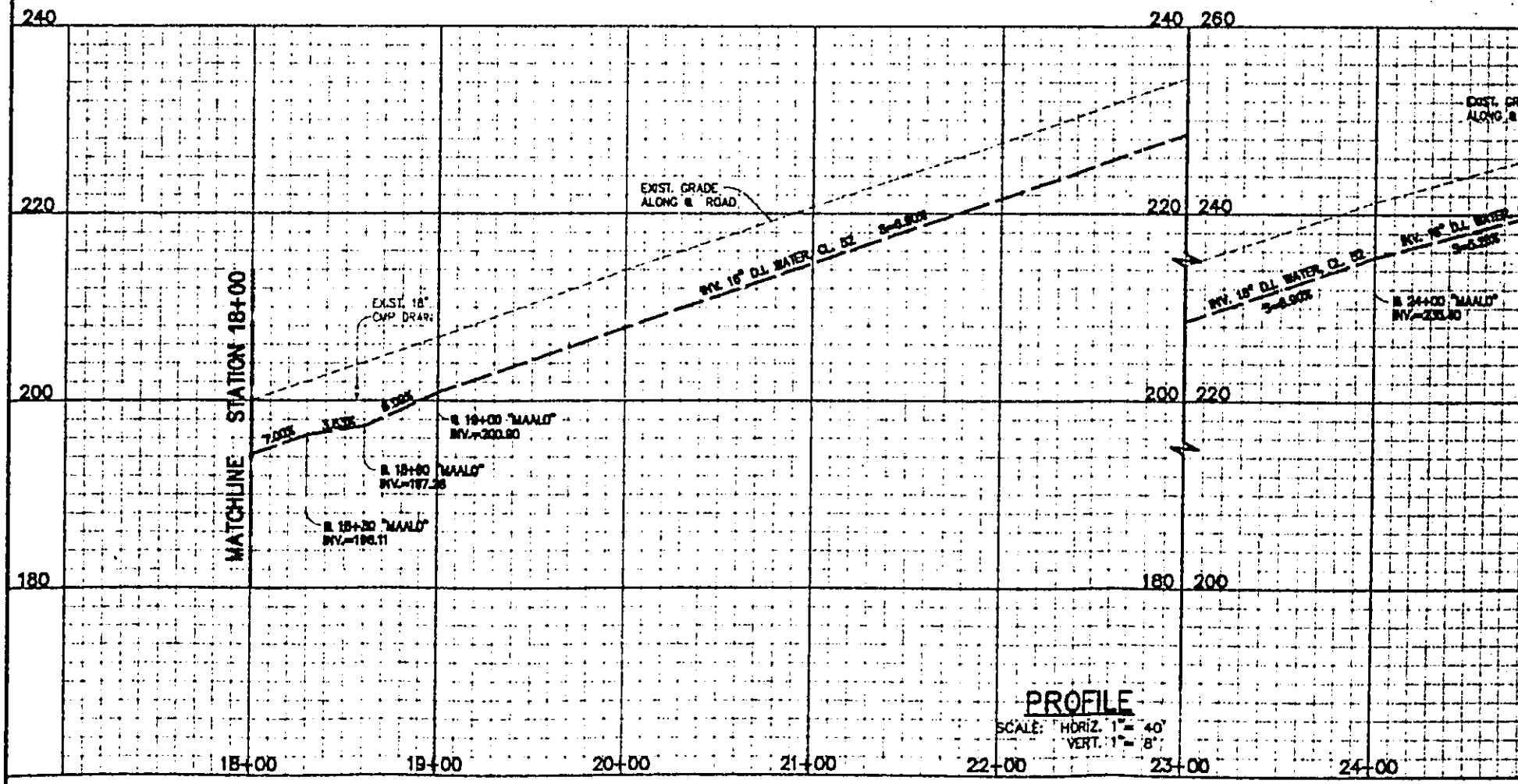
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 Lc = 273.70



PLAN

SCALE: 1" = 40'

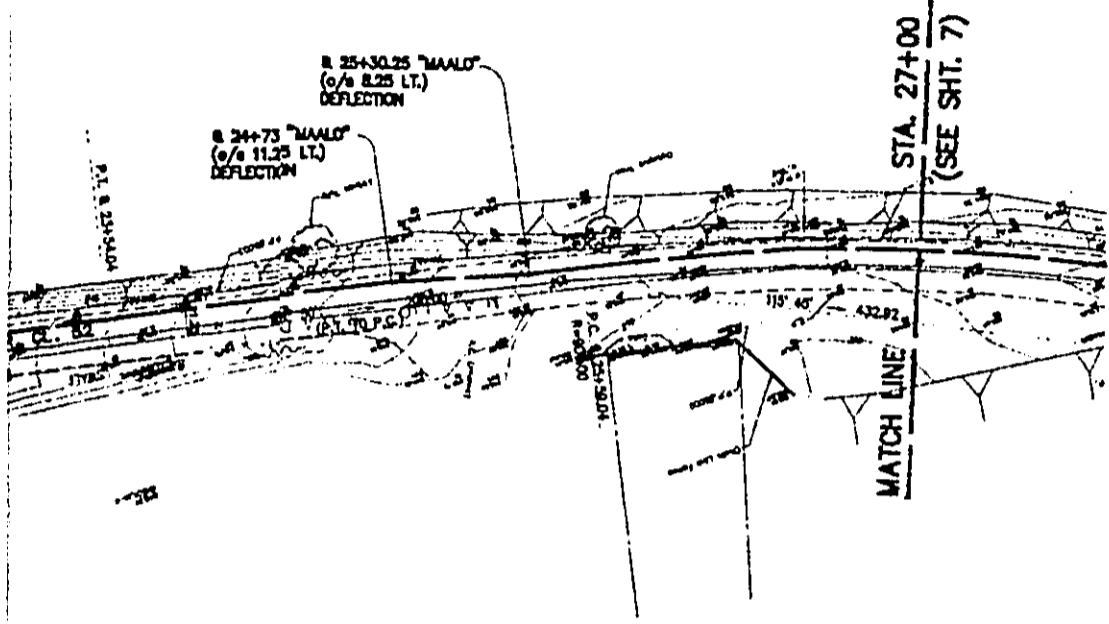
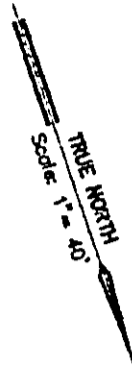


PROFILE

SCALE: HORIZ. 1" = 40'
 VERT. 1" = 8'

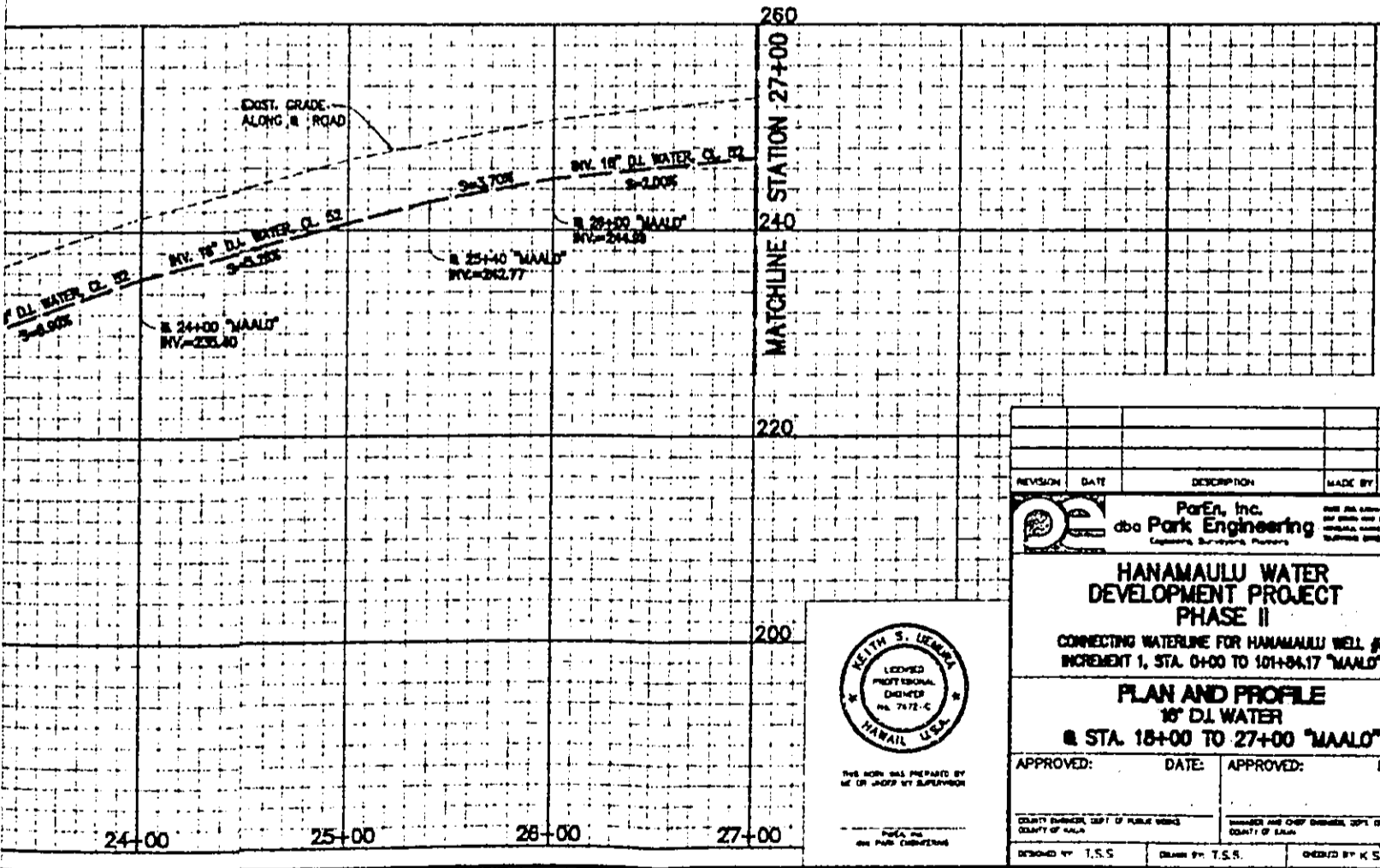
B CURVE DATA

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 C = 432.02'
 Lc = 437.21'




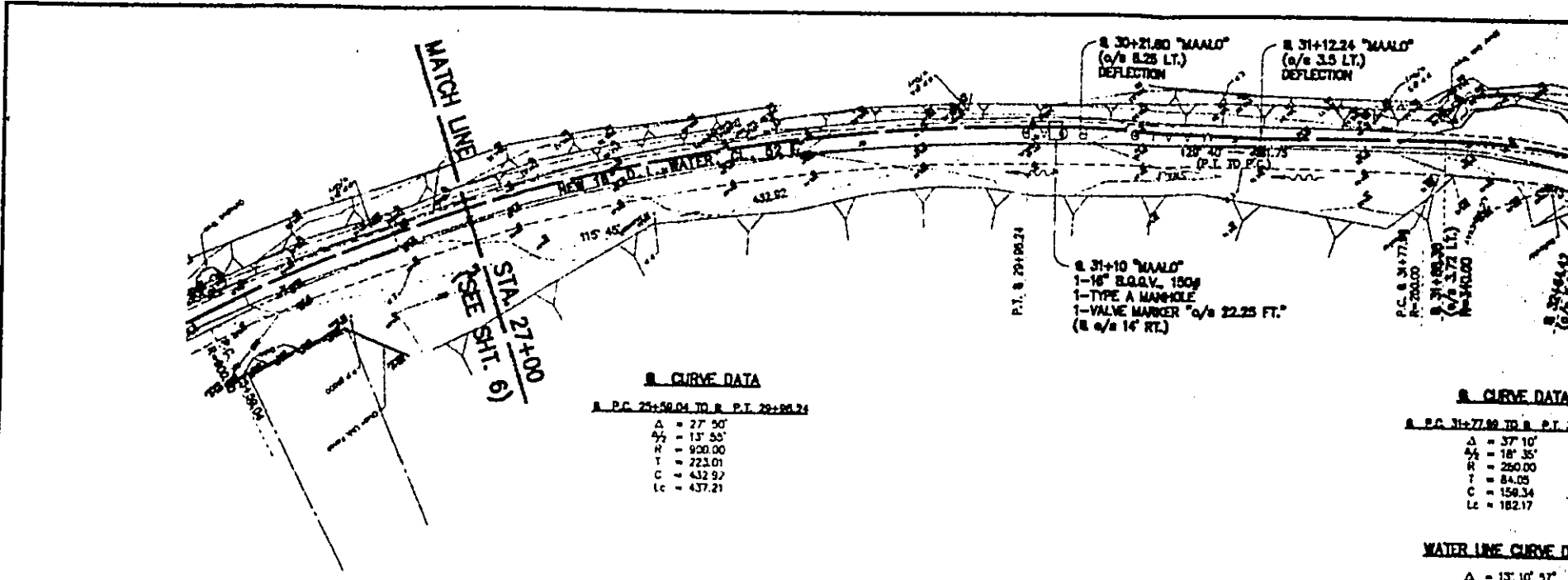
LEGEND

- EXIST. 24" WATER
- EXIST. 18" WATER
- EXIST. ROAD
- EXIST. TRAIL
- EXIST. WATER LINE
- EXIST. WASTE LINE
- EXIST. CABLE LINE
- NEW WATER LINE



THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

REVISION	DATE	DESCRIPTION	MADE BY	APPROVED
 Park Engineering, Inc. dba Park Engineering Consulting, Surveying, Planning				
HANAMAULU WATER DEVELOPMENT PROJECT PHASE II CONNECTING WATERLINE FOR HANAMAULU WELL #5 INCREMENT 1, STA. 0+00 TO 101+84.17 "MAALO"				
PLAN AND PROFILE 18" DI WATER @ STA. 18+00 TO 27+00 "MAALO"				
APPROVED:	DATE:	APPROVED:	DATE:	
COUNTY ENGINEER, DEPT. OF PUBLIC WORKS COUNTY OF HAWAII		INSPECTOR AND CHECK ENGINEER, DEPT. OF WATER COUNTY OF HAWAII		
DESIGNED BY: T.S.S.	DRAWN BY: T.S.S.	CHECKED BY: K.S.U.		



■ CURVE DATA
 R. P.C. 25+50.04 TO R. P.T. 29+00.24

Δ	= 27° 50'
Δ/2	= 13° 55'
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T	= 723.01
C	= 432.97
Lc	= 437.21

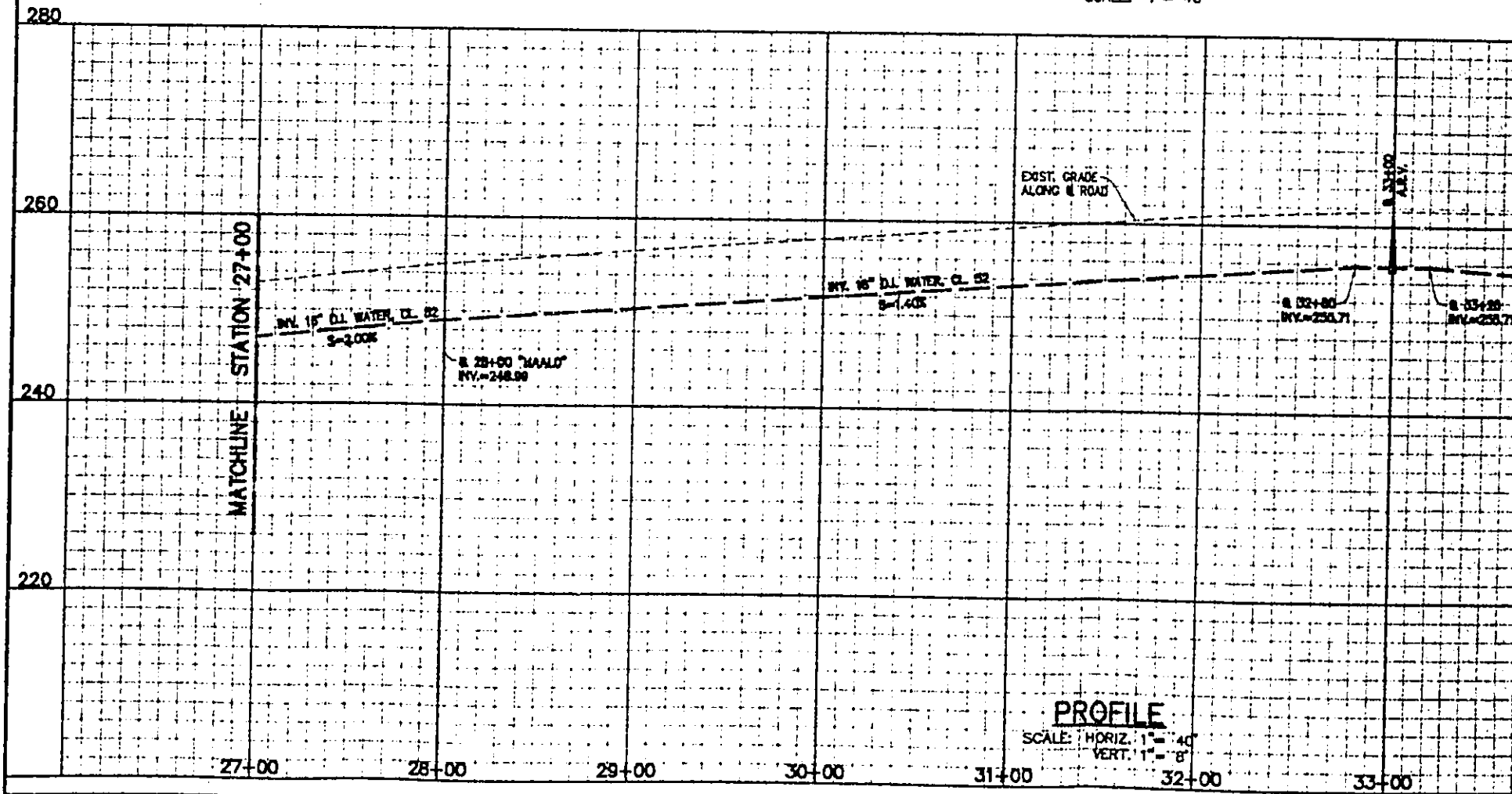
■ CURVE DATA
 R. P.C. 31+77.99 TO R. P.T. 33+00.00

Δ	= 37° 10'
Δ/2	= 18° 35'
R	= 260.00
T	= 84.05
C	= 150.34
Lc	= 182.17

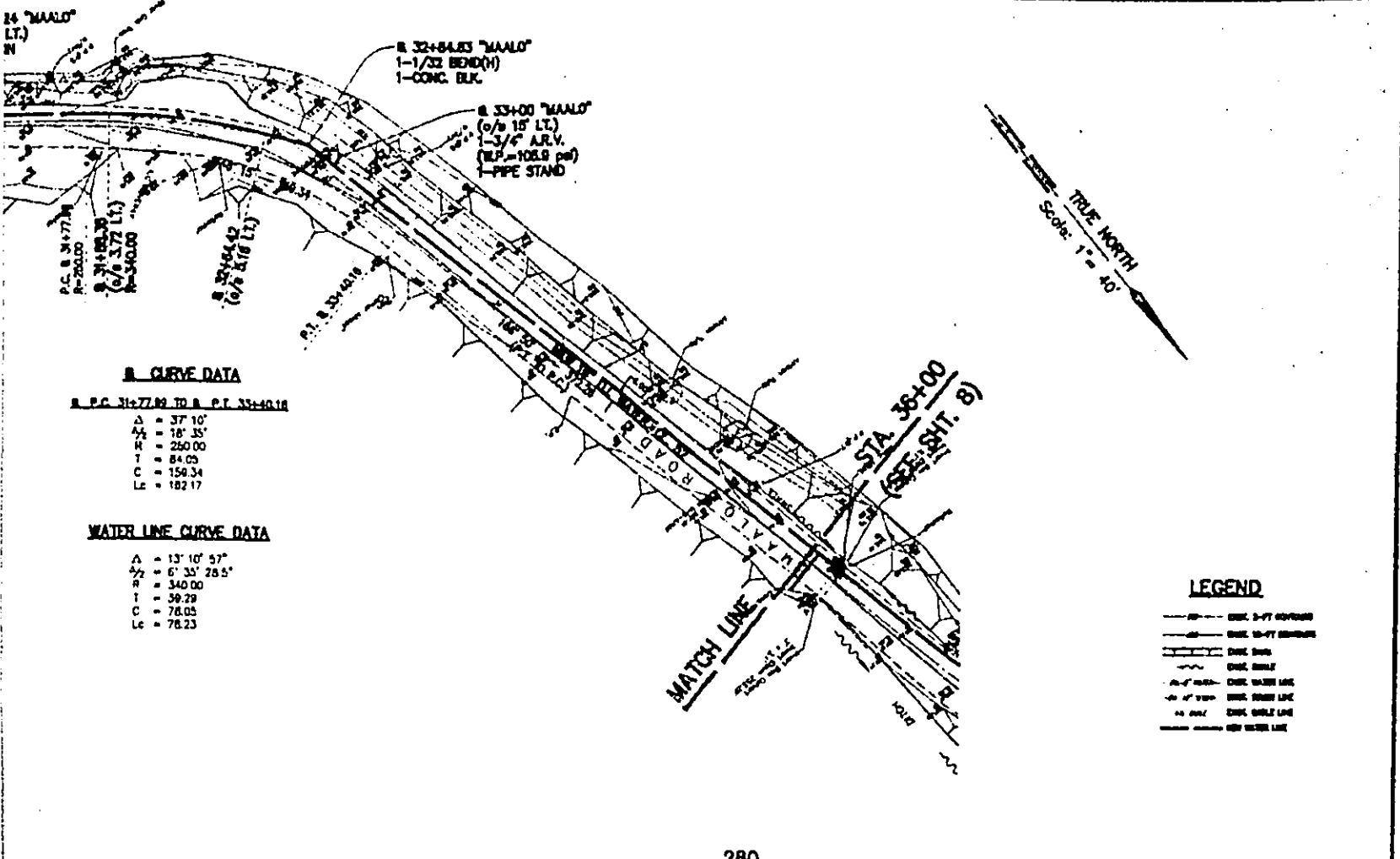
■ WATER LINE CURVE DATA

Δ	= 13° 10' 57"
Δ/2	= 6° 35' 28.5"
R	= 340.00
T	= 39.29
C	= 78.05
Lc	= 78.23

PLAN
 SCALE: 1" = 40'



PROFILE
 SCALE: HORIZ. 1" = 40'
 VERT. 1" = 8'



B CURVE DATA

B.P.C. 31+77.99 TO B.P.T. 34+49.18

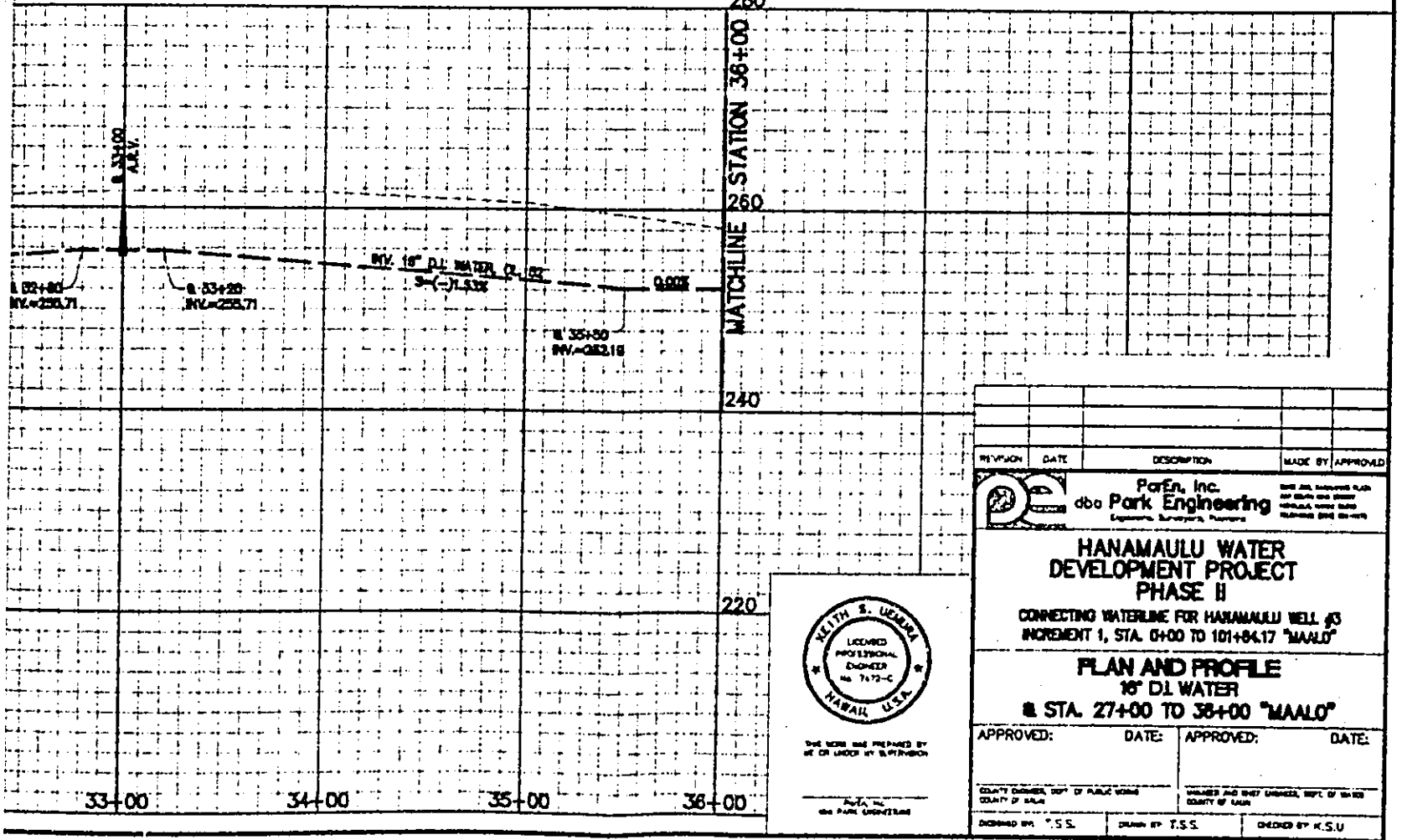
- Δ = 37° 10'
- Δ/2 = 18° 35'
- R = 250.00
- T = 84.05
- C = 158.34
- Lc = 182.17

WATER LINE CURVE DATA

- Δ = 13° 10' 57"
- Δ/2 = 6° 35' 28.5"
- R = 340.00
- T = 59.29
- C = 78.05
- Lc = 78.23

LEGEND

- 3" 3-PT. BEND
- 3" 3-PT. BEND
- CONC. BLK.
- CONC. BULK
- CONC. WATER LINE
- CONC. WATER LINE
- CONC. WATER LINE
- CONC. WATER LINE



REVISION	DATE	DESCRIPTION	MADE BY	APPROVED

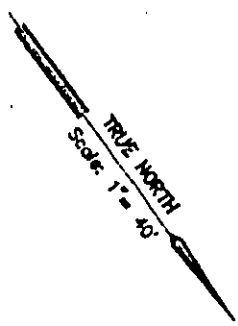
ParEn, Inc.
 dba **Park Engineering**
 Engineers, Surveyors, Planners

HANAMAULU WATER DEVELOPMENT PROJECT PHASE II
 CONNECTING WATERLINE FOR HANAMAULU WELL #3 INCREMENT 1, STA. 0+00 TO 101+84.17 "MAALO"

PLAN AND PROFILE
 18" DI WATER
 STA. 27+00 TO 36+00 "MAALO"

APPROVED:	DATE:	APPROVED:	DATE:

DESIGNED BY: T.S.S. DRAWN BY: T.S.S. CHECKED BY: K.S.U.



- ① R 36+03.85 "MAALO"
(o/s 18' RT.)
1-3/4" A.R.V.
(W.P. = 107.4 psf)
1-PIPE STAND
- ② R 36+06.85 "MAALO"
1-18" 1/8 BEND(TV)
INV. = 252.18
- ③ R 36+24.85 "MAALO"
1-18" 1/8 BEND(TV)
INV. = 252.18
- ④ R 36+11.85 "MAALO"
1-18" 1/8 BEND(BV)
INV. = 246.60
- ⑤ R 36+21.85 "MAALO"
1-18" 1/8 BEND(BV)
INV. = 246.60

R CURVE DATA

R.P.C. 37+12.42 TO R.P.T. 38+73.32

Δ	= 93° 20'
Δ ₂	= 48° 40'
R	= 100.00
T	= 105.99
C	= 145.41
Lc	= 167.90

R CURVE DATA

R.P.C. 38+36.48 TO R.P.T. 41+56.88

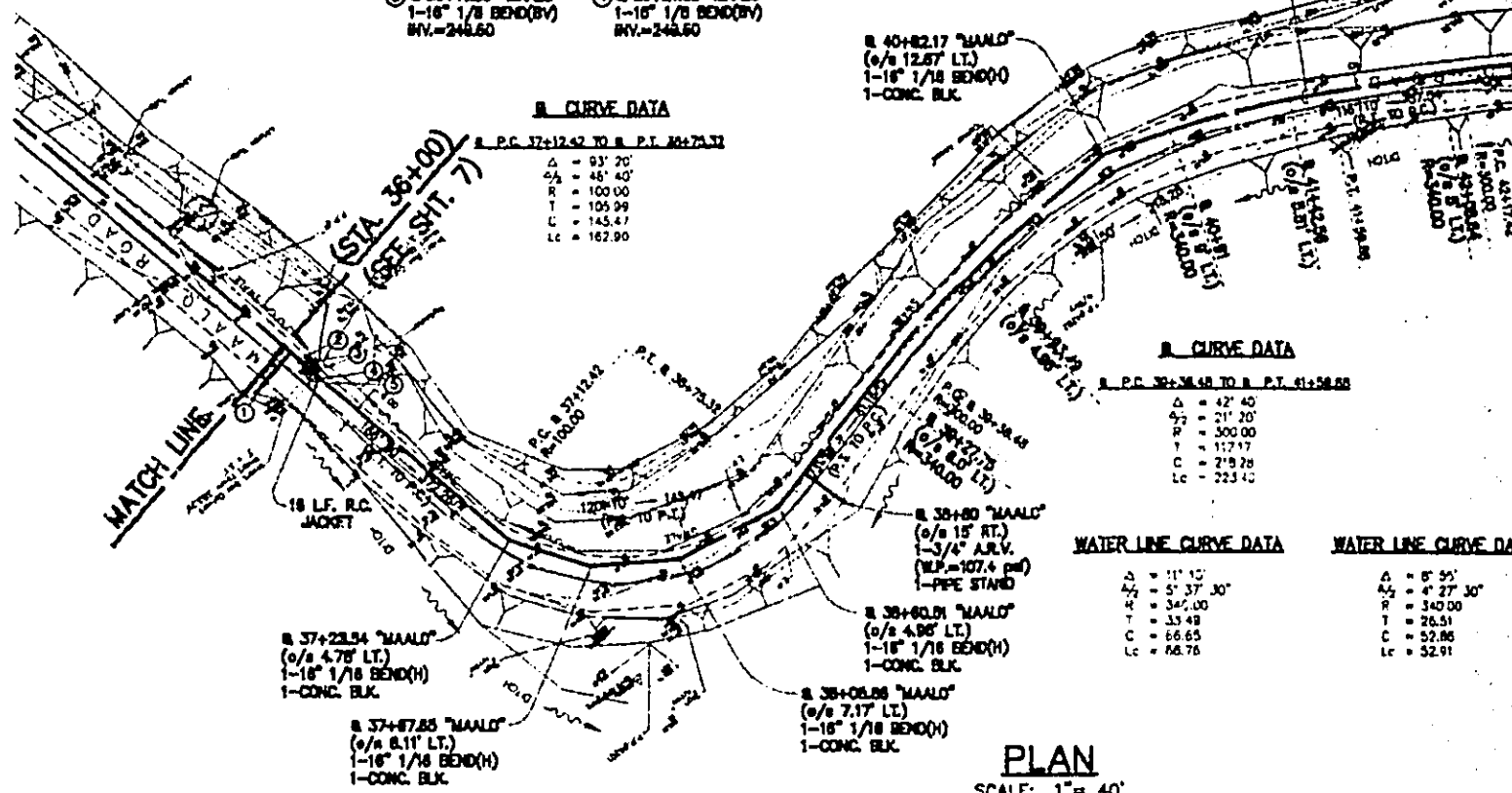
Δ	= 42° 40'
Δ ₂	= 21° 20'
R	= 500.00
T	= 117.17
C	= 278.28
Lc	= 223.10

WATER LINE CURVE DATA

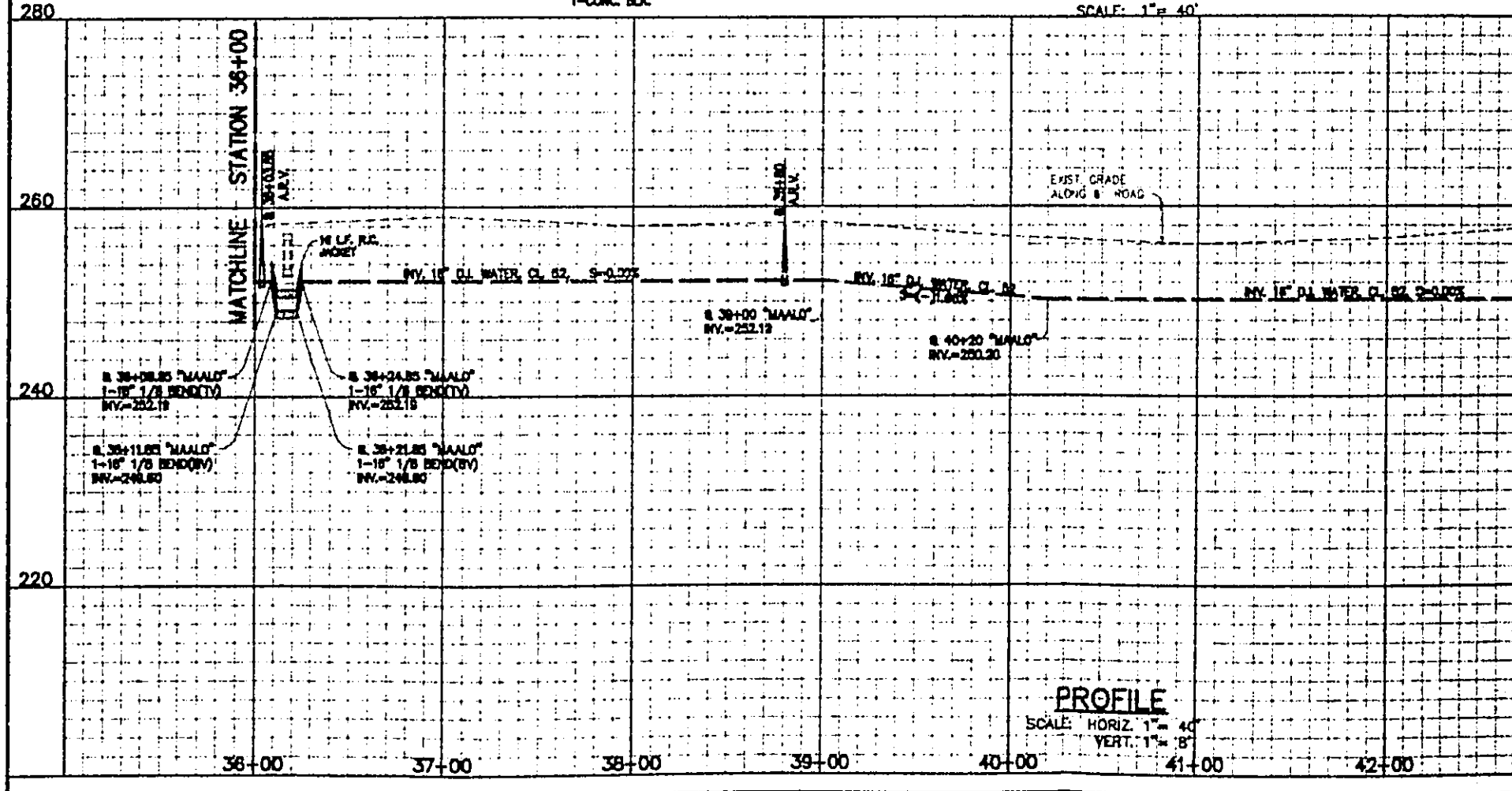
Δ	= 11° 10'
Δ ₂	= 5° 37' 30"
R	= 340.00
T	= 33.48
C	= 66.65
Lc	= 68.76

WATER LINE CURVE DATA

Δ	= 8° 50'
Δ ₂	= 4° 27' 30"
R	= 340.00
T	= 26.51
C	= 52.86
Lc	= 52.91



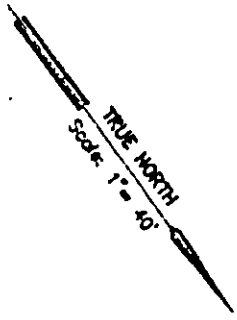
PLAN
SCALE: 1" = 40'



PROFILE
SCALE: HORIZ. 1" = 40'
VERT. 1" = 8'

CORRECTION

THE PRECEDING DOCUMENT(S) HAS
BEEN REPHOTOGRAPHED TO ASSURE
LEGIBILITY
SEE FRAME(S)
IMMEDIATELY FOLLOWING



- ① R 36+03.85 "MAALO"
(o/s 15' RT.)
1-3/4" A.R.V.
(N.P. = 107.4 psf)
1-PIPE STAND
- ② R 36+06.85 "MAALO"
1-18" 1/8 BEND(TV)
INV. = 252.19
- ③ R 36+24.85 "MAALO"
1-18" 1/8 BEND(TV)
INV. = 252.19
- ④ R 36+11.85 "MAALO"
1-18" 1/8 BEND(SV)
INV. = 248.80
- ⑤ R 36+21.85 "MAALO"
1-18" 1/8 BEND(SV)
INV. = 248.80

R CURVE DATA

R.P.C. 37+12.42 TO R.P.T. 38+75.37

Δ	= 91° 20'
Δ/2	= 45° 40'
R	= 100.00
T	= 105.99
C	= 145.47
Lc	= 162.90

R CURVE DATA

R.P.C. 38+34.48 TO R.P.T. 41+58.89

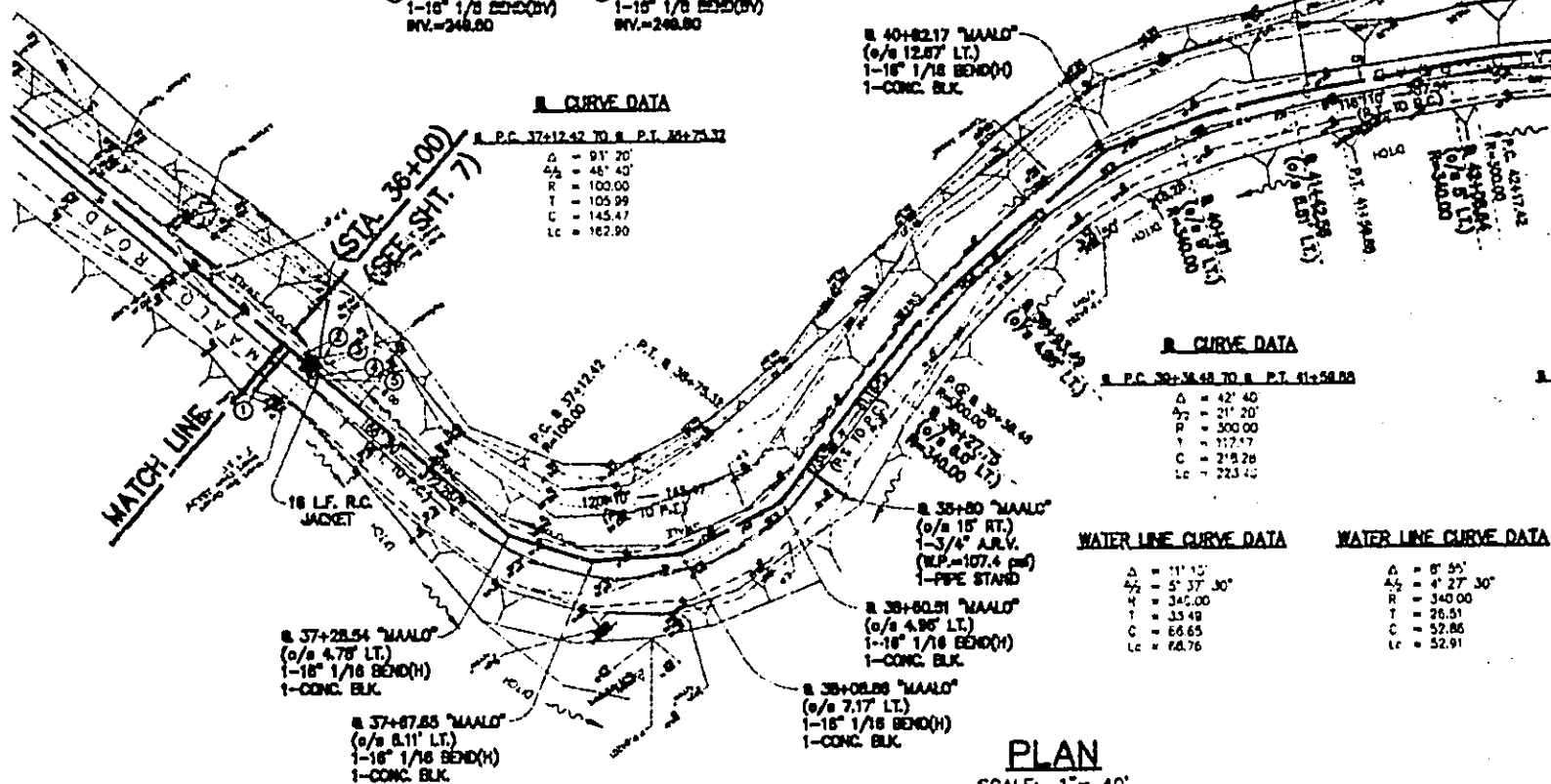
Δ	= 42° 40'
Δ/2	= 21° 20'
R	= 300.00
T	= 317.77
C	= 218.28
Lc	= 223.42

