

APPENDIX B – SEDIMENT DATA

DRAFT
SEDIMENT SAMPLING AND ANALYSIS REPORT
PILLAR POINT HARBOR
PILOT SURFERS BEACH RESTORATION PROJECT

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SAMPLING AND ANALYSIS REPORT

DREDGE MATERIAL INVESTIGATION

PILLAR POINT HARBOR

PILOT SURFERS BEACH RESTORATION PROJECT

August 2019

TABLE OF CONTENTS

	<u>Page No.</u>
1.0 INTRODUCTION.....	1
1.1 Project Summary.....	2
1.2 Site Location	4
1.3 Roles and Responsibilities	4
1.4 Data Users	5
1.5 Harbor Construction, Site Setting and Potential Sources of Contamination	6
1.6 Previous Testing in the Project Area	6
2.0 METHODS.....	7
2.1 Sampling and Testing Design	7
2.1.1 Sampling and Testing Approach.....	7
2.1.2 Sample Identification, Composite Areas, Sediment Collection and Testing.....	7
2.1.3 Summary of Pillar Point Harbor Outer Breakwater Testing and Evaluation Sequence	10
2.2 Field Sampling Protocols	10
2.2.1 Positioning and Depth Measurements	10
2.2.2 Sampling Methods	10
2.2.3 Vibracore Decontamination	11
2.2.4 Core Processing	11
2.2.5 Detailed Soils Log.....	12
2.2.6 Documentation and Sample Custody.....	13
2.3 Laboratory Testing.....	13
2.3.1 Geotechnical Testing	13
3.0 QUALITY CONTROL REQUIREMENTS.....	13
3.1 Field Sampling Quality Management	14
4.0 RESULTS AND DISCUSSION	15
4.1 Sediment Observations	15
4.2 Sediment Physical Results	15
5.0 REFERENCES CITED	19

LIST OF TABLES

	<u>Page No.</u>
Table 1. Project Team and Responsibilities.....	4
Table 2. Key Project Contacts.....	5
Table 3. Actual Sampling Locations, Core Depths, and Composite Identifications, Pillar Point Harbor. ..	9
Table 4. Quality Control Procedures for Field Sediment Sampling.	14
Table 5. Results of Percent Solids and TOC analysis.....	16
Table 6. 2019 Sieve Analysis Data for Pillar Point Harbor Core locations, Inner Beach Grab Locations, and Surfers Beach Reference Locations.....	17

LIST OF FIGURES

	<u>Page No.</u>
Figure 1. Location of Pillar Point Harbor.	3
Figure 2. Pillar Point Harbor Potential Dredge Limits and Sampling Locations.....	8

LIST OF ACRONYMS

ASTM	American Society for Testing and Materials	MSD	Matrix Spike Duplicate
BLK	Method or Procedural Blank	MSD	Minimum Significant Difference
BMP	Best Management Practice	ND	Not Detected
BS	Blank Spike	NOAA	National Oceanic and Atmospheric Administration
BSD	Blank Spike Duplicate	OEHA	Office of Environmental Hazard Assessment
Cal/EPA	California Environmental Protection Agency	PAH	Polyaromatic Hydrocarbon
CD	Compact Disc	PCB	Polychlorinated Biphenyl
CDFG	California Department of Fish and Game	PDS	Post Digestion Spike
CESPD	Corps of Engineers South Pacific Division	PDS	Post Digestion Spike Duplicate
CHHSL	California Human Health screening Level	PPB	Parts Per Billion
COC	Chain of Custody	PPM	Parts Per Million
CSLC	California State Lands Commission	PRG	Preliminary Remediation Goals
CV	Coefficient of Variation	PVC	Polyvinyl Chloride
cy	Cubic Yards	RBC	Risk-Based Concentration
CRM	Certified Reference Material	RL	Reporting Limit
DDD	Dichlorodiphenyldichloroethane	RPD	Relative Percent Difference
DDE	Dichlorodiphenyldichloroethylene	RSLs	Regional Screening Levels for Cleanup of Superfund Sites
DDT	Dichlorodiphenyltrichloroethane	SC-DMMT	Southern California Dredge Material Management Team
DGPS	Differential Global Positioning Satellite	SOPs	Standard Operating Procedures
DTSC	Department of Toxic Substances Control	SRM	Standard Reference Material
DUP	Laboratory Replicates	STLC	Title 22 Soluble Threshold Limit Concentration
ERL	NOAA Effects Range Low	SURR	Surrogate Analysis
ERM	NOAA Effects Range Medium	SWQCB	State Water Resources Control Board
GPS	Global Positioning Satellite	TOC	Total Organic Carbon
HHMSSL	Human Health Medium – Specific Screening Levels	TRPH	Total Recoverable Hydrocarbons
HDPE	High-density Polyethylene	TTLC	Title 22 Total Threshold Limit Concentration
ITM	Inland Testing Manual	UCL	Upper Control Limit
LCL	Lower Control Limit	USACE	U.S. Army Corps of Engineers
LCS	Laboratory Control Spike	USEPA	U.S. Environmental Protection Agency
LDPE	Low-density Polyethylene	QA	Quality Assurance
LSD	Least Significant Difference	QC	Quality Control
MDL	Method Detection Limit	QUAL	Qualifier
MLLW	Mean Lower Low Water	USCS	Unified Soil Classification System
MS	Matrix Spike		

SAMPLING AND ANALYSIS REPORT
Dredge Material Investigation
Pillar Point Harbor
Pilot Surfers Beach Restoration Project
August 2019

1.0 INTRODUCTION

The San Mateo County Harbor District has initiated the Pilot Surfers Beach Restoration Project (project) to protect and restore the shoreline at Surfers Beach. The project will result in relocating clean sand that has accumulated inside the Pillar Point Harbor (PPH) outer breakwater over the past 57 years to the adjacent beach for beneficial re-use.

Surfers Beach has suffered from significant beach and bluff erosion attributed, in large part, to the construction of the PPH outer breakwater, completed in 1961. This rapid erosion of the beach and bluffs extending south of the harbor has been a source of concern over the past several decades. A recent Army Corps of Engineers (USACE) study concluded that the bluffs along Surfers Beach eroded at an average rate of 1.64 feet per year between 1993 and 2012. This erosion rate was determined to be approximately seven times higher than the rate of erosion at a geologically similar stretch of shoreline farther down the coast. Powerful storms during the past two winter seasons have resulted in even more severe erosion, causing major threats to Highway 1, Mirada Road and other coastal infrastructure and leading to emergency repairs by Caltrans and the County of San Mateo.

The project is necessary to reduce the threat of structural damage and recreation loss along Surfers Beach. Specific benefits include: preventing or mitigating beach erosion and sea cliff retreat; improving protection of Highway 1 and other structures; increasing quality and quantity of public access and recreation; reducing the need for hard structures (e.g. seawalls and revetments) and improving beach and wildlife habitat. This project will also address the issues associated with the shoaling that has occurred inside of the Harbor since the outer breakwater was constructed.

The San Mateo County Harbor District Board of Harbor Commissioners recognized the benefits of this proposed project and unanimously approved this pilot project at an October 7, 2015 Board meeting. In February 2016, the District submitted a grant application to Division of Boating and Waterways for \$800,000 to fund the Project implementation (construction and monitoring). The grant request was approved, and the District was notified in July 2017 that there is \$800,000 in the California budget to implement the Project. This includes sediment placement on Surfers Beach of up to 75,000 cubic yards of clean sand excavated/dredged from inside the outer breakwater at Pillar Point Harbor.

The District also successfully applied for funding through the Ocean Protection Council (OPC) for a portion of the necessary planning, engineering and design, environmental studies, and regulatory compliance/permitting. The OPC grant agreement was completed in late June 2017.

1.1 Project Summary

The San Mateo County Harbor District plans to conduct a beach nourishment project at Surfers Beach resulting in the relocation of approximately 75,000 cubic yards of clean sand from inside Pillar Point Harbor to the adjacent beach (Surfers Beach) for beneficial re-use. Please see Figure 1 for a vicinity map of the area. Sampling and testing of sediments to be dredged from Pillar Point Harbor will be completed in order to confirm the suitability of the sediment for beach placement at Surfers Beach, located just east of the Federal Breakwater. This Sampling and Analysis Report (SAR) describes the sample collection, handling, analysis procedures and results for the sampling and testing of material proposed for dredging from Pillar Point Harbor.

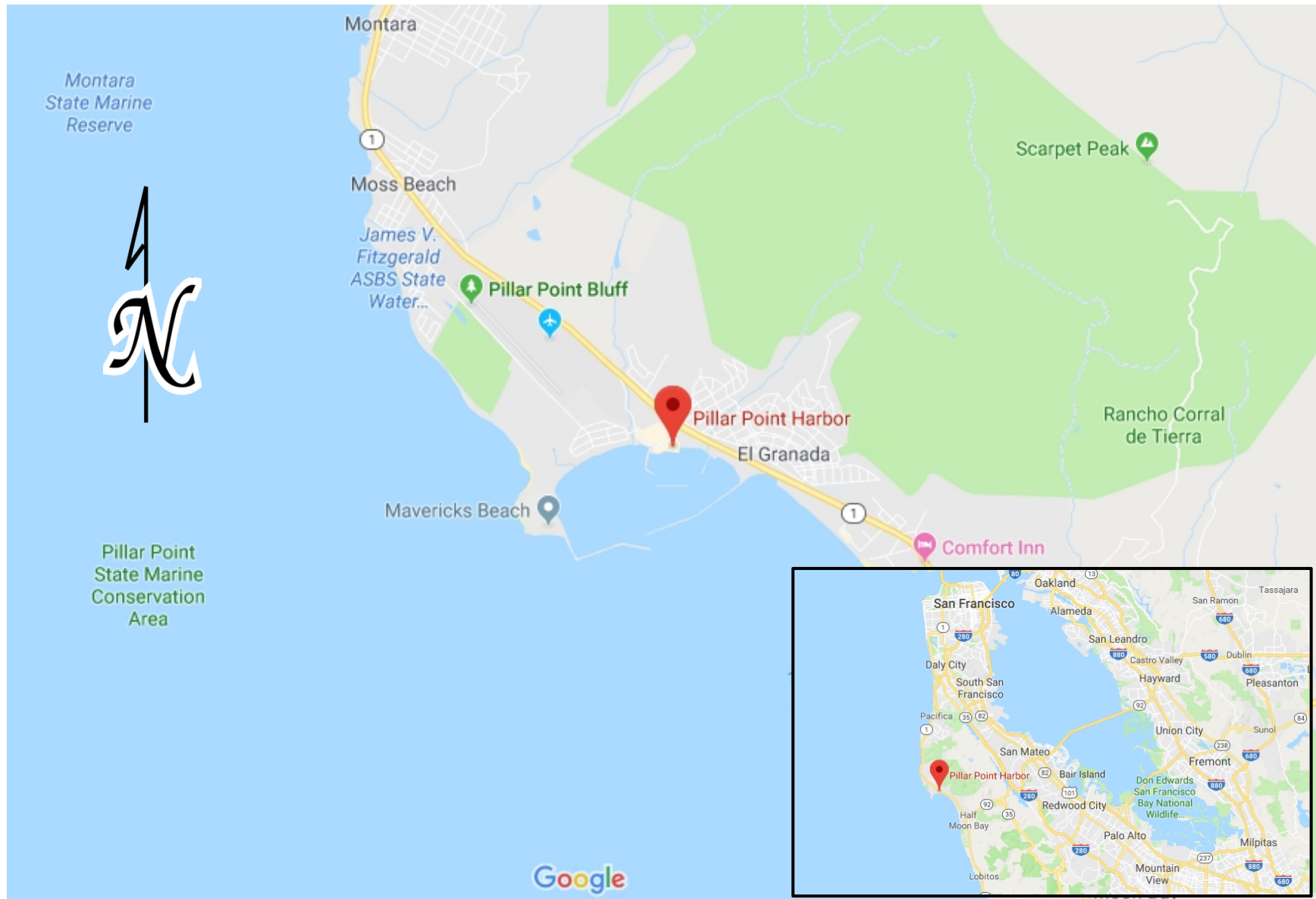


Figure 1. Location of Pillar Point Harbor.

1.2 Site Location

Pillar Point Harbor is located in San Mateo County, California (Figure 1). Geographic coordinates (NAD 83) are 37° 29.95' N and 122° 29.15' W for the approximate center inside the federal breakwater.

1.3 Roles and Responsibilities

Project responsibilities and key contacts for this sediment characterization program are listed in Tables 1 and 2. Kinnetic Laboratories Inc. provided sampling, logging and reporting services. Physical testing was conducted by Leighton Group.

Table 1. Project Team and Responsibilities.

Responsibility	Name	Affiliation
Project Planning and Coordination	John Moren Brad Damitz Spencer Johnson	San Mateo Harbor District Independent Consultant Kinnetic Laboratories
Project Design and Engineering	Louis White, PE Bob Battalio, PE	ESA ESA
Sampling and Analysis Plan (SAP) Preparation	Ken Kronschnabl Spencer Johnson	Kinnetic Laboratories Kinnetic Laboratories
Field Sample Collection and Transport	Spencer Johnson Dale Parent	Kinnetic Laboratories Kinnetic Laboratories
Grain Size Analysis, TOC, and Percent Solids	James Ward	Leighton Group
Health and Safety Officer and Site Safety Plan	Greg Cotten	Kinnetic Laboratories
Laboratory Chemical Analyses	Julie Lam Amy Howk	Eurofins Calscience Kinnetic Laboratories
QA/QC Management Analytical Laboratory QA/QC	Danielle Gonsman Amy Howk	Kinnetic Laboratories Kinnetic Laboratories
Technical Review	Ken Kronschnabl Brad Damitz	Kinnetic Laboratories Independent Consultant
Final Report	Ken Kronschnabl Spencer Johnson	Kinnetic Laboratories Kinnetic Laboratories
Agency Coordination	Brad Damitz	Independent Consultant

Table 2. Key Project Contacts

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1.4 Data Users

For project design purposes, the data produced by this sediment sampling and analysis report will be used by the ESA engineering team to refine permitting level dredging and beach nourishment plans for the project.

For environmental review and regulatory purposes, the principal users of the data produced by this project are the following agencies:

1. San Francisco District, U.S. Army Corps of Engineers (USACE);
2. San Francisco Bay Regional Water Quality Control Board (RWQCB)—Region 2;
3. U.S. Environmental Protection Agency (USEPA) - Region IX;
4. Greater Farallones National Marine Sanctuary (GFNMS)
5. California Coastal Commission.

Other users of the data may include the following agencies:

1. California Department of Fish and Wildlife (CDFW);
2. U.S. Fish and Wildlife Service (USFWS);
3. U.S. National Marine Fisheries Service (USNMFS); and
4. California State Lands Commission (CSLC).

1.5 Harbor Construction, Site Setting and Potential Sources of Contamination

The Army Corps of Engineers began work on a breakwater at Pillar Point for a harbor or refuge for the fishing fleet after World War II and finally completed the project in 1961. The Johnson Pier, docks, and the inner breakwater were built during the 1970's and 1980's. Pillar Point remains a major commercial and sport fishing harbor on California's central coast and is host to many public events including the annual Mavericks surfing competition, the July 4th fireworks display, and the Christmas boat decorating contest.

Pillar Point Harbor contains approximately 369 small boat slips. Pleasure craft as well as commercial fishing vessels inhabit the slips. The Harbor and Johnson Pier offer a variety of services and recreational activities. There are several restaurants and small businesses adjacent to the Harbor but there are no industrial facilities in the area. Just outside the inner breakwater to the East is a six-lane small boat launch ramp. Adjacent to the launch ramp are restroom facilities and a fish cleaning station. A beach curves out approximately 1,200 feet South East from the launch ramp to the federal breakwater. A storm drain enters the Harbor near the launch ramp as well as the outfall to Deer Creek, which causes sediment deposition resulting in nuisance shoaling at the launch ramps. The Harbor also receives localized runoff from areas immediately surrounding the Harbor from several storm drain outfalls and also from Denniston Creek, which drains into the Harbor on the opposite side. Fecal coliform contamination nonpoint sources has been an ongoing issue and has been studied extensively in the recent past.

1.6 Previous Testing in the Project Area

No known sampling and/or testing programs have been conducted in the area of interest, except for the boat launch ramp facility which underwent sampling and testing in 2012 and 2017.

2.0 METHODS

This section describes the dredging design, study design and field and analytical methods for this testing program.

2.1 Sampling and Testing Design

The sampling and testing design for this SAR covers data collection tasks for Pillar Point Harbor sediment collection and testing. Evaluation guidelines are also discussed.

2.1.1 Sampling and Testing Approach

The main approach was to determine the physical properties (Grain Size, Percent Solids, and Total Organic Carbon) of the sediments at each location and depth interval to determine if the sediments are physically suitable for nourishment of Surfers Beach. In addition, sediments from all locations were composited according to depth intervals and tested for grain size, percent solids, and TOC. Chemical data, if acquired, will be compared to the following ecological and human health screening values:

- Effects Range Low (ERL) and Effects Range Medium (ERM) values developed by Long, *et al.* (1995) that correlate concentrations of selected contaminants with likelihood of adverse biological effects;
- California Human Health Screening Levels (CHSSLs) (Cal/EPA, 2005 – updated 2010);
- U.S. EPA Regional Screening Levels (RSLs) (USEPA Region 9, updated 2018); and
- San Francisco Bay Regional Water Quality Control Board Environmental Screening Levels (ESLs) (SFBRWQCB, update 2016a).

2.1.2 Sample Identification, Composite Areas, Sediment Collection and Testing

Vibracore sampling, as described in Section 2.2.2 (Vibracore Sampling Methods), was carried out to collect subsurface sediment data at the eight locations within two distinct borrow areas inside the breakwater shown on Figure 2. The sampling location identifiers are “PPIHVC18-01” through “PPIHVC18-08”. Table 3 lists final coordinates, actual depths, and composite IDs for each sample location.

All cores were advanced to nine feet below the existing mudline or to refusal. Cores were sectioned into 36-inch segments or shorter as appropriate to create a top, middle, and bottom composite sample for physical and carbon analyses (grain size distribution, total organic carbon (TOC), and percent solids) and an archive chemical sample for possible chemical testing. Composites were formed for each of the following: Sites 1 -5, and sites 6 -7 (TOC only) and site 8 was analyzed only individually. Additionally, each segment of each core was subsampled and tested for grain size, and additional archive samples were formed from each core segment.



Figure 2. Pillar Point Harbor Potential Dredge Limits and Sampling Locations.

Table 3. Actual Sampling Locations, Core Depths, and Composite Identifications, Pillar Point Harbor.

Composite Area	Sample Designation	Composite IDs	Latitude North	Longitude West	Water Depths (ft., MLLW)	Design Depth (ft., bgs)	Expected Core Length (ft.)	Core Analyses	Composite Analyses
Inside Breakwater	PPIHVC18-1	PPIHVC18-Top,Mid,&Bot	37°30.106'	122°28.619'	-2.0	9	9	Grain Size, Chem Archive	Grain Size, TOC, % Solids
	PPIHVC18-2		37°30.074'	122°28.657'	-8.7	9	9	Grain Size, Chem Archive	
	PPIHVC18-3		37°30.079'	122°28.599'	-5.7	9	9	Grain Size, Chem Archive	
	PPIHVC18-4		37°30.088'	122°28.552'	-1.4	9	9	Grain Size, Chem Archive	
	PPIHVC18-5		37°30.047'	122°28.594'	-9.6	9	9	Grain Size, Chem Archive	
	PPIHVC18-6	Individual	37°30.944'	122°28.629'	+0.5	9	9	Grain Size, Chem Archive	
	PPIHVC18-7		37°29.913'	122°28.683'	-0.8	9	9	Grain Size, Chem Archive	
	PPIHVC18-8		37°29.872'	122°28.747'	-1.8	9	9	Grain Size, Chem Archive	
Pillar Point Harbor Beach	IHBG-18-1	Individual	37°30.058'	122°28.296'	+2.0	0.5	0.5	Grain Size, Chem Archive	Grain Size, TOC, % Solids
	IHBG-18-2		37°30.025'	122°28.202'	+2.0	0.5	0.5	Grain Size, Chem Archive	
	IHBG-18-3		37°29.985'	122°28.120'	+3.0	0.5	0.5	Grain Size, Chem Archive	
Surfers Beach	SBREF18-1	Individual	37°30.137'	122°28.627'	+3.0	0.5	0.5	Grain Size, Chem Archive	Grain Size, TOC, % Solids
	SBREF18-2		37°30.095'	122°28.530'	+3.0	0.5	0.5	Grain Size, Chem Archive	
	SBREF18-3		37°29.995'	122°28.503'	+3.0	0.5	0.5	Grain Size, Chem Archive	

TBD = To be determined

Archive samples are being stored frozen for at least six months. Grain size, TOC, and Percent Solids samples were not frozen.

2.1.3 Summary of Pillar Point Harbor Outer Breakwater Testing and Evaluation Sequence

The testing and evaluation sequence conducted for the Pillar Point Harbor samples is described in detail in the next subsection and is outlined as follows:

- 1) Conducted sediment grain analyses on each composite and individual sample including individual reference samples from Surfers Beach and individual samples from Pillar Point Harbor Beach (Figure 2).
- 2) If the initial grain size analyses fall below an average of 80 percent sand (as it did for the top, middle, and bottom composite sample for sites 1-5), then confirmatory chemical analyses may be performed on a limited basis and is yetg to be determined.
- 3) Chemical analytical results if obtained will be evaluated against ERLs and ERMs, RSLs, ESLs and CHHSSLs.

2.2 Field Sampling Protocols

This section discusses vibracore sampling, grab sampling, decontamination, sample processing, and documentation procedures carried out for this project.

2.2.1 Positioning and Depth Measurements

Positioning at each sampling location was accomplished using a differential GPS (DGPS) navigation system operating in Wide Area Augmentation System (WAAS) mode with positioning accuracies of 3 to 10 feet. Locations were recorded in geographic coordinates (Latitude and Longitude, NAD 83). A graduated lead line was used to measure water depths that were corrected to mean lower low water (MLLW). Tidal stage was determined using NOAA predicted tide tables checked against a local tide gage or real-time tidal stage data.

All sampling sites were located within dredge limits and within 20 feet of target coordinates. Records were maintained during fieldwork to confirm the accuracy of the DGPS. The DGPS was checked for accuracy at least twice a day and the max error in feet was never greater than 7 feet.

2.2.2 Sampling Methods

Harbor sediment samples were collected using an electric vibracore that can penetrate and obtain samples to the project sample elevation of nine feet bgs or to refusal. The depth of refusal is defined as the depth at which the average rate of penetration is less than 0.1 feet/minute for a two (2) minute period. Refusal was encountered prior to full penetration at sites 1-5 due to underlying formation material. Penetration was to 10.5 feet for Site 6-8. At site 2, where the depth of refusal was reached prior to the sample depth, one additional attempt was made to confirm the presence of formation material.

At the conclusion of a successful vibracore, the core liner was removed and split open for inspection and sampling. None of the core material was extruded from the liner. Processing took place onshore and aboard the sampling vessel.

Vibracore sampling was conducted from a 12 ft x 16 ft pontoon barge, which was positioned with a 17 ft Boston Whaler. The vessels were fully equipped with all necessary navigation, safety, and lifesaving devices per Coast Guard requirements. The barge secured itself in place using spuds.

Kinnetic Laboratories' vibracore consists of a 4-inch diameter aluminum coring tube, a stainless steel cutting tip, and a stainless-steel core catcher. The vibrating unit has two counter-rotating motors encased in waterproof aluminum housing. A three-phase, 240-volt generator powers the motors. Inserted into the core tubes were food-grade clean polyethylene liners. The vibracore head and tube were then lowered overboard with a quadrapod and winch. The unit was then vibrated until it reached target sampling depth or until the depth of refusal was reached.

When penetration of the vibracore was complete, power was shut off to the vibra-head, and the vibracore was brought aboard the vessel. The core cutting tip and catcher were then removed. Afterwards, the core liners were removed and sealed on both ends until processed.

Grab sampling beach sediments was conducted with a 4-inch diameter stainless steel hand auger and stainless steel spoon. The auger was advanced 0.5 feet below the sediment surface and samples were placed into sealable plastic bags for grain size analysis.

2.2.3 Vibracore Decontamination

All sample contact surfaces were stainless steel, polyethylene or Teflon[®] coated. Compositing tools were stainless steel. Except for the core liners, all contact surfaces of the sampling devices and the coring tubes were cleaned for each sampling location. The cleaning protocol consisted of a site water rinse, a Micro-90[®] soap wash, and then 3 deionized water rinses. The polyethylene core liners were new and of food grade quality. All rinsate was collected in containers and disposed of properly.

2.2.4 Core Processing

Cores were placed in a PVC core rack that was cleaned between cores. After placement in the rack, core liners were split lengthwise to expose the recovered sediment. Once exposed, sediment that came in contact with the core liner was removed by scraping with a pre-cleaned stainless steel spoon. Each core was photographed, measured, and lithologically logged in accordance with the Unified Soil Classification System (USCS).

Photographs were taken of each core covering a maximum two-foot interval. These pictures will be provided in the Final Report.

Following logging, vertical composite subsamples were formed from each core as appropriate. Cores These included samples for grain size, TOC and percent solids analyses, discrete chemical

archives, and the composite chemical archive. Vertical composite subsamples were formed by combining and homogenizing a representative sample from each sampling interval, as described in Section 2.1, in a pre-cleaned stainless steel tray. A 0.5-liter portion of this material was placed in a pre-cleaned and certified glass jar with a Teflon[®]-lined lid for archived material. Another portion was placed in sealable plastic bags for grain size analysis. The remaining portion was placed in another pre-cleaned tray for area compositing with the other primary vertical composite subsamples from the remaining locations and same depth interval.

For the preservation of chemical sediment samples, filled containers were placed on ice immediately following sampling and then frozen as soon as possible. A small amount of headspace was allowed to prevent container breakage during freezing. The sample containers were sealed to prevent any moisture loss and possible contamination. No samples showed external contamination due to handling or incorrect sampling procedures

2.2.5 Detailed Soils Log

A detailed soils log was prepared for each sampling location as part of the field log. As a minimum, this log included the project name, hole or transect number or designation, date, time, location, water depth, estimated tide, mudline elevation, type and size of sampling device used, depth of penetration, length of recovery, depths below mudline of samples, and a description and condition of the sediment. The description of the sediment was in accordance with ASTM D 2488 (2006), and included as a minimum: grain size, color, estimation of density (sand) or consistency (silts and clays), odor (if present), and description of amount and types of organics and trash present. These logs will be provided in the Final Report.

2.2.6 Documentation and Sample Custody

All samples had their containers physically marked as to sample location, date, time and analyses. All samples were handled under Chain of Custody (COC) protocols beginning at the time of collection. Sampling data was recorded on field data log sheets. A copy of the field data logs is included in this draft report. An inventory (COC form) will be included of all samples taken and delivered.

Samples were considered to be “in custody” if they were (1) in the custodian’s possession or view, (2) in a secured place (locked) with restricted access, or (3) in a secure container. Standard COC procedures were used for all samples collected, transferred, and analyzed as part of this project. COC forms were used to identify the samples, custodians, and dates of transfer. Except for the shipping company, each person who had custody of the samples signed the COC form and ensured samples were stored properly and not left unattended unless properly secured.

The completed COC form was placed in a sealable plastic bag and placed in the cooler with the samples. COC records are also included in the final report prepared by the testing laboratory.

A daily field activity log was maintained listing the beginning and ending time for every and all phases of operation, the names and responsibilities of all field personnel present, description and length of any delays, and weather and sea conditions. This log also includes DGPS verification notes. These logs will be provided in the Final Report.

2.3 Laboratory Testing

Only grain size, TOC and percent solids were run at this time

2.3.1 Geotechnical Testing

A sufficient quantity of sediment was collected from each location so that a representative amount of sediment was included in each geotechnical sample. These samples represented material for each 36-inch or major core interval as appropriate as shown in Table 6.

All mechanical grain size tests were run according to ASTM D 6913. In addition to the mechanical grain size, total organic carbon (TOC) and percent solids were also analyzed (Table 5).

3.0 QUALITY CONTROL REQUIREMENTS

Formal QA/QC procedures were followed for this project. The objectives of the QA/QC Program were to fully document the field and laboratory data collected, to maintain data integrity from the time of field collection through storage and archiving, and to produce the highest quality data possible. Quality assurance involves all of the planned and systematic actions necessary to provide confidence that work performed by the project team conforms to contract requirements, laboratory methodologies, state and federal regulation requirements, and corporate Standard Operating Procedures (SOPs). The program is designed to allow the data to be assessed by the following parameters: Precision, Accuracy, Comparability, Representativeness, and

Completeness. These parameters are controlled by adhering to documented methods and procedures (SOPs), and by the analysis of quality control (QC) samples on a routine basis.

3.1 Field Sampling Quality Management

Field Quality Control procedures are summarized in Table 4 and includes adherence to SOPs and formal sample documentation and tracking.

Table 4. Quality Control Procedures for Field Sediment Sampling.

<i>Sediment Sampling Field Activity</i>
<ul style="list-style-type: none">• Vibracore Sampling SOP• Grab Sampling SOP• Protocol Cleaning/Low Detection Limits• Certified Clean Laboratory Containers• Horizontal and Vertical Controls• Core Logging & Subsampling Protocols• Sample Control/ Chain of Custody Procedures• Field Logs and Core Logs• Sample Preservation & Shipping Procedures

4.0 RESULTS AND DISCUSSION

As summarized in Tables 5 and 6 below, results of all physical and TOC testing of the Pillar Point Harbor and reference beach samples are provided. This table does not include analytical quality assurance/quality control (QA/QC) data.

4.1 Sediment Observations

Observed sediment characteristics varied somewhat between cores. According to laboratory analysis, sediments from half of the cores were described as poorly graded sand (SP) or poorly graded sand with silt (SP)(SM) and the other half were described as silty sand. All reference beach samples were described as poorly graded sand (SP).

There were no noxious odors, trash, and other non-organic debris observed in any of the cores. There were also no obvious layers of elevated contamination. Eelgrass was noted in the area between sites 7 and 8.

4.2 Sediment Physical Results

Grain size analyses were performed on multiple sections of each of the eight cores collected and each individual beach grab sample. Sieve analysis data for material above project depth for the Pillar Point Harbor cores are provided in Table 6, and the results show that the sediments vary in grain size by location and depth. Locations 6-8 show primarily poorly graded sand with few fines throughout while locations 1,2,3, and 5 show primarily silty sand with the proportion of silt increasing with depth. Location 4 showed poorly graded sand over silty sand. Sieve analysis data for the individual beach grab samples are also provided in Table 6 and show that sediments collected are poorly graded sand with very few fines. Total organic carbon analysis showed inconsequential levels of TOC across all cores and percent solids ranged from (Table 5). Individual grain size distribution curves for each individual grain size sample analyzed above will be provided in the Final Report.

As summarized in Table 6, results indicate that Pillar Point Harbor primary core intervals (mudline to project depth or refusal) varied in sand and silt content by location and depth. Core locations and intervals that showed greater than 80 percent sand were the following:

- Site 1 down to 4.7 feet
- Site 4 down to 4.1 feet
- Site 6 down to 8.5 feet
- Site 7 down to 8.5 feet
- Site 8 down to 7.3 feet

All beach samples showed 98 percent sand or greater.

Table 5. Results of Percent Solids and TOC analysis

Analyte	Top Composite sites 1-5	Mid Composite sites 1-5	Bottom Composite sites 1-5	Top Composite sites 6-7	Mid Composite sites 6-7	Bottom Composite sites 6-7	Top site 8	Mid site 8	Bot site 8
% Solids	73.7	82.4	86.0	78.3	78.8	73.6	71.5	78.6	68.8
% TOC	0.33	0.12	0.028J	0.095	0.23	1.20	0.32	0.33	1.30

Table 6. 2019 Sieve Analysis Data for Pillar Point Harbor Core locations, Inner Beach Grab Locations, and Surfers Beach Reference Locations.

Location	Sampling Depth (ft, BGS)	Gravel			Coarse Sand	Medium Sand		Fine Sand		Silt/Clay	Classification
		Sieve No./Sieve Size/% Passing									
		1/2"	3/8"	4	8	16	30	50	100	200	
		12.5 mm	9.5 mm	4.75 mm	2.36 mm	1.18 mm	0.60 mm	0.30 mm	0.150 mm	0.075 mm	
PPIHVC18-Top (1 to 5 Composite)	0.0'-3.0'	100	100	99.7	96.6	90.7	82.3	74.0	46.9	21.3	Silty Sand (SM)
PPIHVC18-Mid (1 to 5 Composite)	3.0'-6.0'	100	99.4	98.4	93.7	85.7	76.0	67.8	45.9	27.2	Silty Sand (SM)
PPIHVC18-Bottom (1 to 5 Composite)	6.0'+	100	100	99.8	97.0	90.9	84.3	75.6	53.5	39.3	Silty Clayey Sand (SC-SM)
Site 1Top	0.0'-3.0'	100	100	99.2	96.5	92.3	82.6	69.3	33.6	13.5	Silty Sand (SM)
Site 1 Mid	3.0'-4.7'	100	98.8	97.0	91.4	83.2	72.7	62.1	35.0	12.7	Silty Sand (SM)
Site 2 Top	0.0'-2.0'	100	100	99.8	99.4	99.0	98.8	96.7	87.2	47.7	Silty Sand (SM)
Site2 Mid	2.0'-3.7'	100	100	99.5	93.8	85.3	77.0	67.2	52.3	41.7	Silty Sand (SM)
Site 3 Top	0.0'-3.0'	100	100	99.9	99.5	98.6	95.8	91.3	68.7	31.5	Silty Sand (SM)
Site 3 Mid	3.0'-6.0'	100	98.9	96.6	91.4	84.1	77.0	70.2	42.2	23.5	Silty Sand (SM)
Site 3 Bottom	6.0'-6.7'	100	100	99.2	94.3	85.9	77.5	67.8	49.0	36.7	Silty Sand (SM)
Site 4 Top	0.0'-3.0'	100	99.7	99.1	93.5	83.5	72.0	62.0	23.4	4.4	Poorly Graded Sand (SP)
Site 4 3.0-4.1	3.0'-4.1'	100	100	99.7	97.8	89.3	64.4	49.3	16.8	2.3	Poorly Graded Sand (SP)
Site 4 4.1-5.8	4.1'-5.8'	100	100	99.8	97.1	87.7	76.6	66.7	56.6	43.2	Silty Sand (SM)
Site 5 Top	0.0'-3.0'	100	100	99.8	97.7	91.7	84.0	78.7	67.6	43.0	Silty Sand (SM)
Site 5 Mid	3.0'-6.0'	100	100	99.7	94.9	88.2	82.2	75.9	56.8	36.5	Silty Sand (SM)
Site 5 Bottom	6.0'-6.5'	100	100	99.6	98.5	95.6	91.4	84.0	57.5	41.8	Silty Sand (SM)
Site 6 Top	0.0'-3.0'	100	100	100	99.9	99.5	99.3	97.9	48.9	2.7	Poorly Graded Sand (SP)
Site 6 Mid	3.0'-6.0'	100	100	100	100	100	99.8	97.2	29.6	3.9	Poorly Graded Sand (SP)
Site 6 Bottom	6.0'-8.5'	100	100	100	100	99.7	98.9	94.4	32.0	5.6	Poorly Graded Sand with Silt (SP-SM)
Site 7 Top	0.0'-3.0'	100	100	99.9	99.7	99.0	98.5	96.7	47.6	2.8	Poorly Graded Sand (SP)
Site 7 Mid	3.0'-6.0'	100	100	100	100	100	99.9	98.6	53.9	3.7	Poorly Graded Sand (SP)
Site 7 Bottom	6.0'-8.5'	100	100	100	100	99.9	99.3	93.8	40.7	4.8	Poorly Graded Sand with Silt (SP-SM))

Table 6. 2019 Sieve Analysis Data for Pillar Point Harbor Core locations, Inner Beach Grab Locations, and Surfers Beach Reference Locations.

Location	Sampling Depth (ft, BGS)	Gravel			Coarse Sand	Medium Sand		Fine Sand		Silt/Clay	Classification
		Sieve No./Sieve Size/% Passing									
		1/2"	3/8"	4	8	16	30	50	100	200	
		12.5 mm	9.5 mm	4.75 mm	2.36 mm	1.18 mm	0.60 mm	0.30 mm	0.150 mm	0.075 mm	
Site 8 Top	0.0'-3.0'	100	100	100.0	99.9	99.7	99.0	94.5	49.7	3.3	Poorly Graded Sand (SP)
Site 8 Mid	3.0'-6.0'	100	100	100	100	100	99.8	97.6	55.8	4.7	Poorly Graded Sand (SP)
Site 8 Bottom	6.0'-7.3'	100	100	100	100	99.7	98.4	88.1	52.2	8.4	Poorly Graded Sand with Silt (SP-SM)
Inner Harbor Beach Grab 1	0.0'-0.5'	100	100	100	100	100	99.9	98.9	41.7	1.3	Poorly Graded Sand (SP)
Inner Harbor Beach Grab 2	0.0'-0.5'	100	100	100	100	100	99.9	98.9	53.6	2.0	Poorly Graded Sand (SP)
Inner Harbor Beach Grab 3	0.0'-0.5'	100	100	100	100	100	100	99.1	47.1	1.9	Poorly Graded Sand (SP)
Surfer's Beach Reference Grab 1	0.0'-0.5'	100	100	100	100	99.9	99.6	92.3	17.7	1.1	Poorly Graded Sand (SP)
Surfer's Beach Reference Grab 2	0.0'-0.5'	100	100	100	100	100	99.9	93.4	17.7	1.0	Poorly Graded Sand (SP)
Surfer's Beach Reference Grab 3	0.0'-0.5'	100	100	100	100	100	99.2	73.0	9.4	1.1	Poorly Graded Sand (SP)

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**PARTICLE-SIZE DISTRIBUTION (GRADATION)
of SOILS USING SIEVE ANALYSIS**
ASTM D 6913

Project Name: Pillar Point Harbor

Tested By: ACS/OHF Date: 06/26/19

Project No.: 5720.180

Checked By: J. Ward Date: 07/11/19

Station ID: PP Harbor Beach

Date, Time: 06/18/19, 17:02

Sample ID: IHBG18-1

Soil Identification: Olive gray poorly-graded sand (SP)

Container No.:	IP-2	Moisture Content of Total Air - Dry Soil	
		Wt. of Air-Dry Soil + Cont. (g)	0.0
Wt. of Air-Dried Soil + Cont.(g)	687.9	Wt. of Dry Soil + Cont. (g)	0.0
Wt. of Container (g)	96.1	Wt. of Container No._____ (g)	1.0
Dry Wt. of Soil (g)	591.8	Moisture Content (%)	0.0

After Wet Sieve	Container No.	IP-2
	Wt. of Dry Soil + Container (g)	681.8
	Wt. of Container (g)	96.1
	Dry Wt. of Soil Retained on # 200 Sieve (g)	585.7

U. S. Sieve Size		Cumulative Weight Dry Soil Retained (g)	Percent Passing (%)
(in.)	(mm.)		
1 1/2"	37.5		
1"	25.0		
3/4"	19.0		
1/2"	12.5		
3/8"	9.5		
#4	4.75	0.0	100.0
#8	2.36	0.2	100.0
#16	1.18	0.2	100.0
#30	0.600	0.4	99.9
#50	0.300	6.5	98.9
#100	0.150	345.0	41.7
#200	0.075	584.3	1.3
PAN			

GRAVEL: **0 %**

SAND: **99 %**

FINES: **1 %**

GROUP SYMBOL: **SP**

$C_u = D_{60}/D_{10} =$ 2.02

$C_c = (D_{30})^2/(D_{60}*D_{10}) =$ 1.05

Remarks: _____

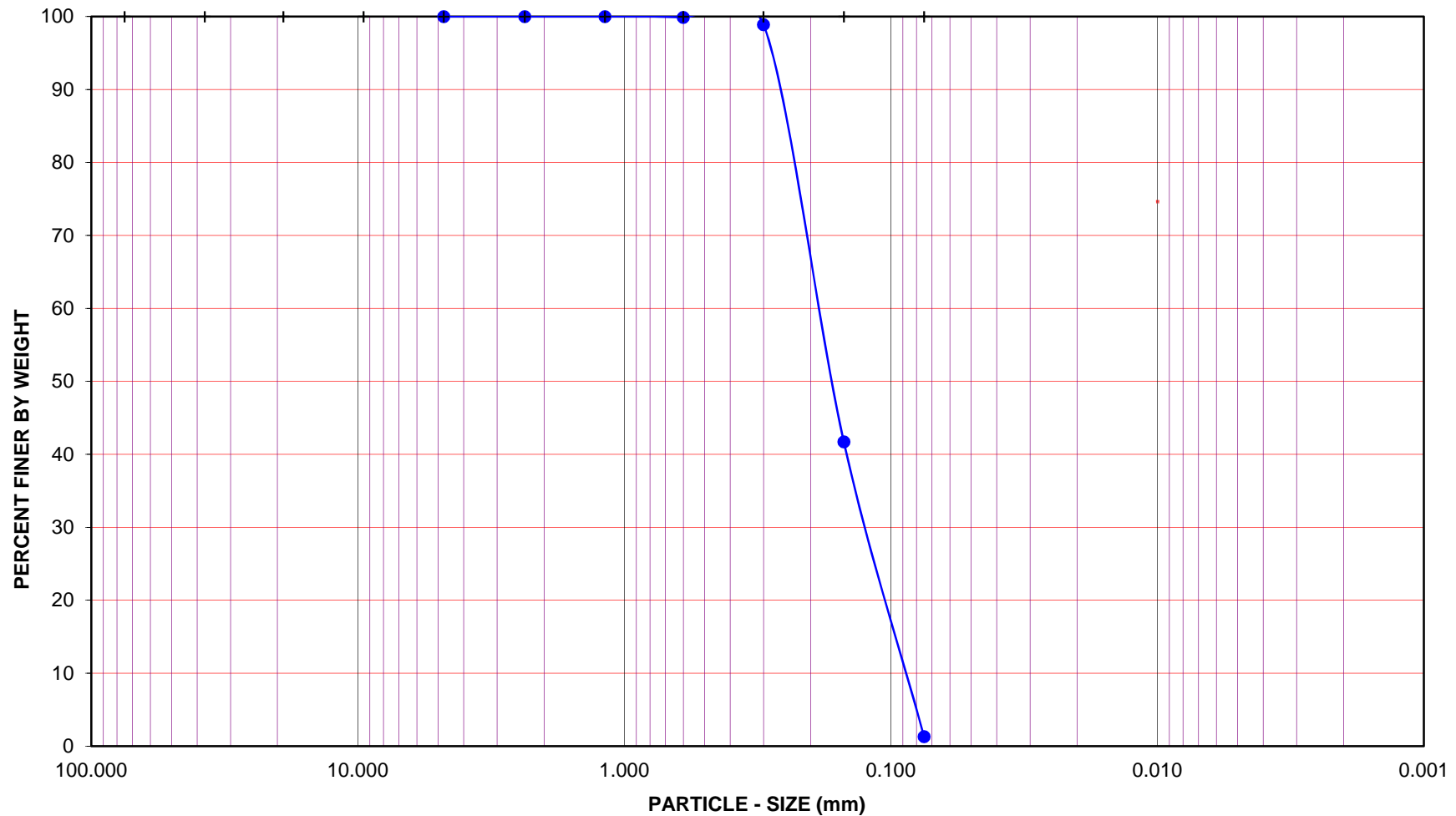
GRAVEL				SAND				FINES		
COARSE		FINE		COARSE	MEDIUM	FINE		SILT		CLAY

U.S. STANDARD SIEVE OPENING

U.S. STANDARD SIEVE NUMBER

HYDROMETER

3.0" 1 1/2" 3/4" 3/8" #4 #8 #16 #30 #50 #100 #200



Project Name: Pillar Point Harbor

Project No.: 5720.180

Station ID: PP Harbor Beach

Sample ID: IHBG18-1

Date, Time: 06/18/19, 17:02

Soil Type : SP

Soil Identification: Olive gray poorly-graded sand (SP)

GR:SA:FI : (%) 0 : 99 : 1

Jul-19



Leighton

**PARTICLE - SIZE
DISTRIBUTION
ASTM D 6913**



**PARTICLE-SIZE DISTRIBUTION (GRADATION)
of SOILS USING SIEVE ANALYSIS**
ASTM D 6913

Project Name: Pillar Point Harbor

Tested By: O. Figueroa Date: 06/25/19

Project No.: 5720.180

Checked By: J. Ward Date: 07/11/19

Station ID: PP Harbor Beach

Date, Time: 06/18/19, 17:10

Sample ID: IHBG18-2

Soil Identification: Olive gray poorly-graded sand (SP)

Container No.:	G	Moisture Content of Total Air - Dry Soil	
		Wt. of Air-Dry Soil + Cont. (g)	0.0
Wt. of Air-Dried Soil + Cont.(g)	661.3	Wt. of Dry Soil + Cont. (g)	0.0
Wt. of Container (g)	142.1	Wt. of Container No._____ (g)	1.0
Dry Wt. of Soil (g)	519.2	Moisture Content (%)	0.0

After Wet Sieve	Container No.	G
	Wt. of Dry Soil + Container (g)	655.3
	Wt. of Container (g)	142.1
	Dry Wt. of Soil Retained on # 200 Sieve (g)	513.2

U. S. Sieve Size		Cumulative Weight Dry Soil Retained (g)	Percent Passing (%)
(in.)	(mm.)		
1 1/2"	37.5		
1"	25.0		
3/4"	19.0		
1/2"	12.5		
3/8"	9.5		
#4	4.75		
#8	2.36	0.0	100.0
#16	1.18	0.1	100.0
#30	0.600	0.5	99.9
#50	0.300	5.9	98.9
#100	0.150	241.1	53.6
#200	0.075	508.7	2.0
PAN			

GRAVEL: **0 %**

SAND: **98 %**

FINES: **2 %**

GROUP SYMBOL: **SP**

$C_u = D_{60}/D_{10} = 1.93$

$C_c = (D_{30})^2/(D_{60} \cdot D_{10}) = 0.91$

Remarks:

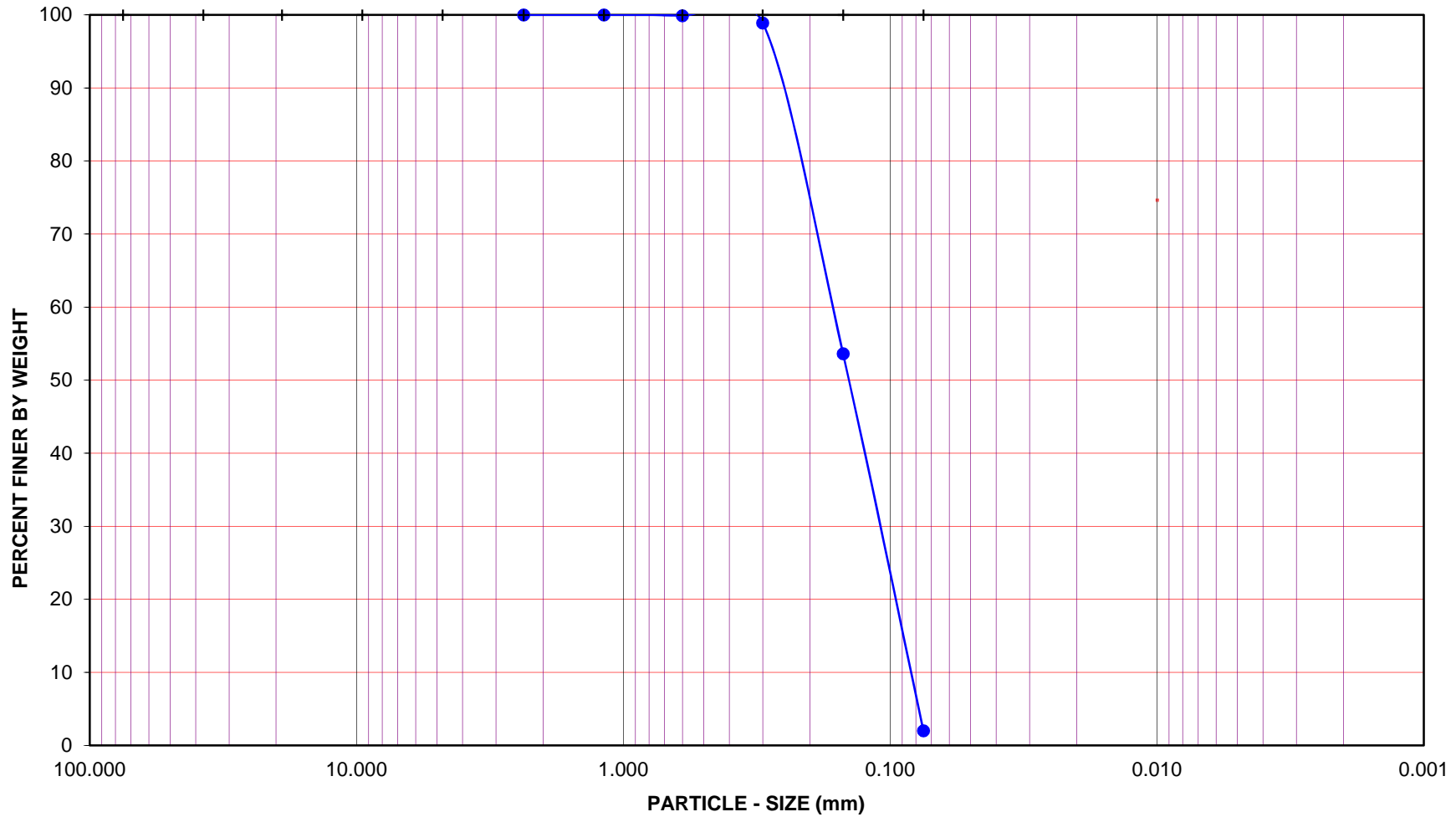
GRAVEL				SAND				FINES	
COARSE		FINE		COARSE	MEDIUM	FINE		SILT	CLAY

U.S. STANDARD SIEVE OPENING

U.S. STANDARD SIEVE NUMBER

HYDROMETER

3.0" 1 1/2" 3/4" 3/8" #4 #8 #16 #30 #50 #100 #200



Project Name: Pillar Point Harbor

Project No.: 5720.180

Station ID: PP Harbor Beach

Sample ID: IHBG18-2

Date, Time: 06/18/19, 17:10

Soil Type : SP

Soil Identification: Olive gray poorly-graded sand (SP)