WATER LINE CURVE DATA

Δ	= 11° 15'
Δ/2	= 5° 37' 30"
R	= 340.00
T	= 33.48
C	= 68.65
Lc	= 74.76

WATER LINE CURVE DATA

Δ	= 8° 55'
Δ/2	= 4° 27' 30"
R	= 340.00
T	= 26.91
C	= 52.86
Lc	= 52.91



PLAN

SCALE: 1" = 40'

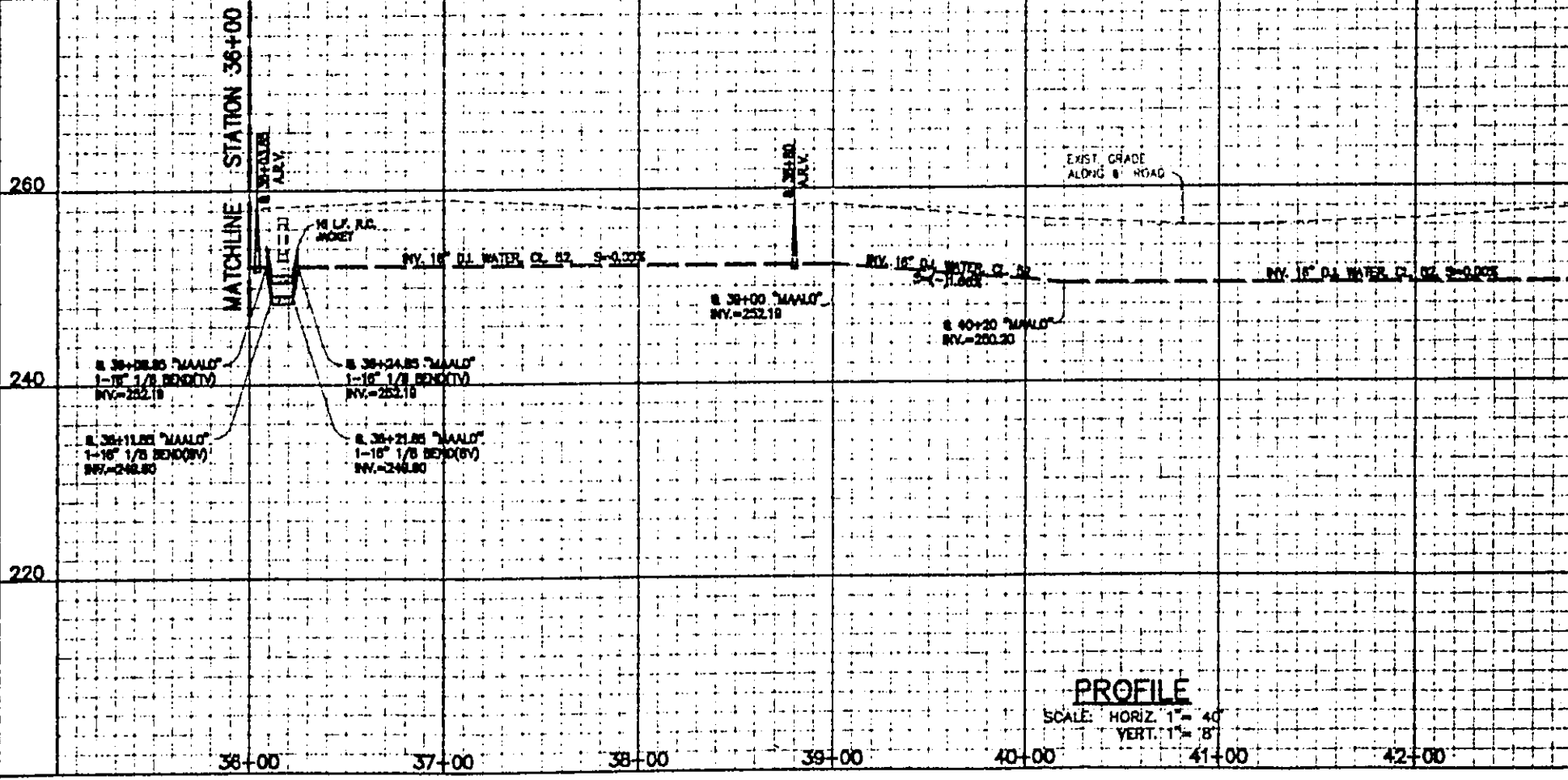
280

260

240

220

MATCHLINE STATION 36+00



PROFILE

SCALE: HORIZ. 1" = 40'
VERT. 1" = 8'

36+00

37+00

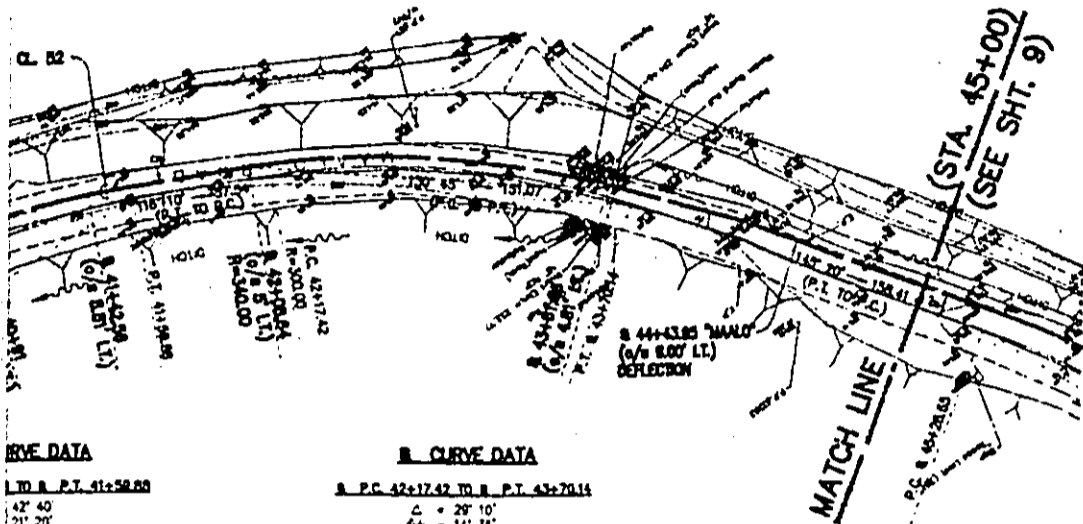
38+00

39+00

40+00

41+00

42+00



PIPE DATA

TO P.T. 41+58.00

42' 40"
21' 20"
300.00
117.17
2' 8.76
223.42

PIPE CURVE DATA

PC 42+17.42 TO P.T. 43+70.14

C = 29' 10"
Δ = 14' 35"
R = 300.00
T = 78.05
C = 151.07
Lc = 152.72

PIPE DATA

30"

WATER LINE CURVE DATA

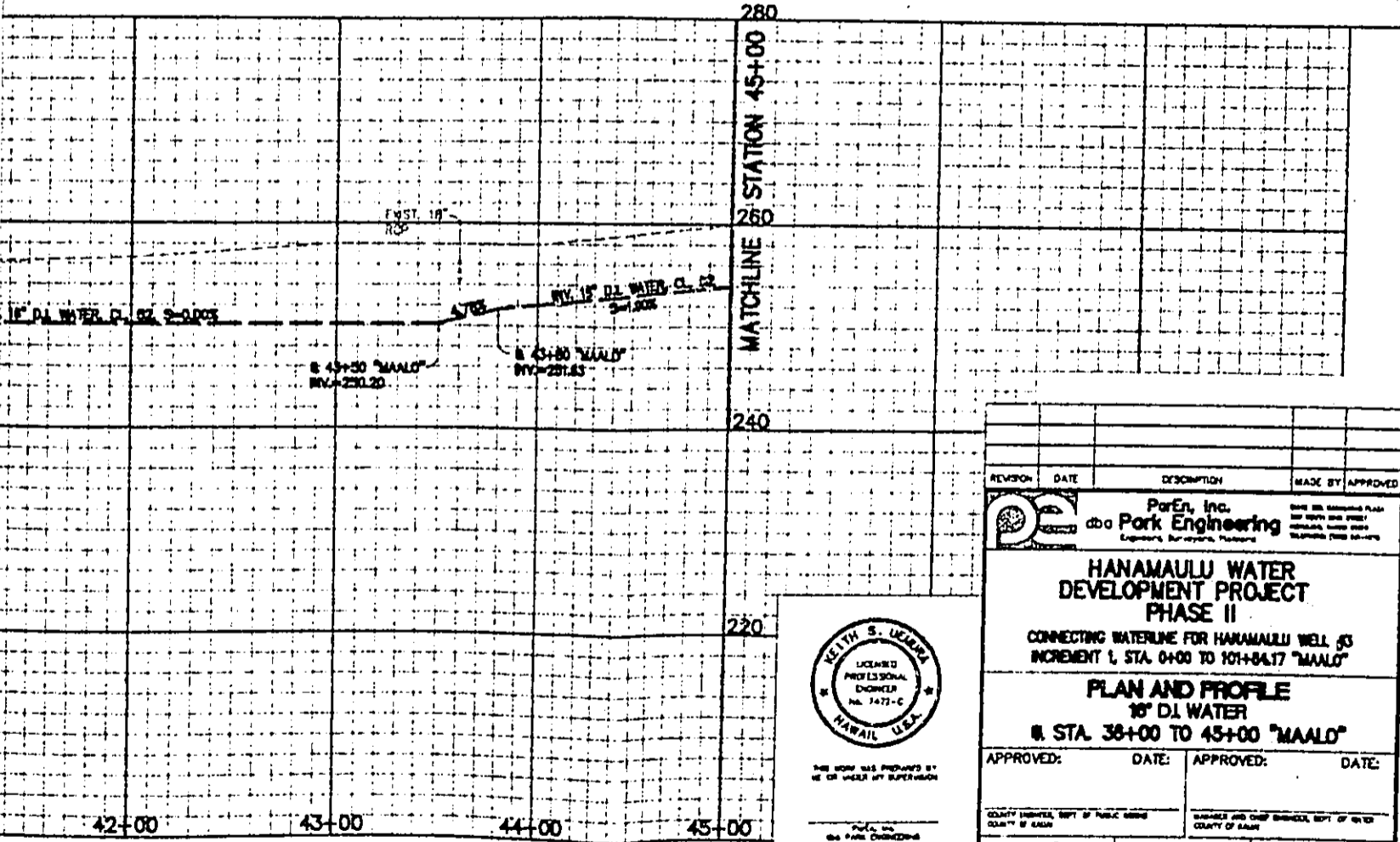
A = 8' 55"
A2 = 4' 27' 30"
R = 340.00
T = 26.51
C = 52.86
Lc = 52.91

WATER LINE CURVE DATA

C = 26' 10"
Δ = 13' 05"
R = 340.00
T = 78.07
C = 153.93
Lc = 155.28

LEGEND

- 6" DI WATER LINE
- 8" DI WATER LINE
- 10" DI WATER LINE
- 12" DI WATER LINE
- 14" DI WATER LINE
- 16" DI WATER LINE
- 18" DI WATER LINE
- 20" DI WATER LINE
- 24" DI WATER LINE
- 30" DI WATER LINE
- 36" DI WATER LINE
- 42" DI WATER LINE
- 48" DI WATER LINE
- 54" DI WATER LINE
- 60" DI WATER LINE
- 72" DI WATER LINE
- 84" DI WATER LINE
- 96" DI WATER LINE
- 108" DI WATER LINE
- 120" DI WATER LINE
- 144" DI WATER LINE
- 168" DI WATER LINE
- 192" DI WATER LINE
- 216" DI WATER LINE
- 240" DI WATER LINE
- 270" DI WATER LINE
- 300" DI WATER LINE
- 324" DI WATER LINE
- 348" DI WATER LINE
- 372" DI WATER LINE
- 396" DI WATER LINE
- 420" DI WATER LINE
- 444" DI WATER LINE
- 468" DI WATER LINE
- 492" DI WATER LINE
- 516" DI WATER LINE
- 540" DI WATER LINE
- 564" DI WATER LINE
- 588" DI WATER LINE
- 612" DI WATER LINE
- 636" DI WATER LINE
- 660" DI WATER LINE
- 684" DI WATER LINE
- 708" DI WATER LINE
- 732" DI WATER LINE
- 756" DI WATER LINE
- 780" DI WATER LINE
- 804" DI WATER LINE
- 828" DI WATER LINE
- 852" DI WATER LINE
- 876" DI WATER LINE
- 900" DI WATER LINE
- 924" DI WATER LINE
- 948" DI WATER LINE
- 972" DI WATER LINE
- 996" DI WATER LINE
- 1020" DI WATER LINE
- 1044" DI WATER LINE
- 1068" DI WATER LINE
- 1092" DI WATER LINE
- 1116" DI WATER LINE
- 1140" DI WATER LINE
- 1164" DI WATER LINE
- 1188" DI WATER LINE
- 1212" DI WATER LINE
- 1236" DI WATER LINE
- 1260" DI WATER LINE
- 1284" DI WATER LINE
- 1308" DI WATER LINE
- 1332" DI WATER LINE
- 1356" DI WATER LINE
- 1380" DI WATER LINE
- 1404" DI WATER LINE
- 1428" DI WATER LINE
- 1452" DI WATER LINE
- 1476" DI WATER LINE
- 1500" DI WATER LINE
- 1524" DI WATER LINE
- 1548" DI WATER LINE
- 1572" DI WATER LINE
- 1596" DI WATER LINE
- 1620" DI WATER LINE
- 1644" DI WATER LINE
- 1668" DI WATER LINE
- 1692" DI WATER LINE
- 1716" DI WATER LINE
- 1740" DI WATER LINE
- 1764" DI WATER LINE
- 1788" DI WATER LINE
- 1812" DI WATER LINE
- 1836" DI WATER LINE
- 1860" DI WATER LINE
- 1884" DI WATER LINE
- 1908" DI WATER LINE
- 1932" DI WATER LINE
- 1956" DI WATER LINE
- 1980" DI WATER LINE
- 2004" DI WATER LINE
- 2028" DI WATER LINE
- 2052" DI WATER LINE
- 2076" DI WATER LINE
- 2100" DI WATER LINE
- 2124" DI WATER LINE
- 2148" DI WATER LINE
- 2172" DI WATER LINE
- 2196" DI WATER LINE
- 2220" DI WATER LINE
- 2244" DI WATER LINE
- 2268" DI WATER LINE
- 2292" DI WATER LINE
- 2316" DI WATER LINE
- 2340" DI WATER LINE
- 2364" DI WATER LINE
- 2388" DI WATER LINE
- 2412" DI WATER LINE
- 2436" DI WATER LINE
- 2460" DI WATER LINE
- 2484" DI WATER LINE
- 2508" DI WATER LINE
- 2532" DI WATER LINE
- 2556" DI WATER LINE
- 2580" DI WATER LINE
- 2604" DI WATER LINE
- 2628" DI WATER LINE
- 2652" DI WATER LINE
- 2676" DI WATER LINE
- 2700" DI WATER LINE
- 2724" DI WATER LINE
- 2748" DI WATER LINE
- 2772" DI WATER LINE
- 2796" DI WATER LINE
- 2820" DI WATER LINE
- 2844" DI WATER LINE
- 2868" DI WATER LINE
- 2892" DI WATER LINE
- 2916" DI WATER LINE
- 2940" DI WATER LINE
- 2964" DI WATER LINE
- 2988" DI WATER LINE
- 3012" DI WATER LINE
- 3036" DI WATER LINE
- 3060" DI WATER LINE
- 3084" DI WATER LINE
- 3108" DI WATER LINE
- 3132" DI WATER LINE
- 3156" DI WATER LINE
- 3180" DI WATER LINE
- 3204" DI WATER LINE
- 3228" DI WATER LINE
- 3252" DI WATER LINE
- 3276" DI WATER LINE
- 3300" DI WATER LINE
- 3324" DI WATER LINE
- 3348" DI WATER LINE
- 3372" DI WATER LINE
- 3396" DI WATER LINE
- 3420" DI WATER LINE
- 3444" DI WATER LINE
- 3468" DI WATER LINE
- 3492" DI WATER LINE
- 3516" DI WATER LINE
- 3540" DI WATER LINE
- 3564" DI WATER LINE
- 3588" DI WATER LINE
- 3612" DI WATER LINE
- 3636" DI WATER LINE
- 3660" DI WATER LINE
- 3684" DI WATER LINE
- 3708" DI WATER LINE
- 3732" DI WATER LINE
- 3756" DI WATER LINE
- 3780" DI WATER LINE
- 3804" DI WATER LINE
- 3828" DI WATER LINE
- 3852" DI WATER LINE
- 3876" DI WATER LINE
- 3900" DI WATER LINE
- 3924" DI WATER LINE
- 3948" DI WATER LINE
- 3972" DI WATER LINE
- 3996" DI WATER LINE
- 4020" DI WATER LINE
- 4044" DI WATER LINE
- 4068" DI WATER LINE
- 4092" DI WATER LINE
- 4116" DI WATER LINE
- 4140" DI WATER LINE
- 4164" DI WATER LINE
- 4188" DI WATER LINE
- 4212" DI WATER LINE
- 4236" DI WATER LINE
- 4260" DI WATER LINE
- 4284" DI WATER LINE
- 4308" DI WATER LINE
- 4332" DI WATER LINE
- 4356" DI WATER LINE
- 4380" DI WATER LINE
- 4404" DI WATER LINE
- 4428" DI WATER LINE
- 4452" DI WATER LINE
- 4476" DI WATER LINE
- 4500" DI WATER LINE



THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION
DATE: 11/22/81
BY: T.S.S.

REVISION	DATE	DESCRIPTION	MADE BY	APPROVED

ParEn, Inc.
dba Park Engineering
Engineers, Surveyors, Planners
1000 Kalia Road, Suite 1000
Honolulu, Hawaii 96813
Telephone: (808) 941-1111

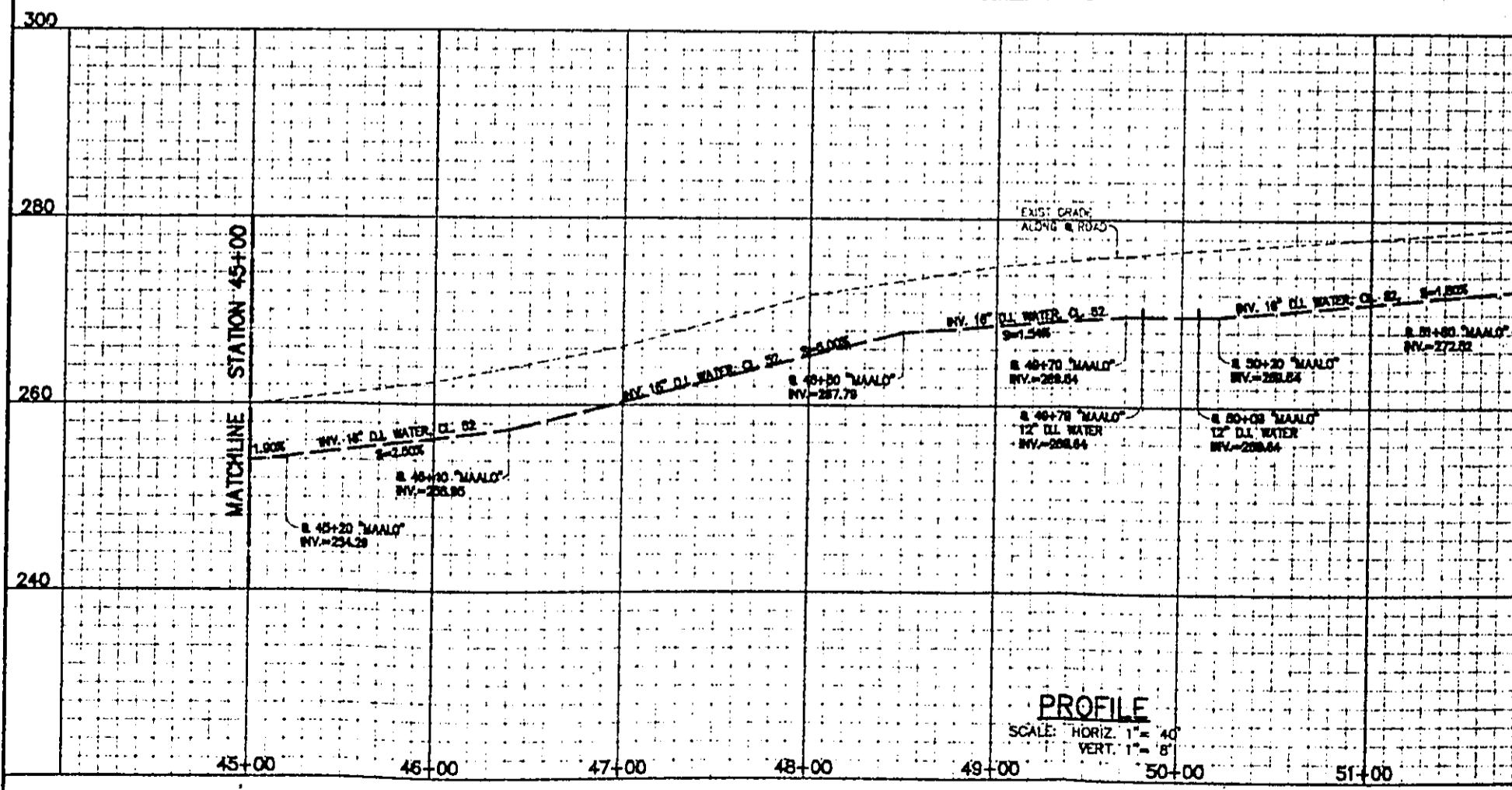
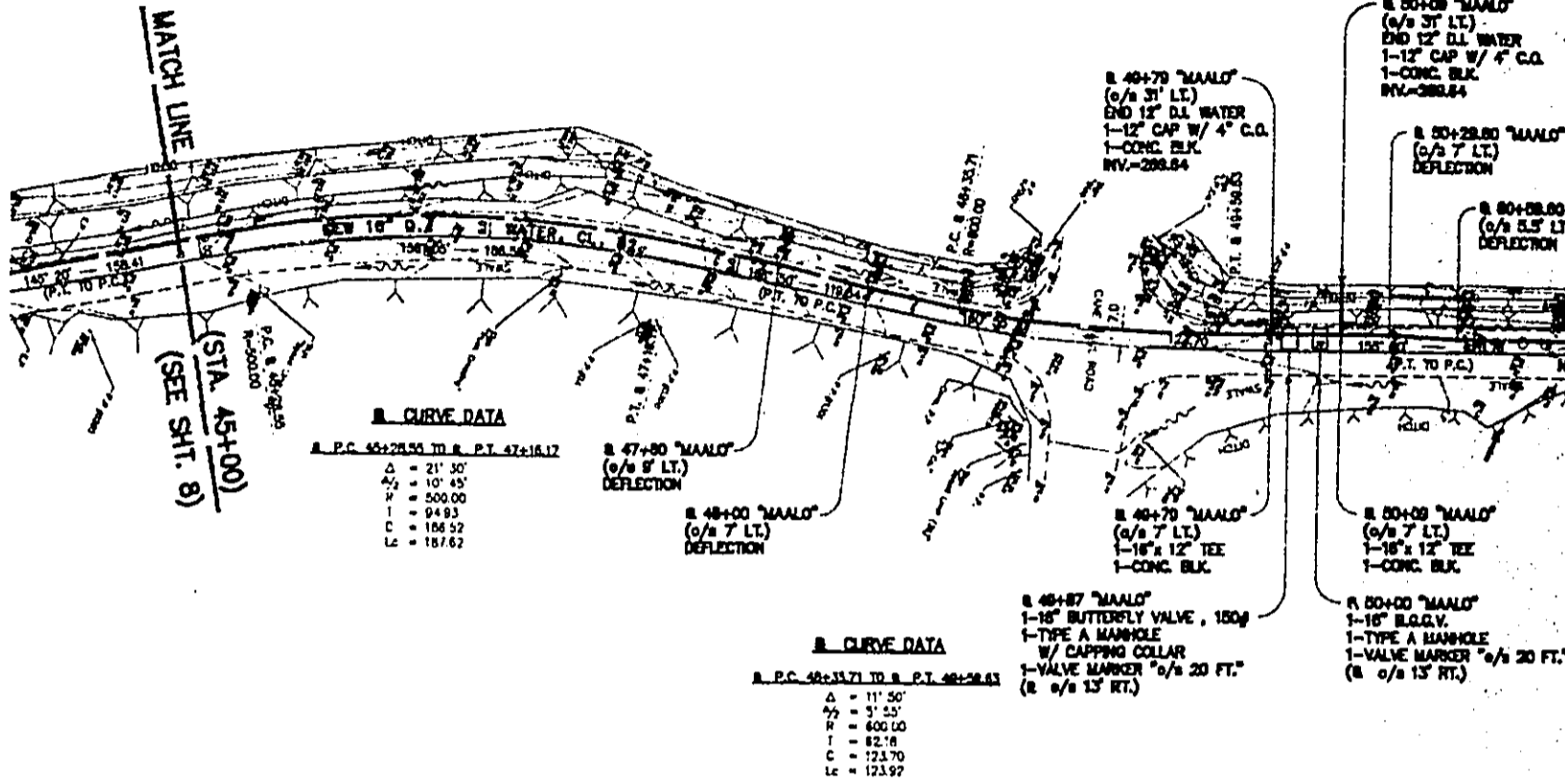
HANAMAULU WATER DEVELOPMENT PROJECT PHASE II
CONNECTING WATERLINE FOR HANAMAULU WELL #3 INCREMENT 1, STA. 0+00 TO 10+84.17 "MAALO"

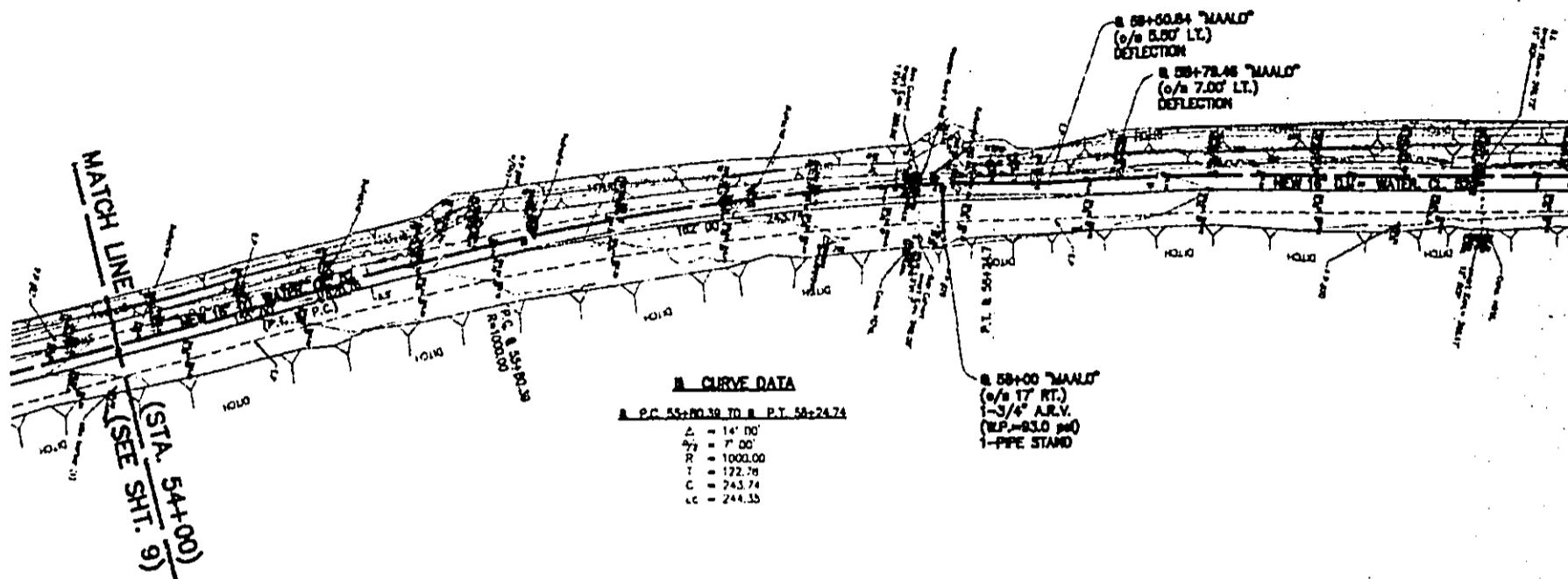
PLAN AND PROFILE
10" DI WATER
ST. STA. 36+00 TO 45+00 "MAALO"

APPROVED:	DATE:	APPROVED:	DATE:

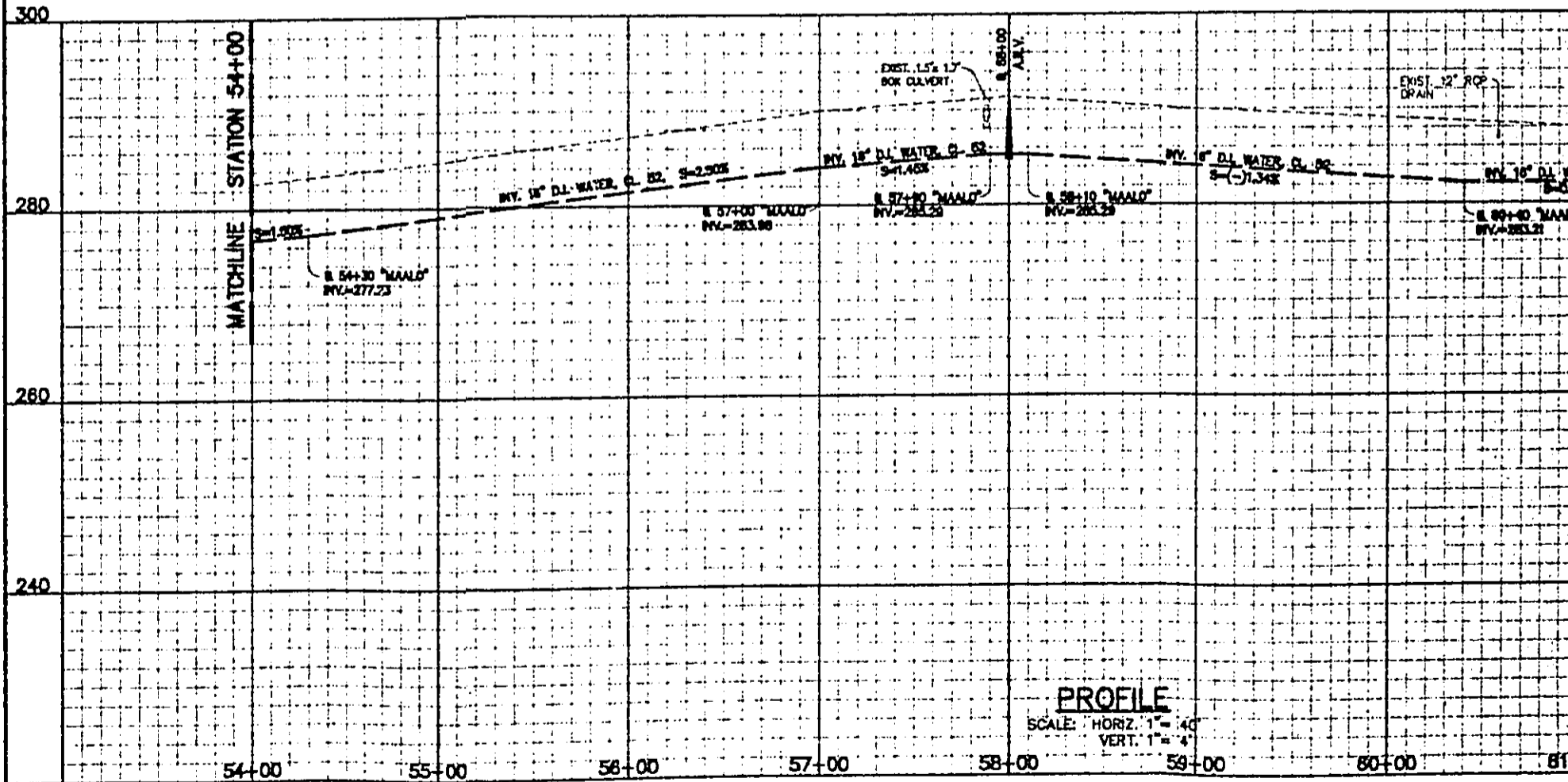
COUNTY ENGINEER, DEPT. OF PUBLIC WORKS
COUNTY OF HAWAII

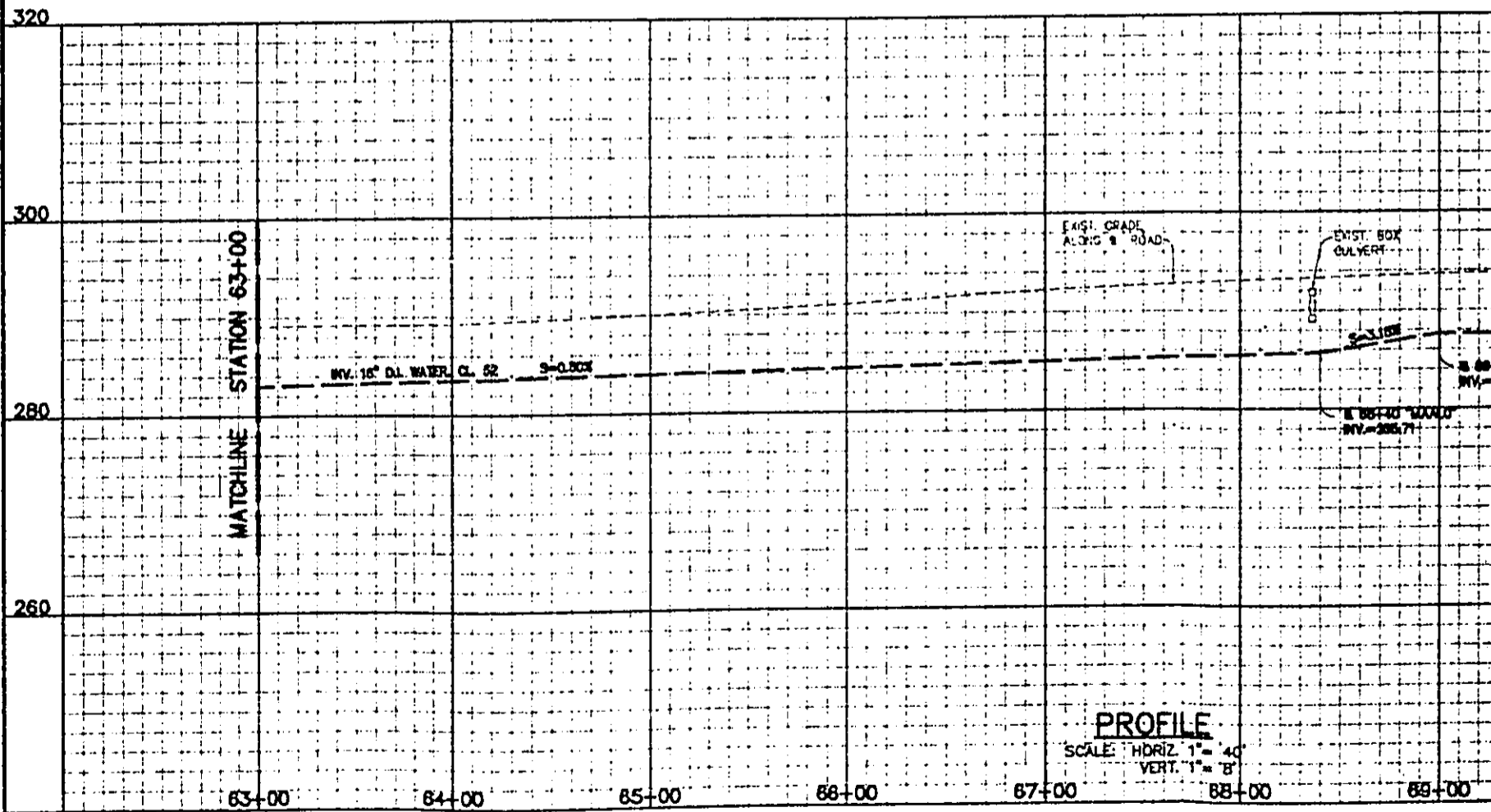
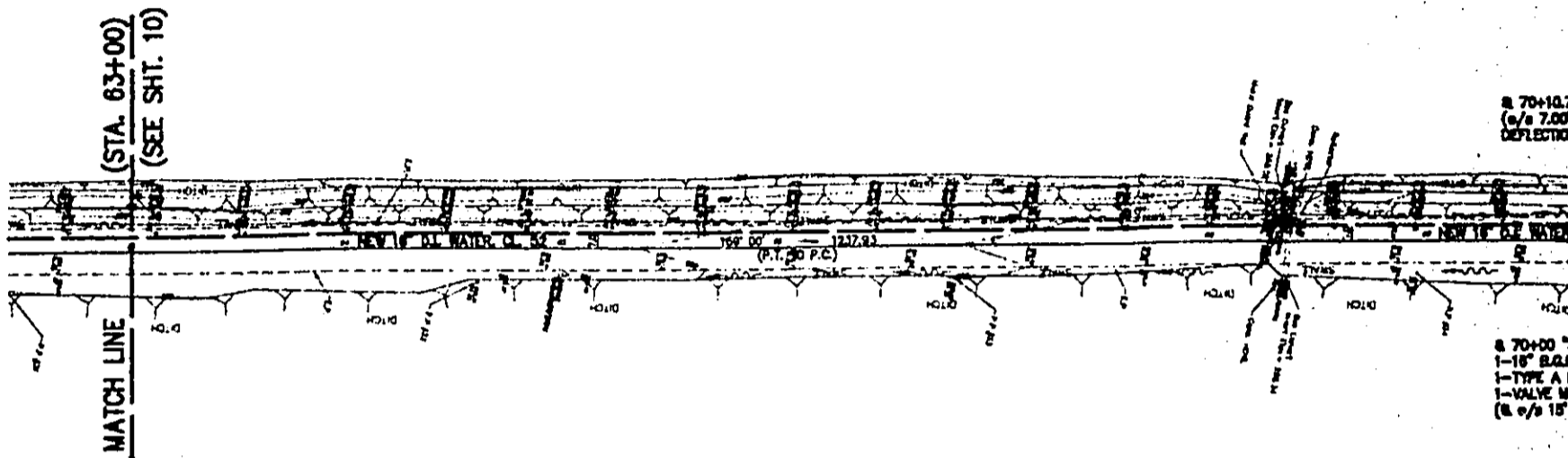
DESIGNED BY: T.S.S. DRAWN BY: T.S.S. CHECKED BY: K.S.U.