GR:SA:FI : (%) 0 : 98 : 2

Jul-19



Leighton

**PARTICLE - SIZE
DISTRIBUTION
ASTM D 6913**



**PARTICLE-SIZE DISTRIBUTION (GRADATION)
of SOILS USING SIEVE ANALYSIS**
ASTM D 6913

Project Name: Pillar Point Harbor

Tested By: O. Figueroa Date: 06/25/19

Project No.: 5720.180

Checked By: J. Ward Date: 07/11/19

Station ID: PP Harbor Beach

Date, Time: 06/18/19, 17:20

Sample ID: IHBG18-3

Soil Identification: Olive gray poorly-graded sand (SP)

Container No.:	GE	Moisture Content of Total Air - Dry Soil	
		Wt. of Air-Dry Soil + Cont. (g)	0.0
Wt. of Air-Dried Soil + Cont.(g)	851.2	Wt. of Dry Soil + Cont. (g)	0.0
Wt. of Container (g)	250.1	Wt. of Container No._____ (g)	1.0
Dry Wt. of Soil (g)	601.1	Moisture Content (%)	0.0

After Wet Sieve	Container No.	GE
	Wt. of Dry Soil + Container (g)	843.6
	Wt. of Container (g)	250.1
	Dry Wt. of Soil Retained on # 200 Sieve (g)	593.5

U. S. Sieve Size		Cumulative Weight Dry Soil Retained (g)	Percent Passing (%)
(in.)	(mm.)		
1 1/2"	37.5		
1"	25.0		
3/4"	19.0		
1/2"	12.5		
3/8"	9.5		
#4	4.75		
#8	2.36		
#16	1.18	0.0	100.0
#30	0.600	0.3	100.0
#50	0.300	5.6	99.1
#100	0.150	317.9	47.1
#200	0.075	589.5	1.9
PAN			

GRAVEL: **0 %**

SAND: **98 %**

FINES: **2 %**

GROUP SYMBOL: **SP**

$C_u = D_{60}/D_{10} =$ 2.02

$C_c = (D_{30})^2/(D_{60}*D_{10}) =$ 1.01

Remarks: _____

GRAVEL				SAND				FINES		
COARSE		FINE		COARSE	MEDIUM	FINE		SILT		CLAY

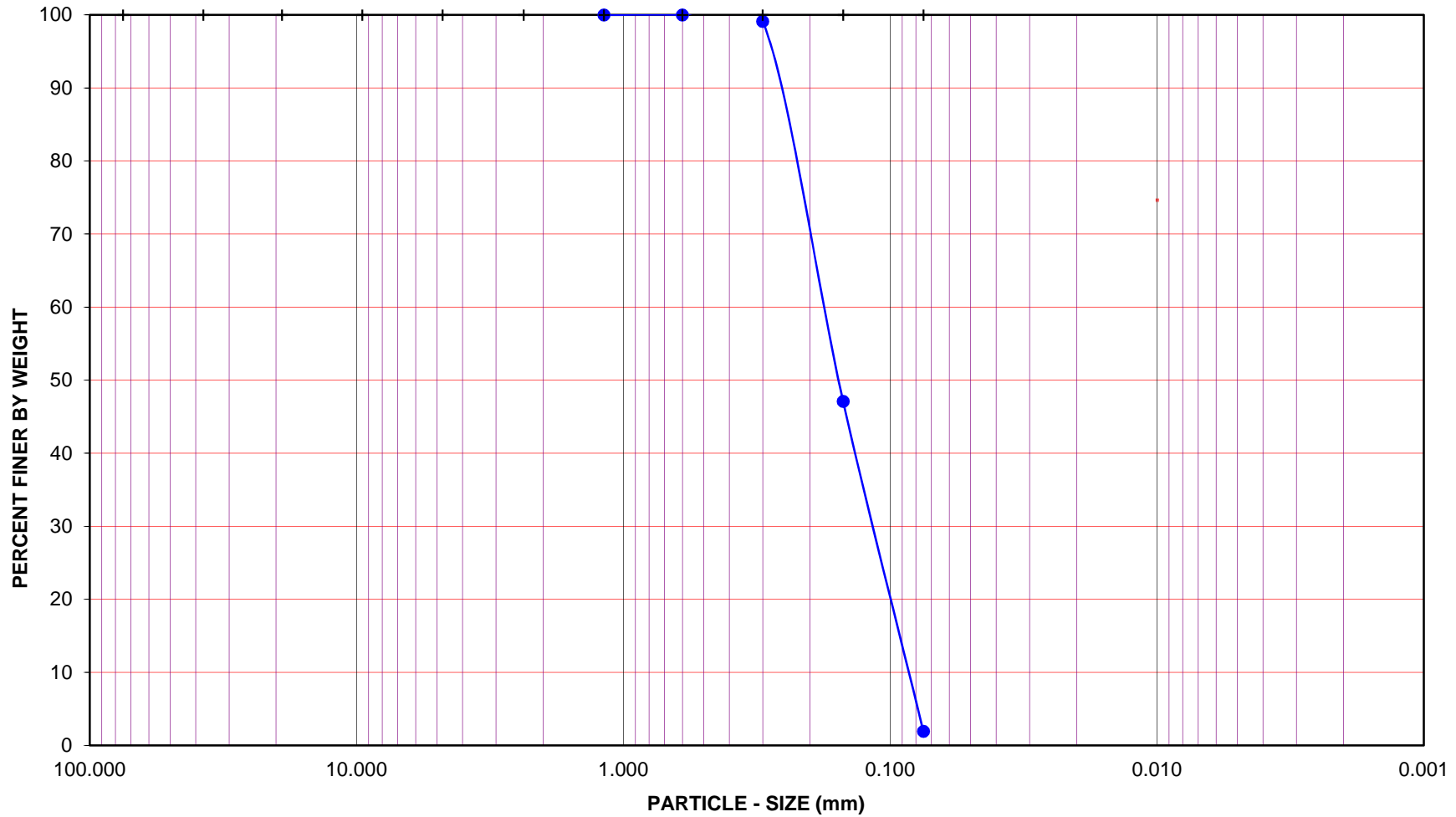
U.S. STANDARD SIEVE OPENING

3.0" 1 1/2" 3/4" 3/8"

U.S. STANDARD SIEVE NUMBER

#4 #8 #16 #30 #50 #100 #200

HYDROMETER



Project Name: Pillar Point Harbor

Project No.: 5720.180

Station ID: PP Harbor Beach

Sample ID: IHBG18-3

Date, Time: 06/18/19, 17:20

Soil Type : SP

Soil Identification: Olive gray poorly-graded sand (SP)

GR:SA:FI : (%) 0 : 98 : 2

Jul-19



Leighton

**PARTICLE - SIZE
DISTRIBUTION
ASTM D 6913**



**PARTICLE-SIZE DISTRIBUTION (GRADATION)
of SOILS USING SIEVE ANALYSIS**
ASTM D 6913

Project Name: Pillar Point Harbor

Tested By: O. Figueroa Date: 06/26/19

Project No.: 5720.180

Checked By: J. Ward Date: 07/11/19

Station ID: 1 Mid

Date, Time: 06/18/19, 12:00

Sample ID: PPIHVC18-1M

Soil Identification: Dark olive gray silty sand (SM)

Container No.:	DR	Moisture Content of Total Air - Dry Soil	
		Wt. of Air-Dry Soil + Cont. (g)	0.0
Wt. of Air-Dried Soil + Cont.(g)	892.0	Wt. of Dry Soil + Cont. (g)	0.0
Wt. of Container (g)	217.5	Wt. of Container No._____ (g)	1.0
Dry Wt. of Soil (g)	674.5	Moisture Content (%)	0.0

After Wet Sieve	Container No.	DR
	Wt. of Dry Soil + Container (g)	814.2
	Wt. of Container (g)	217.5
	Dry Wt. of Soil Retained on # 200 Sieve (g)	596.7

U. S. Sieve Size		Cumulative Weight Dry Soil Retained (g)	Percent Passing (%)
(in.)	(mm.)		
1 1/2"	37.5		
1"	25.0		
3/4"	19.0		
1/2"	12.5	0.0	100.0
3/8"	9.5	8.2	98.8
#4	4.75	20.0	97.0
#8	2.36	58.0	91.4
#16	1.18	113.6	83.2
#30	0.600	184.4	72.7
#50	0.300	255.3	62.1
#100	0.150	438.3	35.0
#200	0.075	588.8	12.7
PAN			

GRAVEL: **3 %**

SAND: **84 %**

FINES: **13 %**

GROUP SYMBOL: **SM**

$C_u = D_{60}/D_{10} =$ _____

$C_c = (D_{30})^2/(D_{60} \cdot D_{10}) =$ _____

Remarks: _____

GRAVEL				SAND				FINES	
COARSE		FINE		COARSE	MEDIUM	FINE		SILT	CLAY

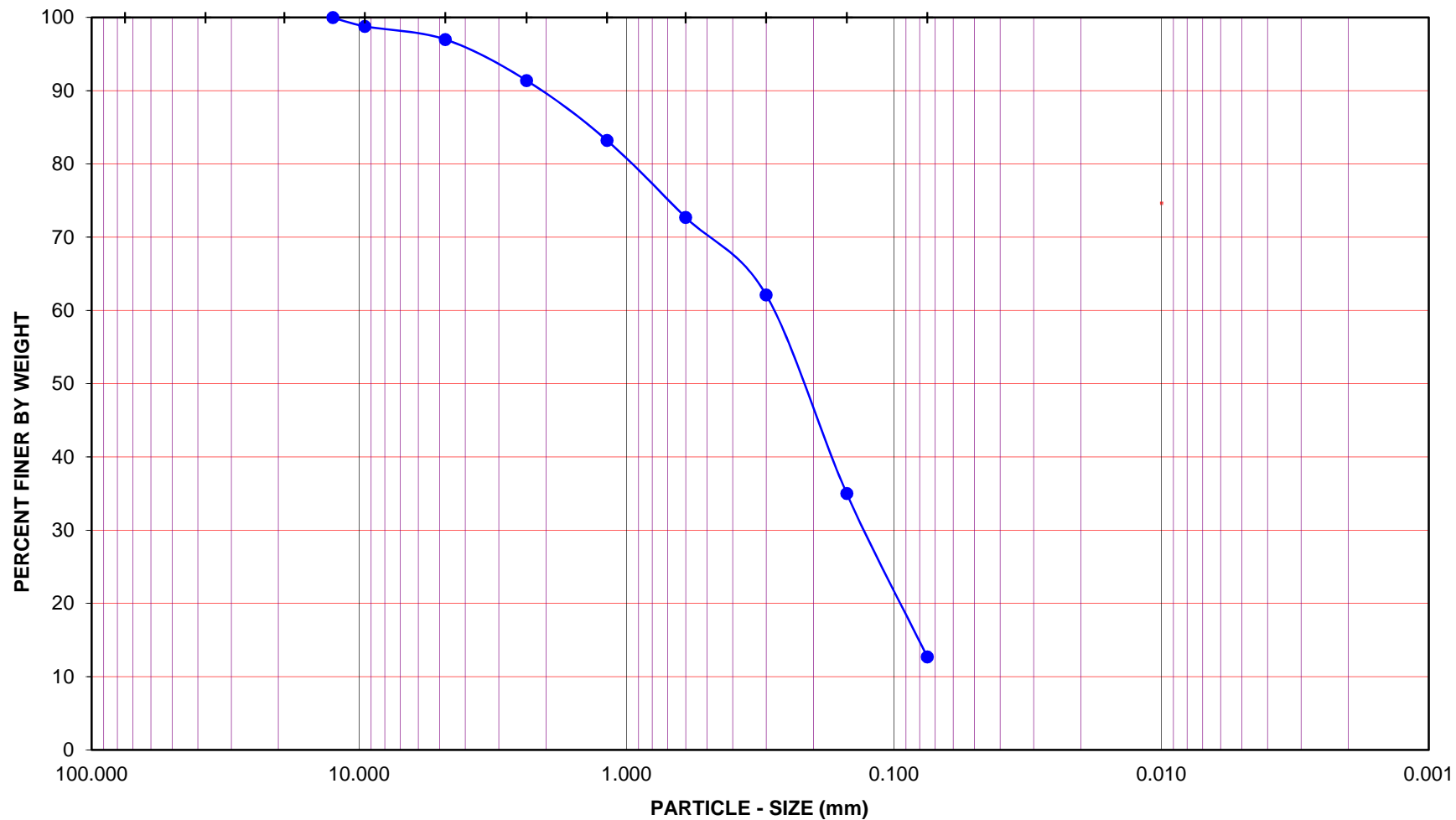
U.S. STANDARD SIEVE OPENING

3.0" 1 1/2" 3/4" 3/8" #4

U.S. STANDARD SIEVE NUMBER

#8 #16 #30 #50 #100 #200

HYDROMETER



Project Name: Pillar Point Harbor

Project No.: 5720.180

Station ID: 1 Mid

Sample ID: PPIHVC18-1M

Date, Time: 06/18/19, 12:00

Soil Type : SM

Soil Identification: Dark olive gray silty sand (SM)

GR:SA:FI : (%) **3 : 84 : 13**

Jul-19



Leighton

**PARTICLE - SIZE
DISTRIBUTION
ASTM D 6913**



**PARTICLE-SIZE DISTRIBUTION (GRADATION)
of SOILS USING SIEVE ANALYSIS**
ASTM D 6913

Project Name: Pillar Point Harbor

Tested By: OHF/GE Date: 06/26/19

Project No.: 5720.180

Checked By: J. Ward Date: 07/11/19

Station ID: 1 Top

Date, Time: 06/18/19, 12:00

Sample ID: PPIHVC18-1T

Soil Identification: Dark olive gray silty sand (SM), shells noted

Container No.:	WR	Moisture Content of Total Air - Dry Soil	
		Wt. of Air-Dry Soil + Cont. (g)	0.0
Wt. of Air-Dried Soil + Cont.(g)	755.8	Wt. of Dry Soil + Cont. (g)	0.0
Wt. of Container (g)	236.9	Wt. of Container No._____ (g)	1.0
Dry Wt. of Soil (g)	518.9	Moisture Content (%)	0.0

After Wet Sieve	Container No.	WR
	Wt. of Dry Soil + Container (g)	691.5
	Wt. of Container (g)	236.9
	Dry Wt. of Soil Retained on # 200 Sieve (g)	454.6

U. S. Sieve Size		Cumulative Weight Dry Soil Retained (g)	Percent Passing (%)
(in.)	(mm.)		
1 1/2"	37.5		
1"	25.0		
3/4"	19.0		
1/2"	12.5		
3/8"	9.5	0.0	100.0
#4	4.75	4.1	99.2
#8	2.36	18.0	96.5
#16	1.18	40.1	92.3
#30	0.600	90.5	82.6
#50	0.300	159.2	69.3
#100	0.150	344.5	33.6
#200	0.075	448.6	13.5
PAN			

GRAVEL: **1 %**

SAND: **85 %**

FINES: **14 %**

GROUP SYMBOL: **SM**

Cu = D₆₀/D₁₀ = _____

Cc = (D₃₀)²/(D₆₀*D₁₀) = _____

Remarks: _____

GRAVEL				SAND						FINES	
COARSE		FINE		COARSE	MEDIUM	FINE				SILT	CLAY

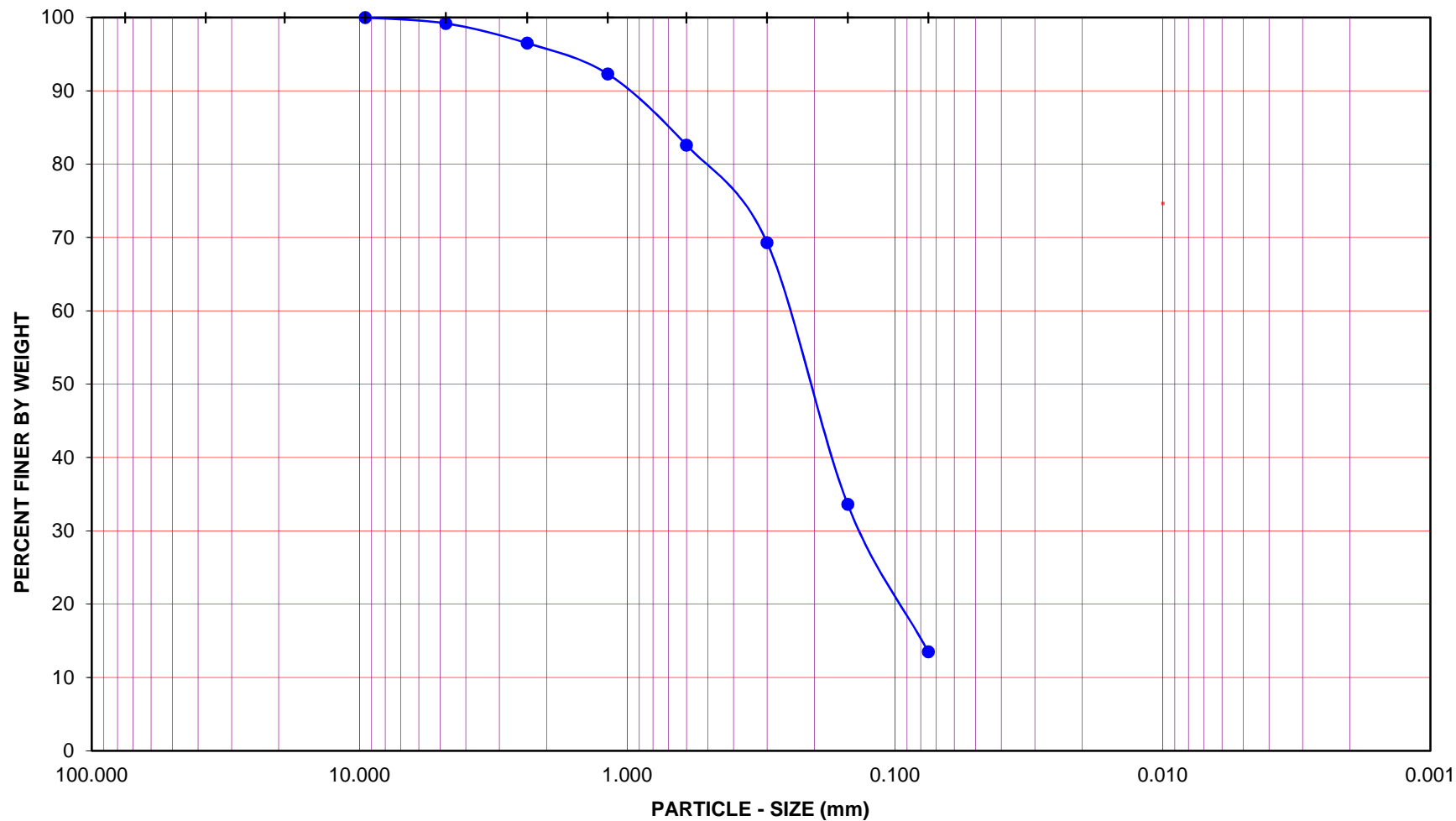
U.S. STANDARD SIEVE OPENING

3.0" 1 1/2" 3/4" 3/8"

U.S. STANDARD SIEVE NUMBER

#4 #8 #16 #30 #50 #100 #200

HYDROMETER



Project Name: Pillar Point Harbor

Project No.: 5720.180

Station ID: 1 Top

Sample ID: PPIHVC18-1T

Date, Time: 06/18/19, 12:00

Soil Type: SM

Soil Identification: Dark olive gray silty sand (SM), shells noted

GR:SA:FI : (%) **1 : 85 : 14**

Jul-19



Leighton

**PARTICLE - SIZE
DISTRIBUTION
ASTM D 6913**



PARTICLE-SIZE DISTRIBUTION (GRADATION) **of SOILS USING SIEVE ANALYSIS** **ASTM D 6913**

Project Name: Pillar Point Harbor

Tested By: OHF/GEB Date: 06/26/19

Project No.: 5720.180

Checked By: J. Ward Date: 07/11/19

Station ID: 2 Mid, 2.0-3.7'

Date, Time: 06/19/19, 11:10

Sample ID: PPIHVC18-2M

Soil Identification: Olive brown silty sand (SM)

Container No.:	DP-1	Moisture Content of Total Air - Dry Soil	
		Wt. of Air-Dry Soil + Cont. (g)	0.0
Wt. of Air-Dried Soil + Cont.(g)	831.7	Wt. of Dry Soil + Cont. (g)	0.0
Wt. of Container (g)	272.4	Wt. of Container No._____ (g)	1.0
Dry Wt. of Soil (g)	559.3	Moisture Content (%)	0.0

After Wet Sieve	Container No.	DP-1
	Wt. of Dry Soil + Container (g)	602.1
	Wt. of Container (g)	272.4
	Dry Wt. of Soil Retained on # 200 Sieve (g)	329.7

U. S. Sieve Size		Cumulative Weight Dry Soil Retained (g)	Percent Passing (%)
(in.)	(mm.)		
1 1/2"	37.5		
1"	25.0		
3/4"	19.0		
1/2"	12.5		
3/8"	9.5	0.0	100.0
#4	4.75	2.8	99.5
#8	2.36	34.4	93.8
#16	1.18	82.0	85.3
#30	0.600	128.6	77.0
#50	0.300	183.3	67.2
#100	0.150	266.9	52.3
#200	0.075	326.0	41.7
PAN			

GRAVEL: **1 %**

SAND: **57 %**

FINES: **42 %**

GROUP SYMBOL: **SM**

Cu = D60/D10 = _____

Cc = (D30)²/(D60*D10) = _____

Remarks: _____

GRAVEL				SAND				FINES	
COARSE		FINE		COARSE	MEDIUM	FINE		SILT	CLAY

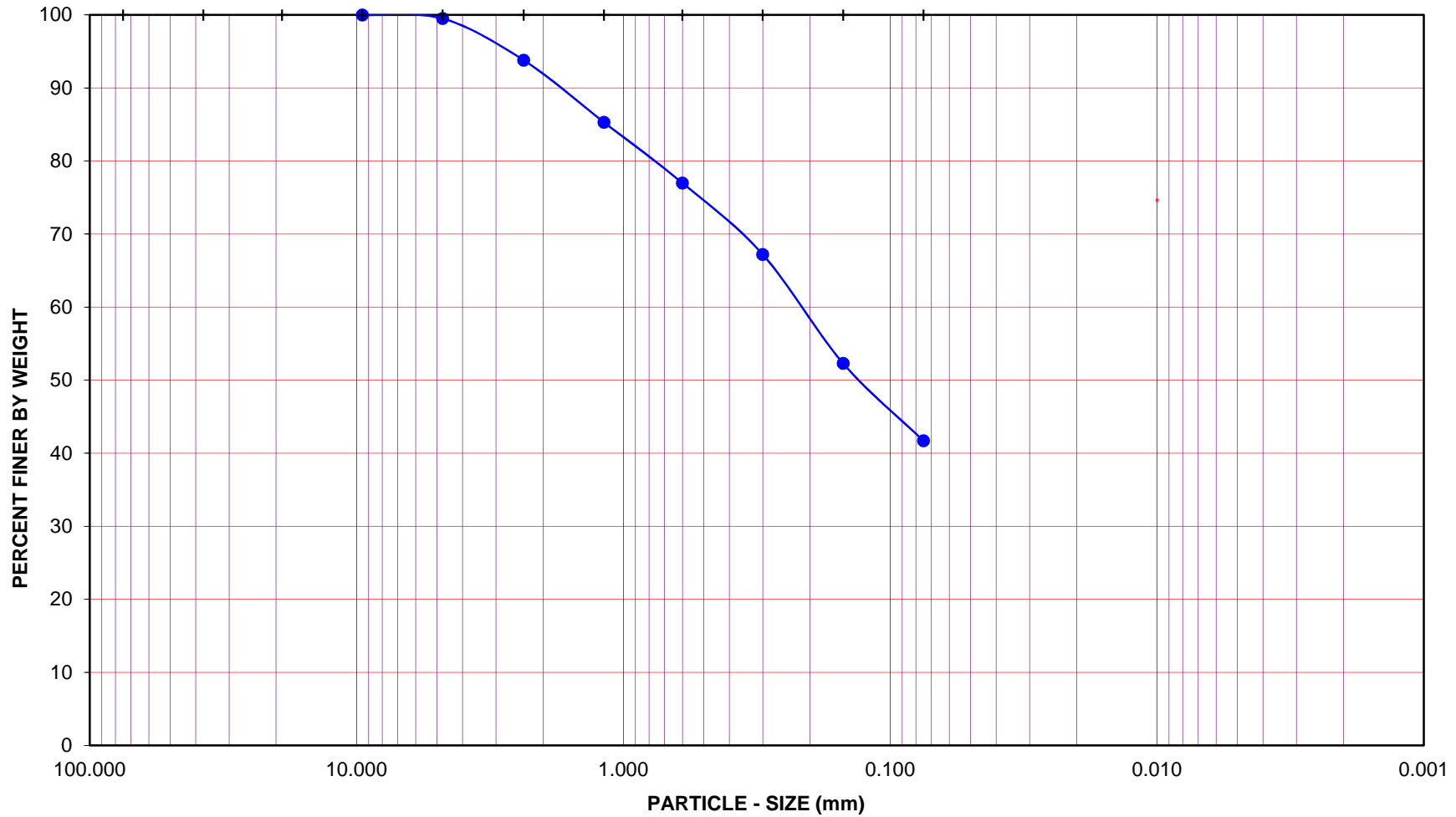
U.S. STANDARD SIEVE OPENING

3.0" 1 1/2" 3/4" 3/8"

U.S. STANDARD SIEVE NUMBER

#4 #8 #16 #30 #50 #100 #200

HYDROMETER



Project Name: Pillar Point Harbor

Project No.: 5720.180

Station ID: 2 Mid, 2.0-3.7'

Sample ID: PPIHVC18-2M

Date, Time: 06/19/19, 11:10

Soil Type : SM

Soil Identification: Olive brown silty sand (SM)

GR:SA:FI : (%) 1 : 57 : 42

Jul-19



Leighton

**PARTICLE - SIZE
DISTRIBUTION
ASTM D 6913**



**PARTICLE-SIZE DISTRIBUTION (GRADATION)
of SOILS USING SIEVE ANALYSIS**
ASTM D 6913

Project Name: Pillar Point Harbor

Tested By: ACS/OHF Date: 06/21/19

Project No.: 5720.180

Checked By: J. Ward Date: 07/11/19

Station ID: 2 Top, 0-2.0'

Date, Time: 06/19/19, 11:10

Sample ID: PPIHVC18-2T

Soil Identification: Olive gray silty sand (SM), few shells noted

Container No.:	YK	Moisture Content of Total Air - Dry Soil	
		Wt. of Air-Dry Soil + Cont. (g)	0.0
Wt. of Air-Dried Soil + Cont.(g)	683.5	Wt. of Dry Soil + Cont. (g)	0.0
Wt. of Container (g)	251.4	Wt. of Container No._____ (g)	1.0
Dry Wt. of Soil (g)	432.1	Moisture Content (%)	0.0

After Wet Sieve	Container No.	YK
	Wt. of Dry Soil + Container (g)	485.2
	Wt. of Container (g)	251.4
	Dry Wt. of Soil Retained on # 200 Sieve (g)	233.8

U. S. Sieve Size		Cumulative Weight Dry Soil Retained (g)	Percent Passing (%)
(in.)	(mm.)		
1 1/2"	37.5		
1"	25.0		
3/4"	19.0		
1/2"	12.5		
3/8"	9.5	0.0	100.0
#4	4.75	1.0	99.8
#8	2.36	2.8	99.4
#16	1.18	4.3	99.0
#30	0.600	5.3	98.8
#50	0.300	14.3	96.7
#100	0.150	55.1	87.2
#200	0.075	226.0	47.7
PAN			

GRAVEL: **0 %**

SAND: **52 %**

FINES: **48 %**

GROUP SYMBOL: **SM**

Cu = D60/D10 = _____

Cc = (D30)²/(D60*D10) = _____

Remarks: _____

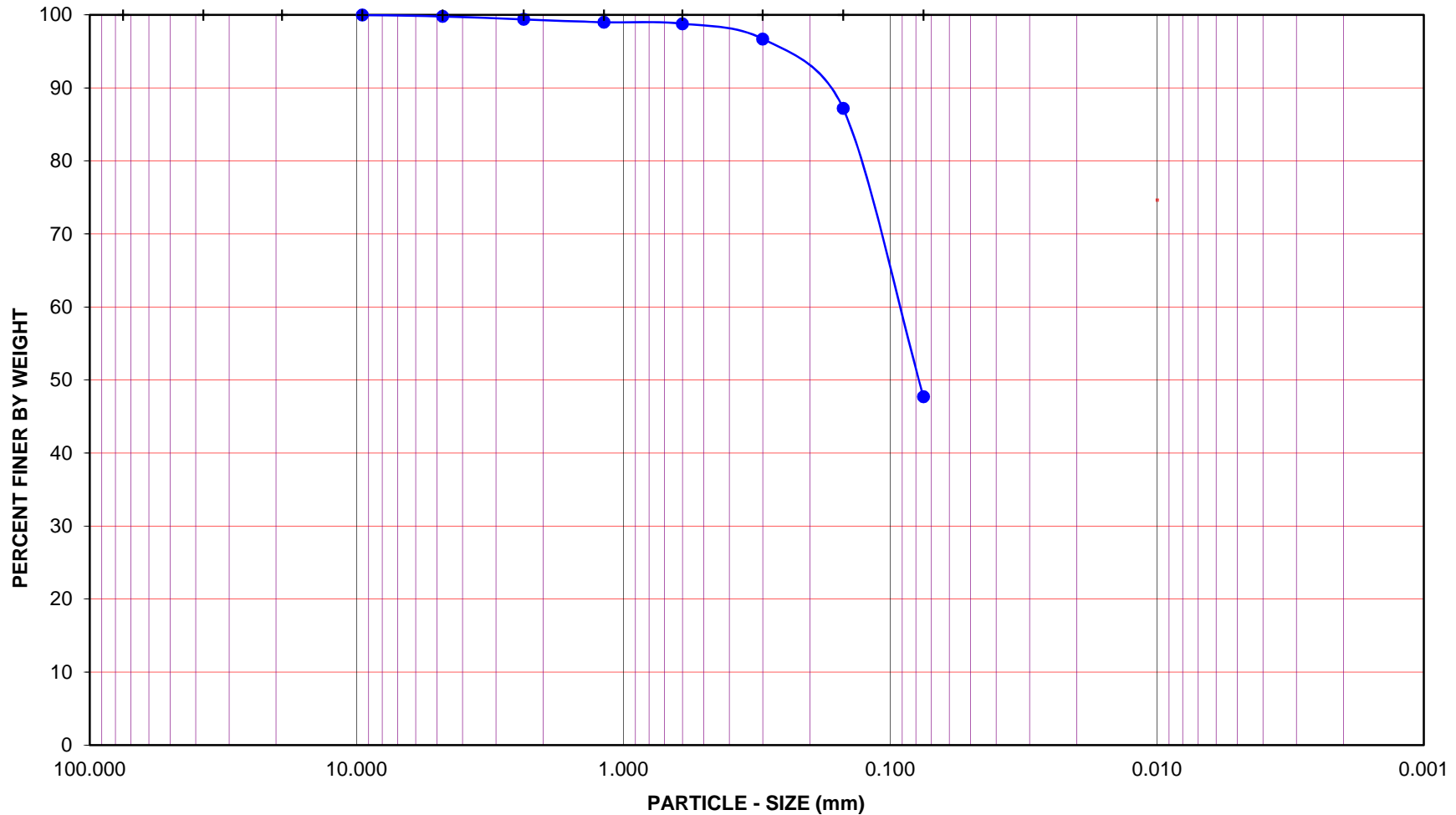
GRAVEL				SAND				FINES	
COARSE		FINE		COARSE	MEDIUM	FINE		SILT	CLAY

U.S. STANDARD SIEVE OPENING

U.S. STANDARD SIEVE NUMBER

HYDROMETER

3.0" 1 1/2" 3/4" 3/8" #4 #8 #16 #30 #50 #100 #200



Project Name: Pillar Point Harbor

Project No.: 5720.180

Station ID: 2 Top, 0-2.0'

Sample ID: PPIHVC18-2T

Date, Time: 06/19/19, 11:10

Soil Type : SM

Soil Identification: Olive gray silty sand (SM), few shells noted

GR:SA:FI : (%) 0 : 52 : 48

Jul-19



Leighton

**PARTICLE - SIZE
DISTRIBUTION
ASTM D 6913**



**PARTICLE-SIZE DISTRIBUTION (GRADATION)
of SOILS USING SIEVE ANALYSIS**
ASTM D 6913

Project Name: Pillar Point Harbor

Tested By: OHF/ACS Date: 06/26/19

Project No.: 5720.180

Checked By: J. Ward Date: 07/11/19

Station ID: 3 Bottom

Date, Time: 06/18/19, 16:25

Sample ID: PPIHVC18-3B

Soil Identification: Olive brown silty sand (SM)

Container No.:	957	Moisture Content of Total Air - Dry Soil	
		Wt. of Air-Dry Soil + Cont. (g)	0.0
Wt. of Air-Dried Soil + Cont.(g)	748.3	Wt. of Dry Soil + Cont. (g)	0.0
Wt. of Container (g)	108.5	Wt. of Container No._____ (g)	1.0
Dry Wt. of Soil (g)	639.8	Moisture Content (%)	0.0

After Wet Sieve	Container No.	957
	Wt. of Dry Soil + Container (g)	518.2
	Wt. of Container (g)	108.5
	Dry Wt. of Soil Retained on # 200 Sieve (g)	409.7

U. S. Sieve Size		Cumulative Weight Dry Soil Retained (g)	Percent Passing (%)
(in.)	(mm.)		
1 1/2"	37.5		
1"	25.0		
3/4"	19.0		
1/2"	12.5		
3/8"	9.5	0.0	100.0
#4	4.75	4.9	99.2
#8	2.36	36.4	94.3
#16	1.18	90.5	85.9
#30	0.600	144.1	77.5
#50	0.300	206.0	67.8
#100	0.150	326.6	49.0
#200	0.075	405.1	36.7
PAN			

GRAVEL: **1 %**

SAND: **62 %**

FINES: **37 %**

GROUP SYMBOL: **SM**

Cu = D60/D10 = _____

Cc = (D30)²/(D60*D10) = _____

Remarks: _____

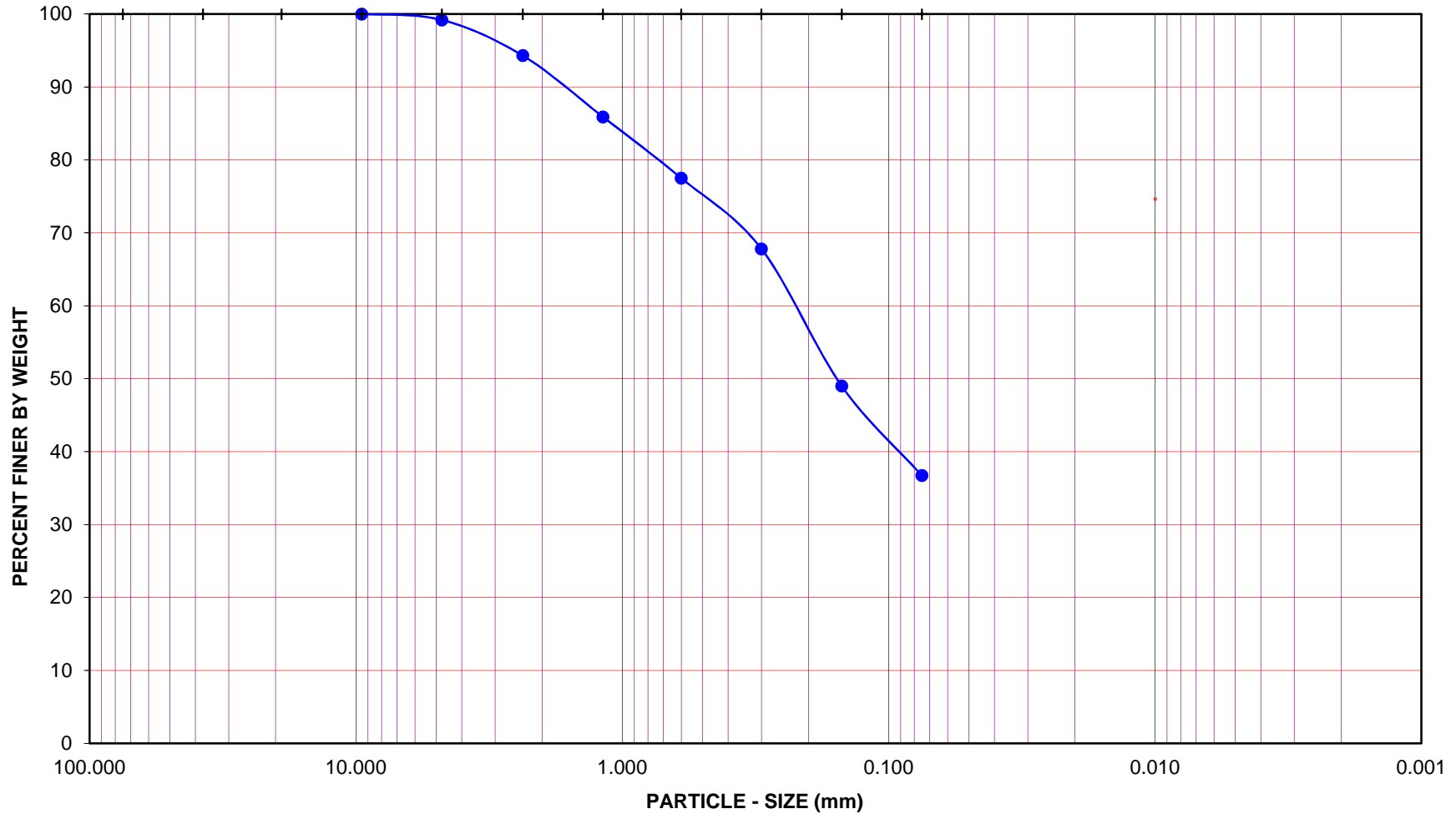
GRAVEL				SAND				FINES		
COARSE		FINE		COARSE	MEDIUM	FINE		SILT		CLAY

U.S. STANDARD SIEVE OPENING

U.S. STANDARD SIEVE NUMBER

HYDROMETER

3.0" 1 1/2" 3/4" 3/8" #4 #8 #16 #30 #50 #100 #200



Project Name: Pillar Point Harbor

Project No.: 5720.180

Station ID: 3 Bottom

Sample ID: PPIHVC18-3B

Date, Time: 06/18/19, 16:25

Soil Type : SM

Soil Identification: Olive brown silty sand (SM)

GR:SA:FI : (%) **1 : 62 : 37**

Jul-19



**PARTICLE - SIZE
DISTRIBUTION
ASTM D 6913**



**PARTICLE-SIZE DISTRIBUTION (GRADATION)
of SOILS USING SIEVE ANALYSIS**
ASTM D 6913

Project Name: Pillar Point Harbor

Tested By: O. Figueroa Date: 06/26/19

Project No.: 5720.180

Checked By: J. Ward Date: 07/11/19

Station ID: 3 Mid

Date, Time: 06/18/19, 16:25

Sample ID: PPIHVC18-3M

Soil Identification: Olive brown silty sand (SM)

Container No.:	XP	Moisture Content of Total Air - Dry Soil	
		Wt. of Air-Dry Soil + Cont. (g)	0.0
Wt. of Air-Dried Soil + Cont.(g)	955.5	Wt. of Dry Soil + Cont. (g)	0.0
Wt. of Container (g)	201.2	Wt. of Container No._____ (g)	1.0
Dry Wt. of Soil (g)	754.3	Moisture Content (%)	0.0

After Wet Sieve	Container No.	XP
	Wt. of Dry Soil + Container (g)	784.4
	Wt. of Container (g)	201.2
	Dry Wt. of Soil Retained on # 200 Sieve (g)	583.2

U. S. Sieve Size		Cumulative Weight Dry Soil Retained (g)	Percent Passing (%)
(in.)	(mm.)		
1 1/2"	37.5		
1"	25.0		
3/4"	19.0		
1/2"	12.5	0.0	100.0
3/8"	9.5	8.6	98.9
#4	4.75	25.9	96.6
#8	2.36	64.5	91.4
#16	1.18	119.8	84.1
#30	0.600	173.5	77.0
#50	0.300	224.6	70.2
#100	0.150	436.3	42.2
#200	0.075	577.4	23.5
PAN			

GRAVEL: **3 %**

SAND: **73 %**

FINES: **24 %**

GROUP SYMBOL: **SM**

Cu = D60/D10 = _____

Cc = (D30)²/(D60*D10) = _____

Remarks: _____

GRAVEL				SAND				FINES	
COARSE		FINE		COARSE	MEDIUM	FINE		SILT	CLAY

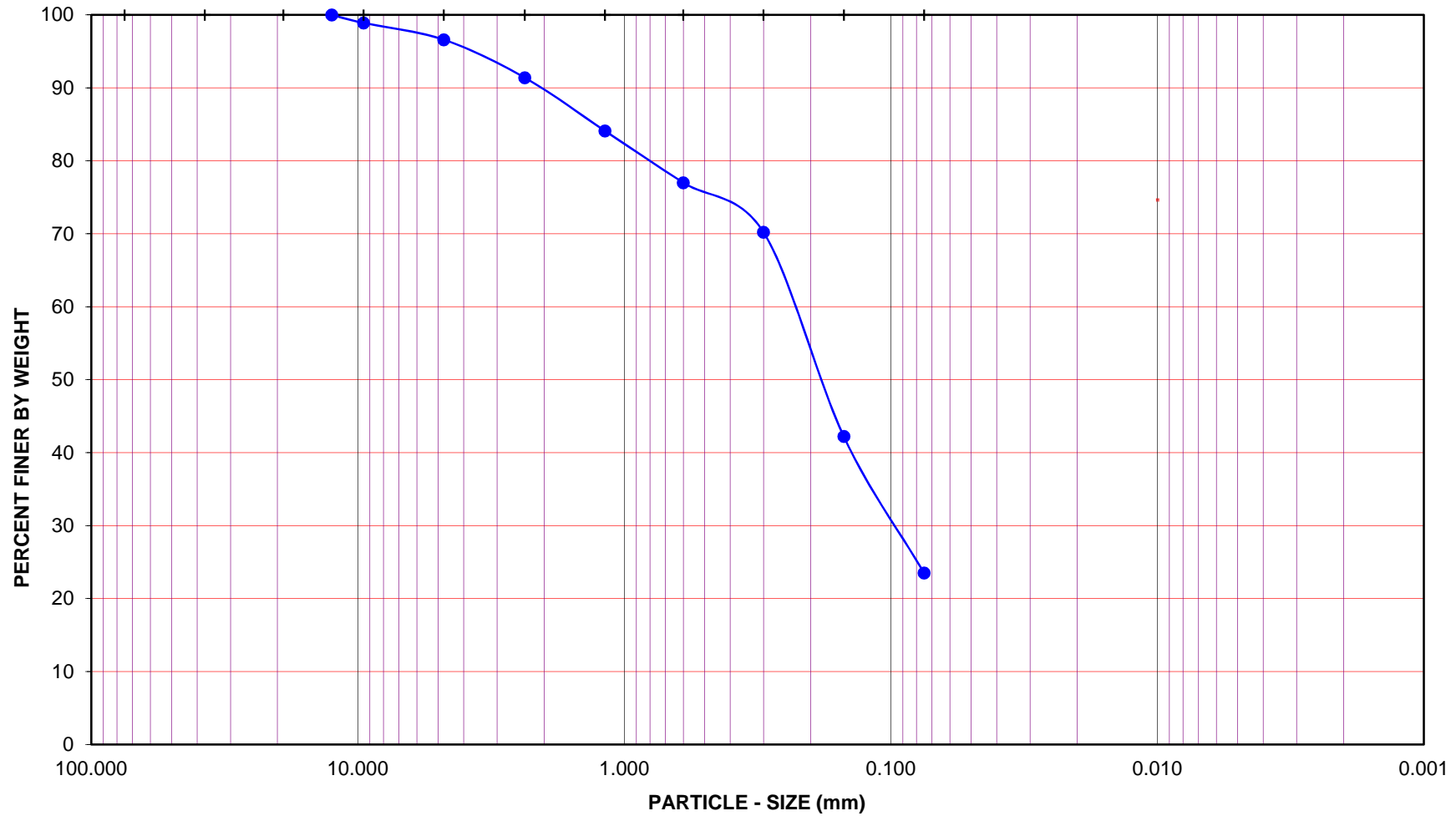
U.S. STANDARD SIEVE OPENING

3.0" 1 1/2" 3/4" 3/8"

U.S. STANDARD SIEVE NUMBER

#4 #8 #16 #30 #50 #100 #200

HYDROMETER



Project Name: Pillar Point Harbor

Project No.: 5720.180

Station ID: 3 Mid

Sample ID: PPIHVC18-3M

Date, Time: 06/18/19, 16:25

Soil Type: SM

Soil Identification: Olive brown silty sand (SM)

GR:SA:FI : (%) **3 : 73 : 24**

Jul-19



Leighton

**PARTICLE - SIZE
DISTRIBUTION
ASTM D 6913**



**PARTICLE-SIZE DISTRIBUTION (GRADATION)
of SOILS USING SIEVE ANALYSIS**
ASTM D 6913

Project Name: Pillar Point Harbor

Tested By: OHF/ACS Date: 06/26/19

Project No.: 5720.180

Checked By: J. Ward Date: 07/11/19

Station ID: 3 Top

Date, Time: 06/18/19, 16:25

Sample ID: PPIHVC18-3T

Soil Identification: Dark olive gray silty sand (SM)

Container No.:	YK	Moisture Content of Total Air - Dry Soil	
		Wt. of Air-Dry Soil + Cont. (g)	0.0
Wt. of Air-Dried Soil + Cont.(g)	659.0	Wt. of Dry Soil + Cont. (g)	0.0
Wt. of Container (g)	251.4	Wt. of Container No._____ (g)	1.0
Dry Wt. of Soil (g)	407.6	Moisture Content (%)	0.0

After Wet Sieve	Container No.	YK
	Wt. of Dry Soil + Container (g)	532.0
	Wt. of Container (g)	251.4
	Dry Wt. of Soil Retained on # 200 Sieve (g)	280.6

U. S. Sieve Size		Cumulative Weight Dry Soil Retained (g)	Percent Passing (%)
(in.)	(mm.)		
1 1/2"	37.5		
1"	25.0		
3/4"	19.0		
1/2"	12.5		
3/8"	9.5	0.0	100.0
#4	4.75	0.5	99.9
#8	2.36	2.2	99.5
#16	1.18	5.9	98.6
#30	0.600	17.3	95.8
#50	0.300	35.4	91.3
#100	0.150	127.7	68.7
#200	0.075	279.2	31.5
PAN			