PLAN
SCALE: 1" = 40'

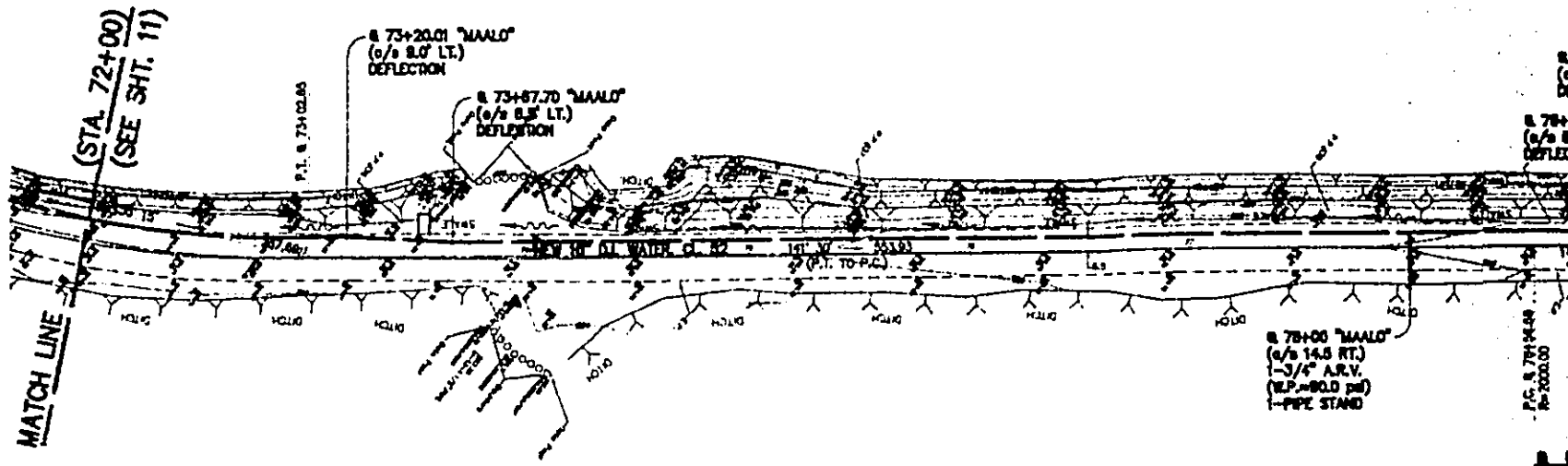




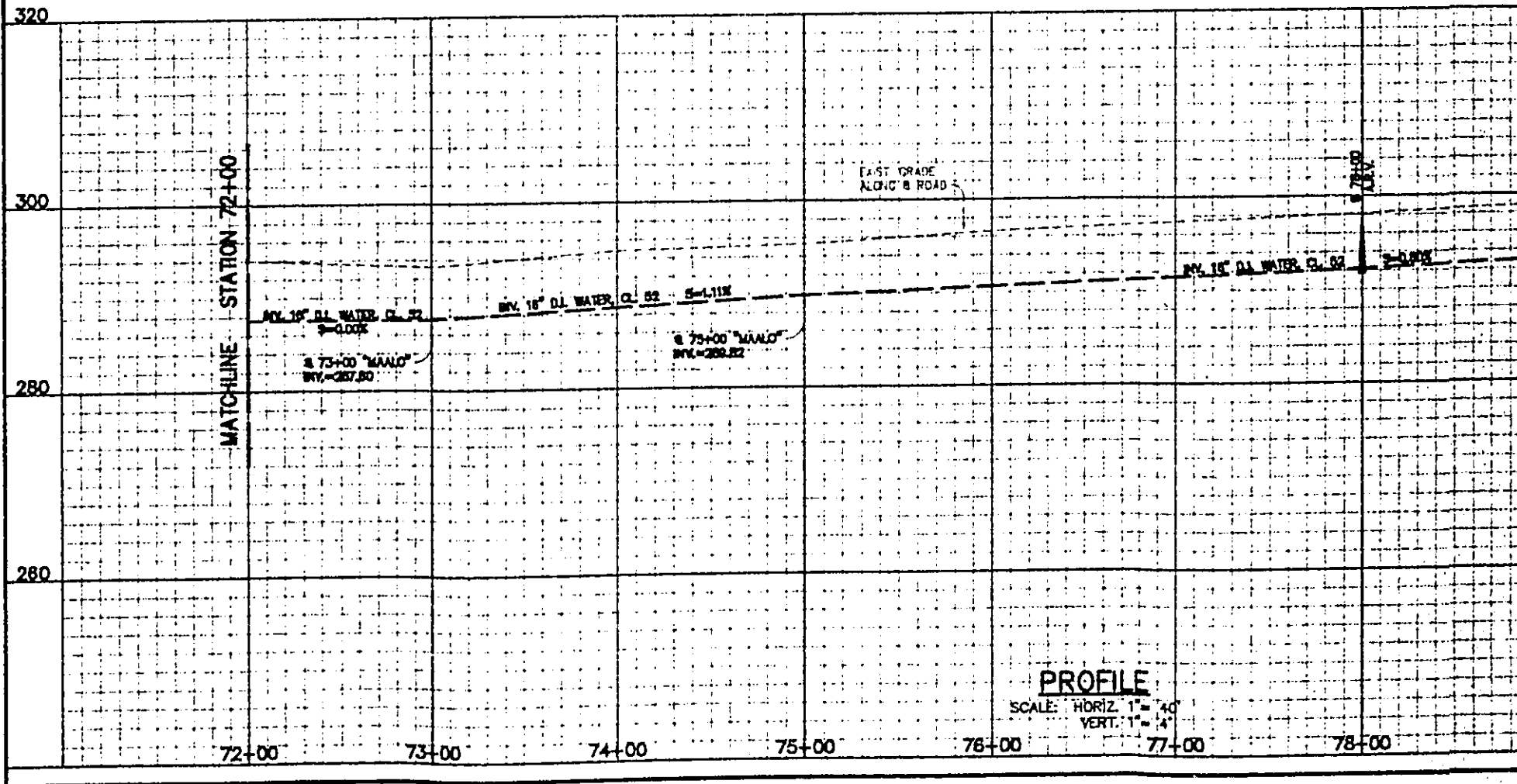
B CURVE DATA

B.P.C. 70+82.67 TO E.P.T. 73+52.65

- A = 27.35'
- B = 137.45'
- X = 500.00'
- Y = 122.30'
- C = 237.68'
- Lc = 239.94'



PLAN
SCALE: 1" = 40'

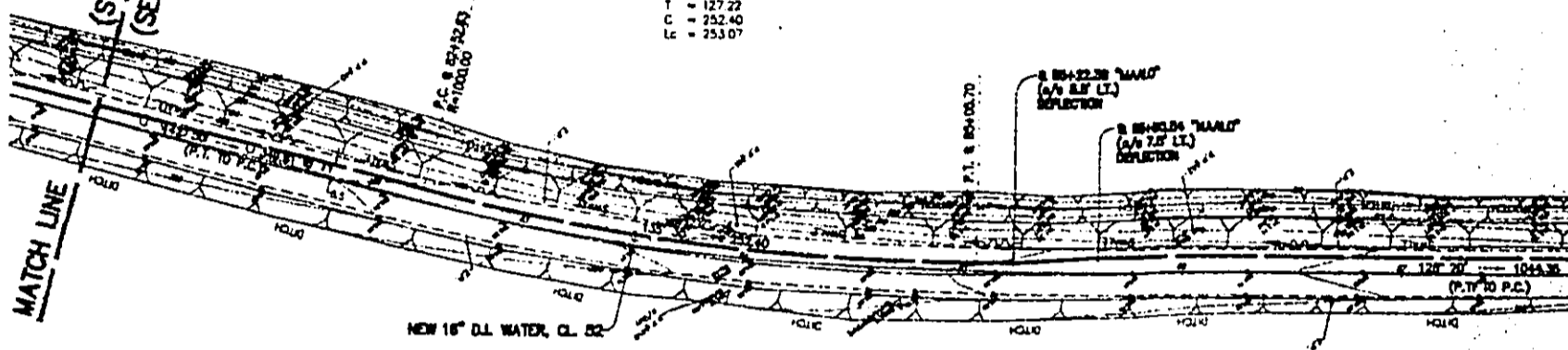


PROFILE
SCALE: HORIZ. 1" = 40'
VERT. 1" = 4'

MATCH LINE
 (STA. 81+00)
 (SEE SH. 12)

B. CURVE DATA

B. P.C. 82+32.83 TO B. P.T. 85+03.70
 Δ = 14° 30'
 Δ/2 = 7° 15'
 R = 1000.00
 T = 127.22
 C = 252.40
 Lc = 253.07



PLAN

SCALE: 1" = 40'

340

320

300

280

MATCHLINE
 STATION 81+00

NEW 16" D.I. WATER, CL. 82. S=-1.30%

B. 83+00 "MAALO"
 INV.=287.42

EXIST. GRADE
 ALONG ROAD

NEW 16" D.I. WATER, CL. 82. S=-1.30%

PROFILE

SCALE: HORIZ. 1" = 40'
 VERT. 1" = 8'

81+00

82+00

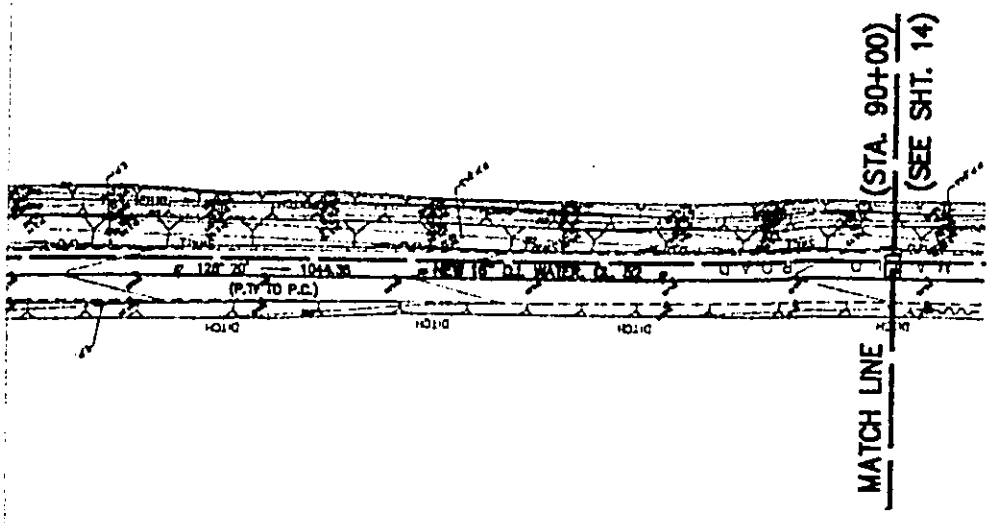
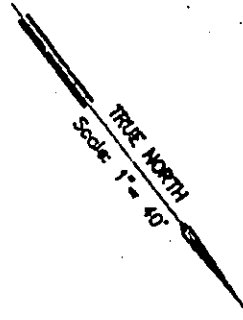
83+00

84+00

85+00

86+00

87+00



- LEGEND**
- 36" DI. 3-FT. COVER
 - 30" DI. 3-FT. COVER
 - 24" DI. 3-FT. COVER
 - 18" DI. 3-FT. COVER
 - 12" DI. 3-FT. COVER
 - 6" DI. 3-FT. COVER
 - 4" DI. 3-FT. COVER
 - 3" DI. 3-FT. COVER
 - 2" DI. 3-FT. COVER
 - 1" DI. 3-FT. COVER
 - 1/2" DI. 3-FT. COVER
 - 1/4" DI. 3-FT. COVER
 - 1/8" DI. 3-FT. COVER
 - 1/16" DI. 3-FT. COVER

340

320

300

280

MATCHLINE STATION 90+00

MATCH LINE

(STA. 90+00)
(SEE SHT. 14)

REVISION	DATE	DESCRIPTION	MADE BY	APPROVED

HANAMAULU WATER DEVELOPMENT PROJECT PHASE II

CONNECTING WATERLINE FOR HANAMAULU WELL #3 INCREMENT 1, STA. 0+00 TO 101+84.17 "MAALO"

PLAN AND PROFILE
16" DI. WATER
@ STA. 81+00 TO 90+00 "MAALO"

APPROVED:	DATE:	APPROVED:	DATE:

COUNTY ENGINEER, DEPT. OF PUBLIC WORKS, COUNTY OF HAWAII

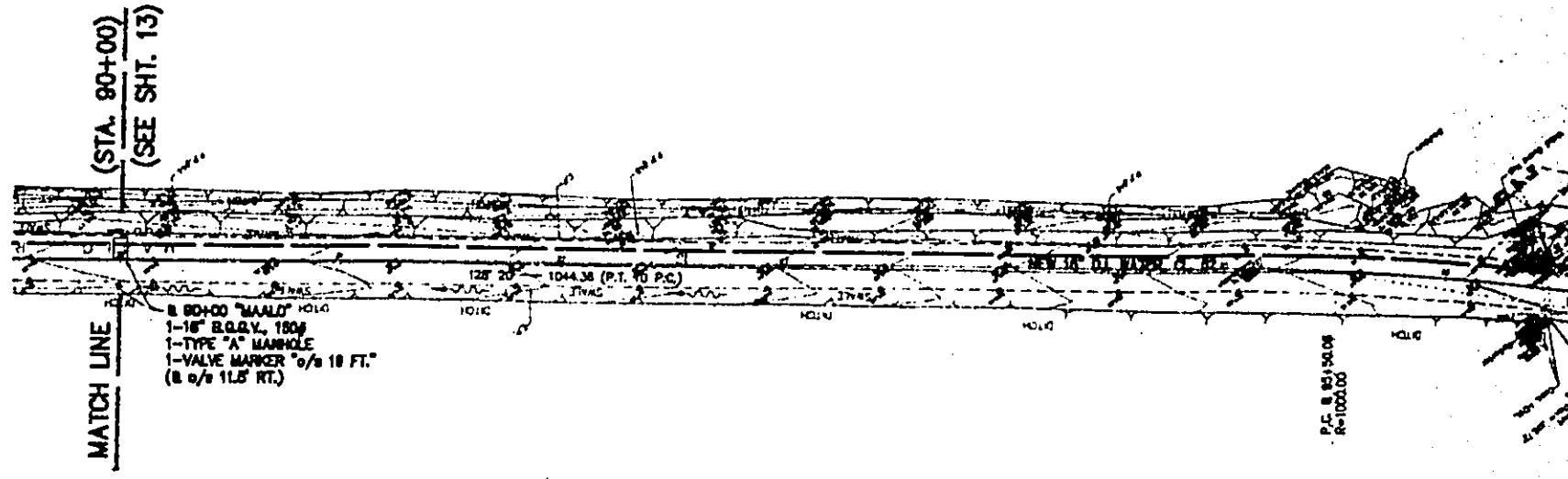
DESIGNED BY: T.S.S. DRAWN BY: T.S.S. CHECKED BY: K.S.U.

87+00 88+00 89+00 90+00



THIS SEAL WAS PREPARED BY ME OR UNDER MY SUPERVISION

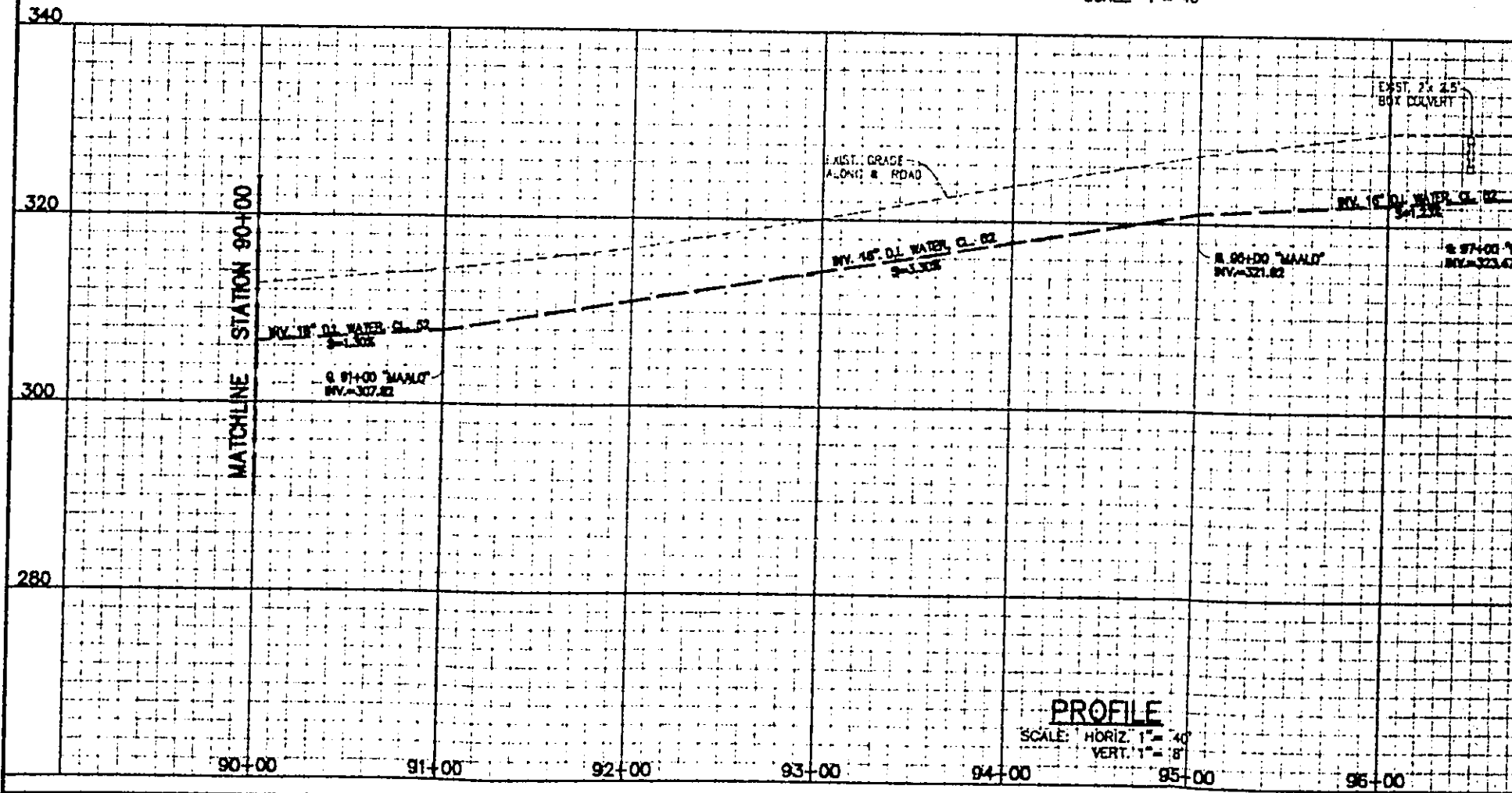
KATHY S. UEMURA
 600 PARK ENGINEERING



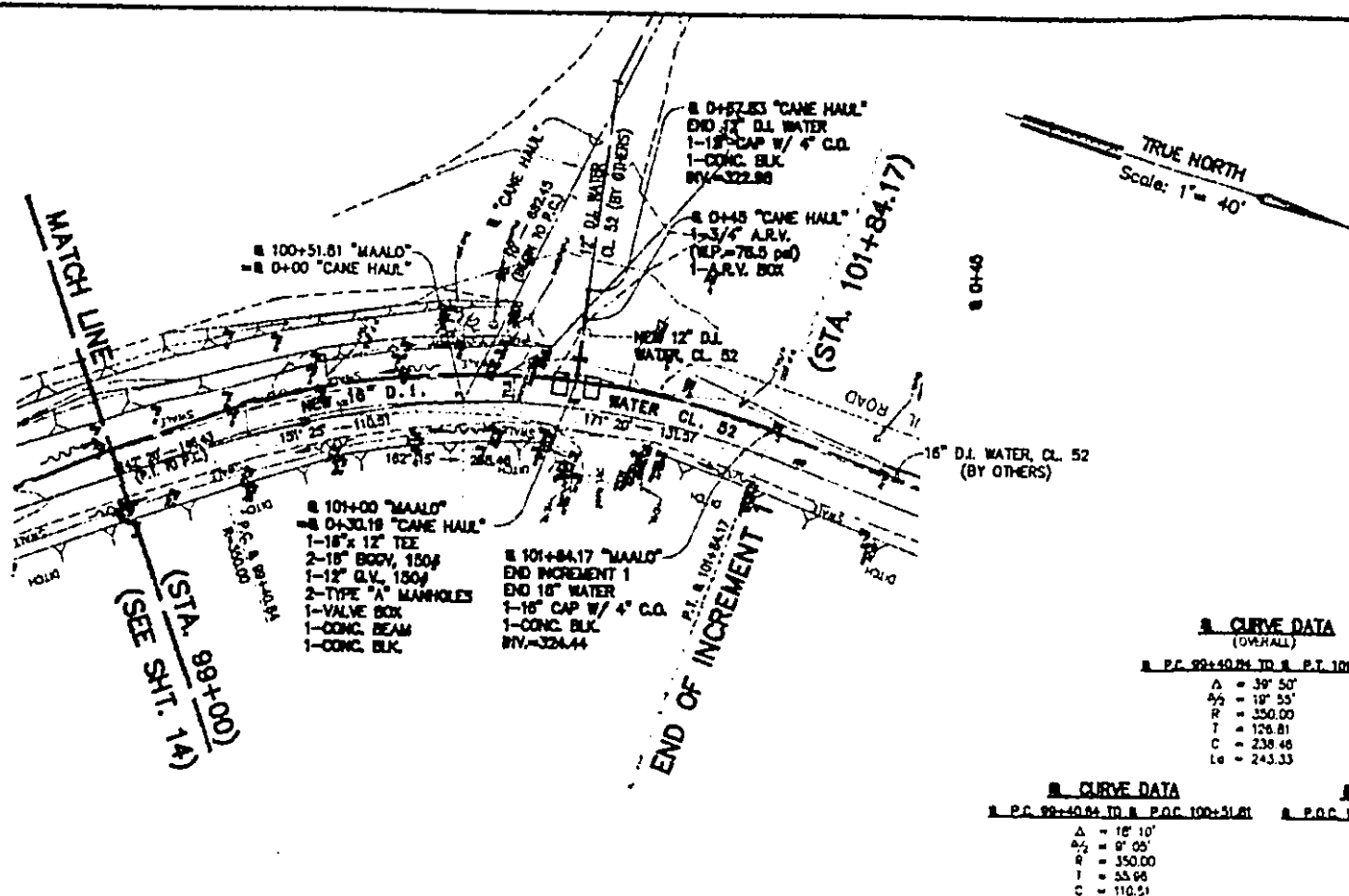
PC CURVE DATA

PC	90+00.00
PT	90+14.00
PI	90+07.00
PE	90+21.00
LC	244.00

PLAN
SCALE: 1" = 40'



PROFILE
SCALE: HORIZ. 1" = 40'
VERT. 1" = 8'



LEGEND

- 12\"/>
- 18\"/>
- CONC. PIPE
- CONC. MANHOLE
- CONC. VALVE BOX
- CONC. BEAM
- CONC. BLK.

PLAN

SCALE: 1" = 40'

3. CURVE DATA (OVERHALL)

3. CURVE DATA
P.C. 99+40.24 TO P.T. 101+84.17

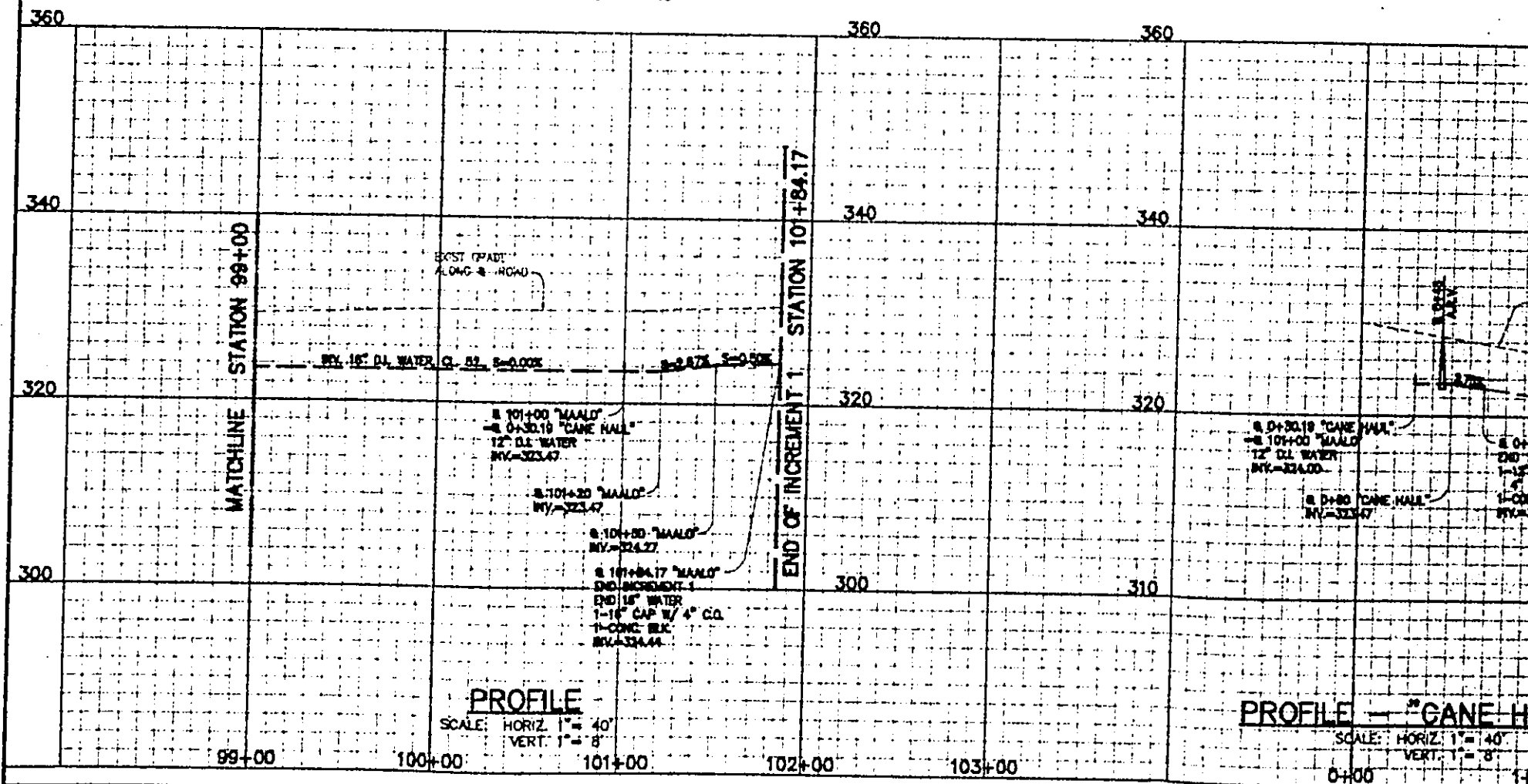
Δ	= 39° 50'
Δ/2	= 19° 55'
R	= 350.00
T	= 126.81
C	= 238.46
Lc	= 243.33

3. CURVE DATA
P.C. 99+40.24 TO P.O.C. 100+51.61

Δ	= 18° 10'
Δ/2	= 9° 05'
R	= 350.00
T	= 55.96
C	= 110.51
Lc	= 110.97

3. CURVE DATA
P.O.C. 100+51.61 TO P.T. 101+84.17

Δ	= 21° 40'
Δ/2	= 10° 50'
R	= 350.00
T	= 66.98
C	= 131.57
Lc	= 132.36



PROFILE

SCALE: HORIZ. 1" = 40'
VERT. 1" = 8'

PROFILE "CANE HALL"

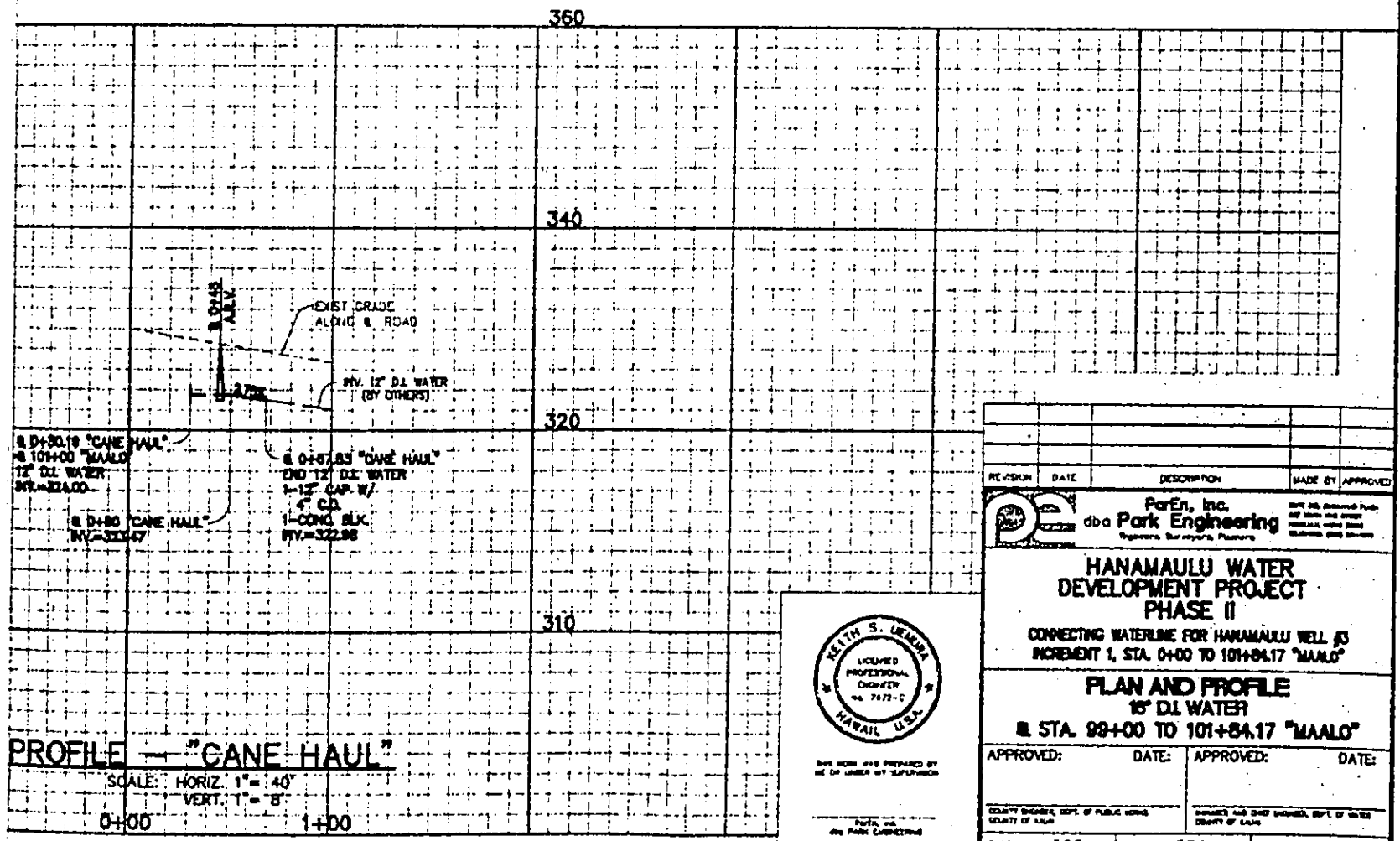
SCALE: HORIZ. 1" = 40'
VERT. 1" = 8'

VE DATA

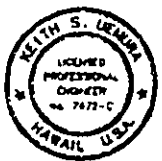
(ALL)
 P.C. P.T. 101+84.17
 7.50'
 7.55'
 10.00'
 18.81'
 38.46'
 13.33'

CURVE DATA

P.O.C. 100+51.81 TO P.T. 101+84.17
 Δ = 21° 40'
 Δ/2 = 10° 50'
 R = 350.06'
 T = 68.98'
 C = 131.57'
 Lc = 132.36'



PROFILE — "CANE HAUL"
 SCALE: HORIZ. 1" = 40'
 VERT. 1" = 8'
 0+00 1+00



THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION
 KEITH S. UEMURA
 CIVIL ENGINEER
 200 PARK CENTER DRIVE
 HONOLULU, HAWAII 96813

REVISION	DATE	DESCRIPTION	MADE BY	APPROVED

ParEn, Inc.
 dba Park Engineering
 ENGINEERS, ARCHITECTS, PLANNERS
 2000 KALANIANA'OLUHANA DRIVE, SUITE 200
 HONOLULU, HAWAII 96815
 PHONE: (808) 943-8888
 FAX: (808) 943-8889

HANAMAULU WATER DEVELOPMENT PROJECT PHASE II
 CONNECTING WATERLINE FOR HANAMAULU WELL #3 INCREMENT 1, STA. 0+00 TO 101+84.17 "MAALO"

PLAN AND PROFILE
 12" DI WATER
 @ STA. 99+00 TO 101+84.17 "MAALO"

APPROVED: _____ DATE: _____ APPROVED: _____ DATE: _____
 COUNTY ENGINEER, DEPT. OF PUBLIC WORKS COUNTY OF HAWAII
 ENGINEER AND DRAFTSMAN, DEPT. OF WATER COUNTY OF HAWAII
 DESIGNED BY T.S.S. DRAWN BY T.S.S. CHECKED BY K.S.U.

APPENDIX C

Hanamaulu Water Development Project – Increment 2

KAUAI COUNTY HOUSING AGENCY
 COUNTY OF KAUAI
 THIS PROJECT IS FUNDED BY THE
 UNITED STATES DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
 COMMUNITY DEVELOPMENT GRANT (CDBG)

HANAMAULU WATER DEVELOPMENT PROJECT PHASE II

Connecting Waterline for Hanamaulu Waterline
 Increment 2, Sta. 101+84.17 (Maalo) to End of Line

TMK: 3-7-POR. 4, 3-8-POR. 2, 3, 6
 HANAMAULU, KAUAI, HAWAII

Prepared By: 
 ParEn, Inc.
 dba Park Engineering
 567 South King Street #300
 Honolulu, Hawaii 96813
 (Contract No. 5700)

INDEX OF DRAWINGS

DESCRIPTION

TITLE SHEET	.....
GENERAL NOTES	.....
MISCELLANEOUS DETAILS	.....
PLAN AND PROFILE	.....
18" D.I. WATER (STA. 101+84.17 TO STA. 106+00 "MAALO")	.....
18" D.I. WATER (STA. 106+00 TO STA. 117+00 "MAALO")	.....
18" D.I. WATER (STA. 117+00 TO STA. 126+00 "MAALO")	.....
18" D.I. WATER (STA. 126+00 TO STA. 135+00 "MAALO")	.....
18" D.I. WATER (STA. 135+00 TO STA. 144+00 "MAALO")	.....
18" D.I. WATER (STA. 144+00 TO STA. 146+84.55 "MAALO" = 0+22.9 "GRAVEL")	.....
18" D.I. WATER (STA. 0+22.9 TO STA. 9+00 "GRAVEL")	.....
18" D.I. WATER (STA. 9+00 TO STA. 18+00 "GRAVEL")	.....
18" D.I. WATER (STA. 18+00 TO STA. 27+00 "GRAVEL")	.....
18" D.I. WATER (STA. 27+00 TO STA. 36+00 "GRAVEL")	.....
18" D.I. WATER (STA. 36+00 TO STA. 45+00 "GRAVEL")	.....
18" D.I. WATER (STA. 45+00 TO STA. 54+00 "GRAVEL")	.....
18" D.I. WATER (STA. 54+00 TO STA. 63+00 "GRAVEL")	.....
18" D.I. WATER (STA. 63+00 TO STA. 70+00 "GRAVEL")	.....
TRAFFIC CONTROL PLAN - PHASE I & II	.....
TRAFFIC CONTROL PLAN - PHASE III & IV	.....
TRAFFIC CONTROL PLAN - PHASE V & VI	.....
TRAFFIC CONTROL PLAN - PHASE VII	.....

APPROVED:

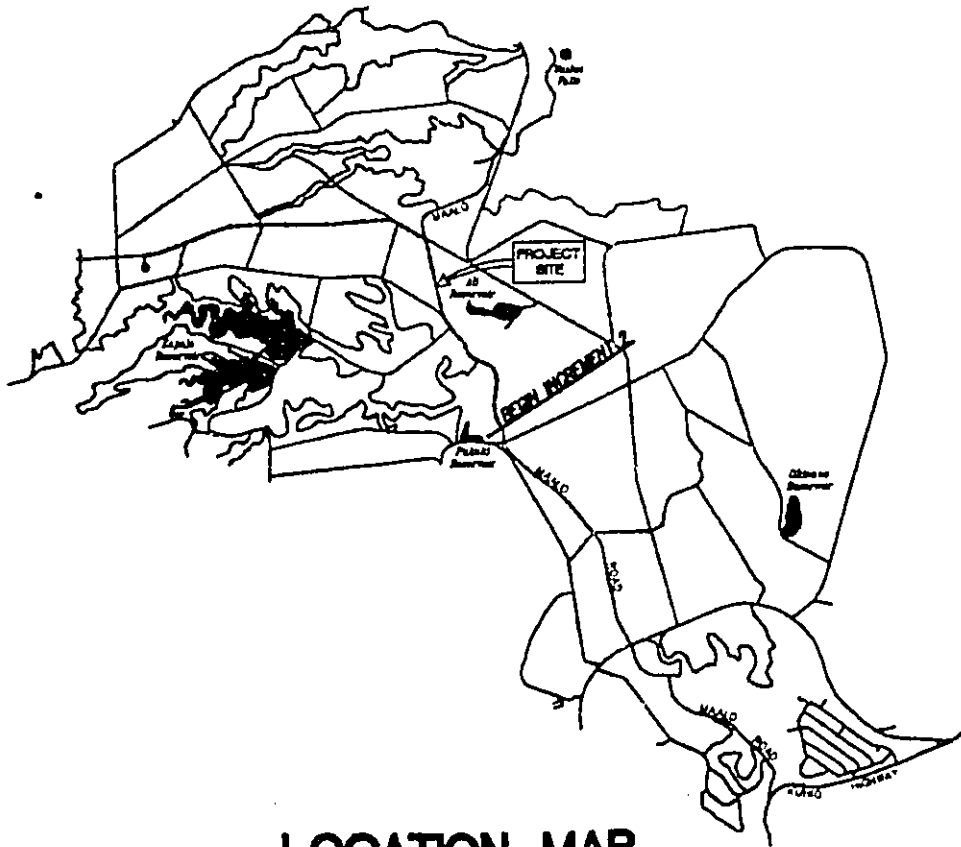
 DIRECTOR OF TRANSPORTATION, DEPARTMENT OF TRANSPORTATION
 STATE OF HAWAII

 COUNTY ENGINEER, DEPARTMENT OF PUBLIC WORKS
 COUNTY OF KAUAI

 MANAGER AND CHIEF ENGINEER, DEPARTMENT OF WATER
 COUNTY OF KAUAI

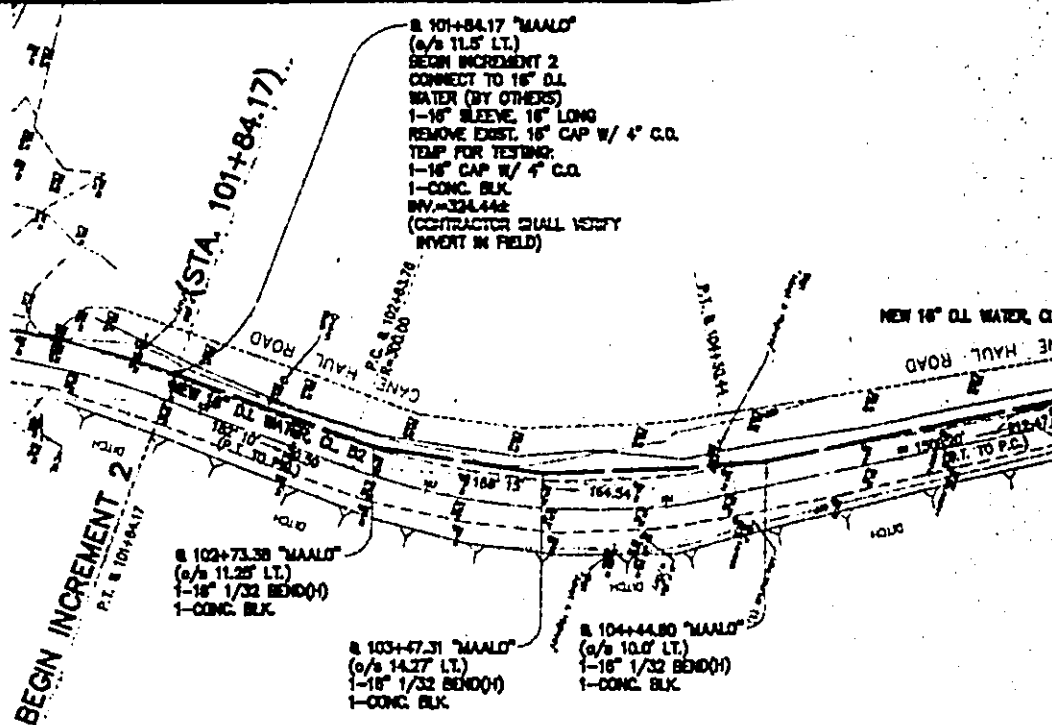
 HOUSING ADMINISTRATOR
 KAUAI COUNTY HOUSING AGENCY

TRUE NORTH
 NOT TO SCALE



LOCATION MAP

NOT TO SCALE

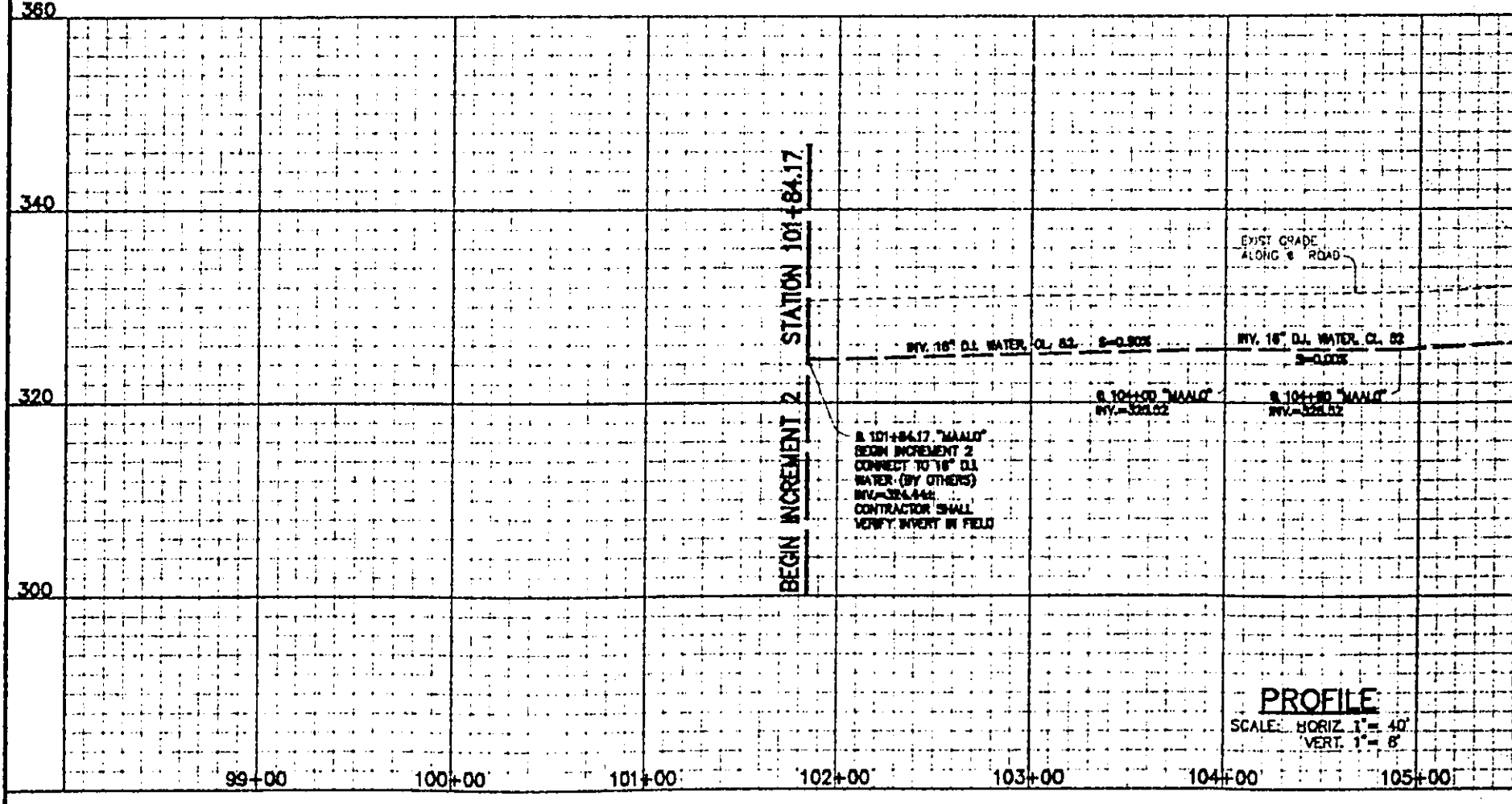


■ CURVE DATA

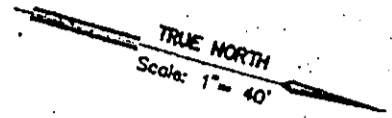
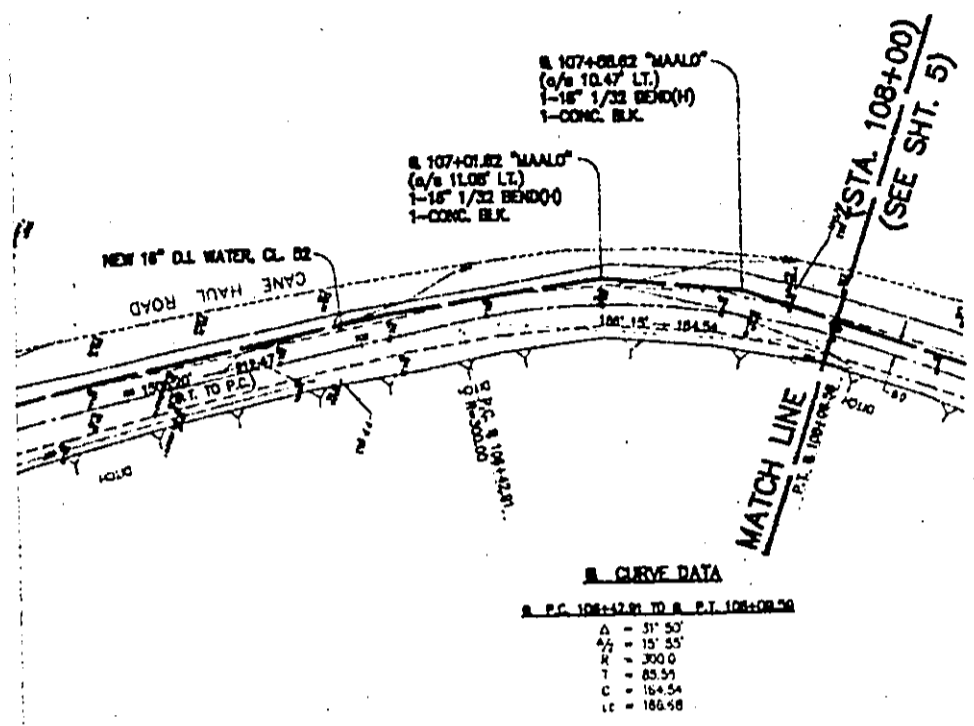
R. P.C. 102+63.78 TO R. P.T. 104+30.44

Δ	= 31° 50'
A ₁	= 15° 05'
A ₂	= 300.00
T	= 93.55
C	= 164.54
Lc	= 166.68

PLAN
SCALE: 1" = 40'



PROFILE
SCALE: HORIZ. 1" = 40'
VERT. 1" = 8'



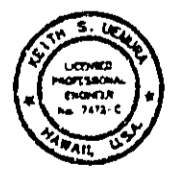
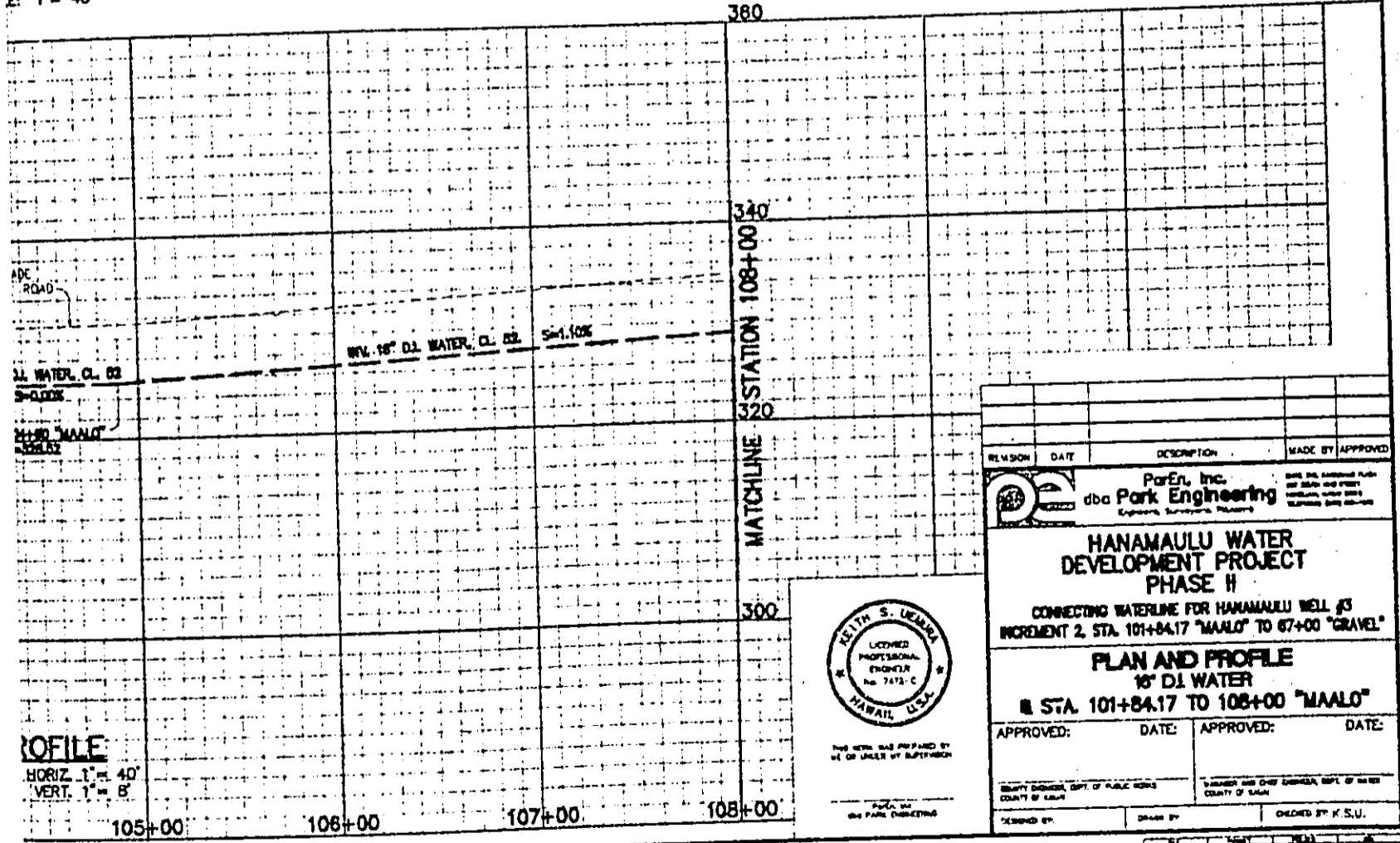
- LEGEND**
- EXST. 2-FT CONTOURS
 - EXST. 10-FT CONTOURS
 - EXST. BANK
 - EXST. SWALE
 - NEW WATER LINE

VERT. CURVE DATA

B. P.C. 106+52.81 TO B. P.T. 108+08.58

Δ	= 31' 50"
L	= 15' 55"
H	= 300.0
T	= 85.51
C	= 184.54
LC	= 186.58

PLAN
E: 1" = 40'

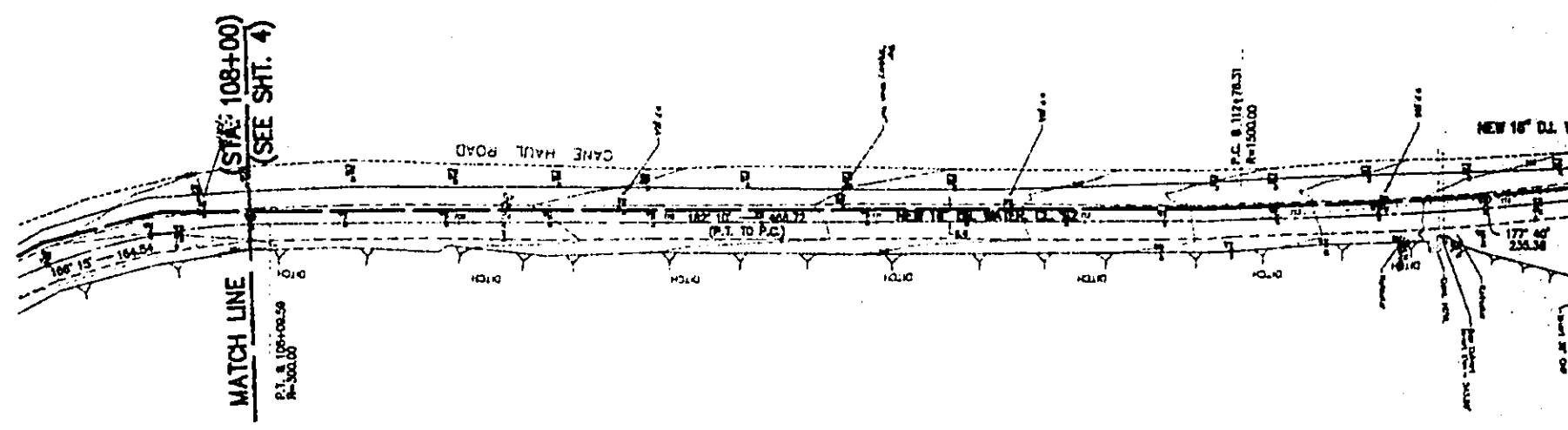


REVISION	DATE	DESCRIPTION	MADE BY	APPROVED
ParEn, Inc. dba Park Engineering <small>Engineers, Surveyors, Planners</small>				
HANAMAULU WATER DEVELOPMENT PROJECT PHASE II CONNECTING WATERLINE FOR HANAMAULU WELL #3 INCREMENT 2, STA. 101+84.17 "MAALO" TO 67+00 "GRAVEL"				
PLAN AND PROFILE 16" DI WATER STA. 101+84.17 TO 108+00 "MAALO"				
APPROVED:	DATE:	APPROVED:	DATE:	
<small>SEAL OF ENGINEER, DEPT. OF PUBLIC WORKS, COUNTY OF HAWAII</small>		<small>SEAL OF CIVIL ENGINEER, DEPT. OF PUBLIC WORKS, COUNTY OF HAWAII</small>		
DESIGNED BY:	DRAWN BY:	CHECKED BY: K.S.U.		

TRUE NORTH
Scale: 1" = 40'

1. CURVE DATA

R. PC 112+78.31 TO R. PT. 114+11.21
 $\Delta = 9' 00"$
 $\Delta/2 = 4' 30"$
 $R = 1500.00$
 $T = 118.65$
 $C = 235.38$
 $LC = 235.62$

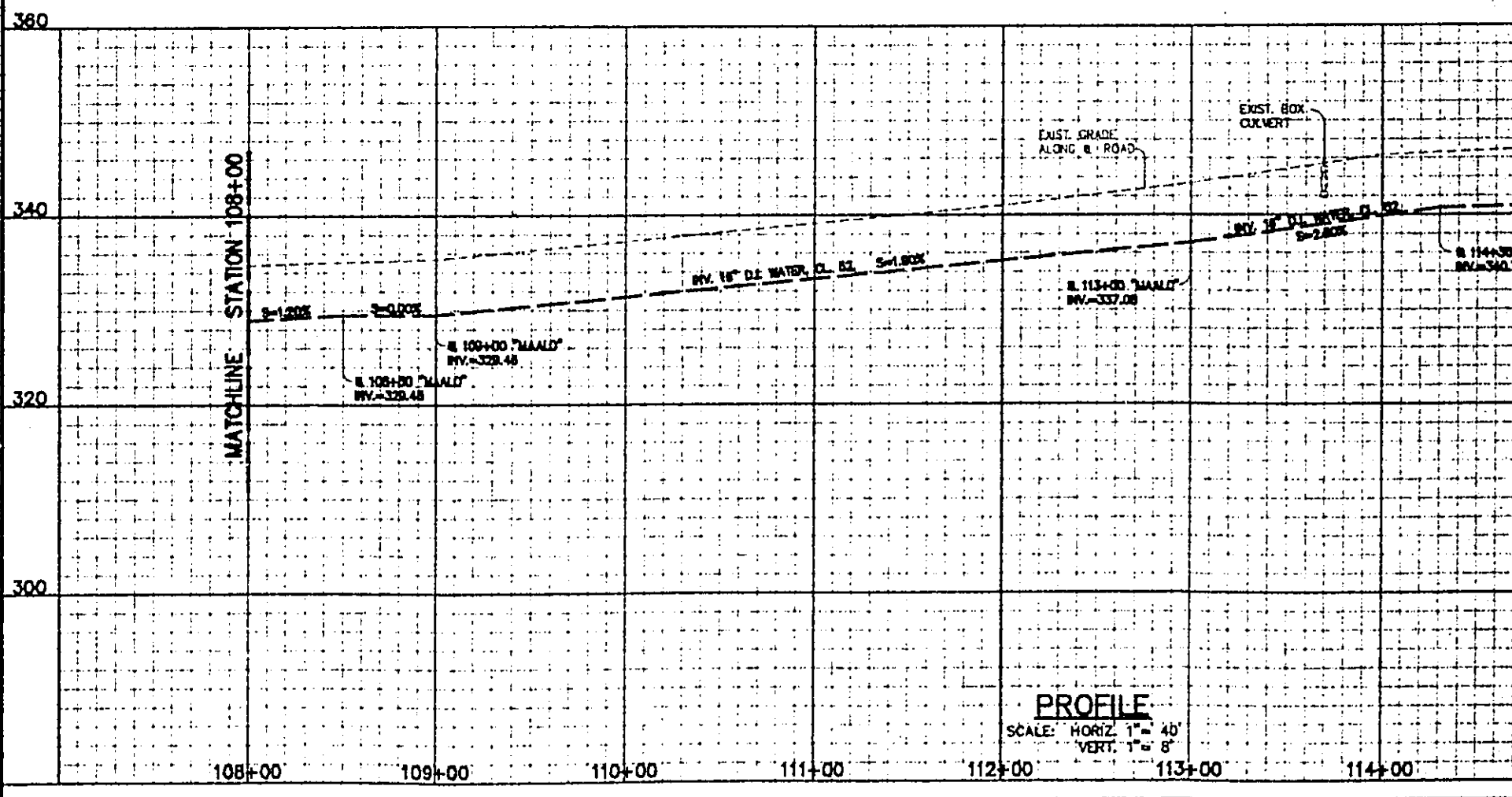


2. CURVE DATA

R. PC 108+42.91 TO R. PT. 108+09.58
 $\Delta = 31' 55"$
 $\Delta/2 = 15' 58"$
 $R = 300.00$
 $T = 85.55$
 $C = 164.54$
 $LC = 168.68$

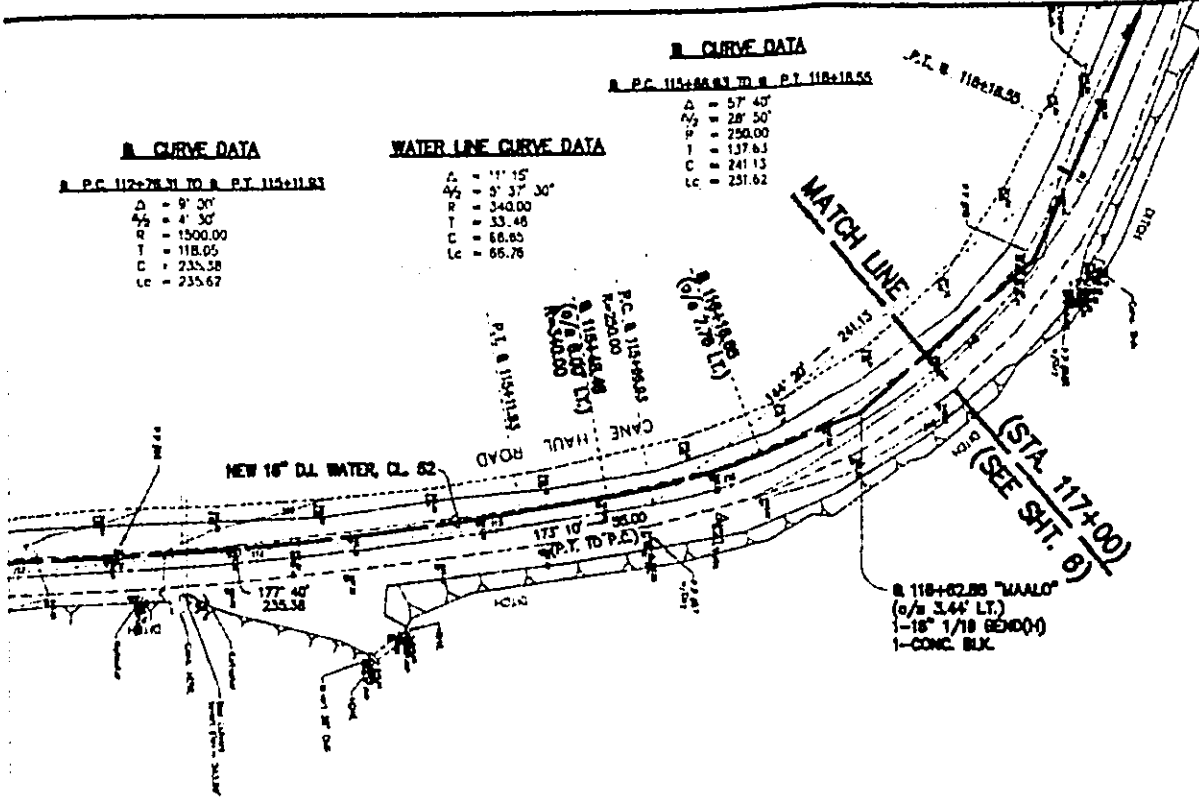
PLAN

SCALE: 1" = 40'



PROFILE

SCALE: HORIZ. 1" = 40'
 VERT. 1" = 8'

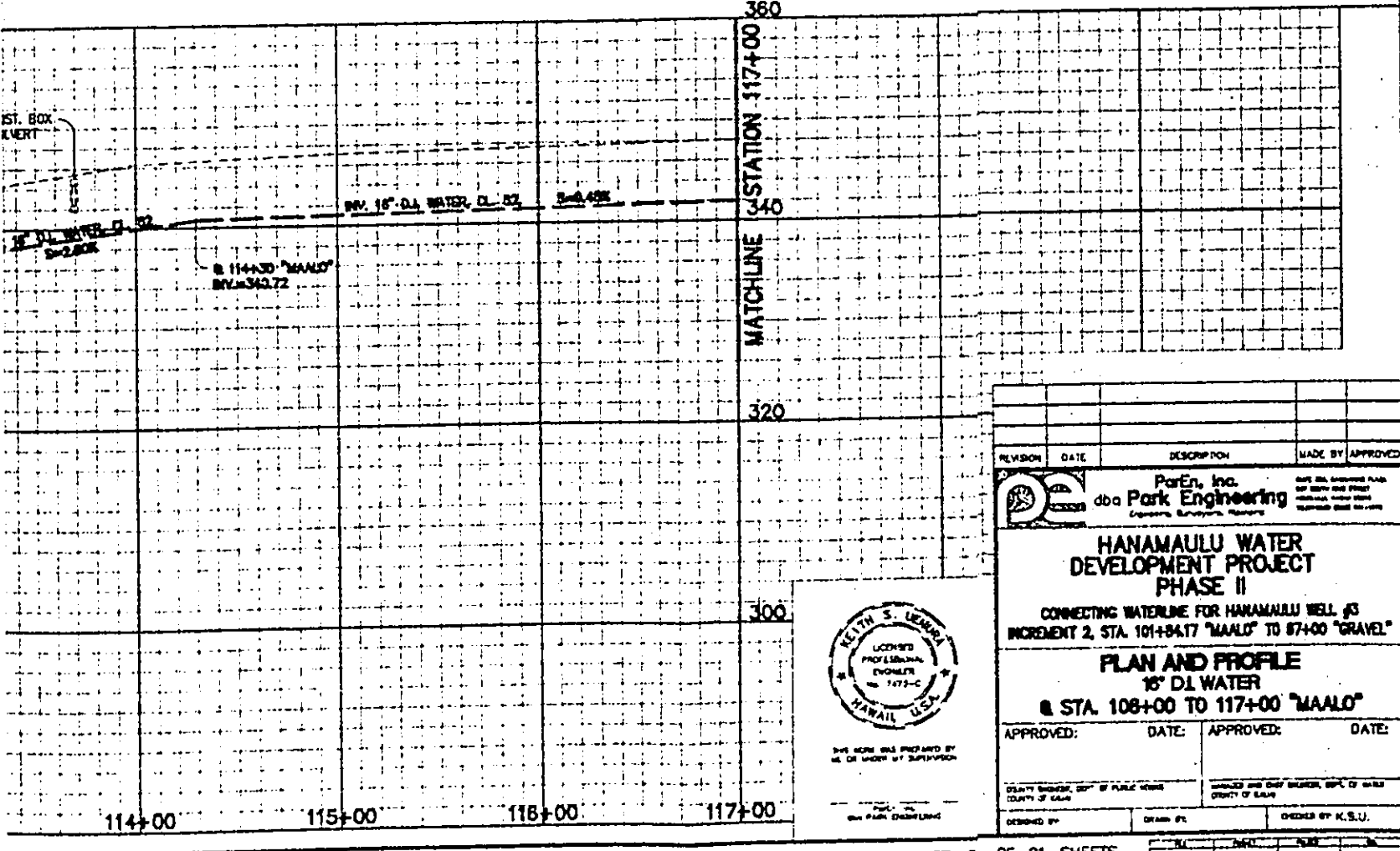


A CURVE DATA
 P.C. 112+78.51 TO P.T. 115+11.81
 Δ = 9° 30'
 Δ/2 = 4° 30'
 R = 1500.00
 T = 118.05
 C = 235.58
 Lc = 235.67

WATER LINE CURVE DATA
 Δ = 11° 15'
 Δ/2 = 5° 37' 30"
 R = 340.00
 T = 33.46
 C = 66.65
 Lc = 66.76

B CURVE DATA
 P.C. 114+86.83 TO P.T. 118+18.55
 Δ = 57° 45'
 Δ/2 = 28° 52'
 R = 250.00
 T = 137.63
 C = 241.13
 Lc = 231.62

LEGEND
 --- EXST. 2-FT CONTOURS
 --- EXST. 10-FT CONTOURS
 --- EXST. BANK
 --- EXST. SWALE
 --- NEW WATER LINE



REVISION	DATE	DESCRIPTION	MADE BY	APPROVED

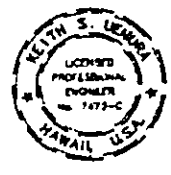
ParEn, Inc.
 dba Park Engineering
 Engineers, Surveyors, Planners

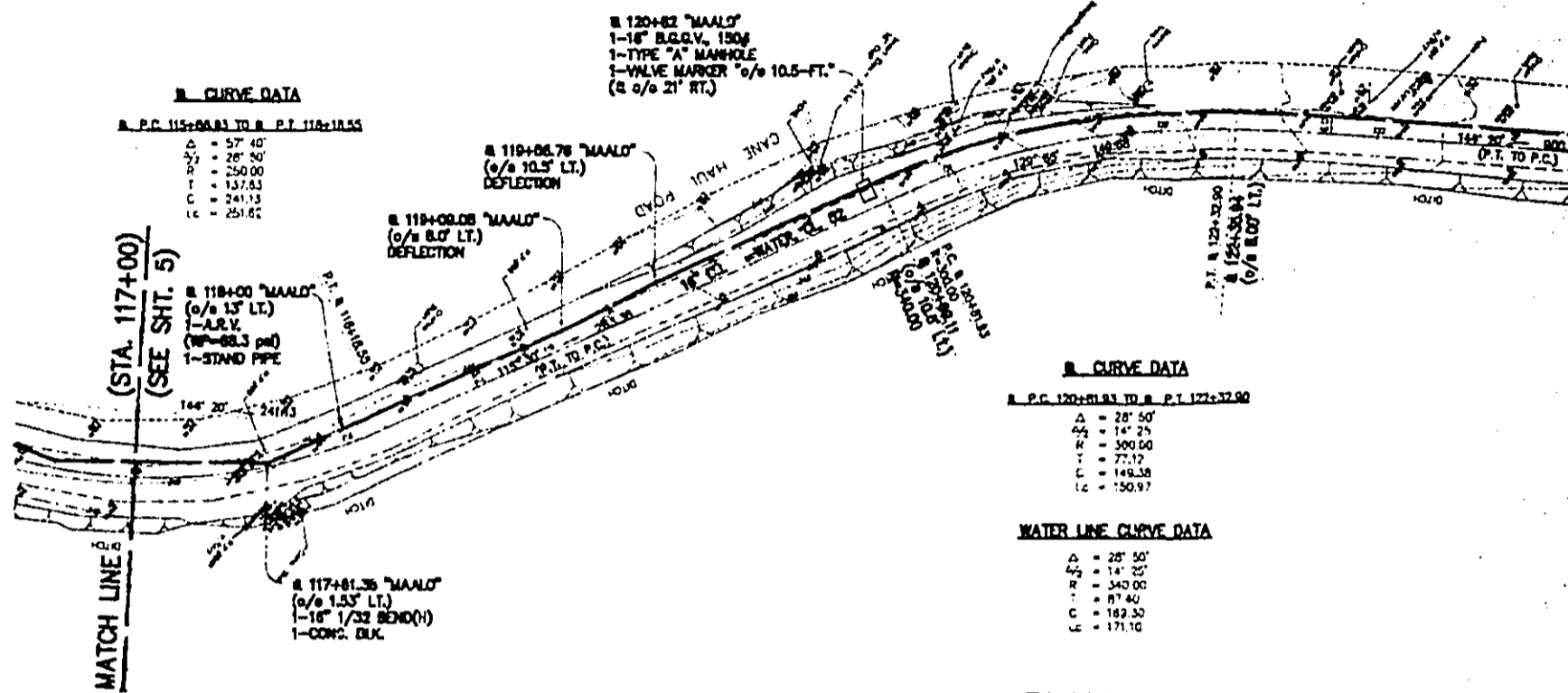
HANAMAULU WATER DEVELOPMENT PROJECT PHASE II
 CONNECTING WATERLINE FOR HANAMAULU WELL #3 INCREMENT 2, STA. 101+84.17 "MAALO" TO 87+00 "GRAVEL"

PLAN AND PROFILE
 16" DI WATER
 @ STA. 108+00 TO 117+00 "MAALO"

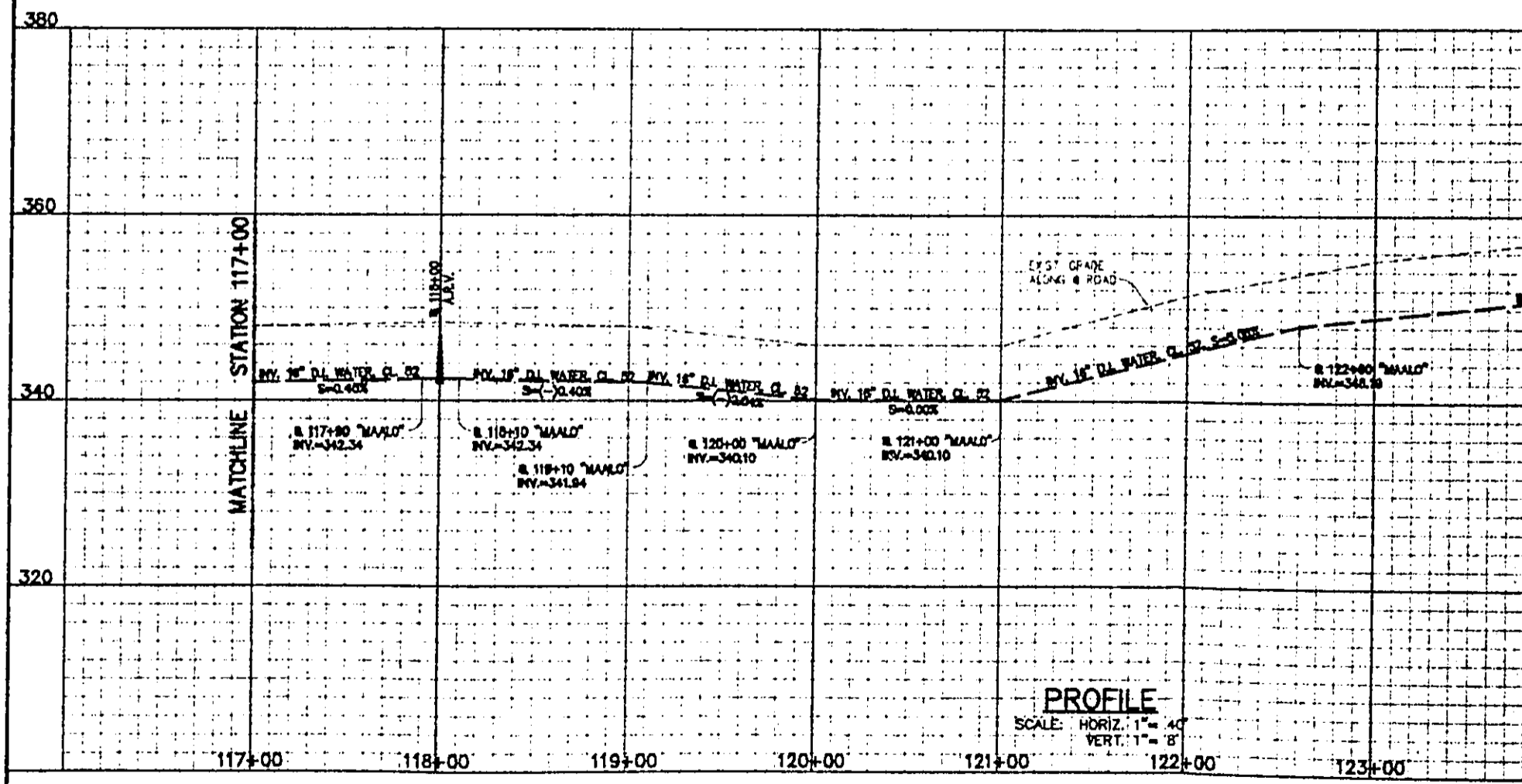
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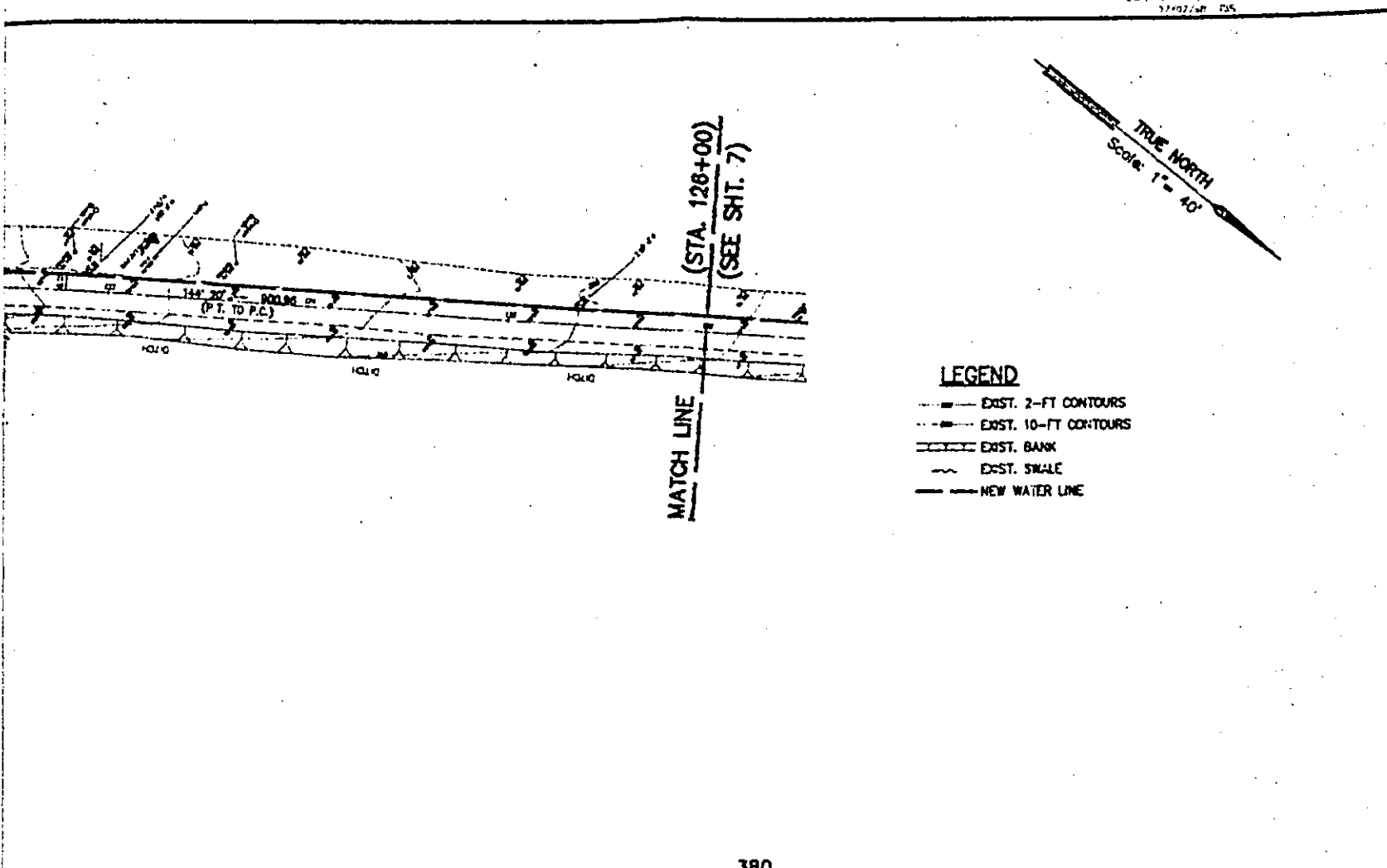
DESIGNED BY: _____ DRAWN BY: _____ CHECKED BY: K.S.U.