GRAVEL: **0 %**

SAND: **68 %**

FINES: **32 %**

GROUP SYMBOL: **SM**

$C_u = D_{60}/D_{10} =$ _____

$C_c = (D_{30})^2/(D_{60} \cdot D_{10}) =$ _____

Remarks: _____

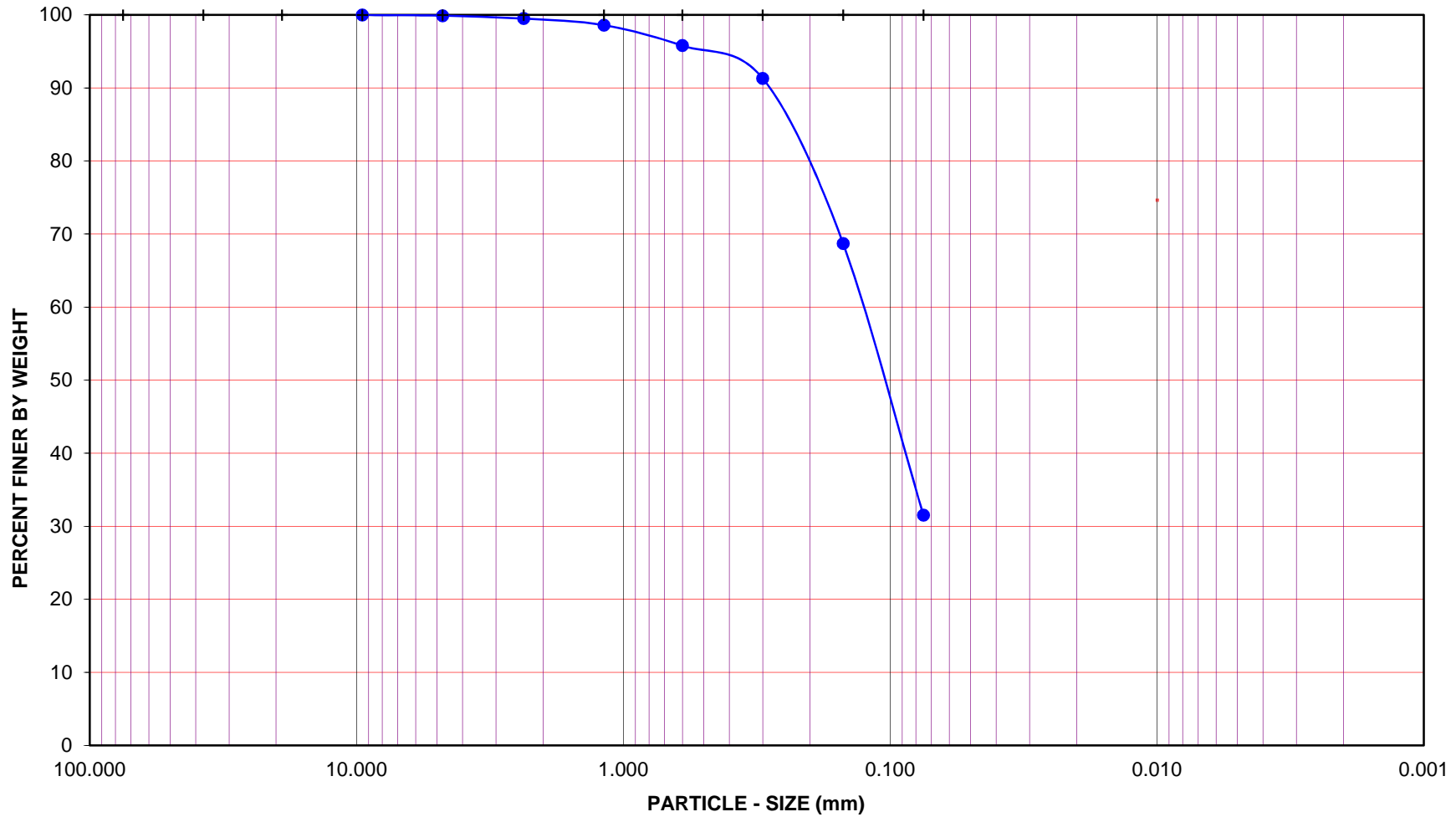
GRAVEL				SAND				FINES	
COARSE		FINE		COARSE	MEDIUM	FINE		SILT	CLAY

U.S. STANDARD SIEVE OPENING

U.S. STANDARD SIEVE NUMBER

HYDROMETER

3.0" 1 1/2" 3/4" 3/8" #4 #8 #16 #30 #50 #100 #200



Project Name: Pillar Point Harbor

Project No.: 5720.180

Station ID: 3 Top

Sample ID: PPIHVC18-3T

Date, Time: 06/18/19, 16:25

Soil Type : SM

Soil Identification: Dark olive gray silty sand (SM)

GR:SA:FI : (%) 0 : 68 : 32

Jul-19



Leighton

**PARTICLE - SIZE
DISTRIBUTION
ASTM D 6913**



**PARTICLE-SIZE DISTRIBUTION (GRADATION)
of SOILS USING SIEVE ANALYSIS**
ASTM D 6913

Project Name: Pillar Point Harbor

Tested By: ACS/OHF Date: 06/21/19

Project No.: 5720.180

Checked By: J. Ward Date: 07/11/19

Station ID: 4-3.0-4.1

Date, Time: 06/18/19, 15:35

Sample ID: PPIHVC18-4-3.0-4.1

Soil Identification: Olive gray poorly-graded sand (SP)

Container No.:	PH	Moisture Content of Total Air - Dry Soil	
		Wt. of Air-Dry Soil + Cont. (g)	0.0
Wt. of Air-Dried Soil + Cont.(g)	829.9	Wt. of Dry Soil + Cont. (g)	0.0
Wt. of Container (g)	202.6	Wt. of Container No._____ (g)	1.0
Dry Wt. of Soil (g)	627.3	Moisture Content (%)	0.0

After Wet Sieve	Container No.	PH
	Wt. of Dry Soil + Container (g)	816.9
	Wt. of Container (g)	202.6
	Dry Wt. of Soil Retained on # 200 Sieve (g)	614.3

U. S. Sieve Size		Cumulative Weight Dry Soil Retained (g)	Percent Passing (%)
(in.)	(mm.)		
1 1/2"	37.5		
1"	25.0		
3/4"	19.0		
1/2"	12.5		
3/8"	9.5	0.0	100.0
#4	4.75	2.0	99.7
#8	2.36	14.1	97.8
#16	1.18	67.3	89.3
#30	0.600	223.6	64.4
#50	0.300	318.3	49.3
#100	0.150	522.0	16.8
#200	0.075	613.1	2.3
PAN			

GRAVEL: **0 %**

SAND: **98 %**

FINES: **2 %**

GROUP SYMBOL: **SP**

$C_u = D_{60}/D_{10} = 4.17$

$C_c = (D_{30})^2/(D_{60} \cdot D_{10}) = 0.67$

Remarks:

GRAVEL				SAND				FINES	
COARSE		FINE		COARSE	MEDIUM	FINE		SILT	CLAY

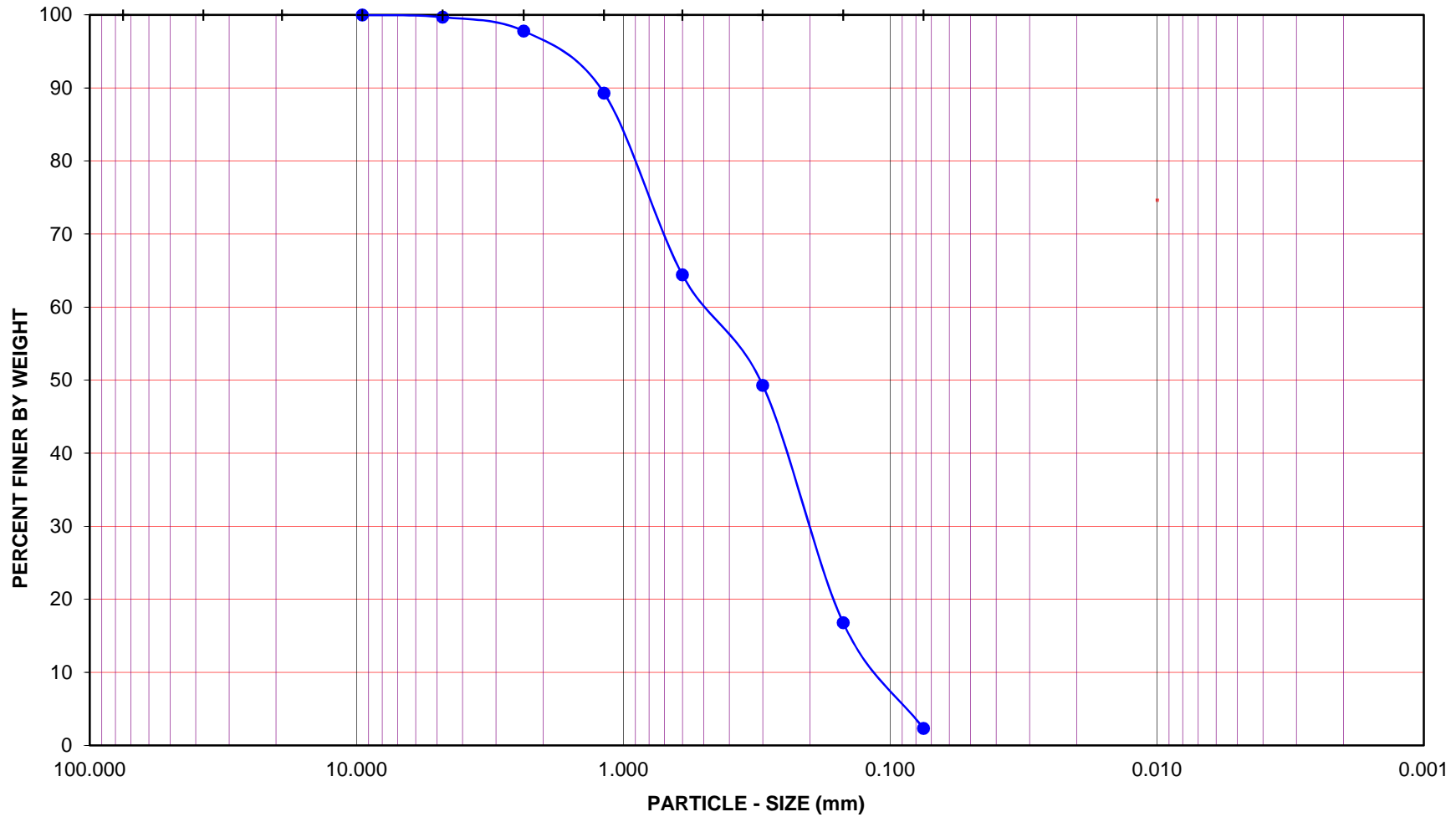
U.S. STANDARD SIEVE OPENING

3.0" 1 1/2" 3/4" 3/8"

U.S. STANDARD SIEVE NUMBER

#4 #8 #16 #30 #50 #100 #200

HYDROMETER



Project Name: Pillar Point Harbor

Project No.: 5720.180

Station ID: 4-3.0-4.1

Sample ID: PPIHVC18-4-3.0-4.1

Date, Time: 06/18/19, 15:35

Soil Type : SP

Soil Identification: Olive gray poorly-graded sand (SP)

GR:SA:FI : (%) 0 : 98 : 2

Jul-19



Leighton

**PARTICLE - SIZE
DISTRIBUTION
ASTM D 6913**



**PARTICLE-SIZE DISTRIBUTION (GRADATION)
of SOILS USING SIEVE ANALYSIS**
ASTM D 6913

Project Name: Pillar Point Harbor

Tested By: ACS/OHF Date: 06/21/19

Project No.: 5720.180

Checked By: J. Ward Date: 07/11/19

Station ID: 4-4.1-5.8

Date, Time: 06/18/19, 15:35

Sample ID: PPIHVC18-4-4.1-5.8

Soil Identification: Brown silty sand (SM)

Container No.:	WR	Moisture Content of Total Air - Dry Soil	
		Wt. of Air-Dry Soil + Cont. (g)	0.0
Wt. of Air-Dried Soil + Cont.(g)	780.0	Wt. of Dry Soil + Cont. (g)	0.0
Wt. of Container (g)	236.9	Wt. of Container No._____ (g)	1.0
Dry Wt. of Soil (g)	543.1	Moisture Content (%)	0.0

After Wet Sieve	Container No.	WR
	Wt. of Dry Soil + Container (g)	552.7
	Wt. of Container (g)	236.9
	Dry Wt. of Soil Retained on # 200 Sieve (g)	315.8

U. S. Sieve Size		Cumulative Weight Dry Soil Retained (g)	Percent Passing (%)
(in.)	(mm.)		
1 1/2"	37.5		
1"	25.0		
3/4"	19.0		
1/2"	12.5		
3/8"	9.5	0.0	100.0
#4	4.75	0.9	99.8
#8	2.36	16.0	97.1
#16	1.18	66.8	87.7
#30	0.600	126.9	76.6
#50	0.300	180.6	66.7
#100	0.150	235.8	56.6
#200	0.075	308.7	43.2
PAN			

GRAVEL: **0 %**

SAND: **57 %**

FINES: **43 %**

GROUP SYMBOL: **SM**

Cu = D60/D10 = _____

Cc = (D30)²/(D60*D10) = _____

Remarks: _____

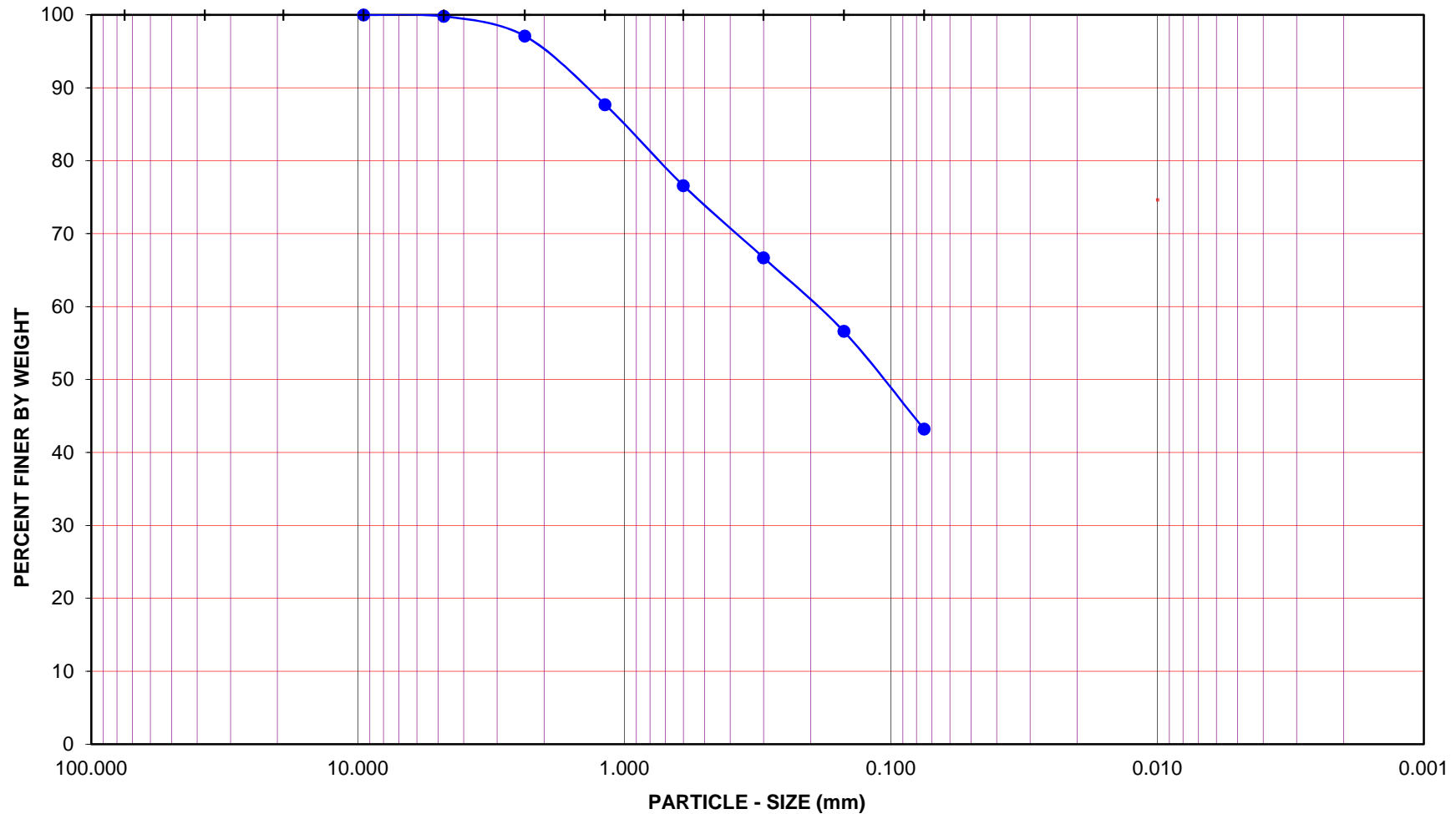
GRAVEL				SAND				FINES	
COARSE		FINE		COARSE	MEDIUM	FINE		SILT	CLAY

U.S. STANDARD SIEVE OPENING

U.S. STANDARD SIEVE NUMBER

HYDROMETER

3.0" 1 1/2" 3/4" 3/8" #4 #8 #16 #30 #50 #100 #200



Project Name: Pillar Point Harbor

Project No.: 5720.180

Station ID: 4-4.1-5.8

Sample ID: PPIHVC18-4-4.1-5.8

Date, Time: 06/18/19, 15:35

Soil Type : SM

Soil Identification: Brown silty sand (SM)

GR:SA:FI : (%) 0 : 57 : 43

Jul-19



Leighton

**PARTICLE - SIZE
DISTRIBUTION
ASTM D 6913**



**PARTICLE-SIZE DISTRIBUTION (GRADATION)
of SOILS USING SIEVE ANALYSIS**
ASTM D 6913

Project Name: Pillar Point Harbor

Tested By: OHF/ACS Date: 06/21/19

Project No.: 5720.180

Checked By: J. Ward Date: 07/11/19

Station ID: 4 Mid

Date, Time: 06/18/19, 15:35

Sample ID: PPIHVC18-4M

Soil Identification: Brown silty sand (SM)

Container No.:	SP	Moisture Content of Total Air - Dry Soil	
		Wt. of Air-Dry Soil + Cont. (g)	0.0
Wt. of Air-Dried Soil + Cont.(g)	802.4	Wt. of Dry Soil + Cont. (g)	0.0
Wt. of Container (g)	220.5	Wt. of Container No._____ (g)	1.0
Dry Wt. of Soil (g)	581.9	Moisture Content (%)	0.0

After Wet Sieve	Container No.	SP
	Wt. of Dry Soil + Container (g)	662.4
	Wt. of Container (g)	220.5
	Dry Wt. of Soil Retained on # 200 Sieve (g)	441.9

U. S. Sieve Size		Cumulative Weight Dry Soil Retained (g)	Percent Passing (%)
(in.)	(mm.)		
1 1/2"	37.5		
1"	25.0		
3/4"	19.0		
1/2"	12.5		
3/8"	9.5	0.0	100.0
#4	4.75	0.8	99.9
#8	2.36	14.0	97.6
#16	1.18	64.5	88.9
#30	0.600	168.7	71.0
#50	0.300	241.3	58.5
#100	0.150	354.0	39.2
#200	0.075	436.3	25.0
PAN			

GRAVEL: **0 %**

SAND: **75 %**

FINES: **25 %**

GROUP SYMBOL: **SM**

Cu = D60/D10 = _____

Cc = (D30)²/(D60*D10) = _____

Remarks: _____

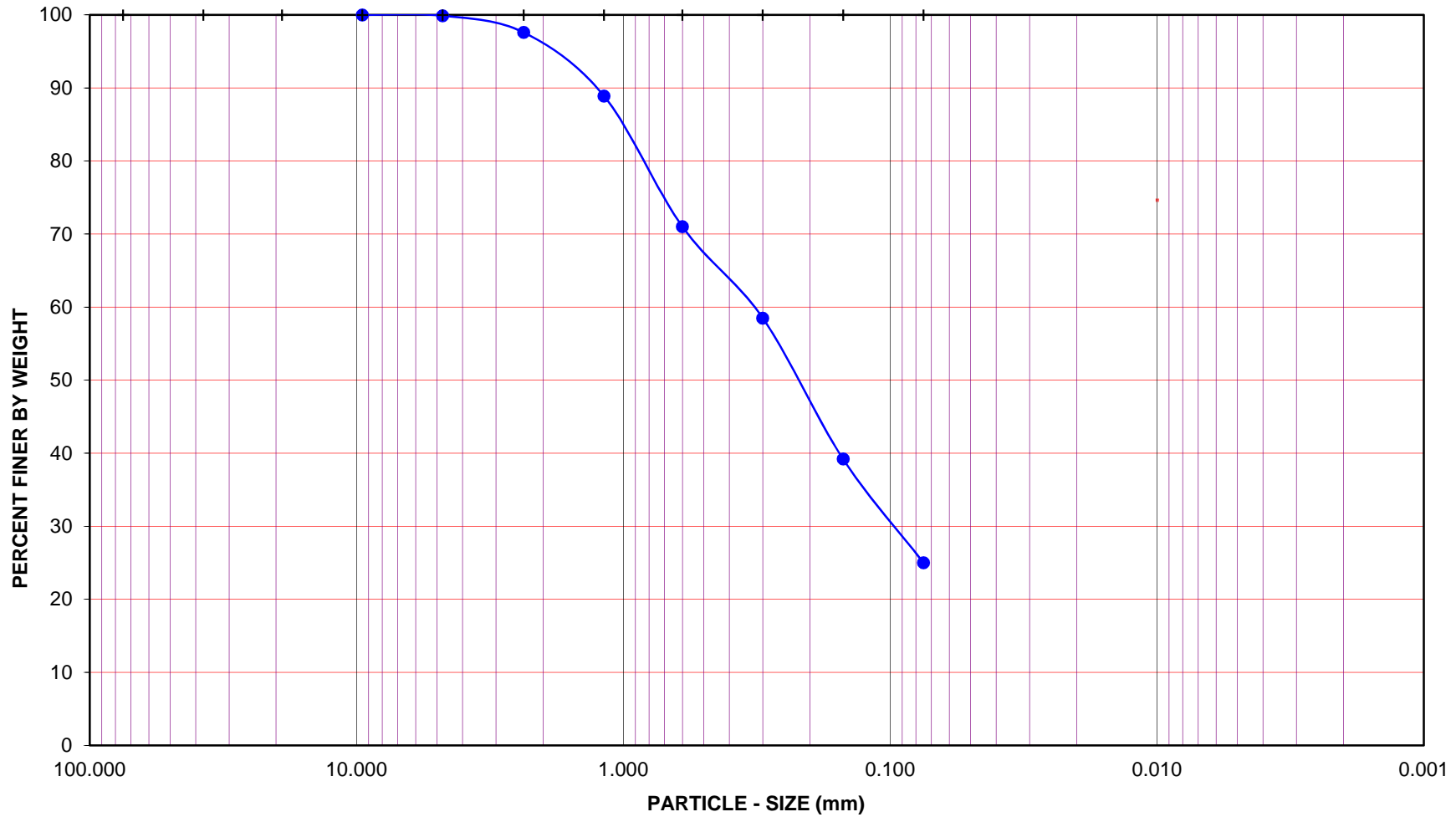
GRAVEL				SAND				FINES	
COARSE		FINE		COARSE	MEDIUM	FINE		SILT	CLAY

U.S. STANDARD SIEVE OPENING

U.S. STANDARD SIEVE NUMBER

HYDROMETER

3.0" 1 1/2" 3/4" 3/8" #4 #8 #16 #30 #50 #100 #200



Project Name: Pillar Point Harbor

Project No.: 5720.180

Station ID: 4 Mid

Sample ID: PPIHVC18-4M

Date, Time: 06/18/19, 15:35

Soil Type : SM

Soil Identification: Brown silty sand (SM)

GR:SA:FI : (%) 0 : 75 : 25

Jul-19



Leighton

**PARTICLE - SIZE
DISTRIBUTION
ASTM D 6913**



**PARTICLE-SIZE DISTRIBUTION (GRADATION)
of SOILS USING SIEVE ANALYSIS**
ASTM D 6913

Project Name: Pillar Point Harbor

Tested By: OHF/ACS Date: 06/26/19

Project No.: 5720.180

Checked By: J. Ward Date: 07/11/19

Station ID: 4 Top

Date, Time: 06/18/19, 15:35

Sample ID: PPIHVC18-4T

Soil Identification: Dark olive gray poorly-graded sand (SP)

Container No.:	PH	Moisture Content of Total Air - Dry Soil	
		Wt. of Air-Dry Soil + Cont. (g)	0.0
Wt. of Air-Dried Soil + Cont.(g)	761.1	Wt. of Dry Soil + Cont. (g)	0.0
Wt. of Container (g)	202.6	Wt. of Container No._____ (g)	1.0
Dry Wt. of Soil (g)	558.5	Moisture Content (%)	0.0

After Wet Sieve	Container No.	PH
	Wt. of Dry Soil + Container (g)	739.7
	Wt. of Container (g)	202.6
	Dry Wt. of Soil Retained on # 200 Sieve (g)	537.1

U. S. Sieve Size		Cumulative Weight Dry Soil Retained (g)	Percent Passing (%)
(in.)	(mm.)		
1 1/2"	37.5		
1"	25.0		
3/4"	19.0		
1/2"	12.5	0.0	100.0
3/8"	9.5	1.8	99.7
#4	4.75	5.1	99.1
#8	2.36	36.2	93.5
#16	1.18	92.3	83.5
#30	0.600	156.2	72.0
#50	0.300	212.3	62.0
#100	0.150	427.7	23.4
#200	0.075	533.8	4.4
PAN			

GRAVEL: **1 %**

SAND: **95 %**

FINES: **4 %**

GROUP SYMBOL: **SP**

$C_u = D_{60}/D_{10} = 2.98$

$C_c = (D_{30})^2/(D_{60} \cdot D_{10}) = 1.10$

Remarks:

GRAVEL				SAND				FINES	
COARSE		FINE		COARSE	MEDIUM	FINE		SILT	CLAY

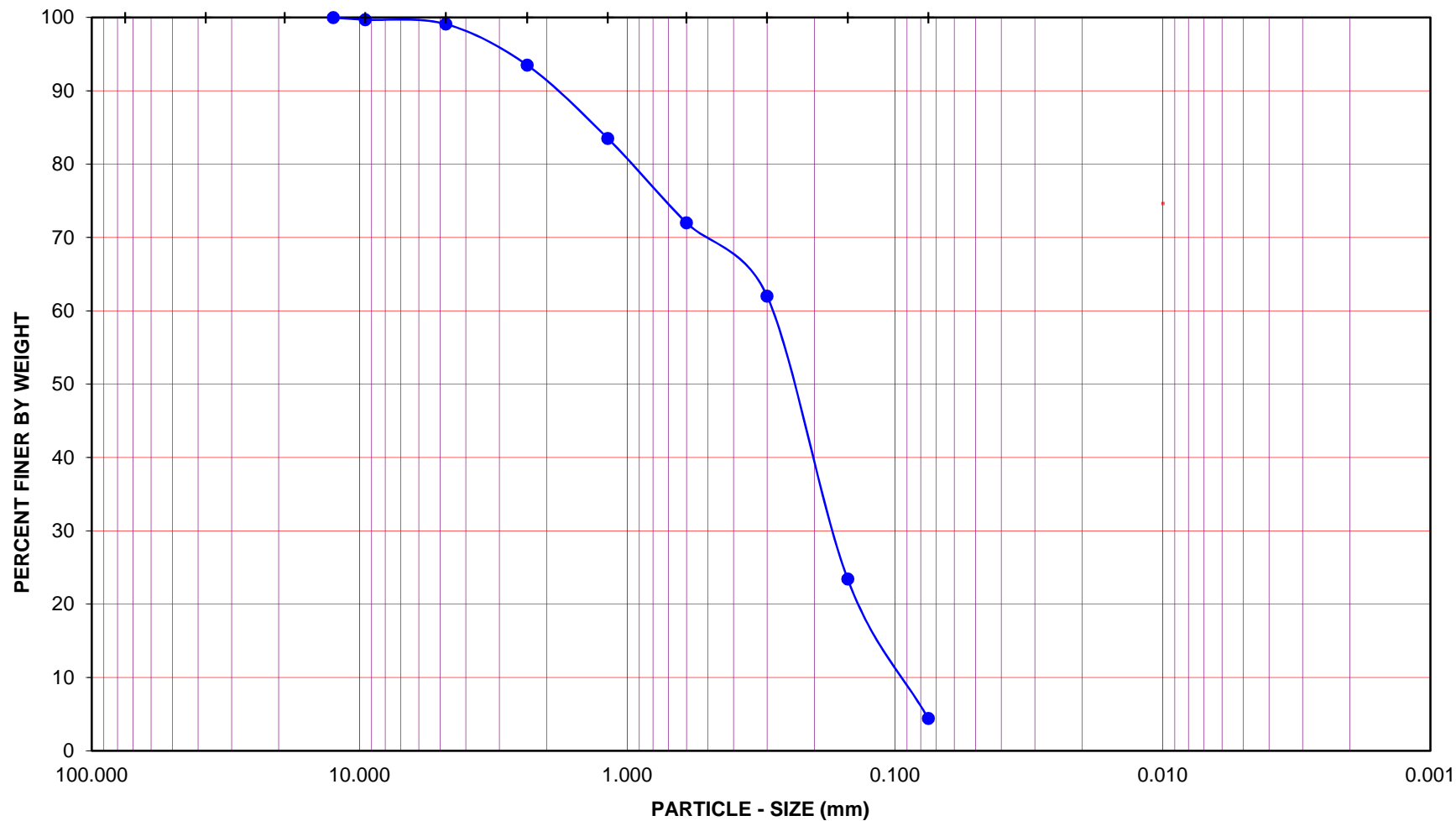
U.S. STANDARD SIEVE OPENING

3.0" 1 1/2" 3/4" 3/8"

U.S. STANDARD SIEVE NUMBER

#4 #8 #16 #30 #50 #100 #200

HYDROMETER



Project Name: Pillar Point Harbor

Project No.: 5720.180

Station ID: 4 Top

Sample ID: PPIHVC18-4T

Date, Time: 06/18/19, 15:35

Soil Type : SP

Soil Identification: Dark olive gray poorly-graded sand (SP)

GR:SA:FI : (%) **1 : 95 : 4**

Jul-19



Leighton

**PARTICLE - SIZE
DISTRIBUTION
ASTM D 6913**



**PARTICLE-SIZE DISTRIBUTION (GRADATION)
of SOILS USING SIEVE ANALYSIS**
ASTM D 6913

Project Name: Pillar Point Harbor

Tested By: O. Figueroa Date: 06/25/19

Project No.: 5720.180

Checked By: J. Ward Date: 07/11/19

Station ID: 5 Bottom

Date, Time: 06/19/19, 10:40

Sample ID: PPIHVC18-5B

Soil Identification: Yellowish brown silty sand (SM)

Container No.:	XP	Moisture Content of Total Air - Dry Soil	
		Wt. of Air-Dry Soil + Cont. (g)	0.0
Wt. of Air-Dried Soil + Cont.(g)	736.7	Wt. of Dry Soil + Cont. (g)	0.0
Wt. of Container (g)	201.2	Wt. of Container No._____ (g)	1.0
Dry Wt. of Soil (g)	535.5	Moisture Content (%)	0.0

After Wet Sieve	Container No.	XP
	Wt. of Dry Soil + Container (g)	516.5
	Wt. of Container (g)	201.2
	Dry Wt. of Soil Retained on # 200 Sieve (g)	315.3

U. S. Sieve Size		Cumulative Weight Dry Soil Retained (g)	Percent Passing (%)
(in.)	(mm.)		
1 1/2"	37.5		
1"	25.0		
3/4"	19.0		
1/2"	12.5		
3/8"	9.5	0.0	100.0
#4	4.75	1.9	99.6
#8	2.36	8.0	98.5
#16	1.18	23.3	95.6
#30	0.600	46.1	91.4
#50	0.300	85.6	84.0
#100	0.150	227.5	57.5
#200	0.075	311.5	41.8
PAN			

GRAVEL: **0 %**

SAND: **58 %**

FINES: **42 %**

GROUP SYMBOL: **SM**

Cu = D60/D10 = _____

Cc = (D30)²/(D60*D10) = _____

Remarks: _____

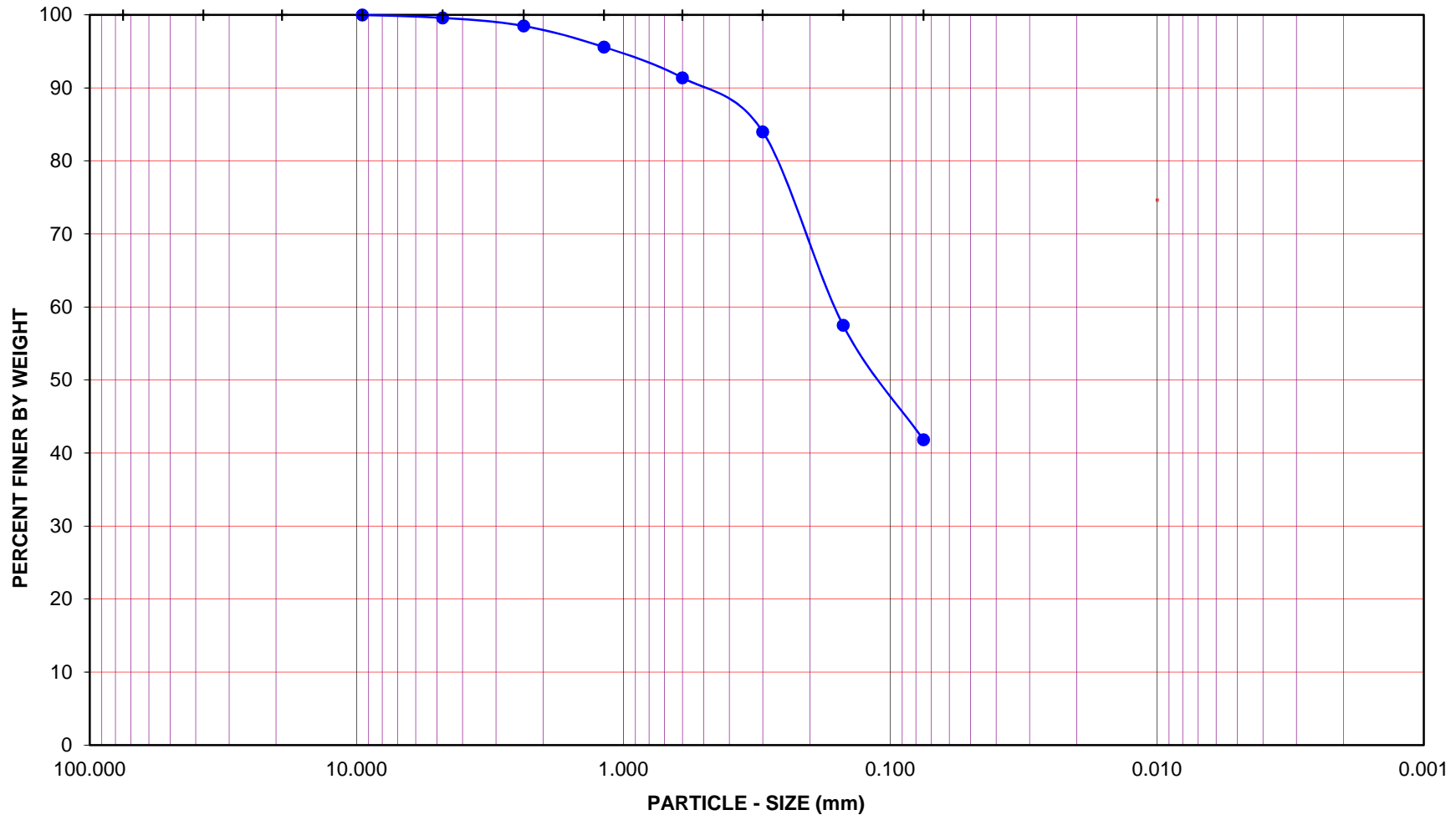
GRAVEL				SAND				FINES	
COARSE		FINE		COARSE	MEDIUM	FINE		SILT	CLAY

U.S. STANDARD SIEVE OPENING

U.S. STANDARD SIEVE NUMBER

HYDROMETER

3.0" 1 1/2" 3/4" 3/8" #4 #8 #16 #30 #50 #100 #200



Project Name: Pillar Point Harbor

Project No.: 5720.180

Station ID: 5 Bottom

Sample ID: PPIHVC18-5B

Date, Time: 06/19/19, 10:40

Soil Type : SM

Soil Identification: Yellowish brown silty sand (SM)

GR:SA:FI : (%) 0 : 58 : 42

Jul-19



Leighton

**PARTICLE - SIZE
DISTRIBUTION
ASTM D 6913**



**PARTICLE-SIZE DISTRIBUTION (GRADATION)
of SOILS USING SIEVE ANALYSIS**
ASTM D 6913

Project Name: Pillar Point Harbor

Tested By: OHF/GE Date: 06/25/19

Project No.: 5720.180

Checked By: J. Ward Date: 07/11/19

Station ID: 5 Mid

Date, Time: 06/19/19, 10:40

Sample ID: PPIHVC18-5M

Soil Identification: Yellowish brown silty sand (SM)

Container No.:	934	Moisture Content of Total Air - Dry Soil	
		Wt. of Air-Dry Soil + Cont. (g)	0.0
Wt. of Air-Dried Soil + Cont.(g)	663.1	Wt. of Dry Soil + Cont. (g)	0.0
Wt. of Container (g)	108.1	Wt. of Container No._____ (g)	1.0
Dry Wt. of Soil (g)	555.0	Moisture Content (%)	0.0

After Wet Sieve	Container No.	934
	Wt. of Dry Soil + Container (g)	467.1
	Wt. of Container (g)	108.1
	Dry Wt. of Soil Retained on # 200 Sieve (g)	359.0

U. S. Sieve Size		Cumulative Weight Dry Soil Retained (g)	Percent Passing (%)
(in.)	(mm.)		
1 1/2"	37.5		
1"	25.0		
3/4"	19.0		
1/2"	12.5		
3/8"	9.5	0.0	100.0
#4	4.75	1.6	99.7
#8	2.36	28.3	94.9
#16	1.18	65.7	88.2
#30	0.600	98.6	82.2
#50	0.300	133.6	75.9
#100	0.150	239.9	56.8
#200	0.075	352.2	36.5
PAN			

GRAVEL: **0 %**

SAND: **63 %**

FINES: **37 %**

GROUP SYMBOL: **SM**

Cu = D₆₀/D₁₀ = _____

Cc = (D₃₀)²/(D₆₀*D₁₀) = _____

Remarks: _____

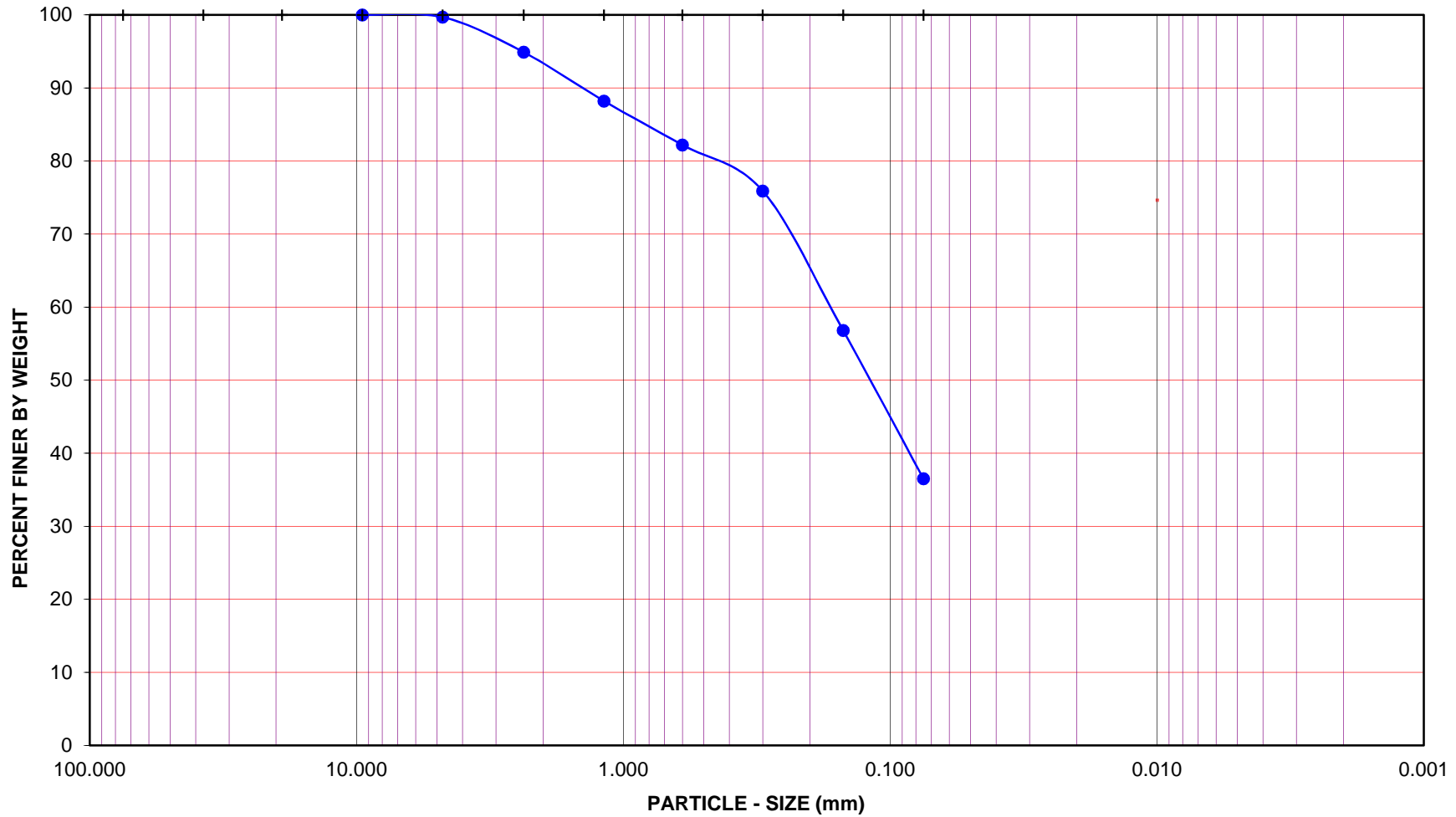
GRAVEL				SAND				FINES	
COARSE		FINE		COARSE	MEDIUM	FINE		SILT	CLAY

U.S. STANDARD SIEVE OPENING

U.S. STANDARD SIEVE NUMBER

HYDROMETER

3.0" 1 1/2" 3/4" 3/8" #4 #8 #16 #30 #50 #100 #200



Project Name: Pillar Point Harbor

Project No.: 5720.180

Station ID: 5 Mid

Sample ID: PPIHVC18-5M

Date, Time: 06/19/19, 10:40

Soil Type : SM

Soil Identification: Yellowish brown silty sand (SM)

GR:SA:FI : (%) 0 : 63 : 37

Jul-19



Leighton

**PARTICLE - SIZE
DISTRIBUTION
ASTM D 6913**



**PARTICLE-SIZE DISTRIBUTION (GRADATION)
of SOILS USING SIEVE ANALYSIS**
ASTM D 6913

Project Name: Pillar Point Harbor

Tested By: OHF/ACS Date: 06/21/19

Project No.: 5720.180

Checked By: J. Ward Date: 07/11/19

Station ID: 5 Top

Date, Time: 06/19/19, 10:40

Sample ID: PPIHVC18-5T

Soil Identification: Olive gray silty sand (SM)

Container No.:	DR	Moisture Content of Total Air - Dry Soil	
		Wt. of Air-Dry Soil + Cont. (g)	0.0
Wt. of Air-Dried Soil + Cont.(g)	745.2	Wt. of Dry Soil + Cont. (g)	0.0
Wt. of Container (g)	217.5	Wt. of Container No._____ (g)	1.0
Dry Wt. of Soil (g)	527.7	Moisture Content (%)	0.0

After Wet Sieve	Container No.	DR
	Wt. of Dry Soil + Container (g)	525.3
	Wt. of Container (g)	217.5
	Dry Wt. of Soil Retained on # 200 Sieve (g)	307.8

U. S. Sieve Size		Cumulative Weight Dry Soil Retained (g)	Percent Passing (%)
(in.)	(mm.)		
1 1/2"	37.5		
1"	25.0		
3/4"	19.0		
1/2"	12.5		
3/8"	9.5	0.0	100.0
#4	4.75	0.8	99.8
#8	2.36	12.1	97.7
#16	1.18	43.8	91.7
#30	0.600	84.6	84.0
#50	0.300	112.2	78.7
#100	0.150	171.1	67.6
#200	0.075	300.9	43.0
PAN			

GRAVEL: **0 %**

SAND: **57 %**

FINES: **43 %**

GROUP SYMBOL: **SM**

$C_u = D_{60}/D_{10} =$ _____

$C_c = (D_{30})^2/(D_{60} \cdot D_{10}) =$ _____

Remarks: _____

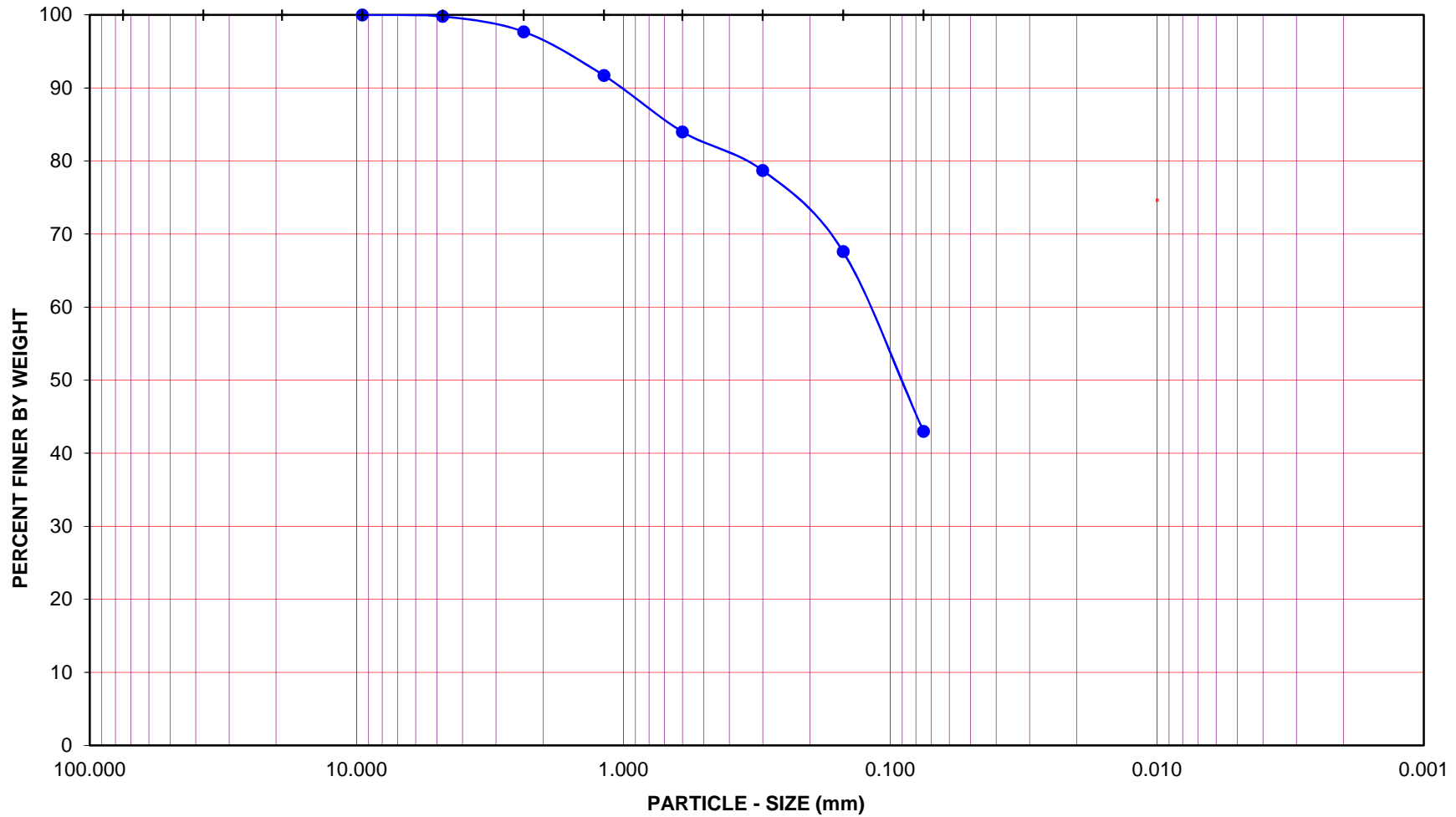
GRAVEL				SAND				FINES	
COARSE		FINE		COARSE	MEDIUM	FINE		SILT	CLAY

U.S. STANDARD SIEVE OPENING

U.S. STANDARD SIEVE NUMBER

HYDROMETER

3.0" 1 1/2" 3/4" 3/8" #4 #8 #16 #30 #50 #100 #200



Project Name: Pillar Point Harbor

Project No.: 5720.180

Station ID: 5 Top

Sample ID: PPIHVC18-5T

Date, Time: 06/19/19, 10:40

Soil Type : SM

Soil Identification: Olive gray silty sand (SM)