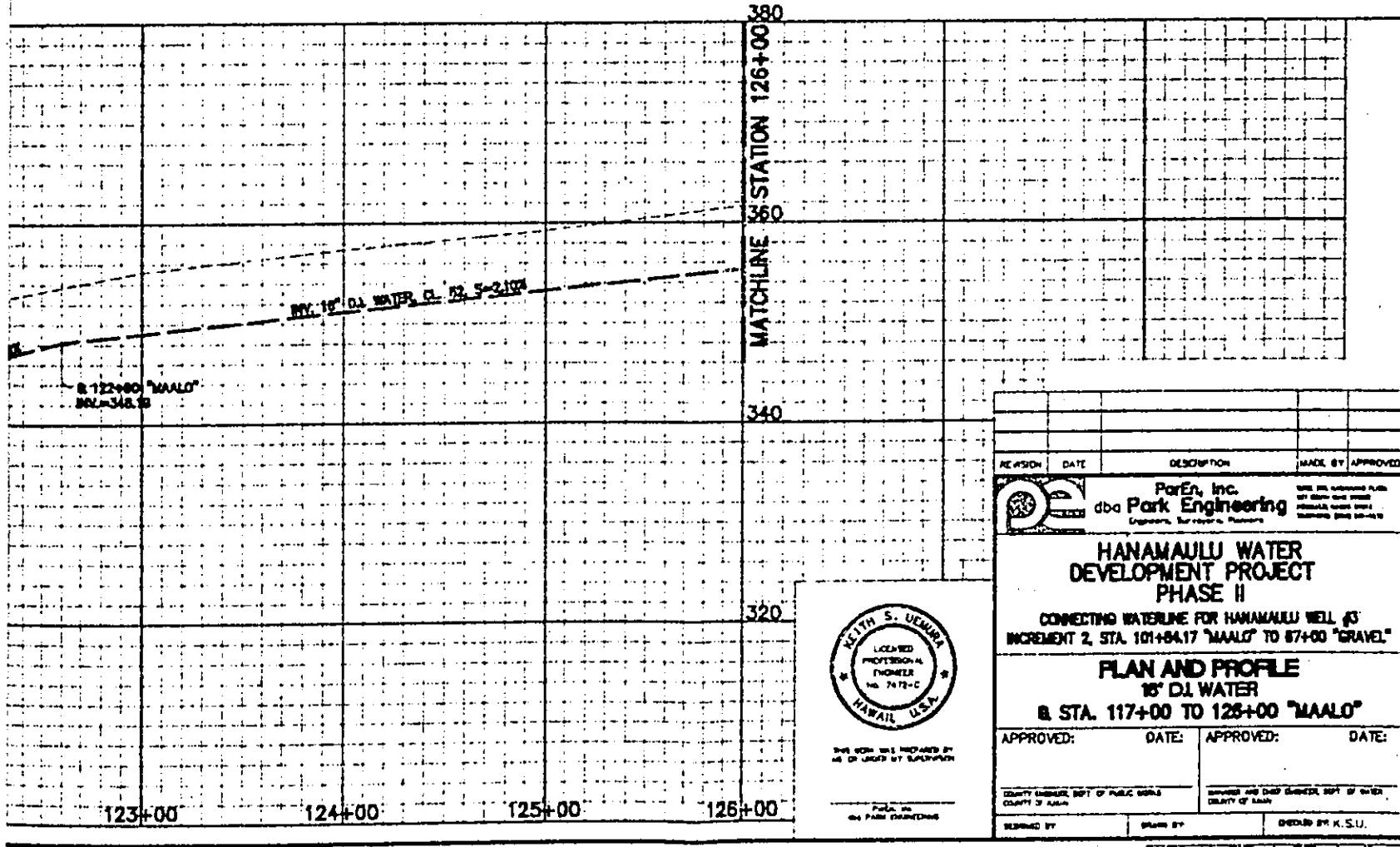


PLAN
 SCALE: 1" = 40'

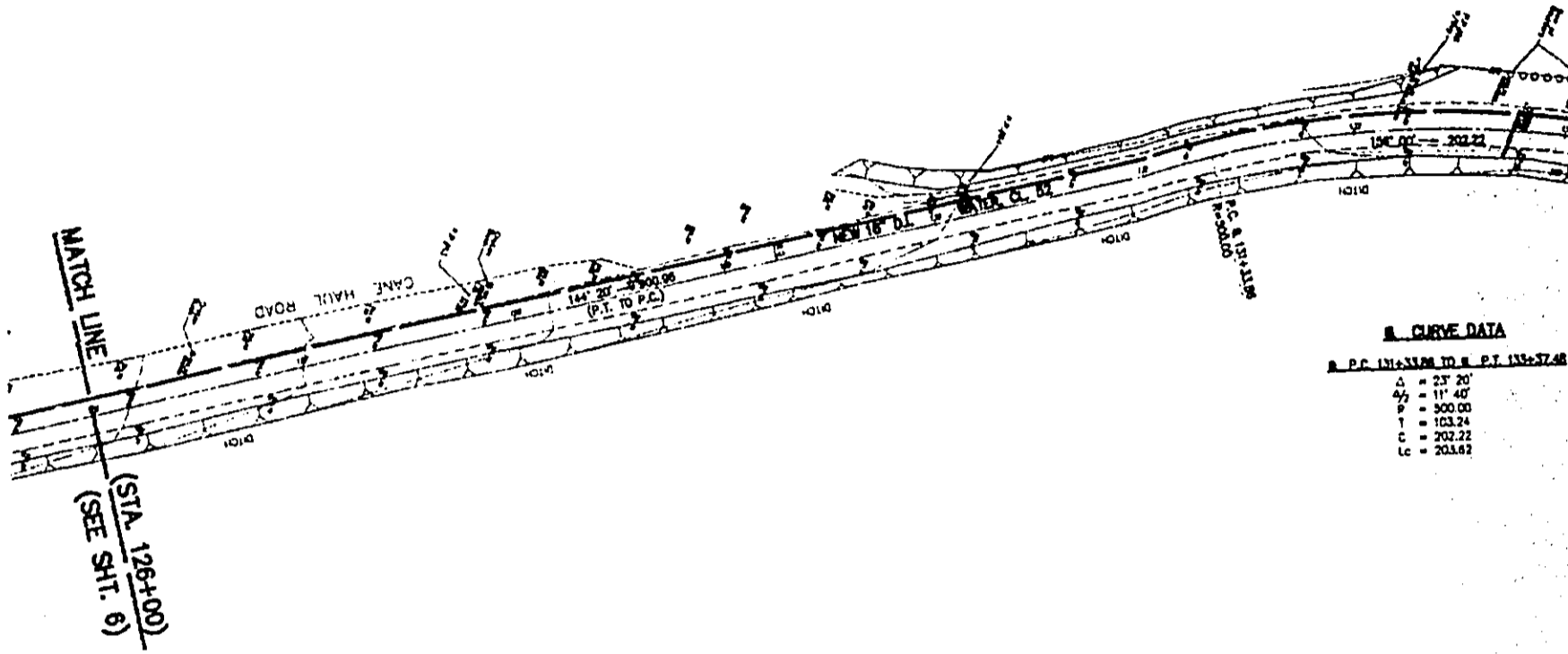




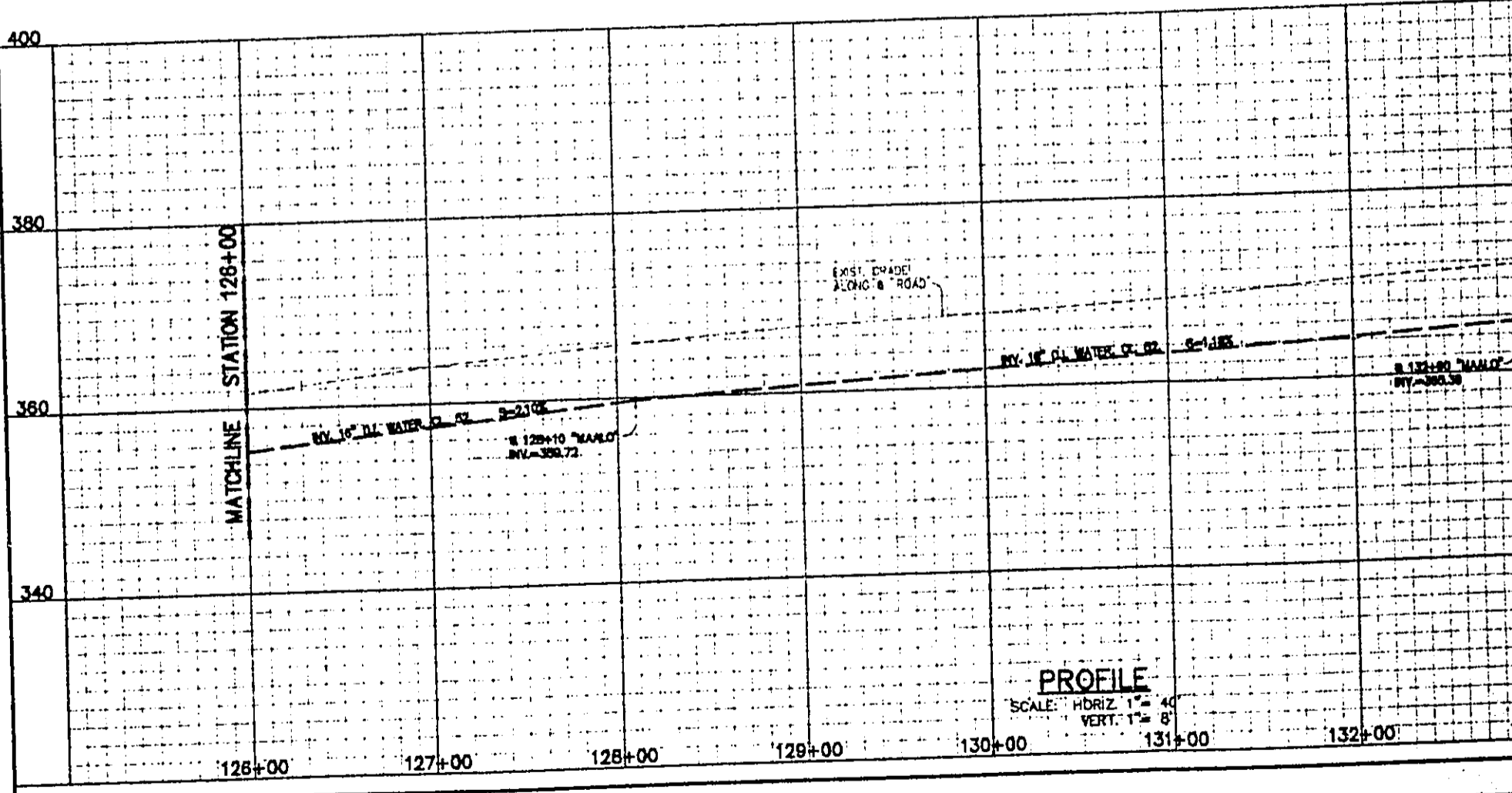
- LEGEND**
- EXIST. 2-FT CONTOURS
 - EXIST. 10-FT CONTOURS
 - EXIST. BANK
 - EXIST. SWALE
 - NEW WATER LINE



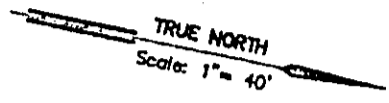
REVISION	DATE	DESCRIPTION	MADE BY	APPROVED
Park Engineering, Inc. dba Park Engineering Engineers, Surveyors, Planners			WE WILL ADVISE YOU BY MAIL ONE WEEK BEFORE OUR NEXT MEETING.	
HANAMAULU WATER DEVELOPMENT PROJECT PHASE II CONNECTING WATERLINE FOR HANAMAULU WELL #3 INCREMENT 2, STA. 101+84.17 "MAALO" TO 87+00 "GRAVEL"				
PLAN AND PROFILE 15" DI WATER B. STA. 117+00 TO 126+00 "MAALO"				
APPROVED:	DATE:	APPROVED:	DATE:	
IDENTIFY ENGINEER, COPY OF PUBLIC WORKS DEPARTMENT OF HAWAII		SIGNATURE AND DATE ENGINEER, COPY OF HAWAII COUNTY OF HAWAII		
DESIGNED BY	DRAWN BY	CHECKED BY K.S.U.		



PLAN
SCALE: 1" = 40'



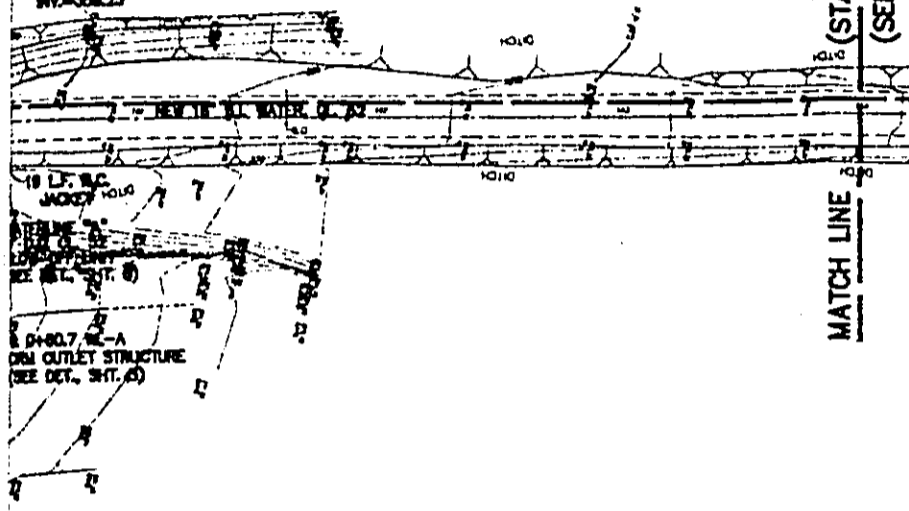
PROFILE
SCALE: HORIZ. 1" = 40'
VERT. 1" = 8'



101+28.20 "MAALO"
1-15" 1/8 BEND(BV) 7
INV.-353.50

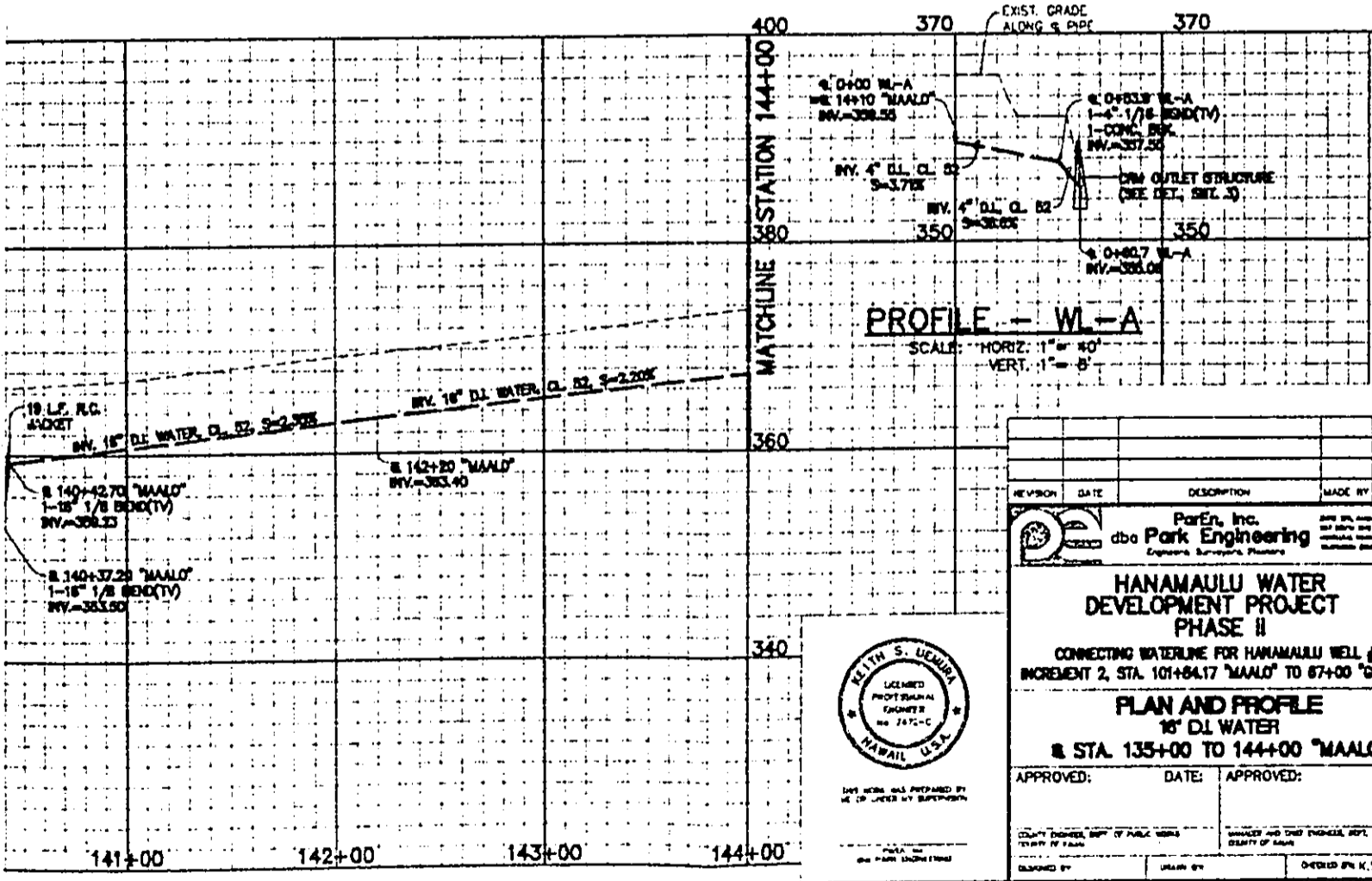
140+37.20 "MAALO"
1-15" 1/8 BEND(BV) 7
INV.-353.50