GR:SA:FI : (%) 0 : 57 : 43

Jul-19



Leighton

**PARTICLE - SIZE
DISTRIBUTION
ASTM D 6913**



**PARTICLE-SIZE DISTRIBUTION (GRADATION)
of SOILS USING SIEVE ANALYSIS**
ASTM D 6913

Project Name: Pillar Point Harbor

Tested By: OHF/GEB Date: 06/25/19

Project No.: 5720.180

Checked By: J. Ward Date: 07/11/19

Station ID: 6 Bottom

Date, Time: 06/18/19, 15:05

Sample ID: PPIHVC18-6B

Soil Identification: Olive gray poorly-graded sand with silt (SP-SM), shells noted

Container No.:	935	Moisture Content of Total Air - Dry Soil	
		Wt. of Air-Dry Soil + Cont. (g)	0.0
Wt. of Air-Dried Soil + Cont.(g)	613.0	Wt. of Dry Soil + Cont. (g)	0.0
Wt. of Container (g)	108.6	Wt. of Container No._____ (g)	1.0
Dry Wt. of Soil (g)	504.4	Moisture Content (%)	0.0

After Wet Sieve	Container No.	935
	Wt. of Dry Soil + Container (g)	587.2
	Wt. of Container (g)	108.6
	Dry Wt. of Soil Retained on # 200 Sieve (g)	478.6

U. S. Sieve Size		Cumulative Weight Dry Soil Retained (g)	Percent Passing (%)
(in.)	(mm.)		
1 1/2"	37.5		
1"	25.0		
3/4"	19.0		
1/2"	12.5		
3/8"	9.5		
#4	4.75	0.0	100.0
#8	2.36	0.1	100.0
#16	1.18	1.4	99.7
#30	0.600	5.5	98.9
#50	0.300	28.3	94.4
#100	0.150	343.1	32.0
#200	0.075	476.0	5.6
PAN			

GRAVEL: **0 %**

SAND: **94 %**

FINES: **6 %**

GROUP SYMBOL: **SP-SM**

$C_u = D_{60}/D_{10} =$ 2.35

$C_c = (D_{30})^2/(D_{60}*D_{10}) =$ 1.15

Remarks:

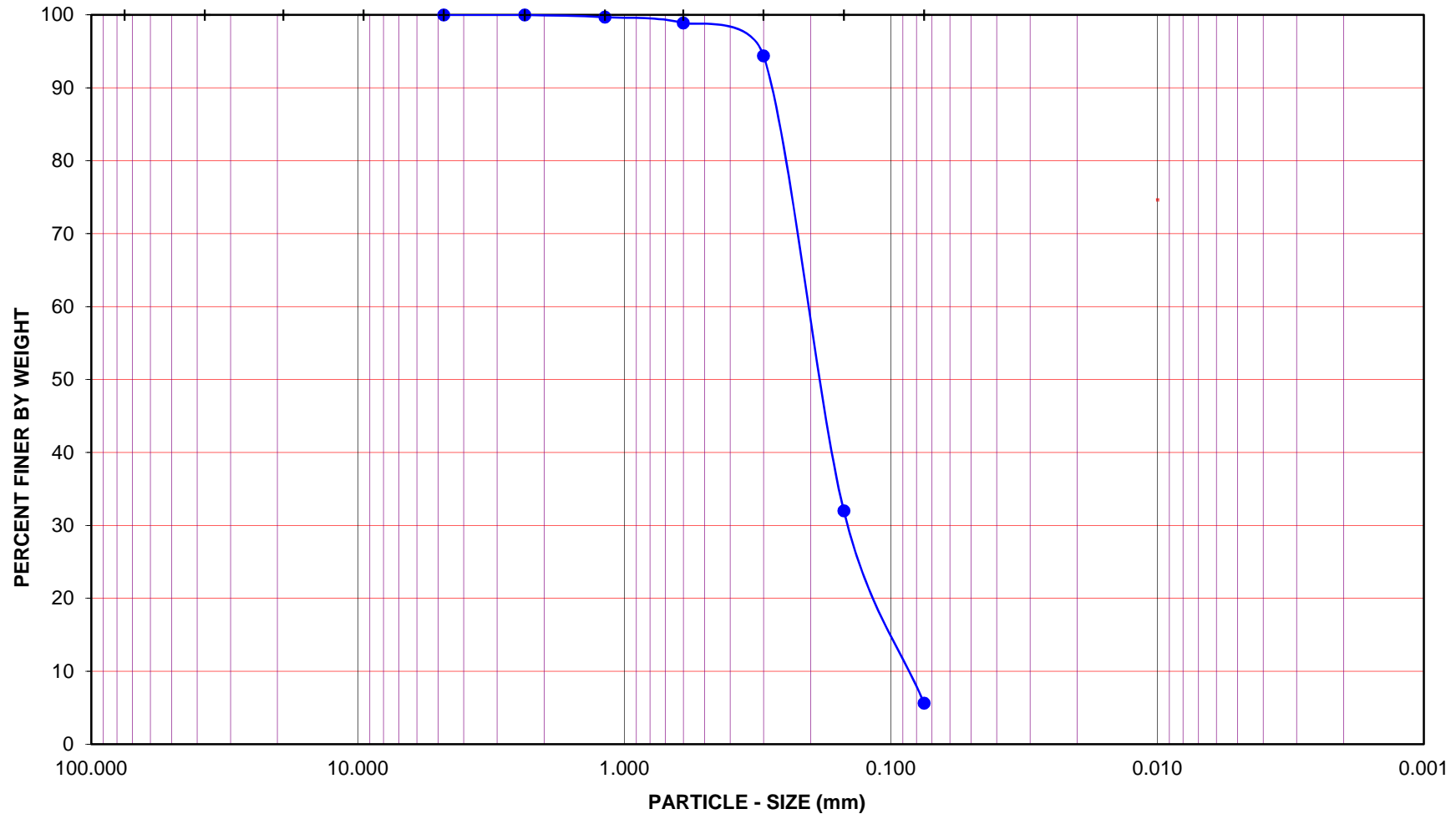
GRAVEL				SAND				FINES	
COARSE		FINE		COARSE	MEDIUM	FINE		SILT	CLAY

U.S. STANDARD SIEVE OPENING

U.S. STANDARD SIEVE NUMBER

HYDROMETER

3.0" 1 1/2" 3/4" 3/8" #4 #8 #16 #30 #50 #100 #200



Project Name: Pillar Point Harbor

Project No.: 5720.180

Station ID: 6 Bottom

Sample ID: PPIHVC18-6B

Date, Time: 06/18/19, 15:05

Soil Type : SP-SM

Soil Identification: Olive gray poorly-graded sand with silt (SP-SM), shells noted

GR:SA:FI : (%) 0 : 94 : 6

Jul-19



Leighton

**PARTICLE - SIZE
DISTRIBUTION
ASTM D 6913**



**PARTICLE-SIZE DISTRIBUTION (GRADATION)
of SOILS USING SIEVE ANALYSIS**
ASTM D 6913

Project Name: Pillar Point Harbor

Tested By: OHF/GEB Date: 06/25/19

Project No.: 5720.180

Checked By: J. Ward Date: 07/11/19

Station ID: 6 Mid

Date, Time: 06/18/19, 15:05

Sample ID: PPIHVC18-6M

Soil Identification: Olive gray poorly-graded sand (SP)

Container No.:	929	Moisture Content of Total Air - Dry Soil	
		Wt. of Air-Dry Soil + Cont. (g)	0.0
Wt. of Air-Dried Soil + Cont.(g)	714.8	Wt. of Dry Soil + Cont. (g)	0.0
Wt. of Container (g)	108.0	Wt. of Container No._____ (g)	1.0
Dry Wt. of Soil (g)	606.8	Moisture Content (%)	0.0

After Wet Sieve	Container No.	929
	Wt. of Dry Soil + Container (g)	694.6
	Wt. of Container (g)	108.0
	Dry Wt. of Soil Retained on # 200 Sieve (g)	586.6

U. S. Sieve Size		Cumulative Weight Dry Soil Retained (g)	Percent Passing (%)
(in.)	(mm.)		
1 1/2"	37.5		
1"	25.0		
3/4"	19.0		
1/2"	12.5		
3/8"	9.5		
#4	4.75		
#8	2.36	0.0	100.0
#16	1.18	0.2	100.0
#30	0.600	1.4	99.8
#50	0.300	17.2	97.2
#100	0.150	427.0	29.6
#200	0.075	583.3	3.9
PAN			

GRAVEL: **0 %**

SAND: **96 %**

FINES: **4 %**

GROUP SYMBOL: **SP**

$C_u = D_{60}/D_{10} = 2.22$

$C_c = (D_{30})^2/(D_{60} \cdot D_{10}) = 1.42$

Remarks:

GRAVEL				SAND				FINES	
COARSE		FINE		COARSE	MEDIUM	FINE		SILT	CLAY

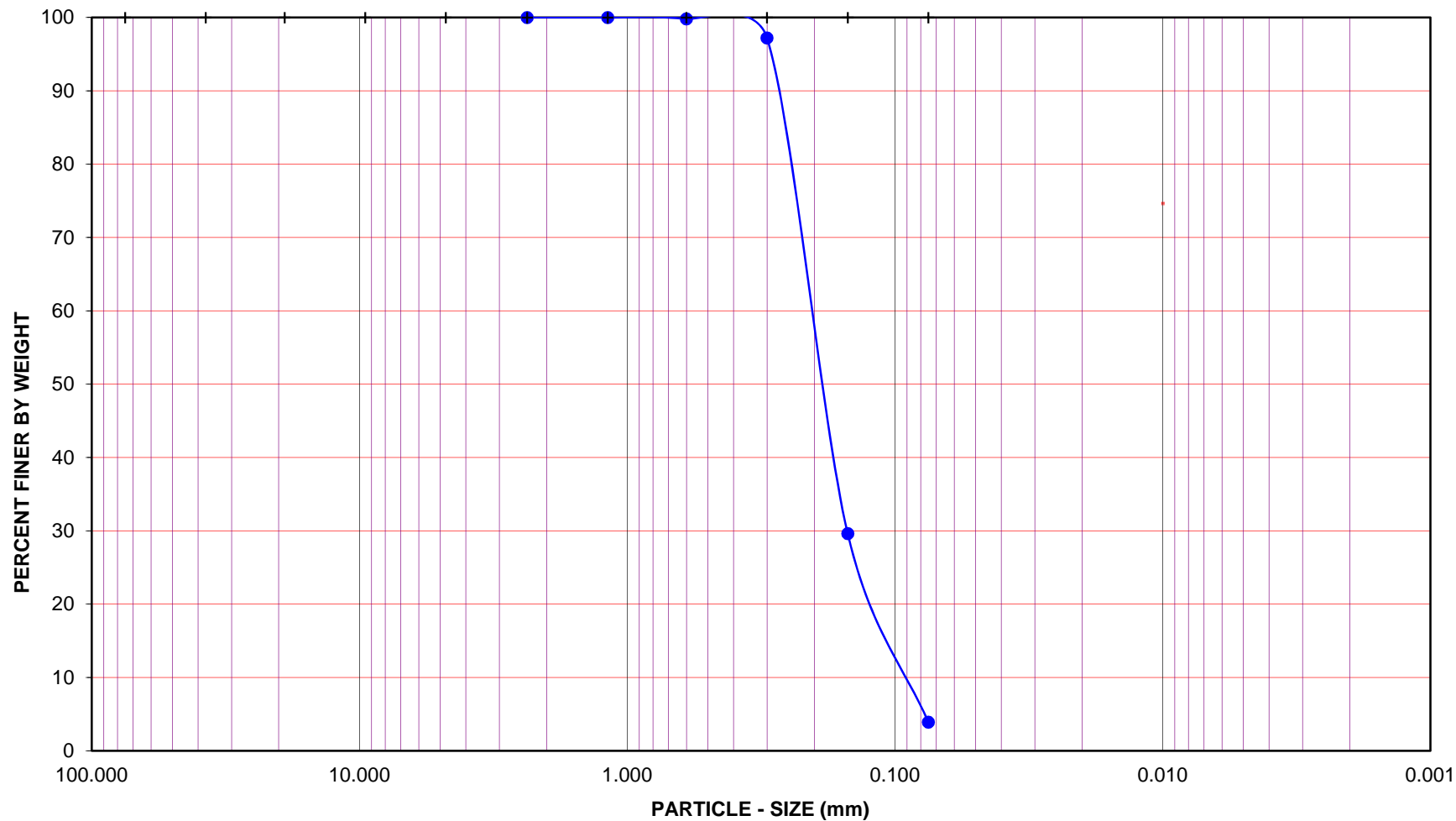
U.S. STANDARD SIEVE OPENING

3.0" 1 1/2" 3/4" 3/8" #4

U.S. STANDARD SIEVE NUMBER

#8 #16 #30 #50 #100 #200

HYDROMETER



Project Name: Pillar Point Harbor

Project No.: 5720.180

Station ID: 6 Mid

Sample ID: PPIHVC18-6M

Date, Time: 06/18/19, 15:05

Soil Type : SP

Soil Identification: Olive gray poorly-graded sand (SP)

GR:SA:FI : (%) 0 : 96 : 4

Jul-19



Leighton

**PARTICLE - SIZE
DISTRIBUTION
ASTM D 6913**



**PARTICLE-SIZE DISTRIBUTION (GRADATION)
of SOILS USING SIEVE ANALYSIS**
ASTM D 6913

Project Name: Pillar Point Harbor

Tested By: O. Figueroa Date: 06/25/19

Project No.: 5720.180

Checked By: J. Ward Date: 07/11/19

Station ID: 6 Top

Date, Time: 06/18/19, 15:05

Sample ID: PPIHVC18-6T

Soil Identification: Olive gray poorly-graded sand (SP)

Container No.:	957	Moisture Content of Total Air - Dry Soil	
		Wt. of Air-Dry Soil + Cont. (g)	0.0
Wt. of Air-Dried Soil + Cont.(g)	647.9	Wt. of Dry Soil + Cont. (g)	0.0
Wt. of Container (g)	108.5	Wt. of Container No._____ (g)	1.0
Dry Wt. of Soil (g)	539.4	Moisture Content (%)	0.0

After Wet Sieve	Container No.	957
	Wt. of Dry Soil + Container (g)	635.5
	Wt. of Container (g)	108.5
	Dry Wt. of Soil Retained on # 200 Sieve (g)	527.0

U. S. Sieve Size		Cumulative Weight Dry Soil Retained (g)	Percent Passing (%)
(in.)	(mm.)		
1 1/2"	37.5		
1"	25.0		
3/4"	19.0		
1/2"	12.5		
3/8"	9.5		
#4	4.75	0.0	100.0
#8	2.36	0.6	99.9
#16	1.18	2.5	99.5
#30	0.600	3.9	99.3
#50	0.300	11.5	97.9
#100	0.150	275.6	48.9
#200	0.075	525.1	2.7
PAN			

GRAVEL: **0 %**

SAND: **97 %**

FINES: **3 %**

GROUP SYMBOL: **SP**

$C_u = D_{60}/D_{10} = 2.05$

$C_c = (D_{30})^2/(D_{60} \cdot D_{10}) = 1.02$

Remarks:



**PARTICLE-SIZE DISTRIBUTION (GRADATION)
of SOILS USING SIEVE ANALYSIS**
ASTM D 6913

Project Name: Pillar Point Harbor

Tested By: OHF/GEB Date: 06/25/19

Project No.: 5720.180

Checked By: J. Ward Date: 07/11/19

Station ID: 7 Bottom

Date, Time: 06/18/19, 14:25

Sample ID: PPIHVC18-7B

Soil Identification: Olive gray poorly-graded sand with silt (SP-SM)

Container No.:	IMC-1	Moisture Content of Total Air - Dry Soil	
		Wt. of Air-Dry Soil + Cont. (g)	0.0
Wt. of Air-Dried Soil + Cont.(g)	767.5	Wt. of Dry Soil + Cont. (g)	0.0
Wt. of Container (g)	300.2	Wt. of Container No._____ (g)	1.0
Dry Wt. of Soil (g)	467.3	Moisture Content (%)	0.0

After Wet Sieve	Container No.	IMC-1
	Wt. of Dry Soil + Container (g)	748.6
	Wt. of Container (g)	300.2
	Dry Wt. of Soil Retained on # 200 Sieve (g)	448.4

U. S. Sieve Size		Cumulative Weight Dry Soil Retained (g)	Percent Passing (%)
(in.)	(mm.)		
1 1/2"	37.5		
1"	25.0		
3/4"	19.0		
1/2"	12.5		
3/8"	9.5		
#4	4.75		
#8	2.36	0.0	100.0
#16	1.18	0.4	99.9
#30	0.600	3.3	99.3
#50	0.300	29.2	93.8
#100	0.150	277.2	40.7
#200	0.075	444.8	4.8
PAN			

GRAVEL: **0 %**

SAND: **95 %**

FINES: **5 %**

GROUP SYMBOL: **SP-SM**

$C_u = D_{60}/D_{10} = 2.29$

$C_c = (D_{30})^2/(D_{60} \cdot D_{10}) = 1.07$

Remarks:

GRAVEL				SAND				FINES	
COARSE		FINE		COARSE	MEDIUM	FINE		SILT	CLAY

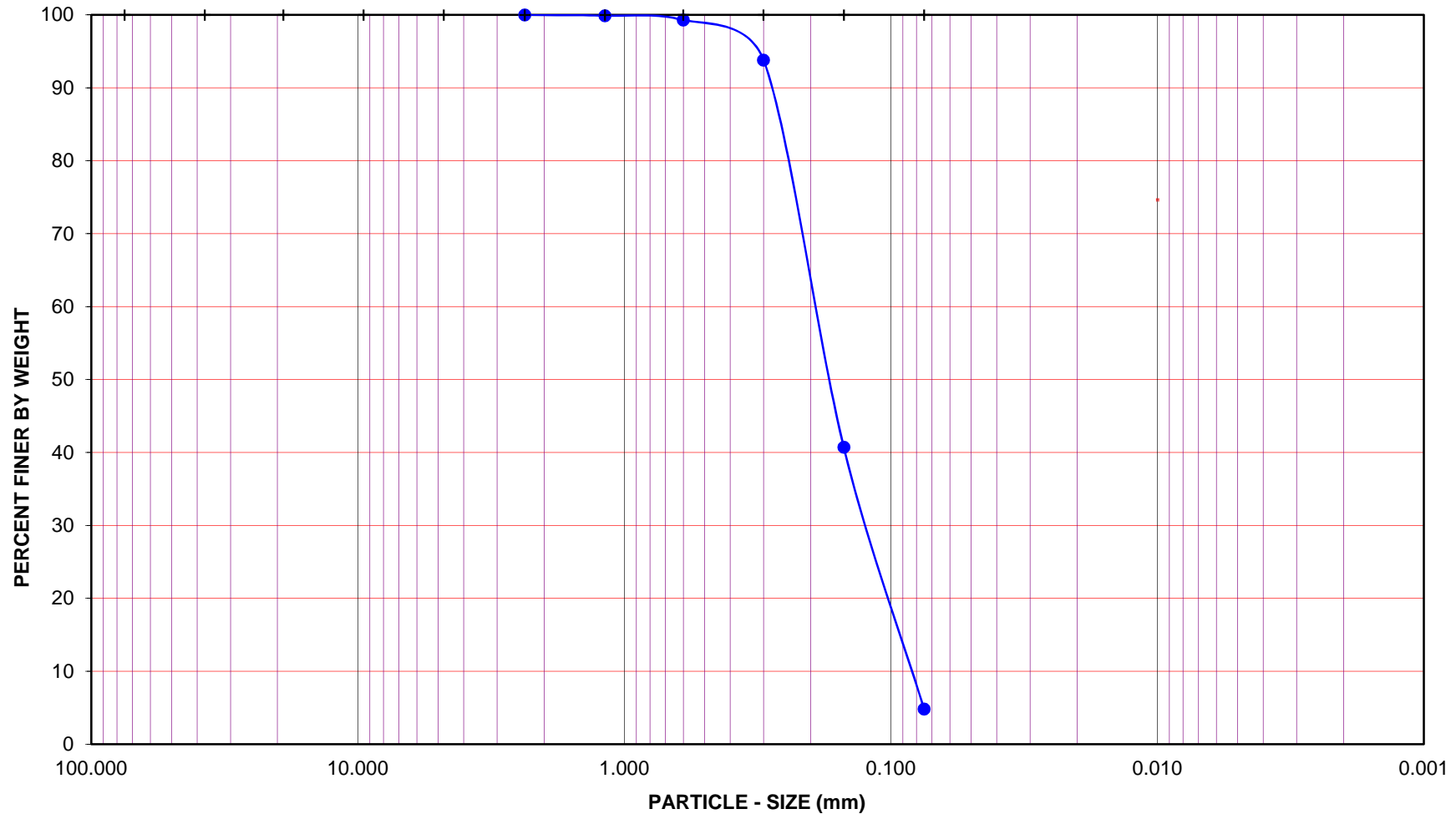
U.S. STANDARD SIEVE OPENING

3.0" 1 1/2" 3/4" 3/8" #4

U.S. STANDARD SIEVE NUMBER

#8 #16 #30 #50 #100 #200

HYDROMETER



Project Name: Pillar Point Harbor

Project No.: 5720.180

Station ID: 7 Bottom

Sample ID: PPIHVC18-7B

Date, Time: 06/18/19, 14:25

Soil Type: SP-SM

Soil Identification: Olive gray poorly-graded sand with silt (SP-SM)

GR:SA:FI : (%) 0 : 95 : 5

Jul-19



Leighton

**PARTICLE - SIZE
DISTRIBUTION
ASTM D 6913**



**PARTICLE-SIZE DISTRIBUTION (GRADATION)
of SOILS USING SIEVE ANALYSIS**
ASTM D 6913

Project Name: Pillar Point Harbor

Tested By: ACS/OHF Date: 06/21/19

Project No.: 5720.180

Checked By: J. Ward Date: 07/11/19

Station ID: 7 Mid

Date, Time: 06/18/19, 14:25

Sample ID: PPIHVC18-7M

Soil Identification: Olive gray poorly-graded sand (SP)

Container No.:	CT	Moisture Content of Total Air - Dry Soil	
		Wt. of Air-Dry Soil + Cont. (g)	0.0
Wt. of Air-Dried Soil + Cont.(g)	643.4	Wt. of Dry Soil + Cont. (g)	0.0
Wt. of Container (g)	244.0	Wt. of Container No._____ (g)	1.0
Dry Wt. of Soil (g)	399.4	Moisture Content (%)	0.0

After Wet Sieve	Container No.	CT
	Wt. of Dry Soil + Container (g)	630.0
	Wt. of Container (g)	244.0
	Dry Wt. of Soil Retained on # 200 Sieve (g)	386.0

U. S. Sieve Size		Cumulative Weight Dry Soil Retained (g)	Percent Passing (%)
(in.)	(mm.)		
1 1/2"	37.5		
1"	25.0		
3/4"	19.0		
1/2"	12.5		
3/8"	9.5		
#4	4.75		
#8	2.36		
#16	1.18	0.0	100.0
#30	0.600	0.4	99.9
#50	0.300	5.4	98.6
#100	0.150	184.3	53.9
#200	0.075	384.6	3.7
PAN			