140+42.70 "MAALO"
1-15" 1/8 BEND(TV) 7
INV.-353.23



LEGEND

- - - - - EXIST. 2-FT CONTOURS
- - - - - EXIST. 10-FT CONTOURS
- ===== EXIST. BANK
- ~~~~~ EXIST. SWALE
- NEW WATER LINE



REVISION	DATE	DESCRIPTION	MADE BY	APPROVED

ParEn, Inc.
dba **Park Engineering**
Engineers, Surveyors, Planners

HANAMAULU WATER DEVELOPMENT PHASE II
CONNECTING WATERLINE FOR HANAMAULU WELL #3
INCREMENT 2, STA. 101+84.17 "MAALO" TO 87+00 "GRAVEL"

PLAN AND PROFILE
15" DI WATER
15" DI WATER
15" DI WATER

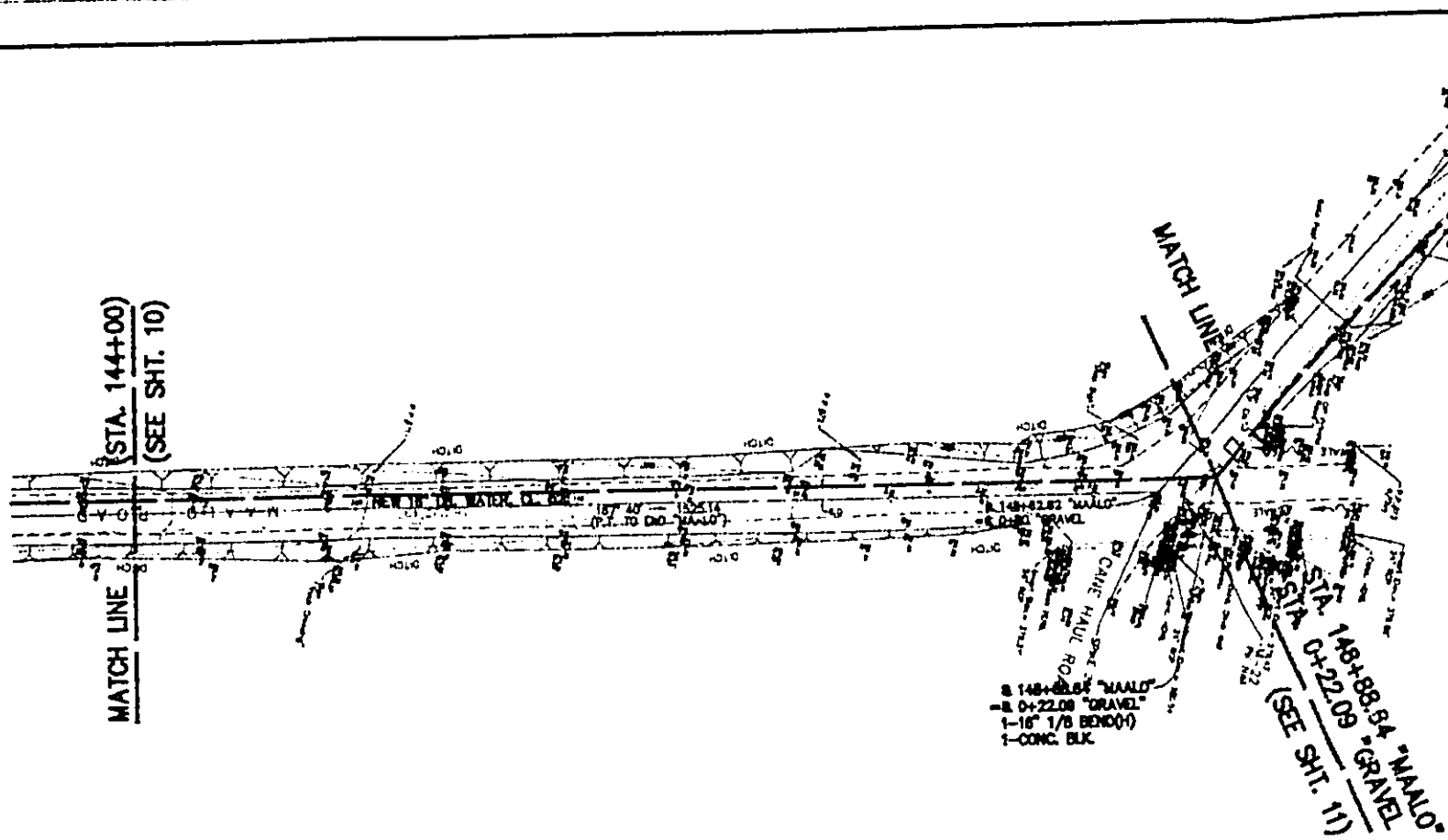
APPROVED: _____ DATE: _____ APPROVED: _____ DATE: _____

COUNTY ENGINEER, DEPT. OF PUBLIC WORKS
HONOLULU, HAWAII

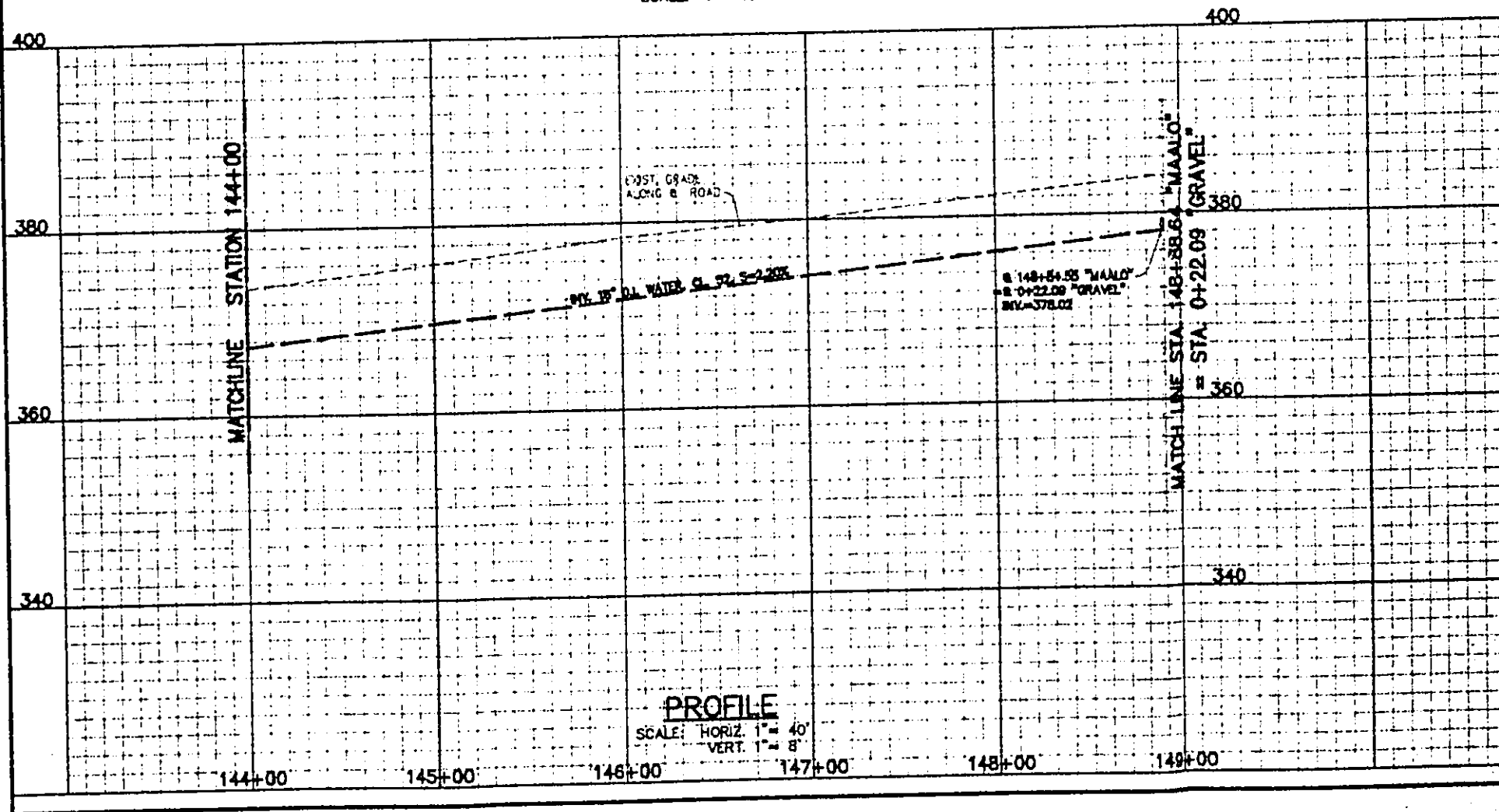
DESIGNED BY: _____ DRAWN BY: _____ CHECKED BY: K.S.U.



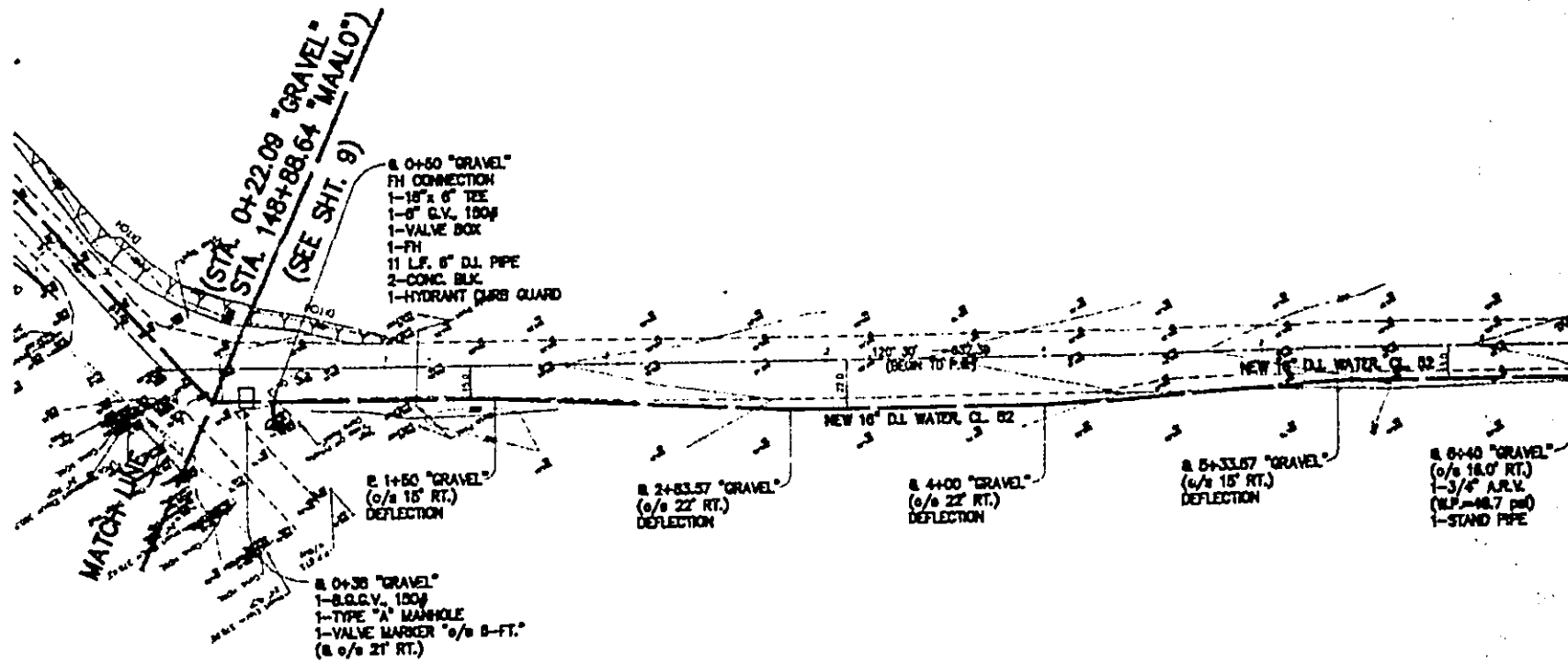
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION



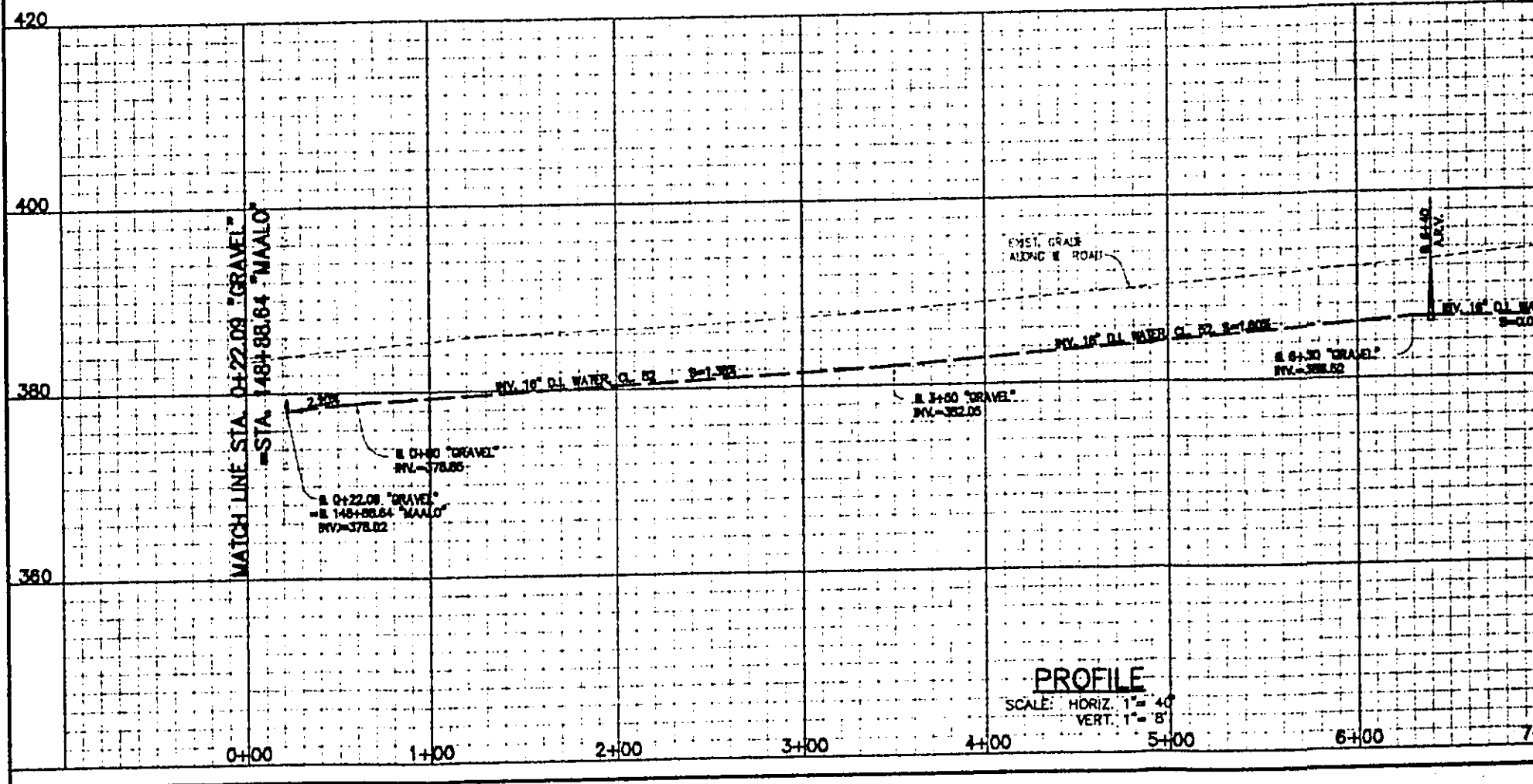
PLAN
SCALE: 1" = 40'



PROFILE
SCALE: HORIZ. 1" = 40'
VERT. 1" = 8'



PLAN
 SCALE: 1" = 40'



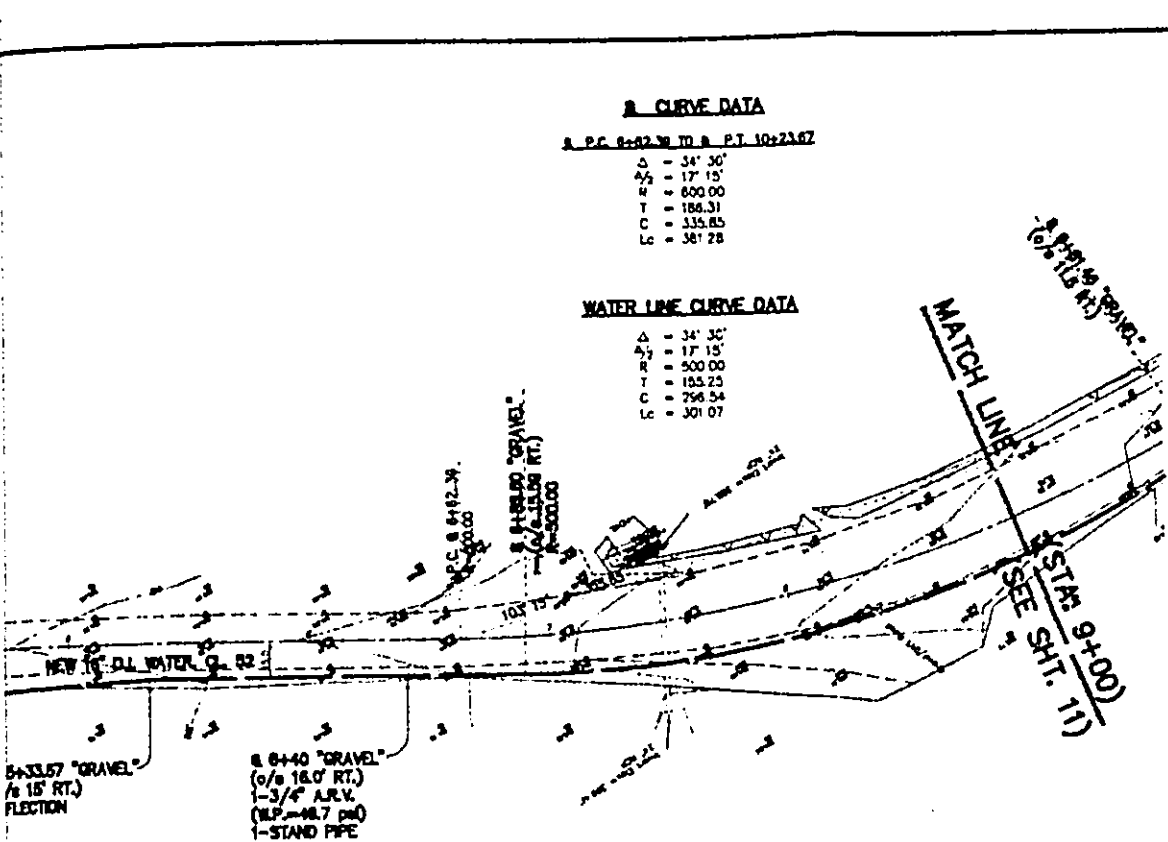
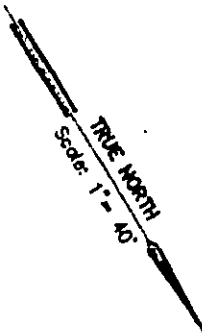
2. CURVE DATA

2. P.C. 8+22.38 TO 2. P.T. 10+23.67

- Δ = 34° 30'
- A₂ = 17' 15"
- R = 600.00
- T = 186.31
- C = 335.85
- Lc = 387.28

3. WATER LINE CURVE DATA

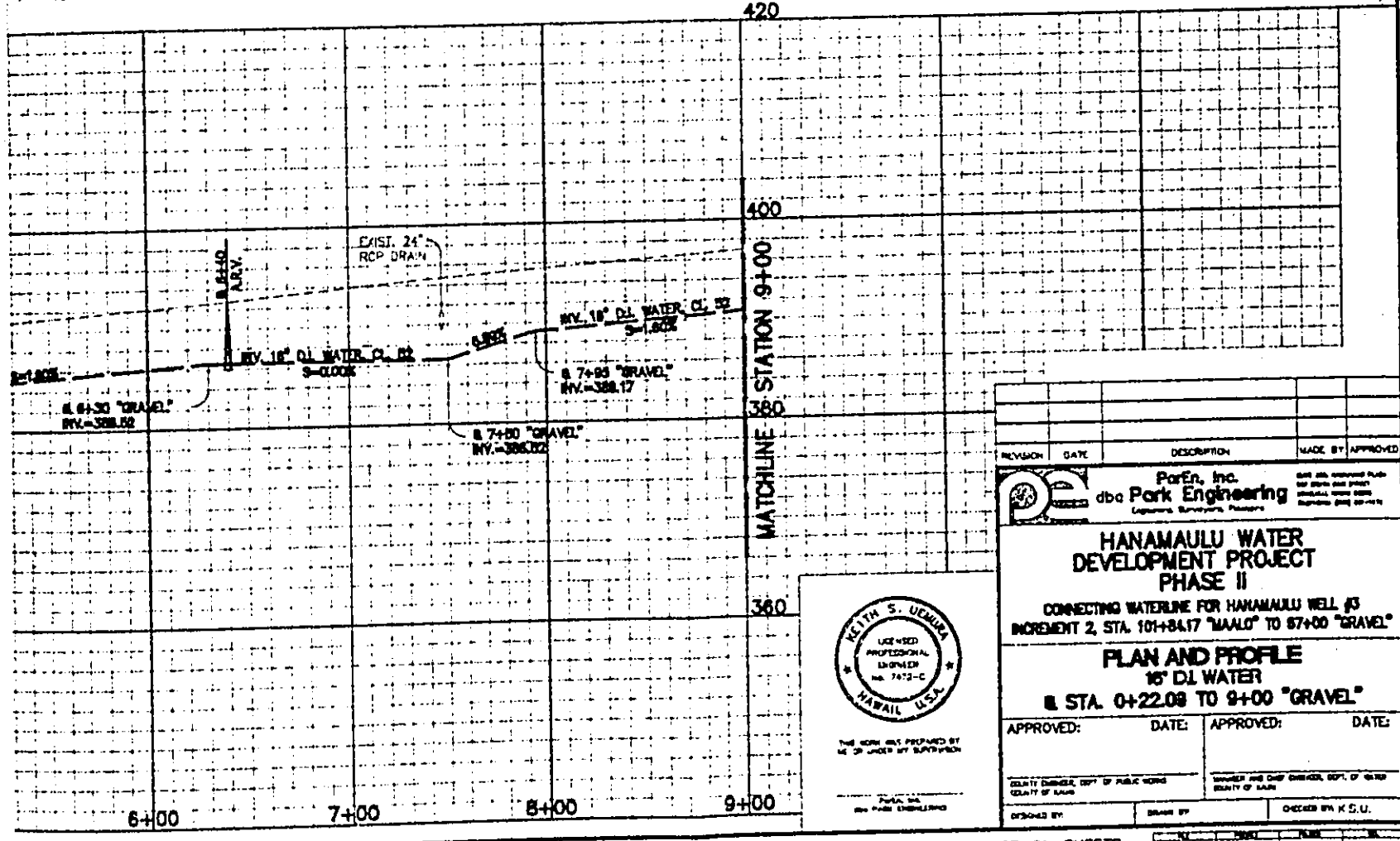
- Δ = 34° 30'
- A₂ = 17' 15"
- R = 500.00
- T = 155.25
- C = 256.54
- Lc = 301.07



LEGEND

- EXIST. 2-FT CONTOURS
- EXIST. 10-FT CONTOURS
- EXIST. BANK
- EXIST. SWALE
- NEW WATER LINE

AN
1" = 40'



REVISION	DATE	DESCRIPTION	MADE BY	APPROVED

ParEn, Inc.
dba **Park Engineering**
Engineers, Surveyors, Planners

HANAMAULU WATER DEVELOPMENT PROJECT
PHASE II
CONNECTING WATERLINE FOR HANAMAULU WELL #3
INCREMENT 2, STA. 101+84.17 "MAALO" TO 87+00 "GRAVEL"

PLAN AND PROFILE
16" DI WATER
2. STA. 0+22.09 TO 9+00 "GRAVEL"

APPROVED:	DATE:	APPROVED:	DATE:

COUNTY ENGINEER, DEPT. OF PUBLIC WORKS
COUNTY OF HAWAII

DESIGNED BY: DRAWN BY: CHECKED BY: K.S.U.



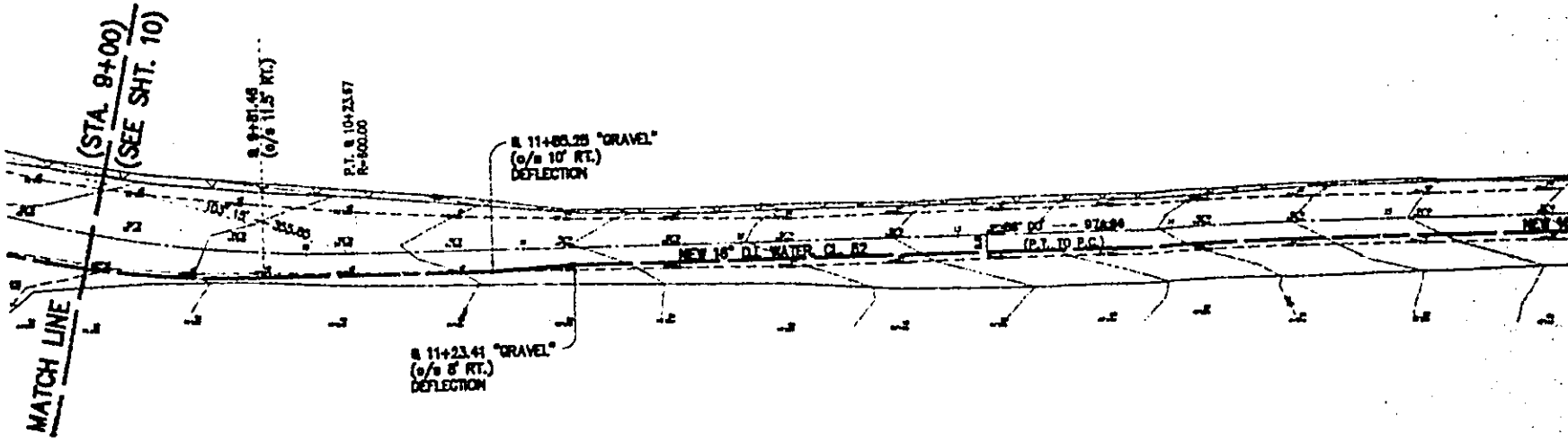
WATER LINE CURVE DATA

Δ = 34° 30'
 Δ/2 = 17° 15'
 R = 500.00
 T = 155.25
 C = 296.54
 Lc = 301.07

S. CURVE DATA

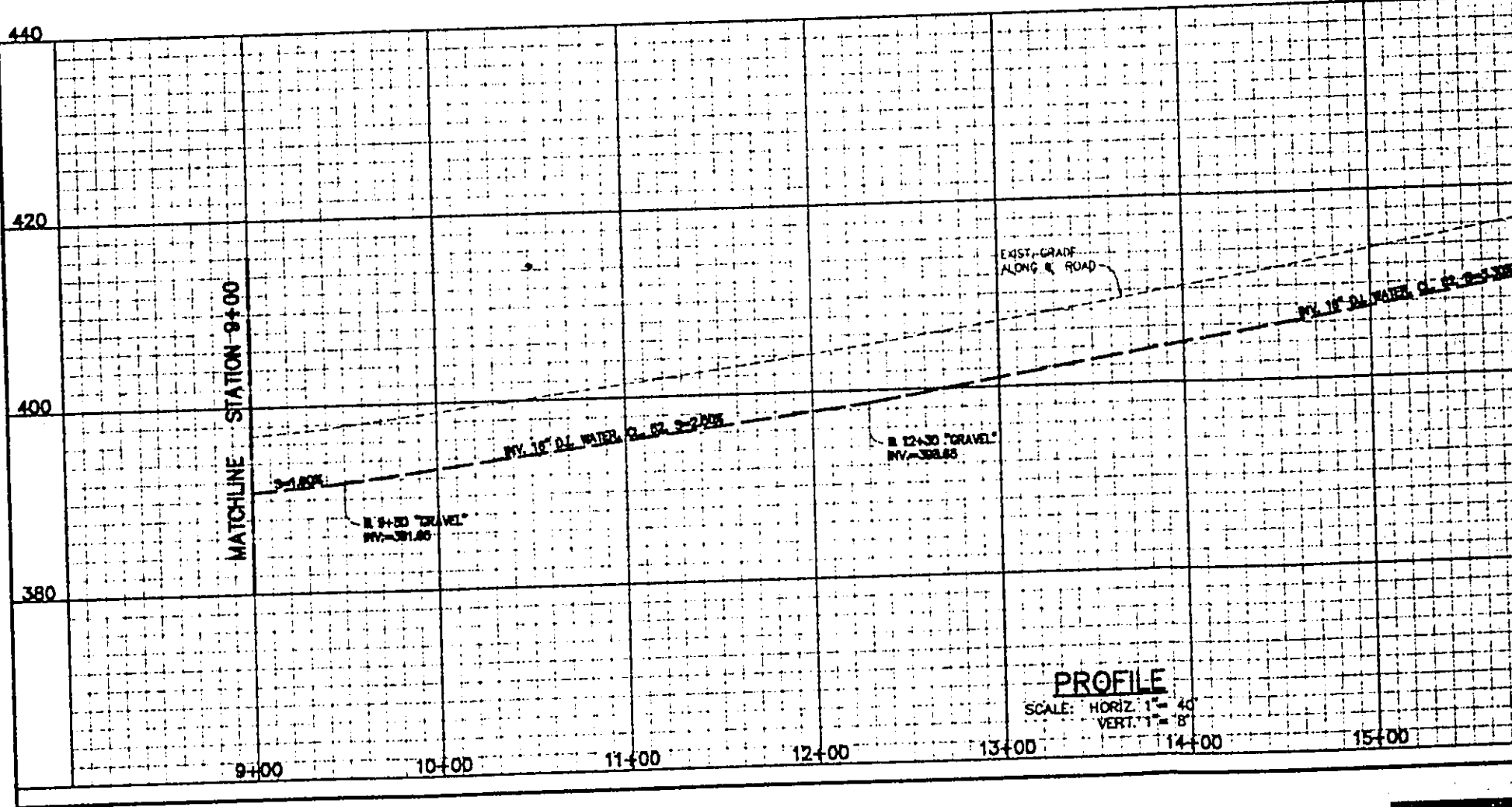
S. P. 8+42.59 TO E. P. 10+23.67

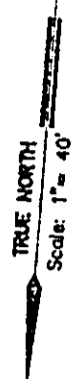
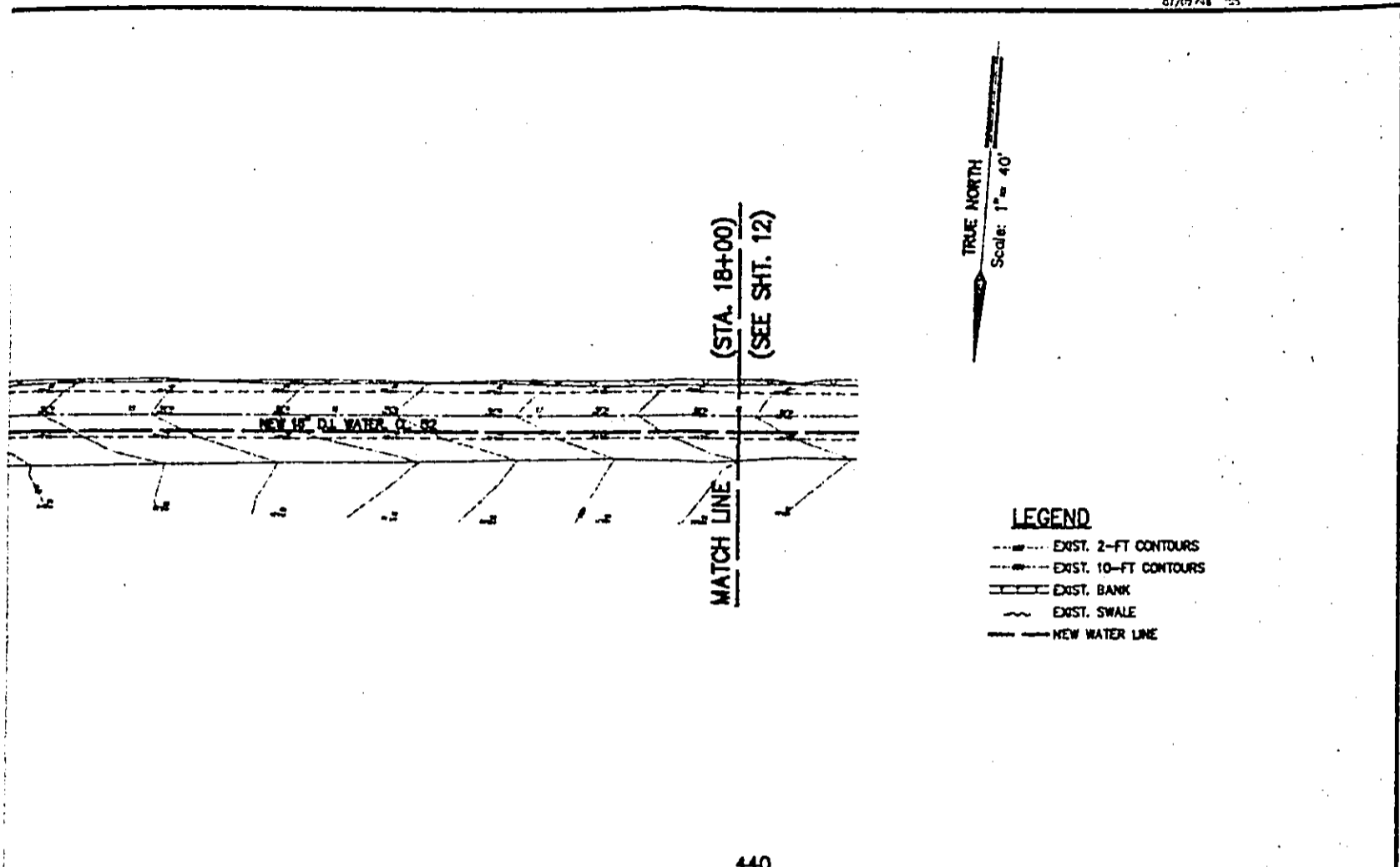
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 Δ/2 = 17° 15'
 R = 800.00
 T = 185.31
 C = 355.85
 Lc = 361.28



PLAN

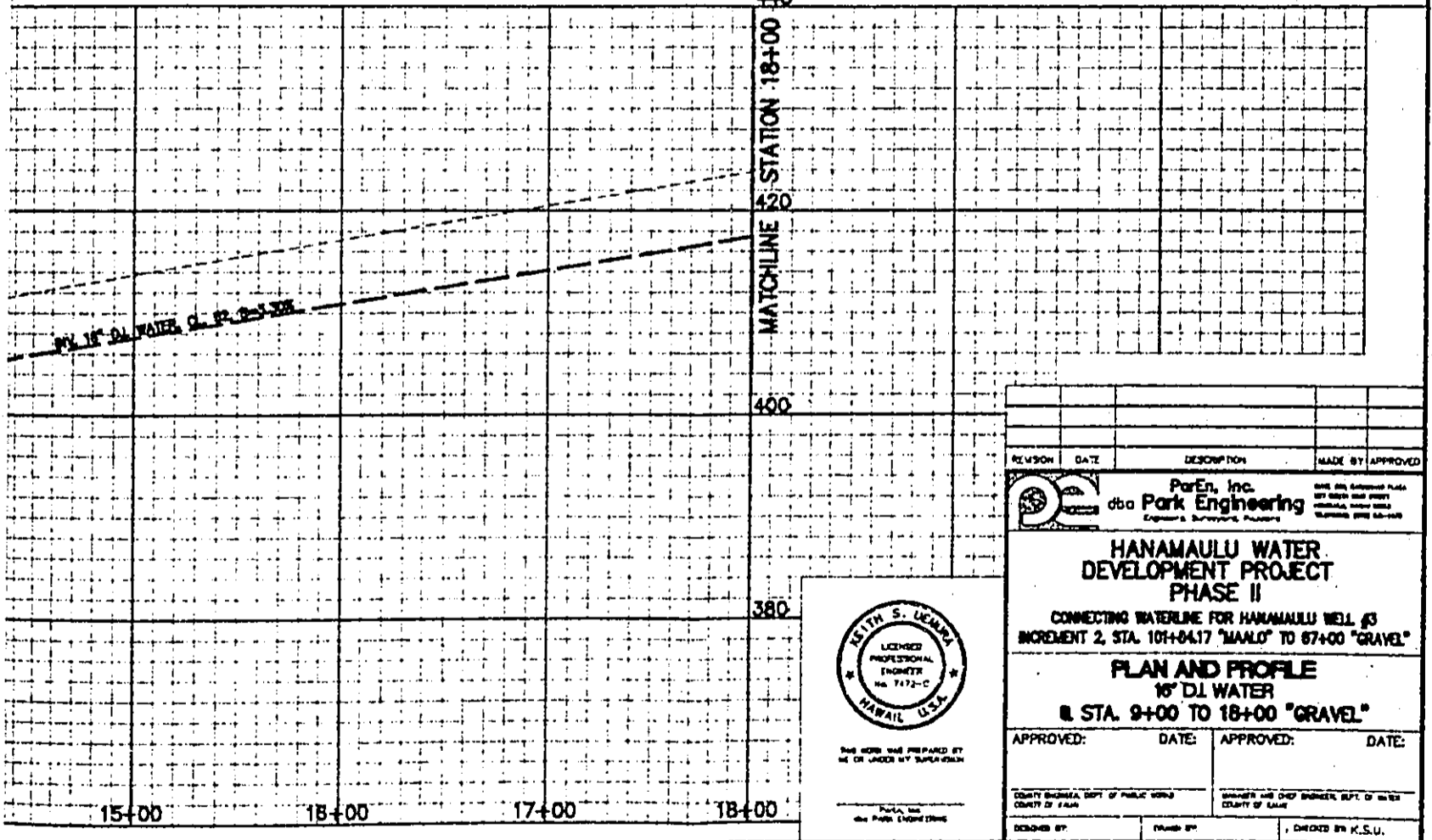
SCALE: 1" = 40'





LEGEND


- EXIST. 2-FT CONTOURS
- EXIST. 10-FT CONTOURS
- EXIST. BANK
- EXIST. SWALE
- NEW WATER LINE



THE WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

Keith S. Uemura
dba Park Engineering

REVISION	DATE	DESCRIPTION	MADE BY	APPROVED

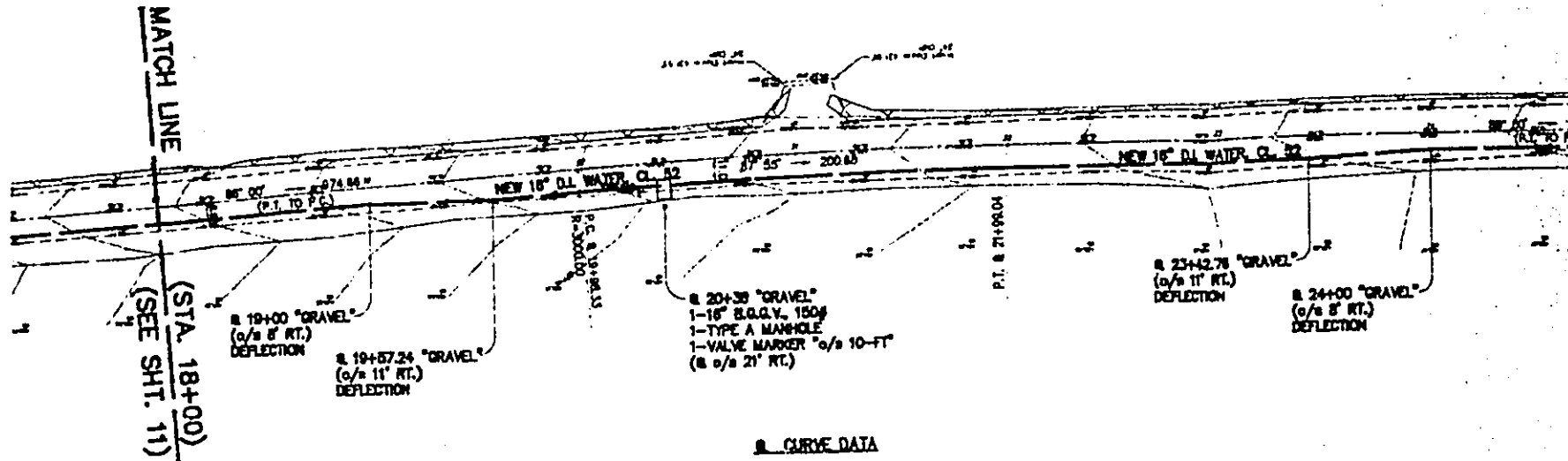

ParkEn, Inc.
dba Park Engineering
ENGINEERS, ARCHITECTS, PLANNERS

HANAMAULU WATER DEVELOPMENT PROJECT PHASE II
 CONNECTING WATERLINE FOR HANAMAULU WELL #3
 INCREMENT 2, STA. 10+04.17 "MAALO" TO 87+00 "GRAVEL"
PLAN AND PROFILE
10" DI WATER
IN STA. 9+00 TO 18+00 "GRAVEL"

APPROVED:	DATE:	APPROVED:	DATE:

COUNTY ENGINEER, DEPT. OF PUBLIC WORKS, COUNTY OF HAWAII
ENGINEER AND CHIEF ENGINEER, DEPT. OF WATER, COUNTY OF HAWAII

DESIGNED BY: _____ DRAWN BY: _____ CHECKED BY: K.S.U.

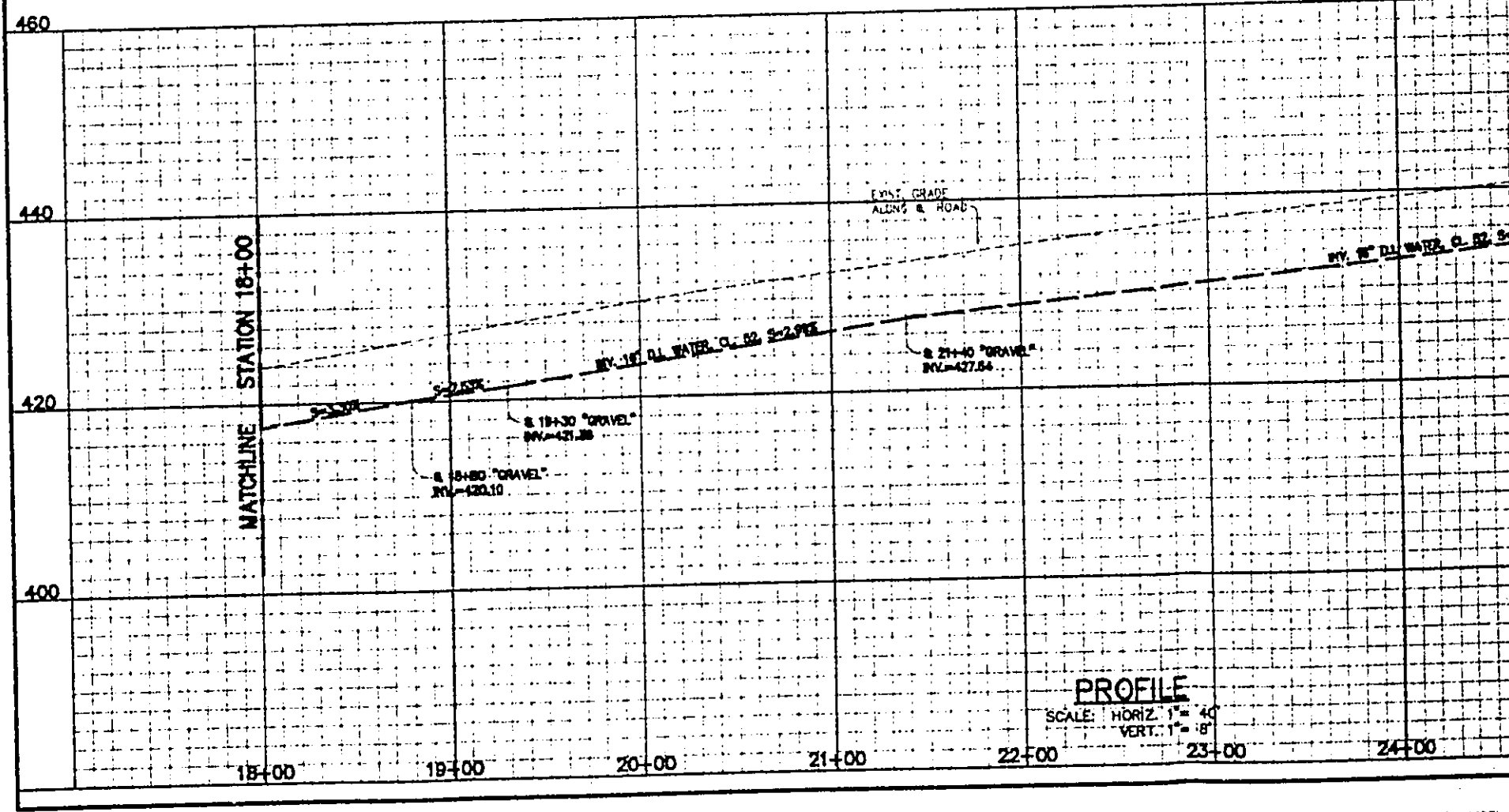


B. CURVE DATA

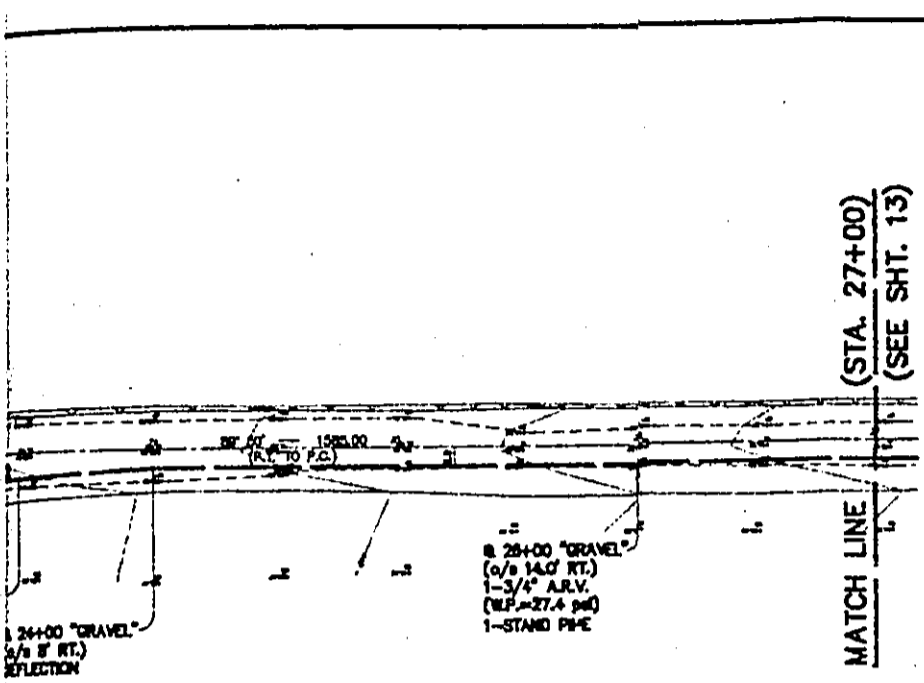
B. P.C. 18+94.33 TO B. P.T. 21+99.04

Δ	= 5° 50'
A_2	= 1° 55'
H	= 3000.00
T	= 100.39
C	= 200.68
L_c	= 200.71

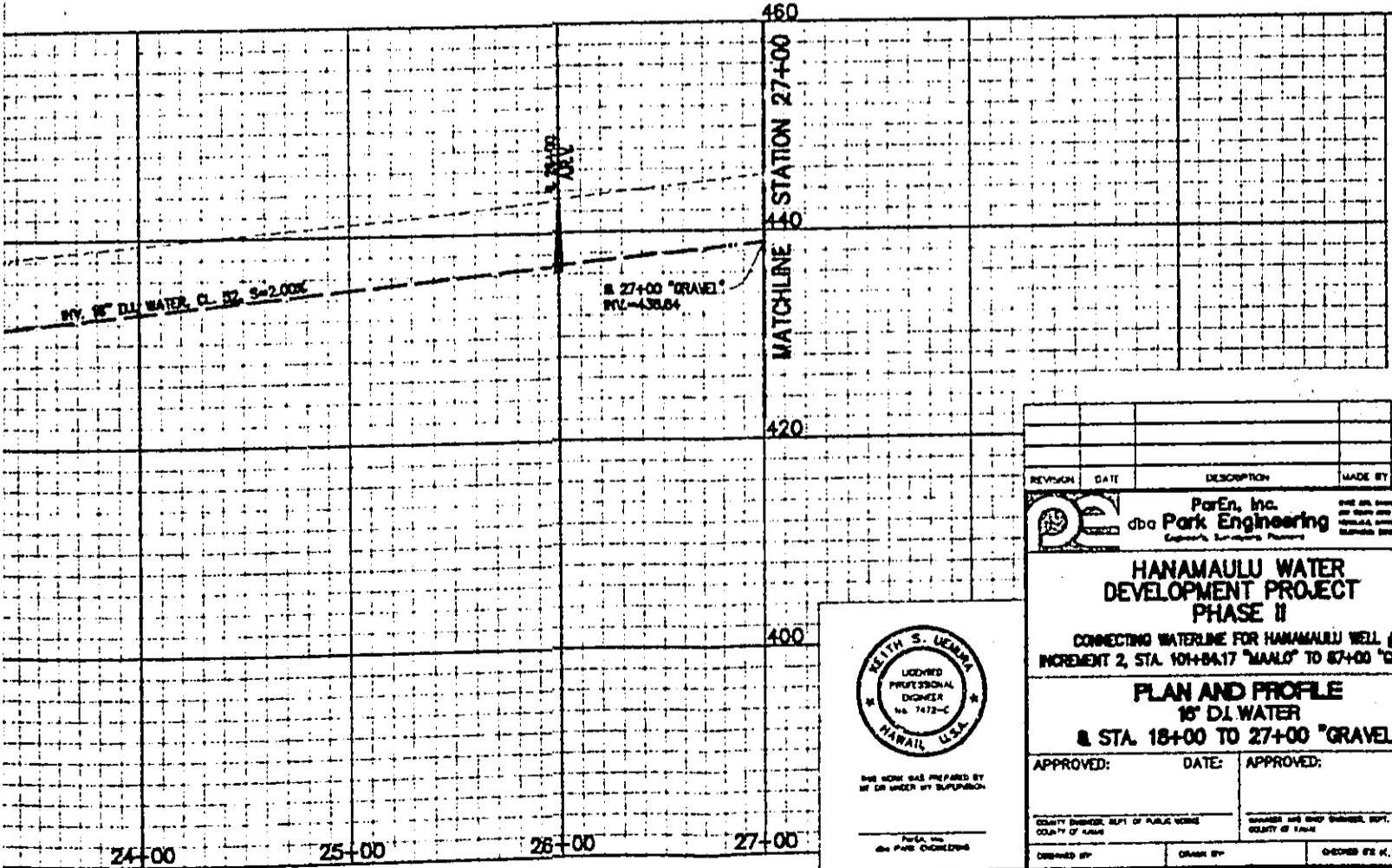
PLAN
SCALE: 1" = 40'



PROFILE
SCALE: HORIZ. 1" = 40'
VERT. 1" = 8'



- LEGEND**
- EXIST. 2-FT CONTOURS
 - EXIST. 10-FT CONTOURS
 - EXIST. BANK
 - EXIST. SWALE
 - NEW WATER LINE



THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

Keith S. Uemura
Professional Engineer

REVISION	DATE	DESCRIPTION	MADE BY	APPROVED

ParEn, Inc.
dba **Park Engineering**
Engineers, Surveyors, Planners

HANAMAULU WATER DEVELOPMENT PROJECT PHASE II

CONNECTING WATERLINE FOR HANAMAULU WELL #3 INCREMENT 2, STA. 10+84.17 "MAALO" TO 27+00 "GRAVEL"

PLAN AND PROFILE
18" DI. WATER
& STA. 18+00 TO 27+00 "GRAVEL"

APPROVED:	DATE:	APPROVED:	DATE:
-----------	-------	-----------	-------

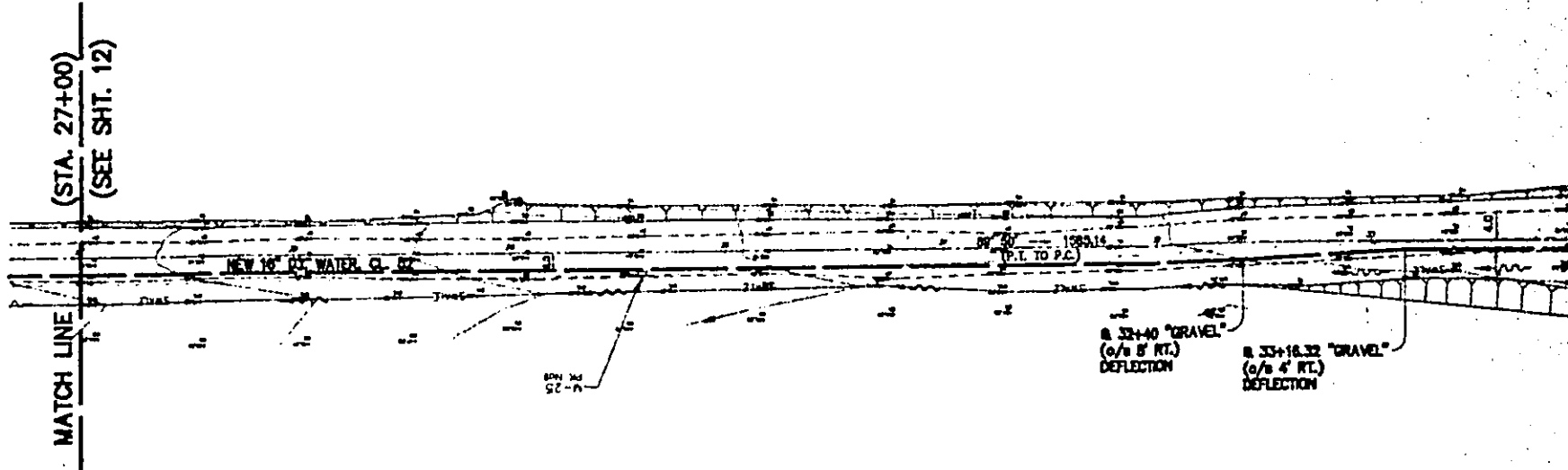
COUNTY ENGINEER, DEPT. OF PUBLIC WORKS, COUNTY OF HAWAII

CHECKED BY: _____

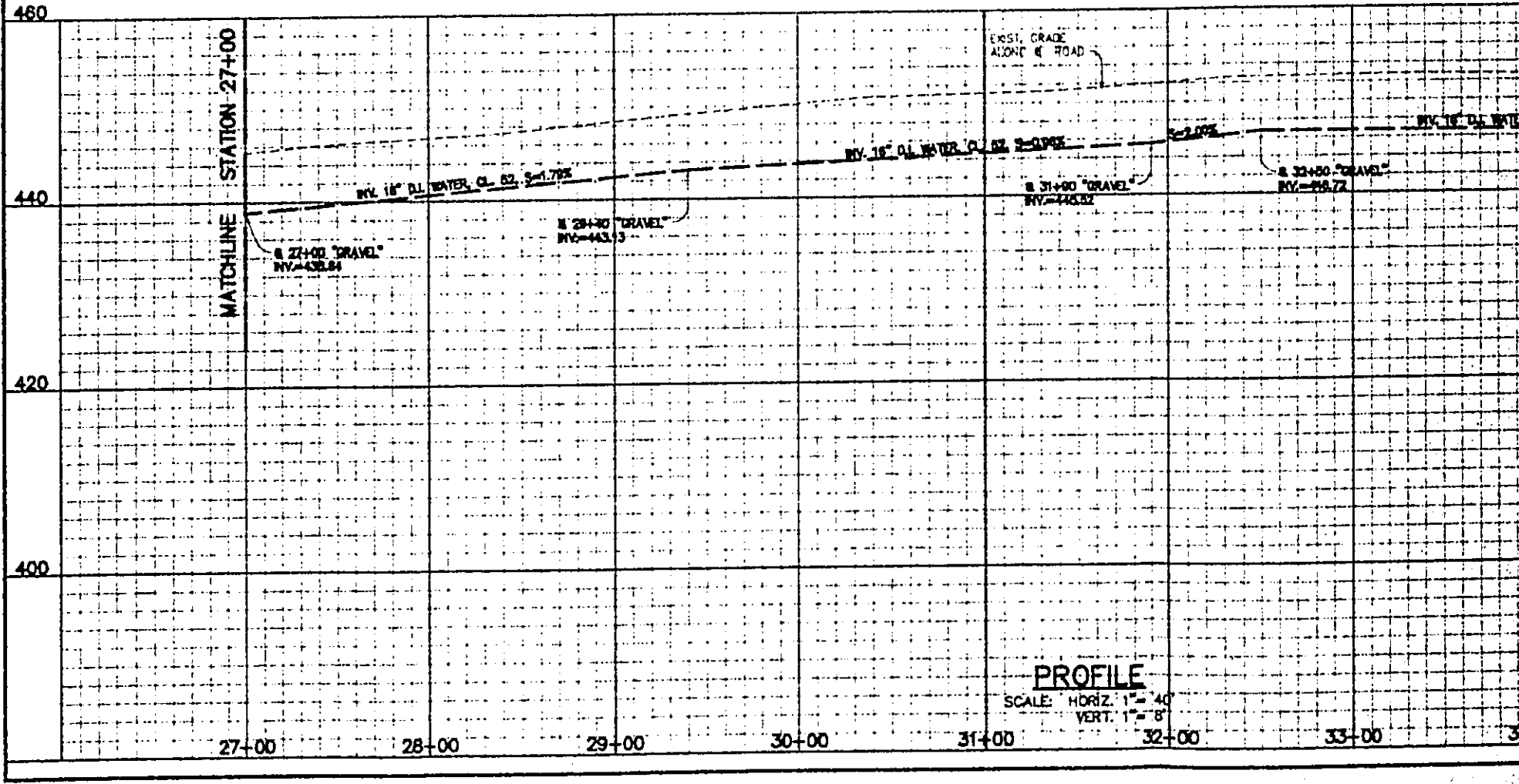
DESIGNED BY: _____

DRAWN BY: _____

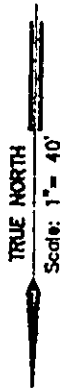
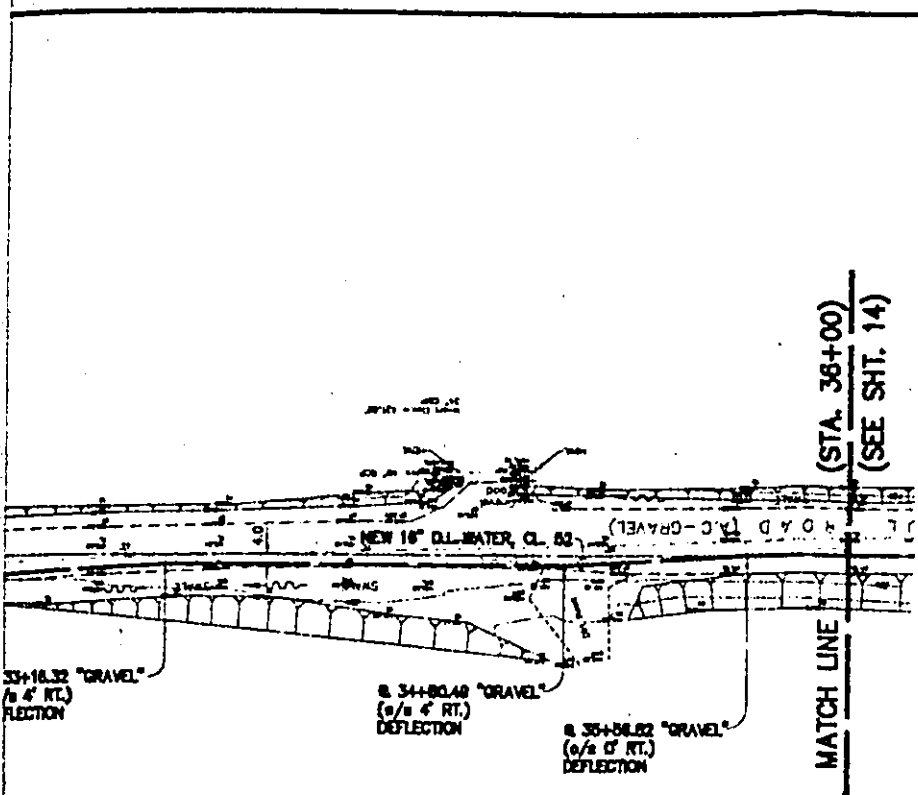
CHECKED BY: K.S.U.



PLAN
SCALE: 1" = 40'

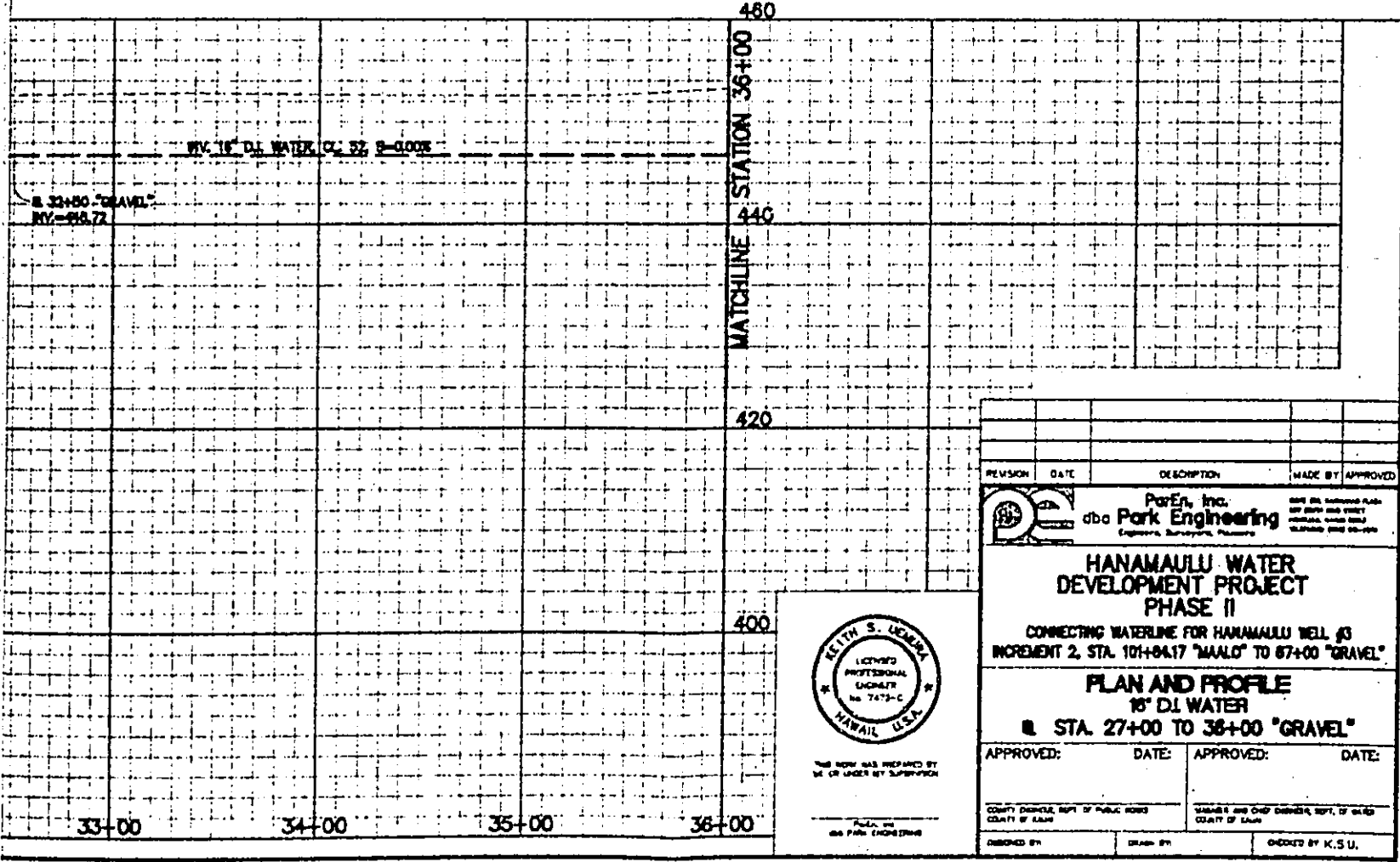


PROFILE
SCALE: HORIZ. 1" = 40'
VERT. 1" = 8'




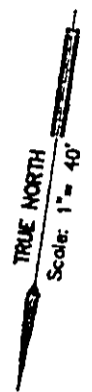
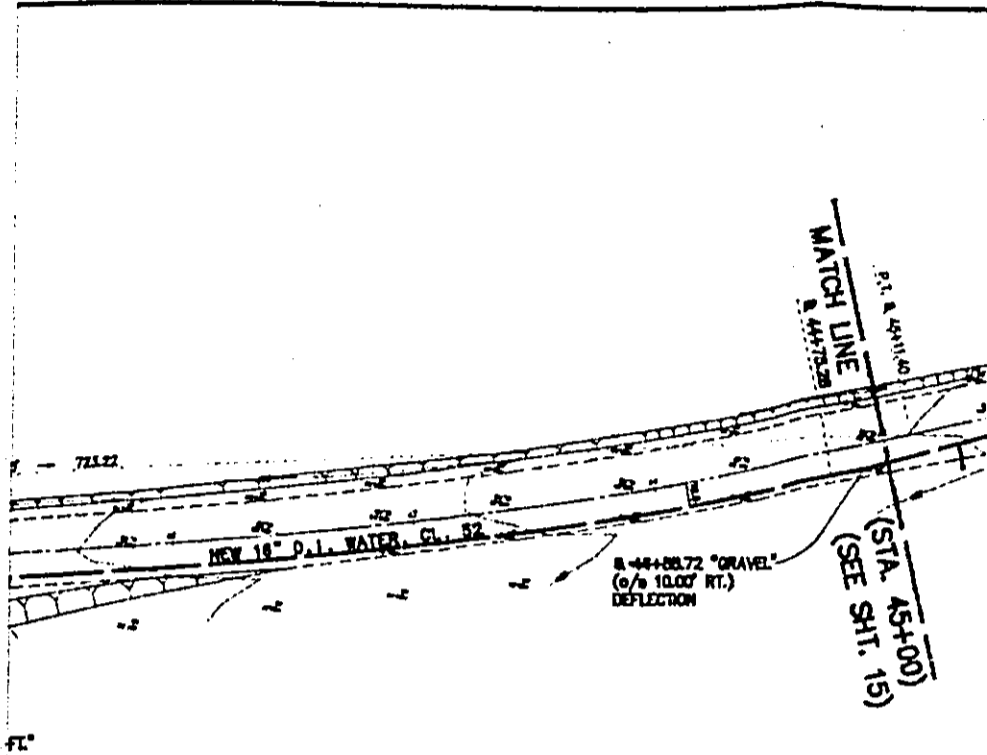
LEGEND

- - - EXIST. 2-FT CONTOURS
- - - EXIST. 10-FT CONTOURS
- - - EXIST. BANK
- - - EXIST. SWALE
- - - NEW WATER LINE



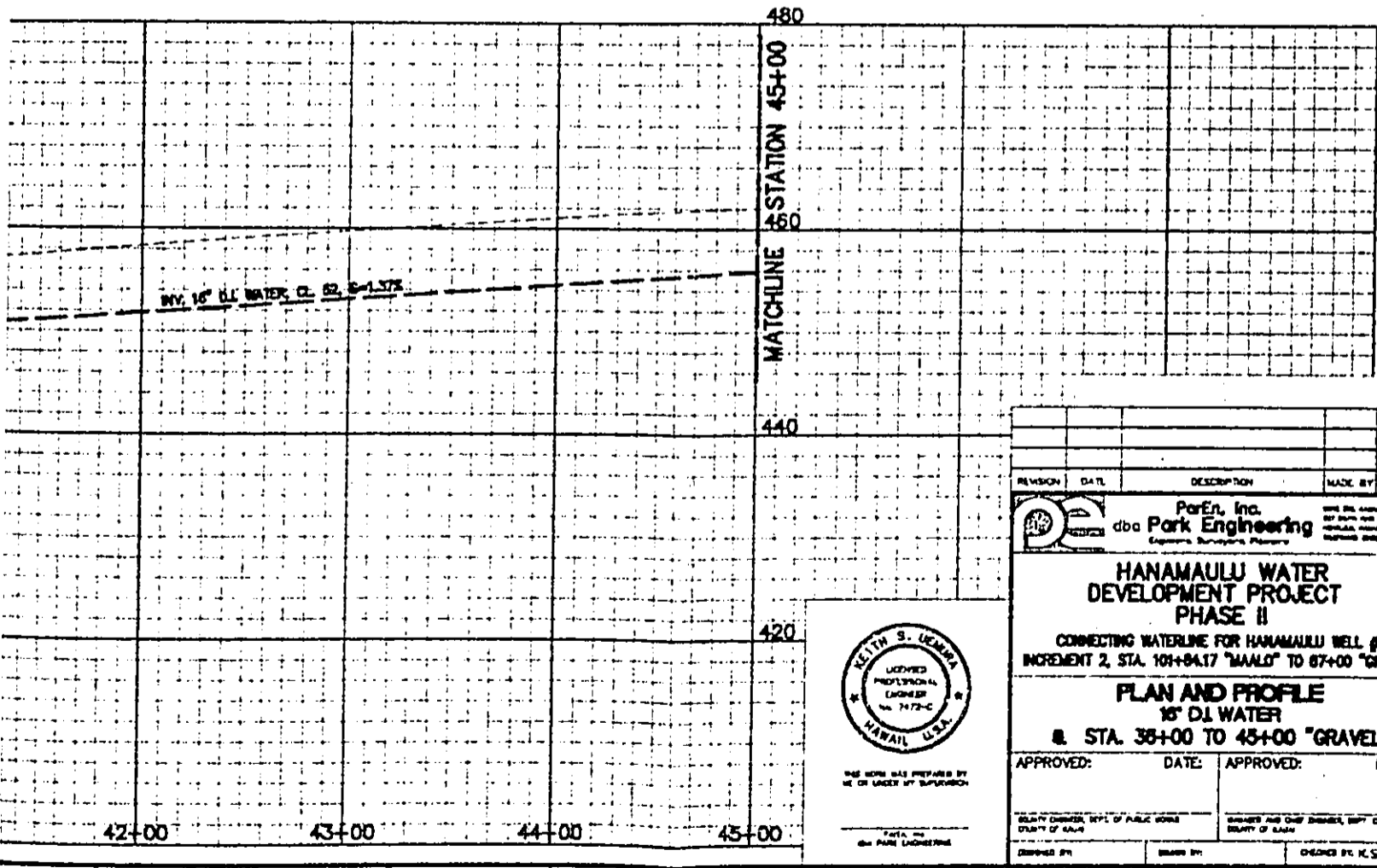
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

REVISION	DATE	DESCRIPTION	MADE BY	APPROVED
 Park Engineering, Inc. dba Park Engineering <small>Engineers, Surveyors, Planners</small>				
HANAMAULU WATER DEVELOPMENT PROJECT PHASE II CONNECTING WATERLINE FOR HANAMAULU WELL #3 INCREMENT 2, STA. 101+04.17 "MAALO" TO 87+00 "GRAVEL"				
PLAN AND PROFILE 16" DI WATER STA. 27+00 TO 38+00 "GRAVEL"				
APPROVED:		DATE:	APPROVED:	
DESIGNED BY:		DRAWN BY:	CHECKED BY K.S.U.	




LEGEND

- EXIST. 2-FT CONTOURS
- EXIST. 10-FT CONTOURS
- EXIST. BANK
- EXIST. SWALE
- NEW WATER LINE



THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

REVISION	DATE	DESCRIPTION	MADE BY	APPROVED


Park En. Inc.
 dba **Park Engineering**
 Engineers, Surveyors, Planners
1005 KALANANAKU BLVD
 SUITE 200, HONOLULU, HAWAII 96813
 TELEPHONE: 808-943-1144
 FACSIMILE: 808-943-1145

HANAMAULU WATER DEVELOPMENT PROJECT
PHASE II
 CONNECTING WATERLINE FOR HANAMAULU WELL (S INCREMENT 2, STA. 101+84.17 "MAALO" TO 87+00 "GRAVEL")

PLAN AND PROFILE
16" DI WATER
ST. STA. 38+00 TO 45+00 "GRAVEL"

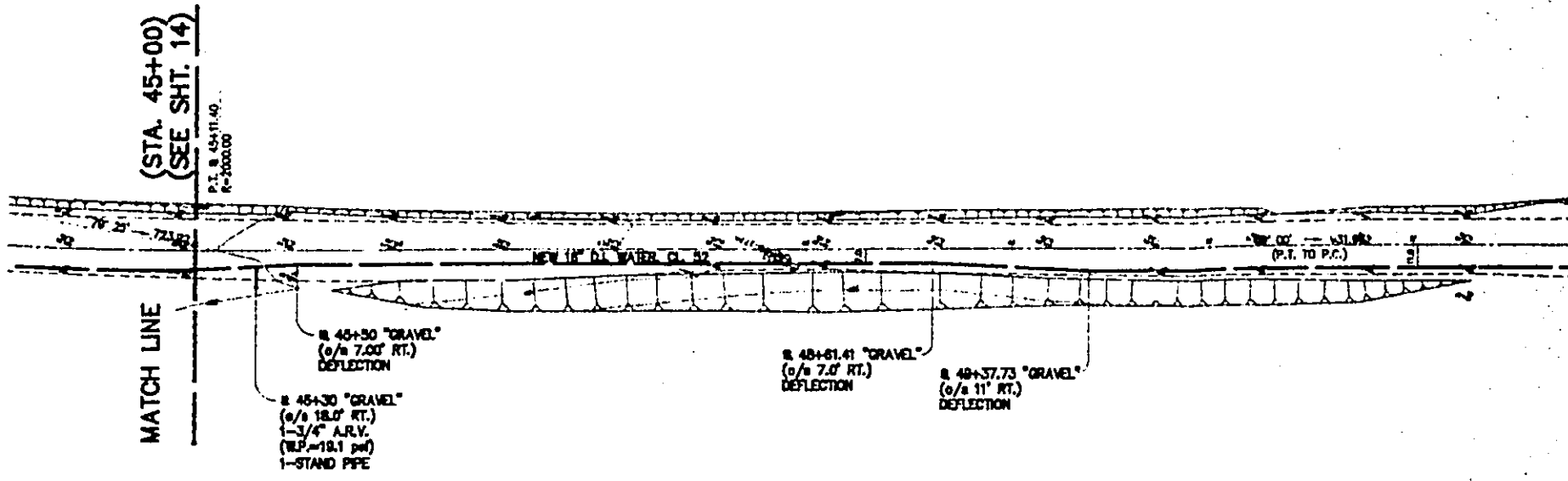
APPROVED:	DATE:	APPROVED:	DATE:

DESIGNED BY: [] CHECKED BY: []
DRAWN BY: []

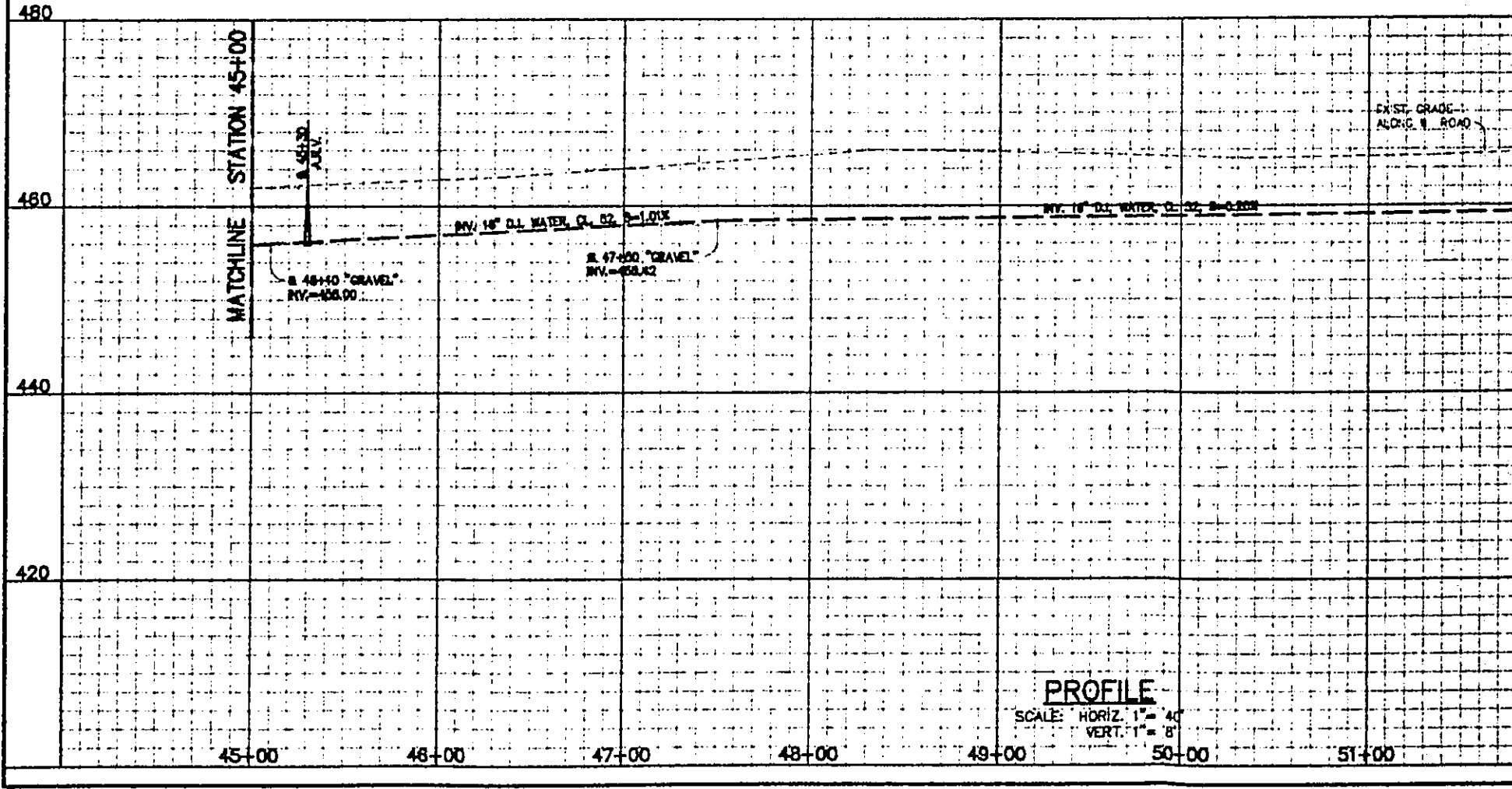
CURVE DATA

P.C. 44+11.40 TO P.T. 46+11.40

- Δ = 20° 50'
- Δ/2 = 10° 25'
- R = 2000.00
- T = 387.67
- C = 723.22
- Lc = 777.22

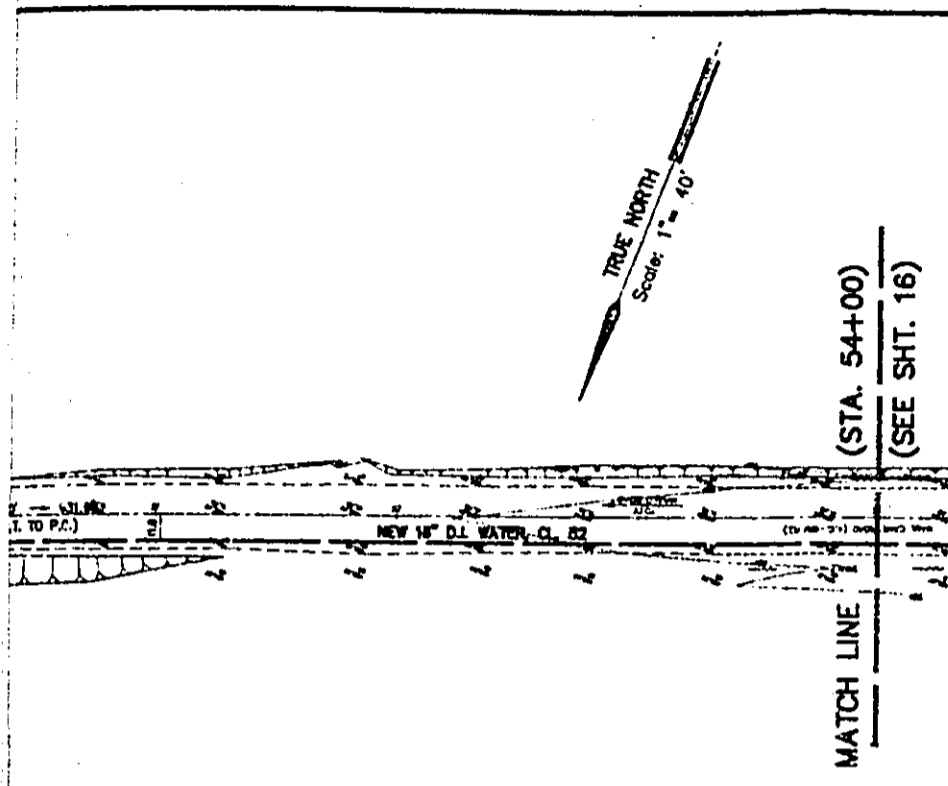


PLAN
SCALE: 1" = 40'



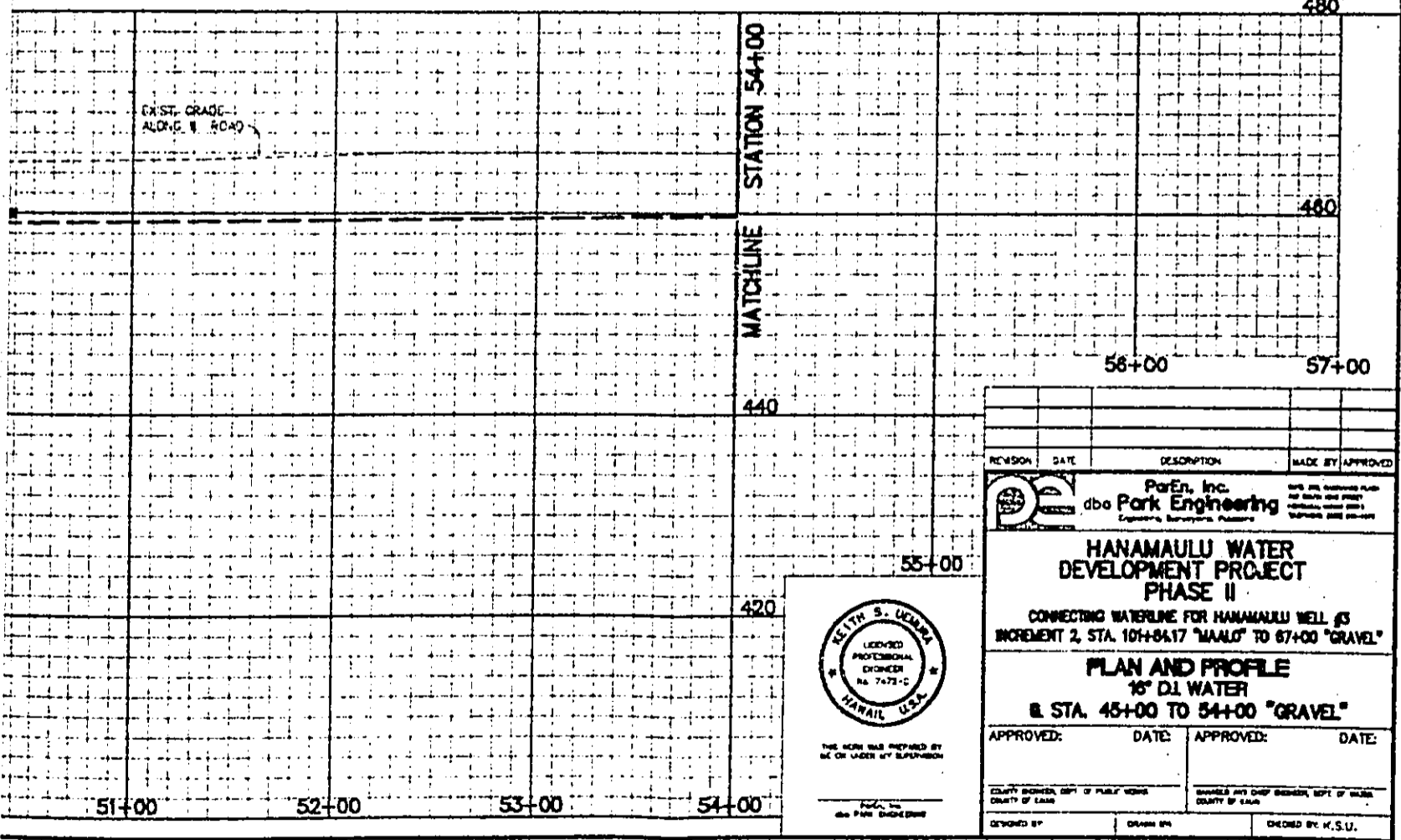
PROFILE

SCALE: HORIZ. 1" = 40'
VERT. 1" = 8'



MATCH LINE
(STA. 54+00)
(SEE SHT. 16)

- LEGEND**
- - - EXIST. 2-FT CONTOURS
 - - - EXIST. 10-FT CONTOURS
 - - - EXIST. BANK
 - - - EXIST. SWALE
 - - - NEW WATER LINE



REVISION	DATE	DESCRIPTION	MADE BY	APPROVED

ParEn, Inc.
dba Park Engineering
Engineers, Surveyors, Planners

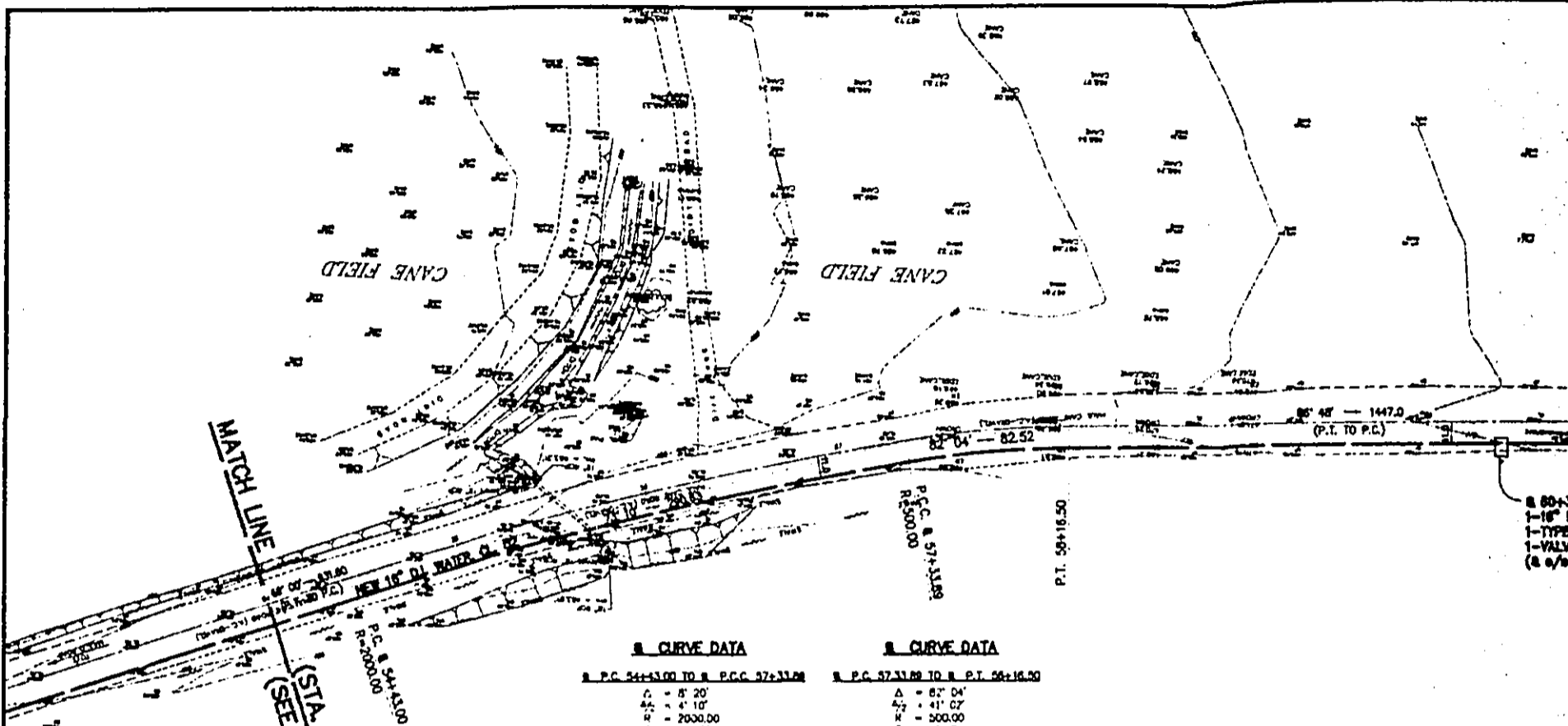
HANAMAULU WATER DEVELOPMENT PROJECT PHASE II
CONNECTING WATERLINE FOR HANAMAULU WELL #3 INCREMENT 2, STA. 10+84.17 "MAALO" TO 67+00 "GRAVEL"

PLAN AND PROFILE
16" DI WATER
& STA. 45+00 TO 54+00 "GRAVEL"

APPROVED:	DATE:	APPROVED:	DATE:

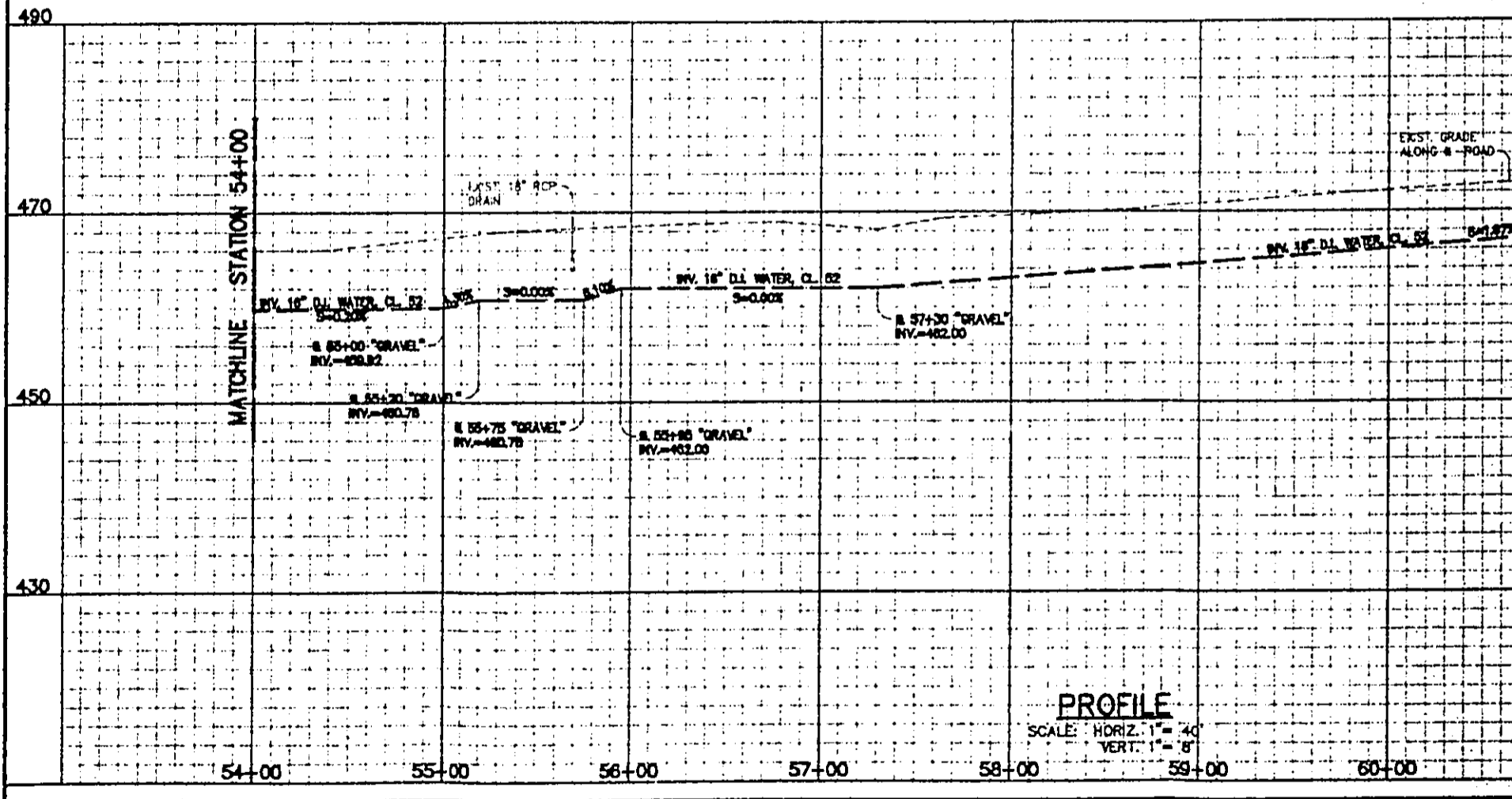
COUNTY ENGINEER, DEPT. OF PUBLIC WORKS, COUNTY OF HAWAII

DESIGNED BY: _____ DRAWN BY: _____ CHECKED BY: K.S.U.

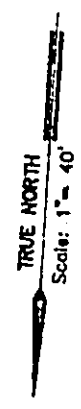
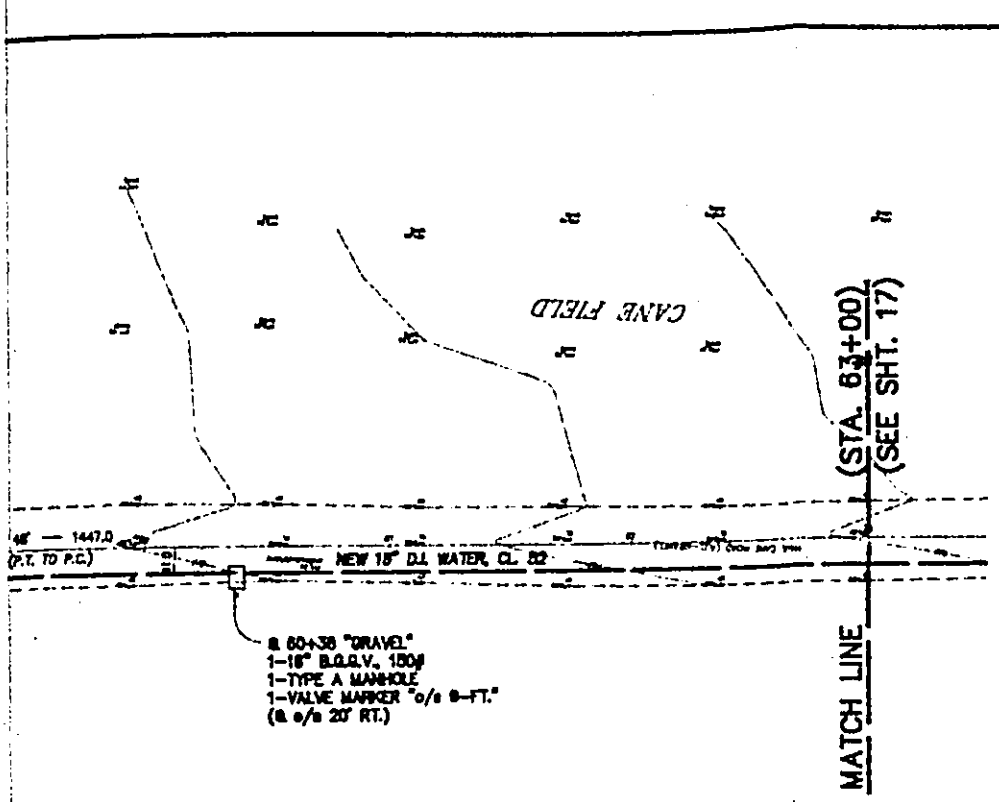


S CURVE DATA		S CURVE DATA	
S. P.C. 54+33.00 TO S. P.C.C. 57+33.00		S. P.C. 57+33.00 TO S. P.T. 59+16.50	
Δ	= 8° 20'	Δ	= 62° 04'
$E.C.$	= 4' 10"	$E.C.$	= 41' 07"
T	= 2000.00	T	= 500.00
L	= 145.70	L	= 41.40
C	= 290.83	C	= 82.52
LC	= 790.86	LC	= 82.61

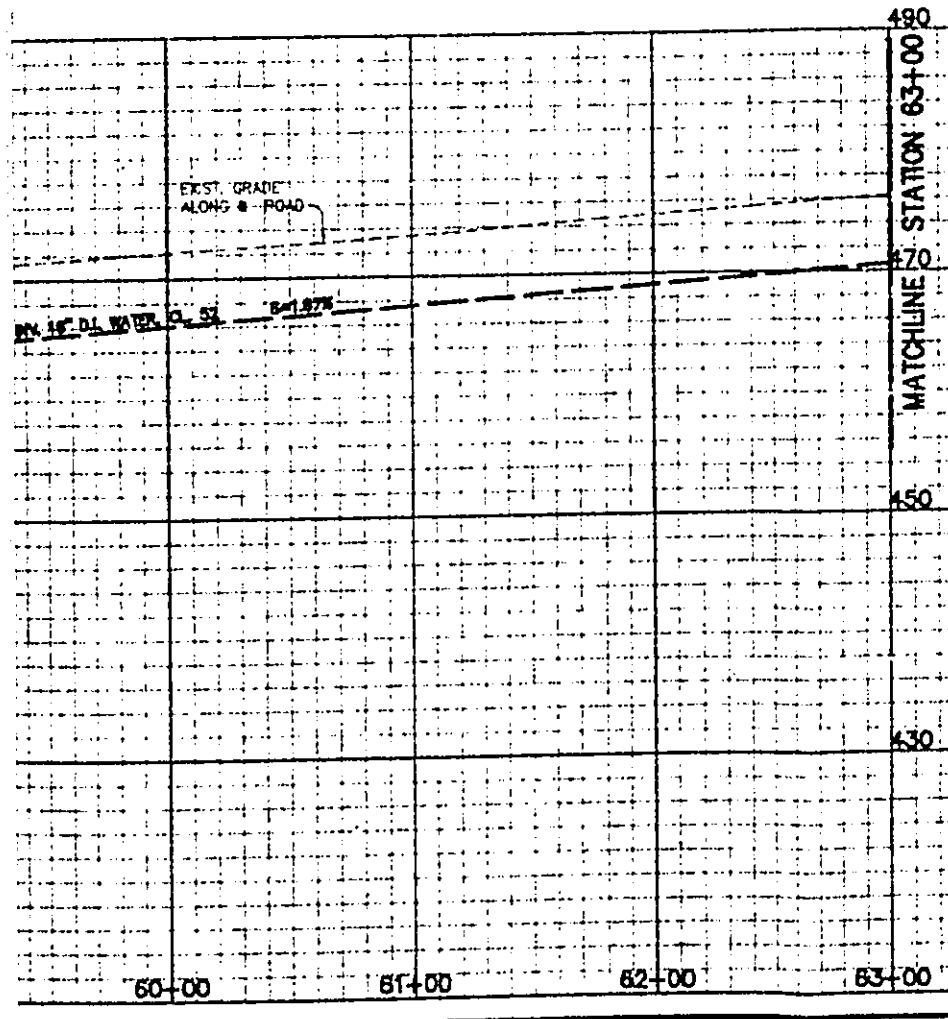
PLAN
SCALE: 1" = 40'



PROFILE
SCALE: HORIZ. 1" = 40'
VERT. 1" = 8'



- LEGEND**
- - - EXIST. 2-FT CONTOURS
 - - - EXIST. 10-FT CONTOURS
 - ==== EXIST. BANK
 - EXIST. SWALE
 - NEW WATER LINE



THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION
 KEITH S. UEHARA
 dba Park Engineering

REVISION	DATE	DESCRIPTION	MADE BY	APPROVED

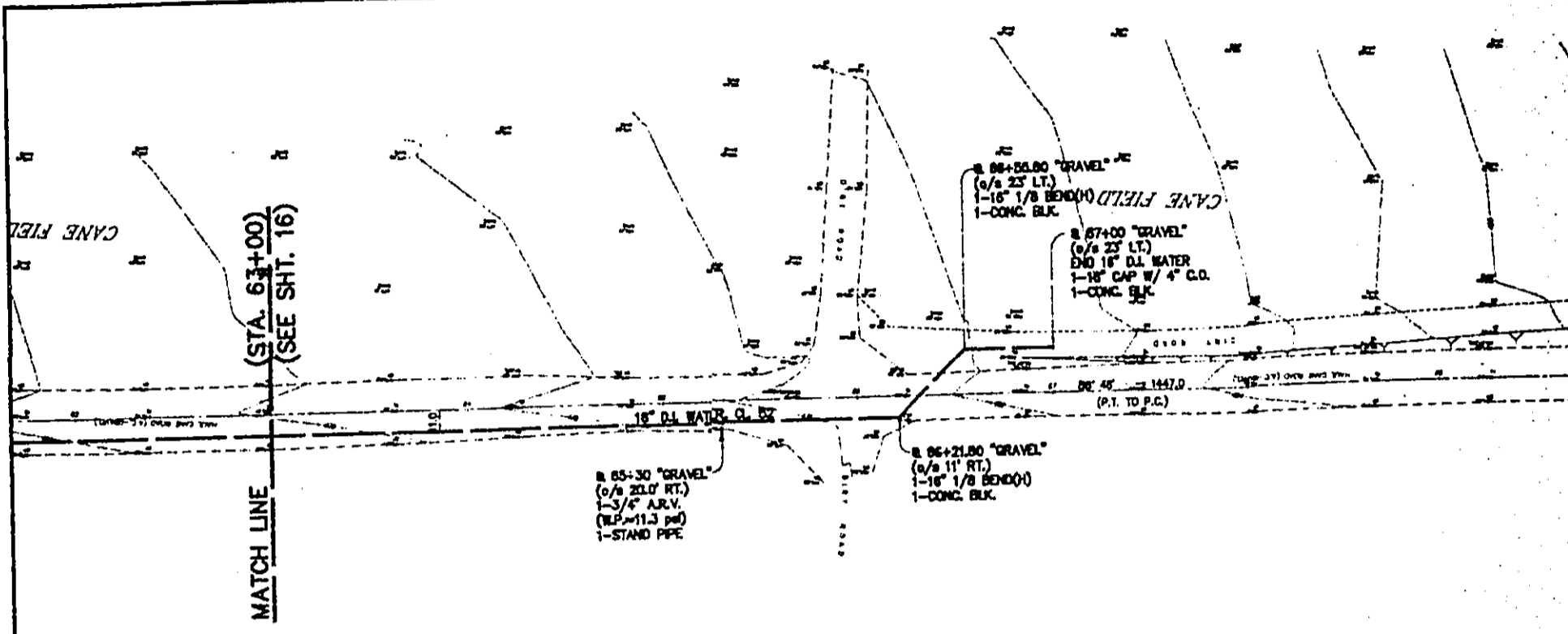
ParEn, Inc.
 dba **Park Engineering**
 Engineers, Surveyors, Planners

HANAMAULU WATER DEVELOPMENT PROJECT PHASE II
 CONNECTING WATERLINE FOR HANAMAULU WELL #5 INCREMENT 2, STA. 101+84.17 "MAALO" TO 67+00 "GRAVEL"

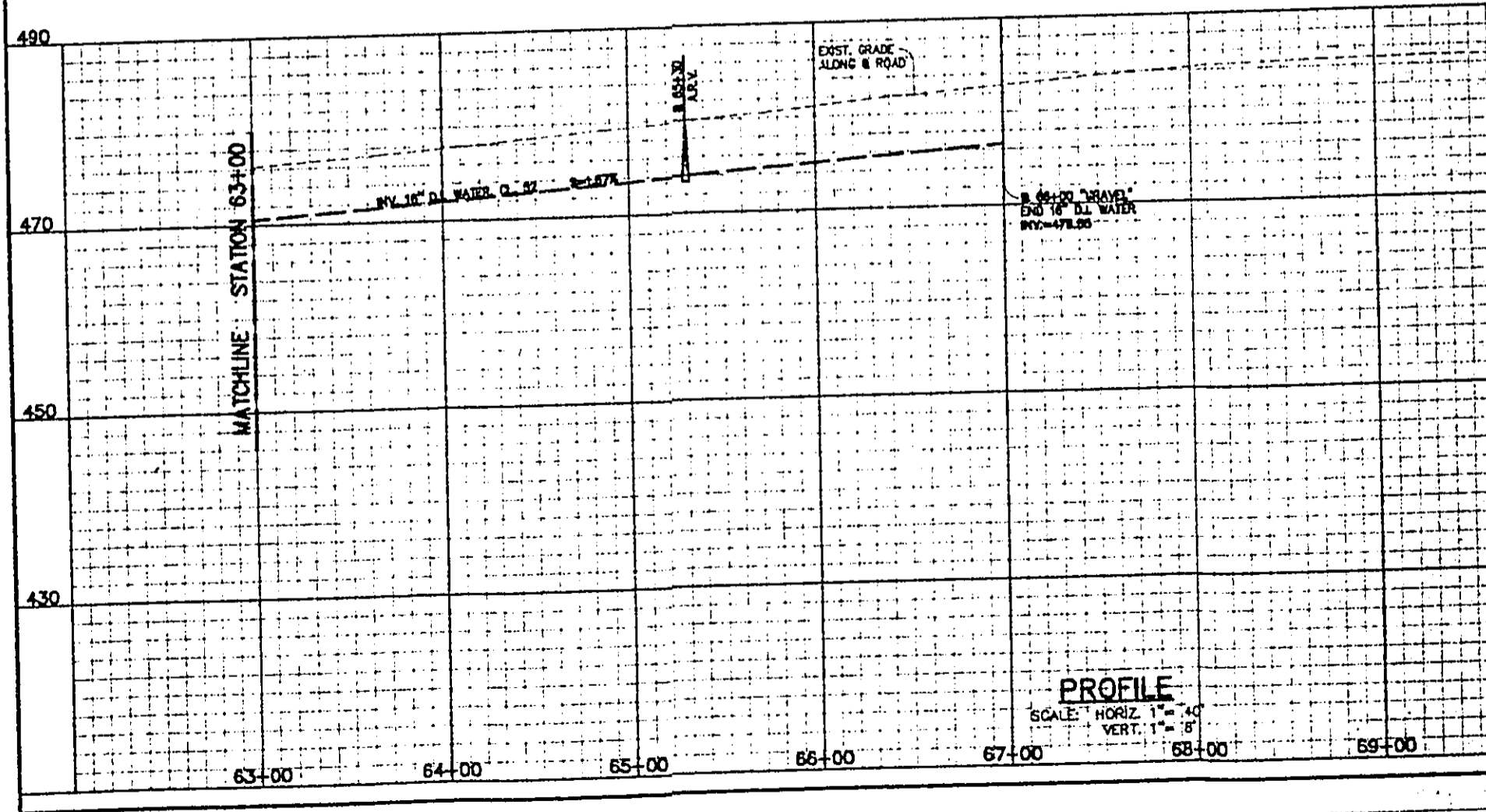
PLAN AND PROFILE
18" DI WATER
8 STA. 54+00 TO 63+00 "GRAVEL"

APPROVED:	DATE:	APPROVED:	DATE:

DESIGNED BY: _____ DRAWN BY: _____ CHECKED BY: K.S.U.

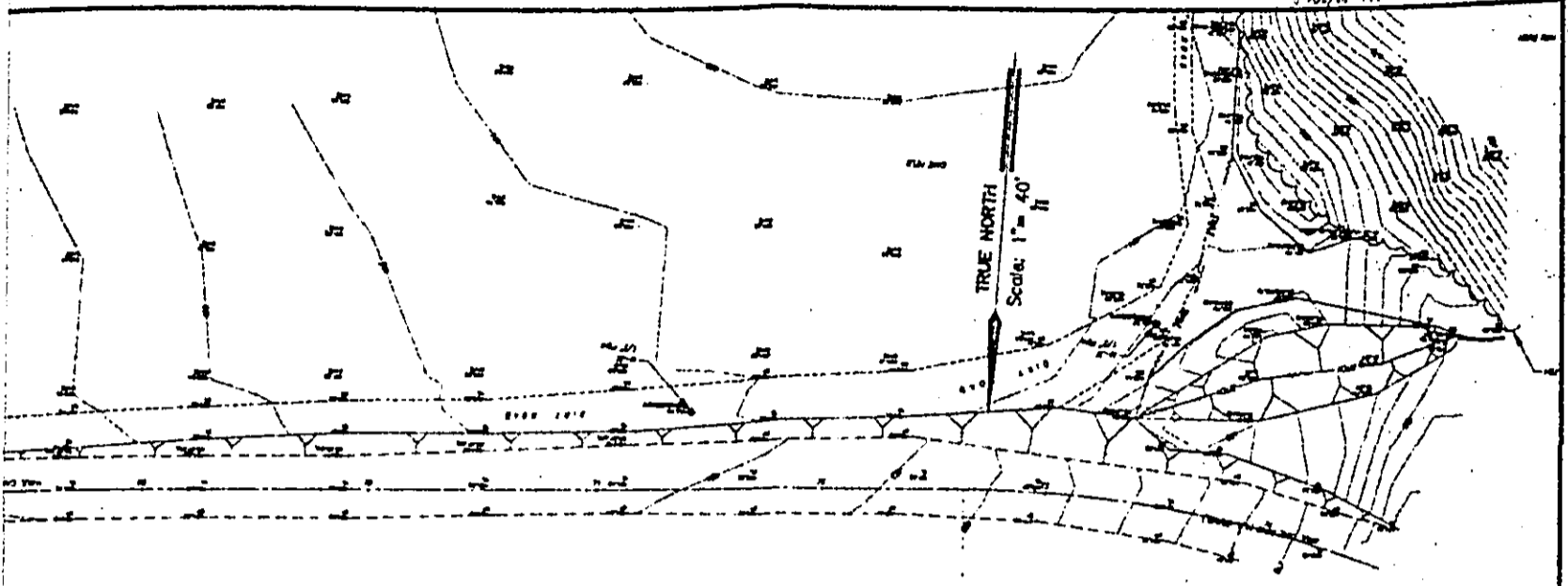


PLAN
SCALE: 1" = 40'



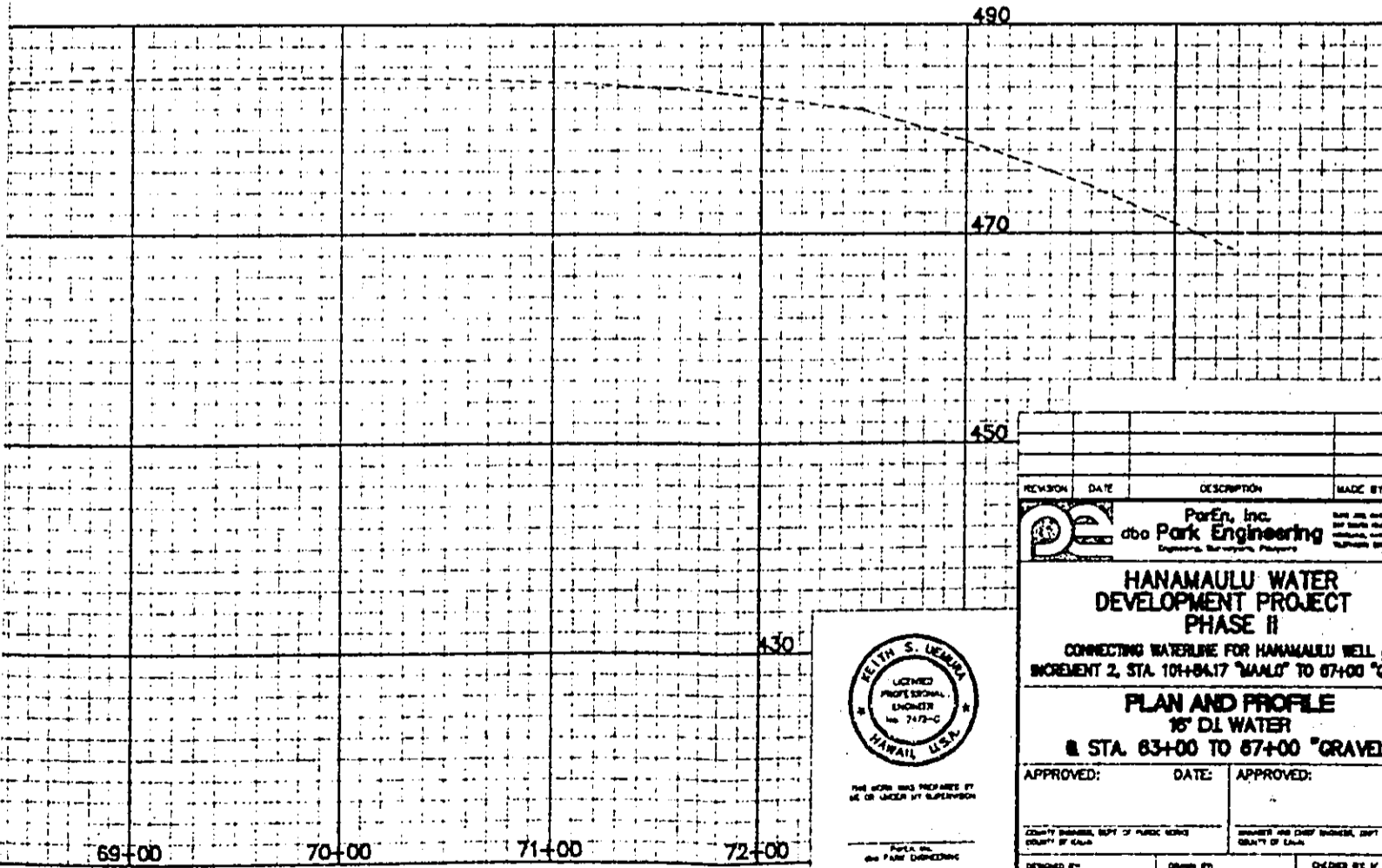
PROFILE
SCALE: HORIZ. 1" = 40'
VERT. 1" = 8'


DATE: 10/15/88
 DRAWN BY: J.S.



LEGEND

- EXIST. 2-FT CONTOURS
- EXIST. 10-FT CONTOURS
- EXIST. BANK
- EXIST. SWALE
- NEW WATER LINE



REVISION	DATE	DESCRIPTION	MADE BY	APPROVED
 Park Engineering, Inc. Engineers, Surveyors, Planners <small>1000 Kalia Road, Suite 100, Honolulu, HI 96813</small>				

HANAMAULU WATER DEVELOPMENT PROJECT PHASE II
 CONNECTING WATERLINE FOR HANAMAULU WELL #3
 INCREMENT 2, STA. 101+84.17 "MAALO" TO 87+00 "GRAVEL"

PLAN AND PROFILE
 15" DI WATER
 @ STA. 83+00 TO 87+00 "GRAVEL"



THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

APPROVED:	DATE:	APPROVED:	DATE:
<small>COUNTY ENGINEER, DEPT. OF PUBLIC WORKS COUNTY OF HAWAII</small>		<small>ENGINEER AND SURVEYOR, DEPT. OF PUBLIC WORKS COUNTY OF HAWAII</small>	
DESIGNED BY:	DRAWN BY:	CHECKED BY: K.S.L.	

APPENDIX D
Lihue Water Development Project

HOUSING AGENCY
OF KAUAI
FUNDED BY THE
HOUSING AND URBAN DEVELOPMENT (HUD)
GRANT (SPG) PROGRAM

WATER PROJECT CASE II

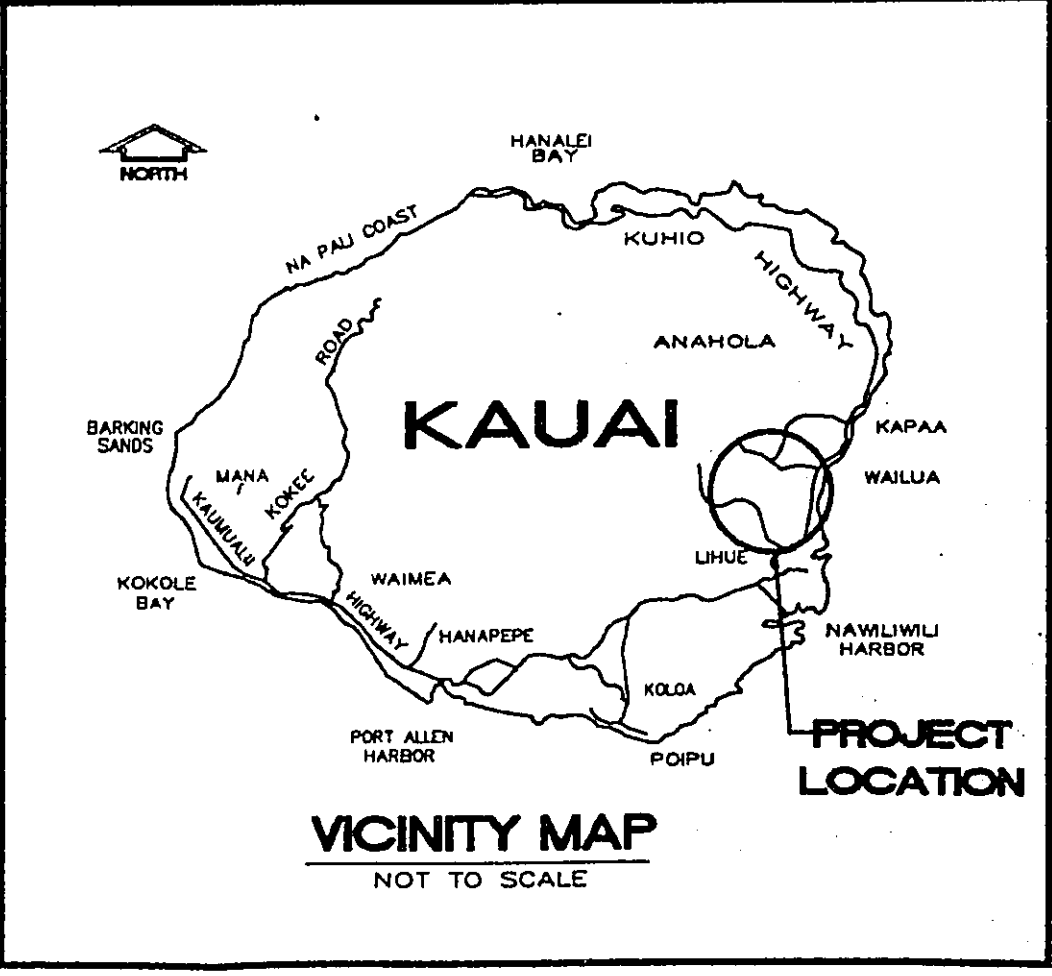
Line to Pukaki Well

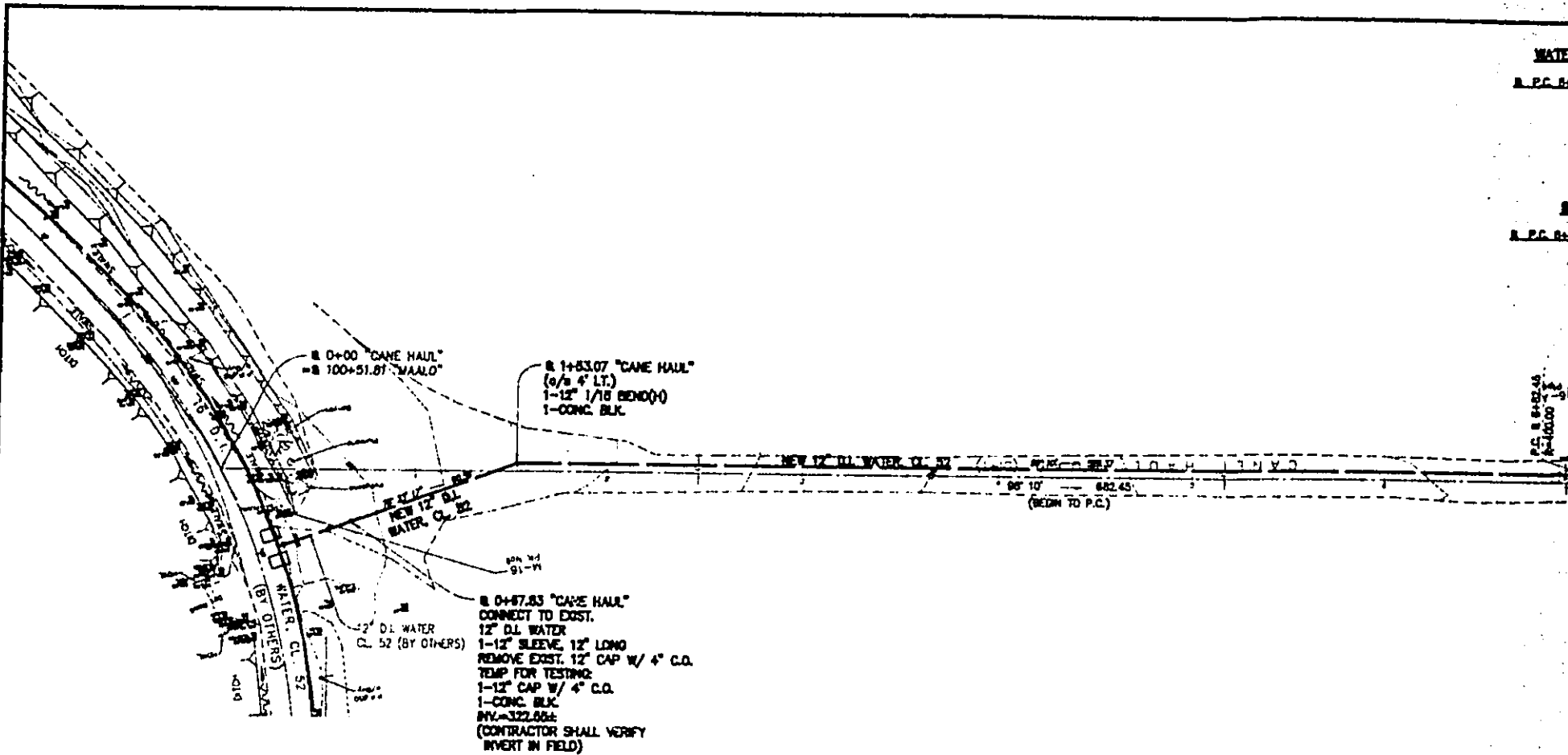
4, 3-8-POR. 2, 3, 6
KAUAI, HAWAII


Park Engineering
126 Park Engineering
567 South King Street #300
Honolulu, Hawaii 96813
(Tel. No. 5704)

INDEX OF DRAWINGS

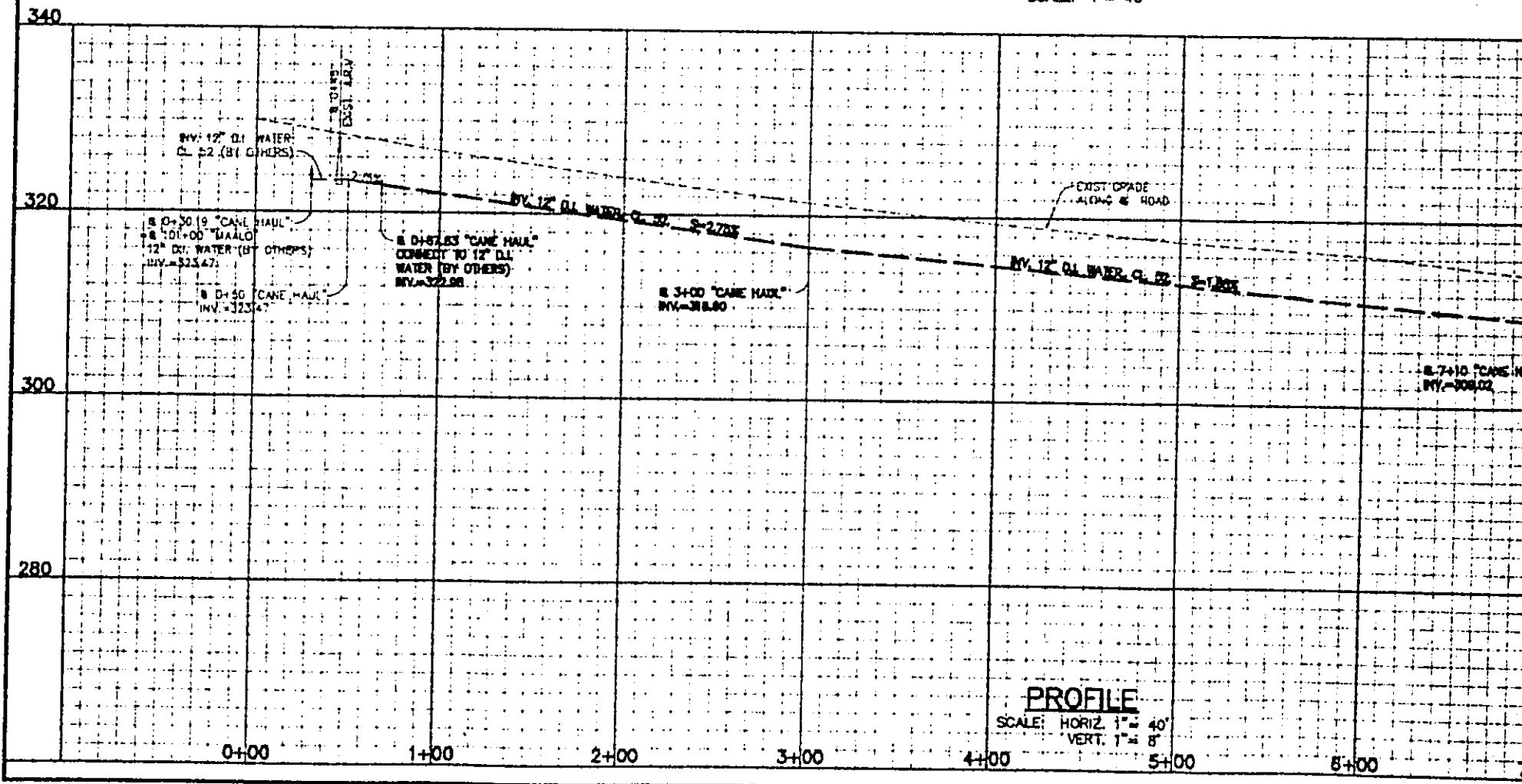
	SHEET NO.
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PLAN

SCALE: 1" = 40'



PROFILE

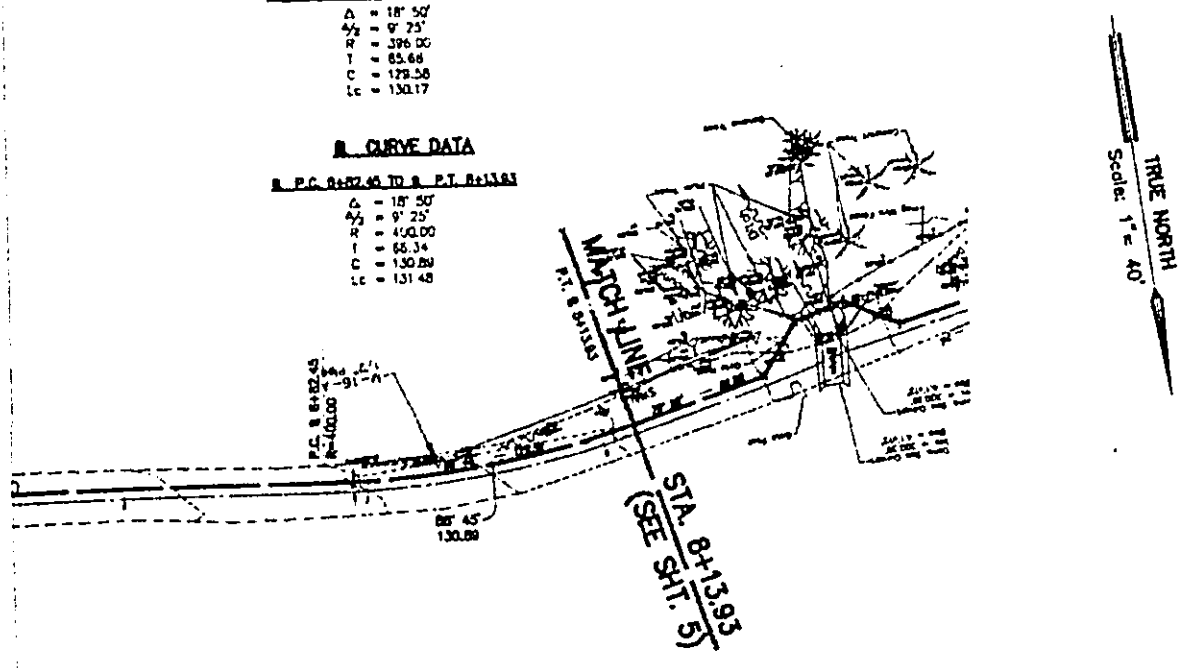
SCALE: HORIZ. 1" = 40'
VERT. 1" = 8'

WATER LINE CURVE DATA

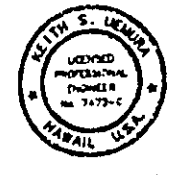
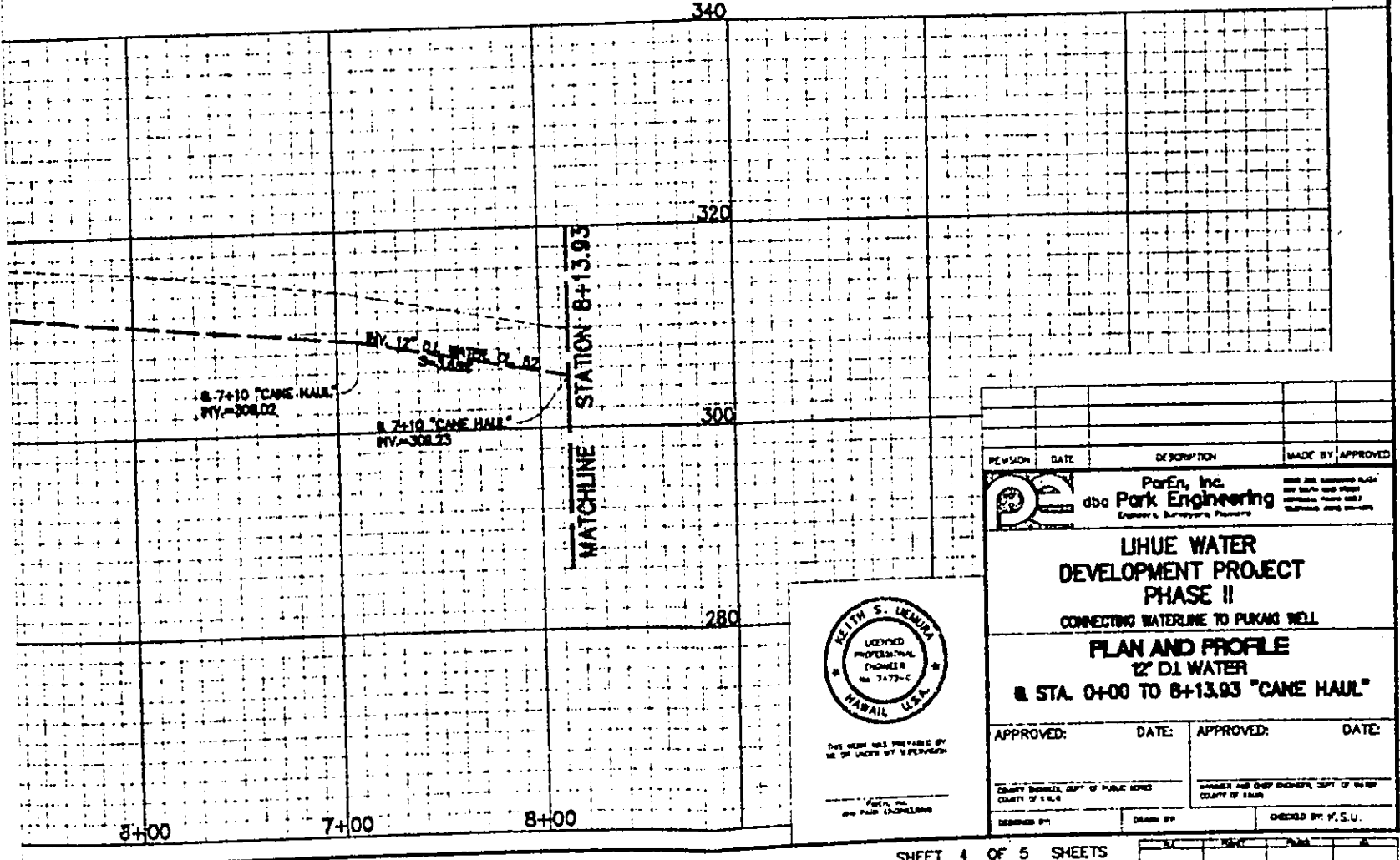
A. P.C. 8+52.45 TO B. P.T. 8+13.93
 $\Delta = 18^\circ 50'$
 $\Delta/2 = 9^\circ 25'$
 $R = 396.00'$
 $T = 85.68'$
 $C = 179.56'$
 $Lc = 130.17'$


B. CURVE DATA

A. P.C. 8+52.45 TO B. P.T. 8+13.93
 $\Delta = 18^\circ 50'$
 $\Delta/2 = 9^\circ 25'$
 $R = 400.00'$
 $T = 86.34'$
 $C = 130.89'$
 $Lc = 131.48'$



- LEGEND**
- - - - - EXIST. 2-FT CONTOURS
 - - - - - EXIST. 10-FT CONTOURS
 - - - - - EXIST. BANK
 - - - - - EXIST. SWALE
 - — — — — NEW WATER LINE



REVISION	DATE	DESCRIPTION	MADE BY	APPROVED
 Park Engineering, Inc. dba Park Engineering Engineers & Surveyors Hawaii				
LIHUE WATER DEVELOPMENT PROJECT PHASE II CONNECTING WATERLINE TO PUKAO WELL				
PLAN AND PROFILE 12" DI WATER 8+ STA. 0+00 TO 8+13.93 "CANE HAUL"				
APPROVED:	DATE:	APPROVED:	DATE:	
COUNTY ENGINEER, DEPT. OF PUBLIC WORKS COUNTY OF HAWAII		ENGINEER AND SURVEYOR, DEPT. OF WATER COUNTY OF HAWAII		
DESIGNED BY:	DRAWN BY:	CHECKED BY: K.S.U.		

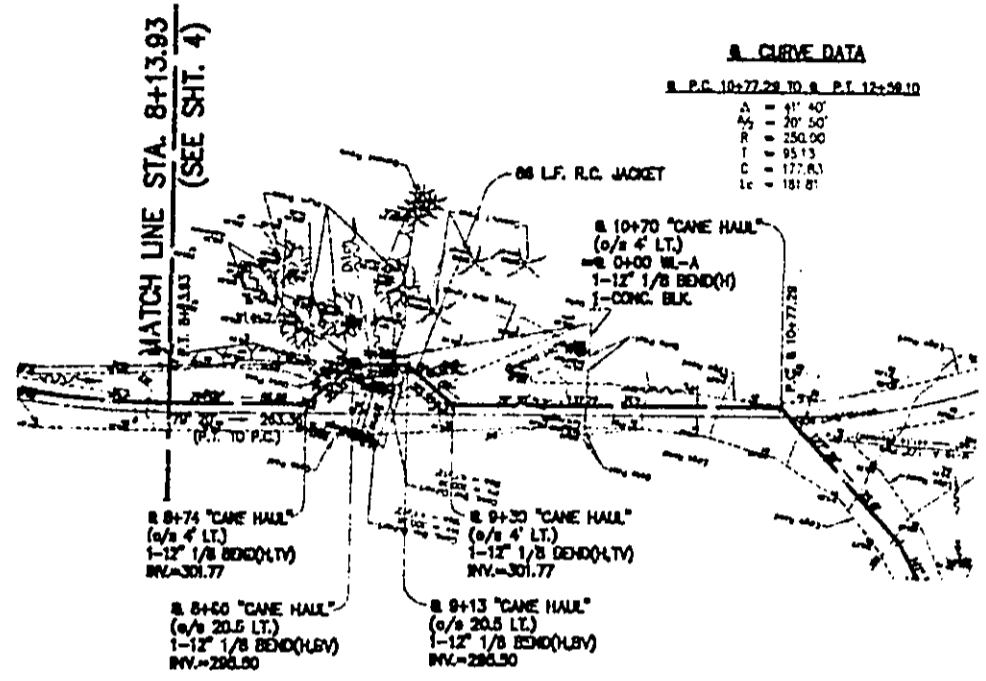
TRUE NORTH
Scale: 1" = 40'

TRUE NORTH
Scale: 1" = 40'

B. CURVE DATA

B. P.C. 10+77.24 TO B. P.T. 12+58.10

A	= 41' 40"
A _s	= 20' 50"
R	= 250.00
T	= 95.13
C	= 177.83
Lc	= 181.81'



LEGEND

- - - EXIST. 2-FT CONTOURS
- - - EXIST. 10-FT CONTOURS
- - - EXIST. BANK
- - - EXIST. SWALE
- NEW WATER LINE

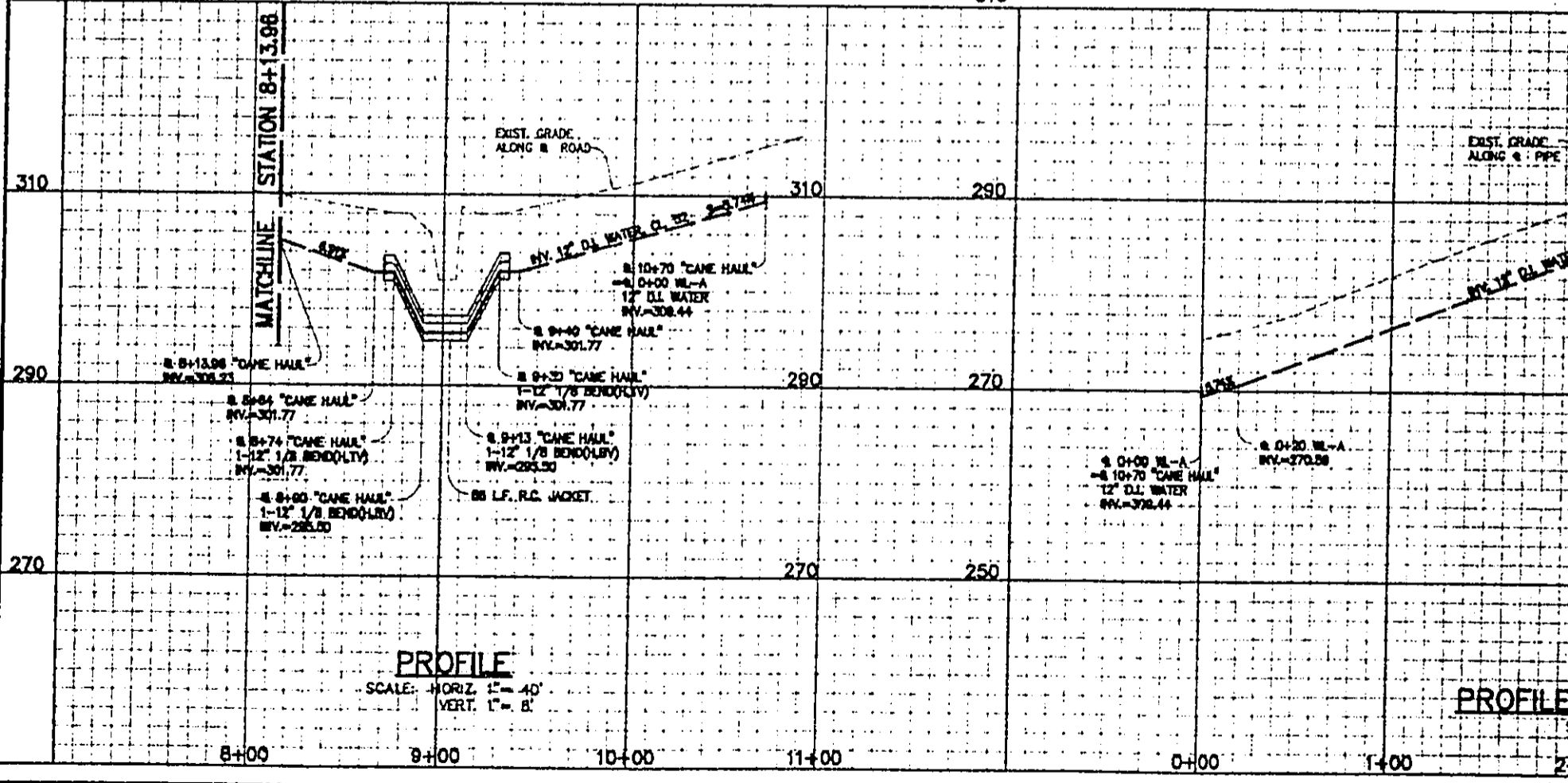
PLAN

SCALE: 1" = 40'

330

330

310



PROFILE

SCALE: HORIZ. 1" = 40'
VERT. 1" = 8'

PROFILE

8+00

9+00

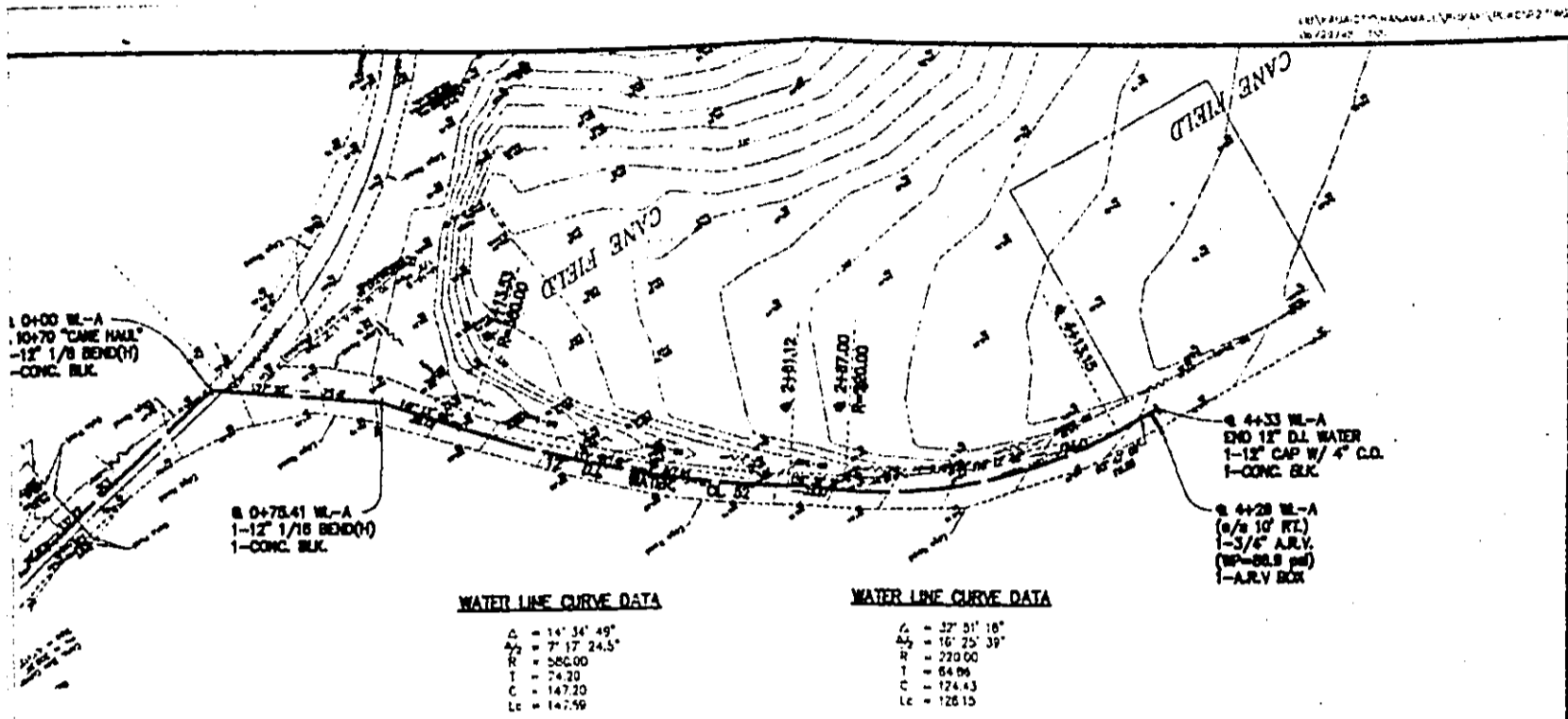
10+00

11+00

0+00

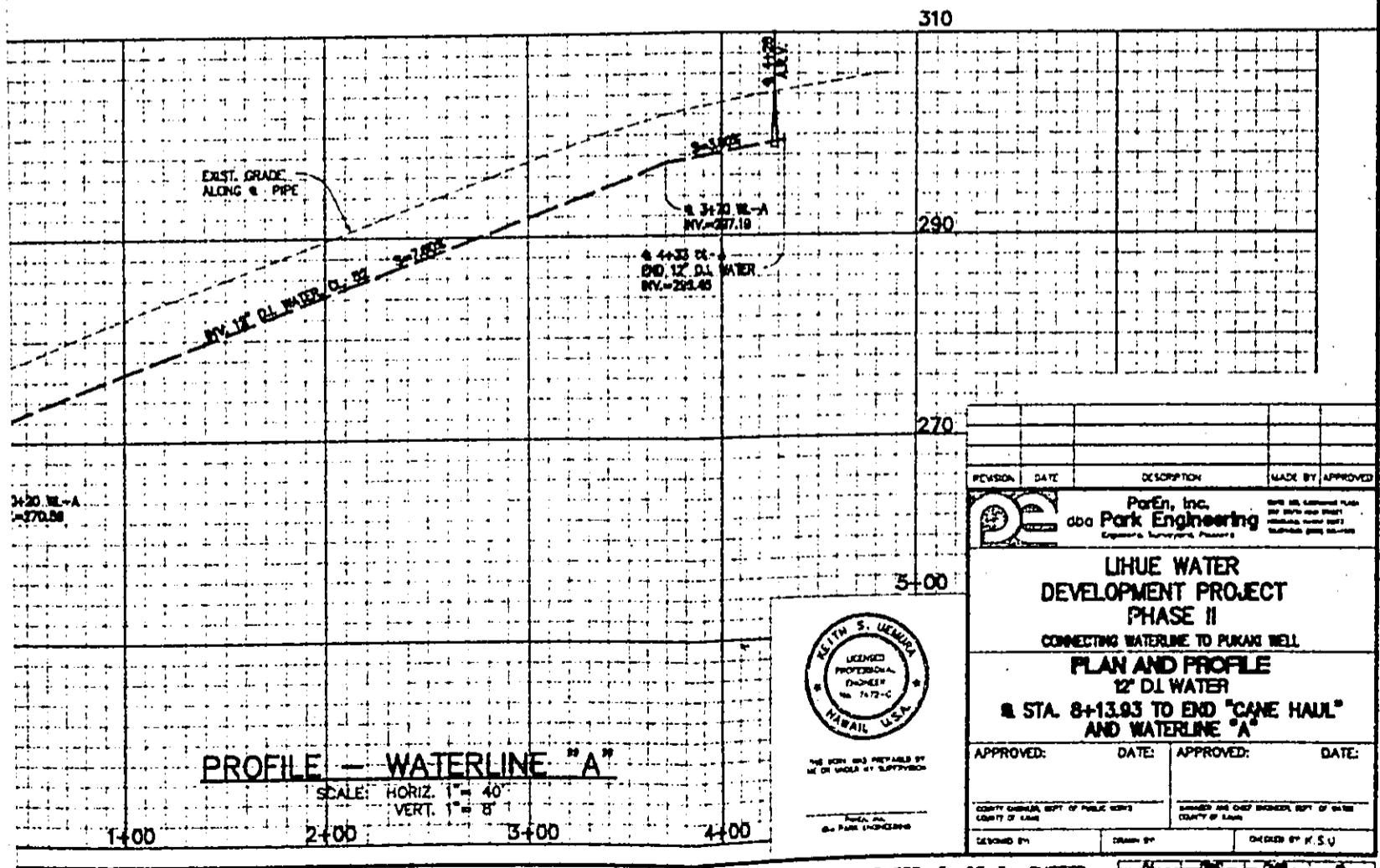
1+00

2



WATER LINE CURVE DATA		WATER LINE CURVE DATA	
Δ = 14° 34' 49"	Δ = 37° 31' 18"	Δ = 16° 25' 39"	
A_1 = 7' 17" 24.5'	A_2 = 16' 25' 39"	R = 220.00	
R = 580.00	T = 74.20	T = 64.06	
C = 147.20	Lc = 147.59	C = 124.43	
		Lc = 126.15	

PLAN - WATERLINE "A"
SCALE: 1" = 40'



REVISION	DATE	DESCRIPTION	MADE BY	APPROVED

ParEn, Inc.
dba Park Engineering
Engineers, Surveyors, Planners

LIHUE WATER DEVELOPMENT PROJECT PHASE II
CONNECTING WATERLINE TO PUKANI WELL
PLAN AND PROFILE
12" DI WATER
@ STA. 8+13.93 TO END "CANE HAUL" AND WATERLINE "A"

APPROVED:	DATE:	APPROVED:	DATE:

DESIGNED BY: _____ DRAWN BY: _____ CHECKED BY: K.S.U.