GRAVEL: **0 %**

SAND: **96 %**

FINES: **4 %**

GROUP SYMBOL: **SP**

$C_u = D_{60}/D_{10} =$ 1.98

$C_c = (D_{30})^2/(D_{60}*D_{10}) =$ 0.93

Remarks: _____

GRAVEL				SAND				FINES		
COARSE		FINE		COARSE	MEDIUM	FINE		SILT		CLAY

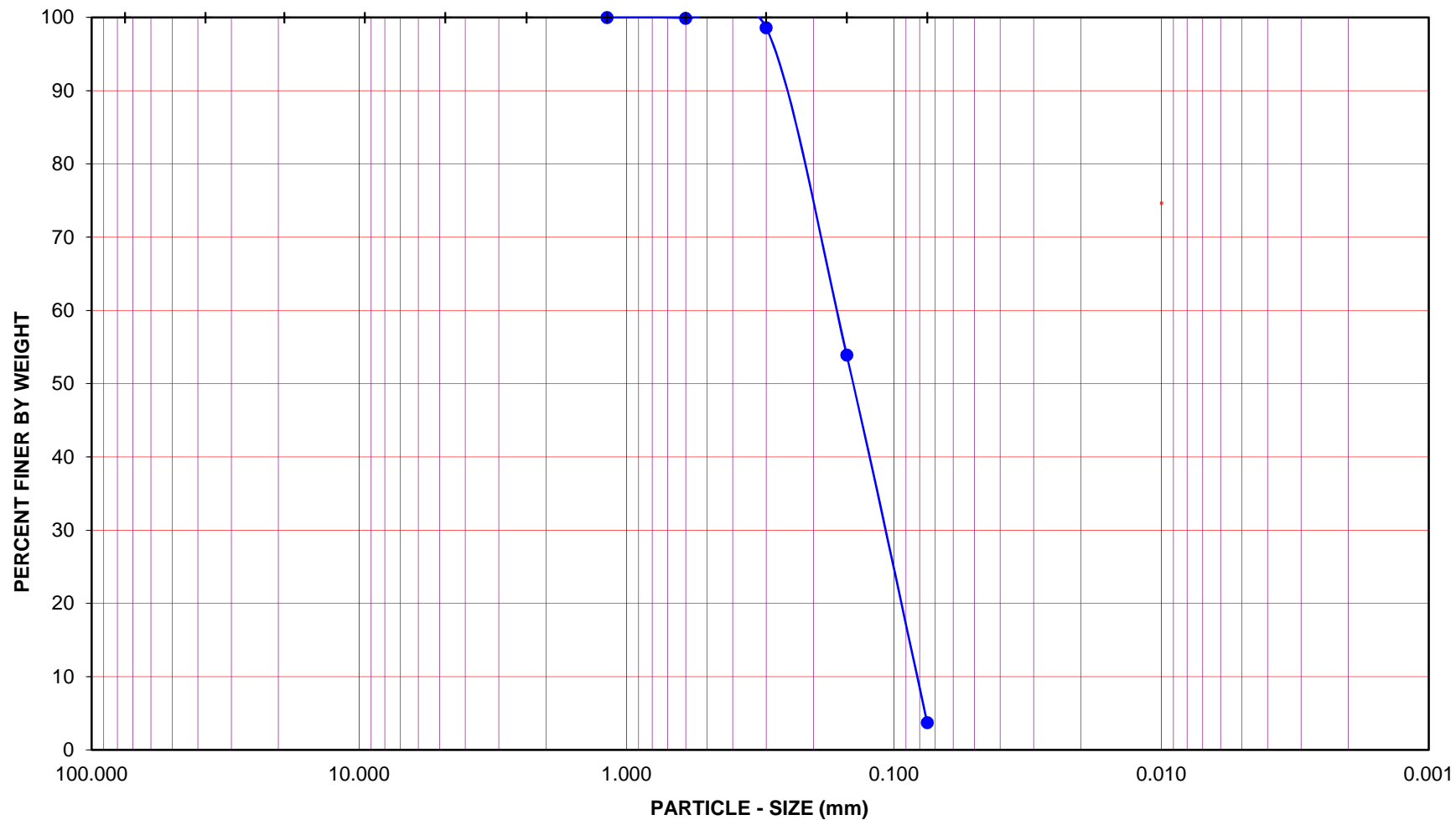
U.S. STANDARD SIEVE OPENING

3.0" 1 1/2" 3/4" 3/8" #4

U.S. STANDARD SIEVE NUMBER

#8 #16 #30 #50 #100 #200

HYDROMETER



Project Name: Pillar Point Harbor

Project No.: 5720.180

Station ID: 7 Mid

Sample ID: PPIHVC18-7M

Date, Time: 06/18/19, 14:25

Soil Type : SP

Soil Identification: Olive gray poorly-graded sand (SP)

GR:SA:FI : (%) 0 : 96 : 4



Leighton

**PARTICLE - SIZE
DISTRIBUTION
ASTM D 6913**

Jul-19



**PARTICLE-SIZE DISTRIBUTION (GRADATION)
of SOILS USING SIEVE ANALYSIS**
ASTM D 6913

Project Name: Pillar Point Harbor

Tested By: O. Figueroa Date: 06/25/19

Project No.: 5720.180

Checked By: J. Ward Date: 07/11/19

Station ID: 7 Top

Date, Time: 06/18/19, 14:25

Sample ID: PPIHVC18-7T

Soil Identification: Grayish brown poorly-graded sand (SP)

Container No.:	D7	Moisture Content of Total Air - Dry Soil	
		Wt. of Air-Dry Soil + Cont. (g)	0.0
Wt. of Air-Dried Soil + Cont.(g)	787.7	Wt. of Dry Soil + Cont. (g)	0.0
Wt. of Container (g)	206.2	Wt. of Container No._____ (g)	1.0
Dry Wt. of Soil (g)	581.5	Moisture Content (%)	0.0

After Wet Sieve	Container No.	D7
	Wt. of Dry Soil + Container (g)	774.4
	Wt. of Container (g)	206.2
	Dry Wt. of Soil Retained on # 200 Sieve (g)	568.2

U. S. Sieve Size		Cumulative Weight Dry Soil Retained (g)	Percent Passing (%)
(in.)	(mm.)		
1 1/2"	37.5		
1"	25.0		
3/4"	19.0		
1/2"	12.5		
3/8"	9.5	0.0	100.0
#4	4.75	0.3	99.9
#8	2.36	1.5	99.7
#16	1.18	5.8	99.0
#30	0.600	8.7	98.5
#50	0.300	19.0	96.7
#100	0.150	304.5	47.6
#200	0.075	565.2	2.8
PAN			

GRAVEL: **0 %**

SAND: **97 %**

FINES: **3 %**

GROUP SYMBOL: **SP**

$C_u = D_{60}/D_{10} = 2.05$

$C_c = (D_{30})^2/(D_{60} \cdot D_{10}) = 1.02$

Remarks:

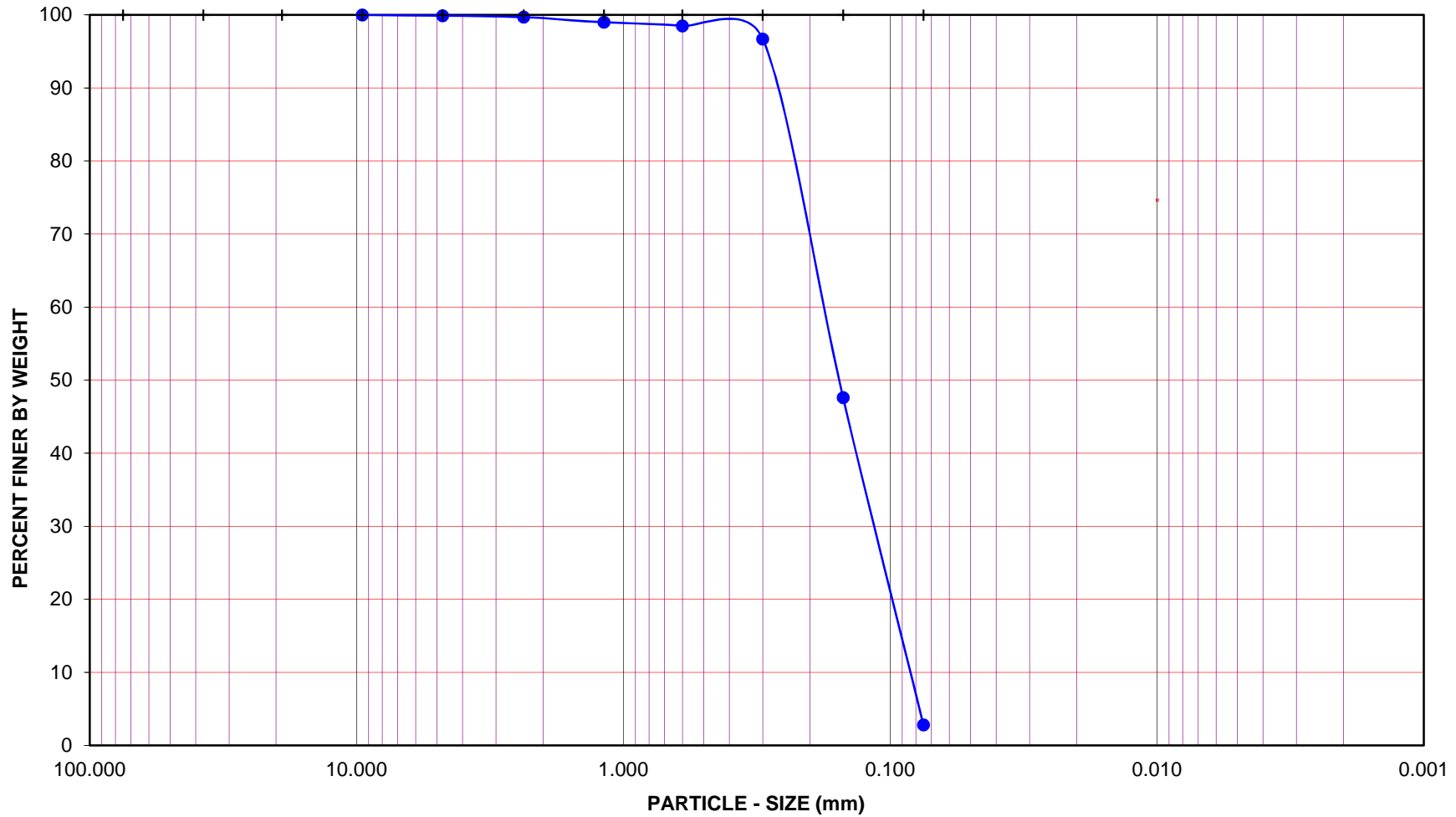
GRAVEL				SAND				FINES	
COARSE		FINE		COARSE	MEDIUM	FINE		SILT	CLAY

U.S. STANDARD SIEVE OPENING

U.S. STANDARD SIEVE NUMBER

HYDROMETER

3.0" 1 1/2" 3/4" 3/8" #4 #8 #16 #30 #50 #100 #200



Project Name: Pillar Point Harbor

Project No.: 5720.180

Station ID: 7 Top

Sample ID: PPIHVC18-7T

Date, Time: 06/18/19, 14:25

Soil Type : SP

Soil Identification: Grayish brown poorly-graded sand (SP)

GR:SA:FI : (%) 0 : 97 : 3

Jul-19



Leighton

**PARTICLE - SIZE
DISTRIBUTION
ASTM D 6913**



**PARTICLE-SIZE DISTRIBUTION (GRADATION)
of SOILS USING SIEVE ANALYSIS**
ASTM D 6913

Project Name: Pillar Point Harbor

Tested By: ACS/OHF Date: 06/21/19

Project No.: 5720.180

Checked By: J. Ward Date: 07/11/19

Station ID: 8 Bottom

Date, Time: 06/18/19, 13:55

Sample ID: PPIHVC18-8B

Soil Identification: Olive gray poorly-graded sand with silt (SP-SM)

Container No.:	PHD	Moisture Content of Total Air - Dry Soil	
		Wt. of Air-Dry Soil + Cont. (g)	0.0
Wt. of Air-Dried Soil + Cont.(g)	678.4	Wt. of Dry Soil + Cont. (g)	0.0
Wt. of Container (g)	214.9	Wt. of Container No._____ (g)	1.0
Dry Wt. of Soil (g)	463.5	Moisture Content (%)	0.0

After Wet Sieve	Container No.	PHD
	Wt. of Dry Soil + Container (g)	643.5
	Wt. of Container (g)	214.9
	Dry Wt. of Soil Retained on # 200 Sieve (g)	428.6

U. S. Sieve Size		Cumulative Weight Dry Soil Retained (g)	Percent Passing (%)
(in.)	(mm.)		
1 1/2"	37.5		
1"	25.0		
3/4"	19.0		
1/2"	12.5		
3/8"	9.5		
#4	4.75		
#8	2.36	0.0	100.0
#16	1.18	1.3	99.7
#30	0.600	7.6	98.4
#50	0.300	55.1	88.1
#100	0.150	221.4	52.2
#200	0.075	424.4	8.4
PAN			

GRAVEL: **0 %**

SAND: **92 %**

FINES: **8 %**

GROUP SYMBOL: **SP-SM**

$C_u = D_{60}/D_{10} =$ 2.18

$C_c = (D_{30})^2/(D_{60}*D_{10}) =$ 0.91

Remarks: _____

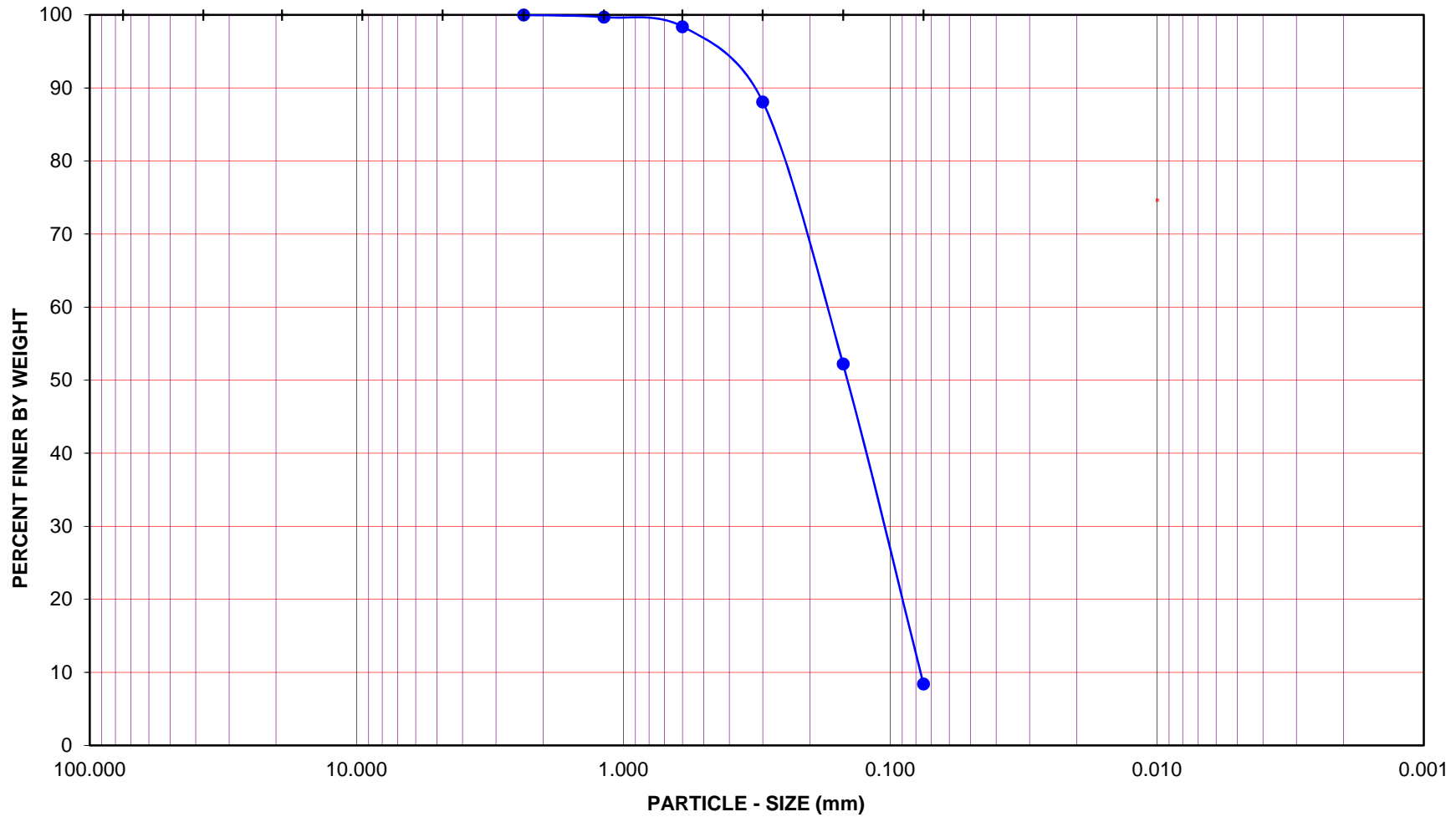
GRAVEL				SAND				FINES	
COARSE		FINE		COARSE	MEDIUM	FINE		SILT	CLAY

U.S. STANDARD SIEVE OPENING

U.S. STANDARD SIEVE NUMBER

HYDROMETER

3.0" 1 1/2" 3/4" 3/8" #4 #8 #16 #30 #50 #100 #200



Project Name: Pillar Point Harbor

Project No.: 5720.180

Station ID: 8 Bottom

Sample ID: PPIHVC18-8B

Date, Time: 06/18/19, 13:55

Soil Type : SP-SM

Soil Identification: Olive gray poorly-graded sand with silt (SP-SM)

GR:SA:FI : (%) 0 : 92 : 8

Jul-19



Leighton

**PARTICLE - SIZE
DISTRIBUTION
ASTM D 6913**



**PARTICLE-SIZE DISTRIBUTION (GRADATION)
of SOILS USING SIEVE ANALYSIS**
ASTM D 6913

Project Name: Pillar Point Harbor

Tested By: O. Figueroa Date: 06/25/19

Project No.: 5720.180

Checked By: J. Ward Date: 07/11/19

Station ID: 8 Mid

Date, Time: 06/18/19, 13:55

Sample ID: PPIHVC18-8M

Soil Identification: Grayish brown poorly-graded sand with silt (SP-SM)

Container No.:	VIP	Moisture Content of Total Air - Dry Soil	
		Wt. of Air-Dry Soil + Cont. (g)	0.0
Wt. of Air-Dried Soil + Cont.(g)	750.4	Wt. of Dry Soil + Cont. (g)	0.0
Wt. of Container (g)	219.5	Wt. of Container No._____ (g)	1.0
Dry Wt. of Soil (g)	530.9	Moisture Content (%)	0.0

After Wet Sieve	Container No.	VIP
	Wt. of Dry Soil + Container (g)	729.0
	Wt. of Container (g)	219.5
	Dry Wt. of Soil Retained on # 200 Sieve (g)	509.5

U. S. Sieve Size		Cumulative Weight Dry Soil Retained (g)	Percent Passing (%)
(in.)	(mm.)		
1 1/2"	37.5		
1"	25.0		
3/4"	19.0		
1/2"	12.5		
3/8"	9.5		
#4	4.75		
#8	2.36	0.0	100.0
#16	1.18	0.2	100.0
#30	0.600	1.3	99.8
#50	0.300	12.8	97.6
#100	0.150	234.6	55.8
#200	0.075	506.2	4.7
PAN			

GRAVEL: **0 %**

SAND: **95 %**

FINES: **5 %**

GROUP SYMBOL: **SP-SM**

$C_u = D_{60}/D_{10} =$ 2.00

$C_c = (D_{30})^2/(D_{60}*D_{10}) =$ 0.95

Remarks: _____

GRAVEL				SAND				FINES	
COARSE		FINE		COARSE	MEDIUM	FINE		SILT	CLAY

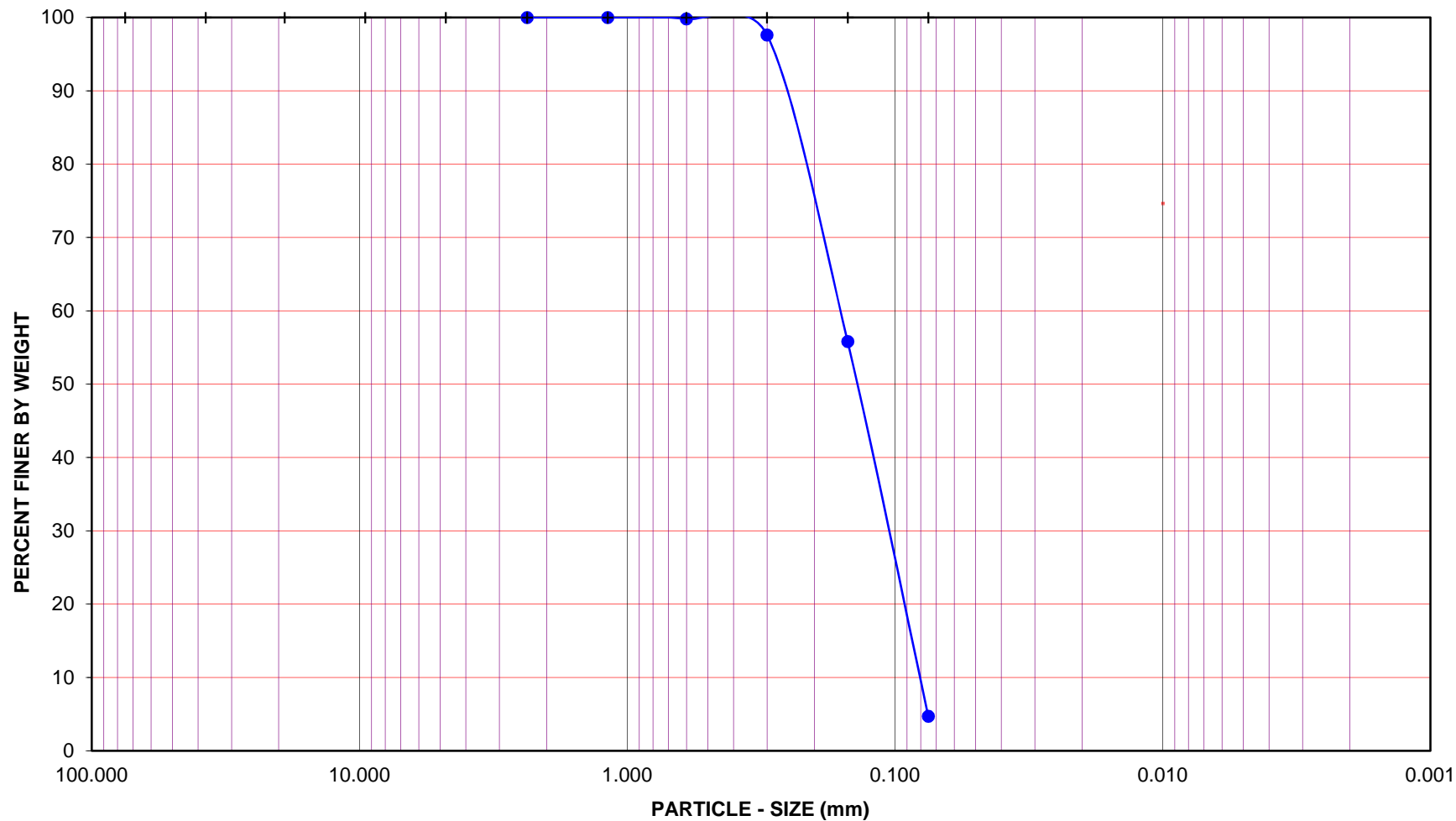
U.S. STANDARD SIEVE OPENING

3.0" 1 1/2" 3/4" 3/8"

U.S. STANDARD SIEVE NUMBER

#4 #8 #16 #30 #50 #100 #200

HYDROMETER



Project Name: Pillar Point Harbor

Project No.: 5720.180

Station ID: 8 Mid

Sample ID: PPIHVC18-8M

Date, Time: 06/18/19, 13:55

Soil Type : SP-SM

Soil Identification: Grayish brown poorly-graded sand with silt (SP-SM)

GR:SA:FI : (%) 0 : 95 : 5

Jul-19



Leighton

**PARTICLE - SIZE
DISTRIBUTION
ASTM D 6913**



**PARTICLE-SIZE DISTRIBUTION (GRADATION)
of SOILS USING SIEVE ANALYSIS**
ASTM D 6913

Project Name: Pillar Point Harbor

Tested By: O. Figueroa Date: 06/25/19

Project No.: 5720.180

Checked By: J. Ward Date: 07/11/19

Station ID: 8 Top

Date, Time: 06/18/19, 13:55

Sample ID: PPIHVC18-8T

Soil Identification: Olive gray poorly-graded sand (SP)

Container No.:	H	Moisture Content of Total Air - Dry Soil	
		Wt. of Air-Dry Soil + Cont. (g)	0.0
Wt. of Air-Dried Soil + Cont.(g)	650.7	Wt. of Dry Soil + Cont. (g)	0.0
Wt. of Container (g)	145.0	Wt. of Container No._____ (g)	1.0
Dry Wt. of Soil (g)	505.7	Moisture Content (%)	0.0

After Wet Sieve	Container No.	H
	Wt. of Dry Soil + Container (g)	636.9
	Wt. of Container (g)	145.0
	Dry Wt. of Soil Retained on # 200 Sieve (g)	491.9

U. S. Sieve Size		Cumulative Weight Dry Soil Retained (g)	Percent Passing (%)
(in.)	(mm.)		
1 1/2"	37.5		
1"	25.0		
3/4"	19.0		
1/2"	12.5		
3/8"	9.5		
#4	4.75	0.0	100.0
#8	2.36	0.3	99.9
#16	1.18	1.3	99.7
#30	0.600	5.3	99.0
#50	0.300	28.0	94.5
#100	0.150	254.3	49.7
#200	0.075	489.2	3.3
PAN			

GRAVEL: **0 %**

SAND: **97 %**

FINES: **3 %**

GROUP SYMBOL: **SP**

$C_u = D_{60}/D_{10} =$ 2.05

$C_c = (D_{30})^2/(D_{60}*D_{10}) =$ 1.02

Remarks: _____

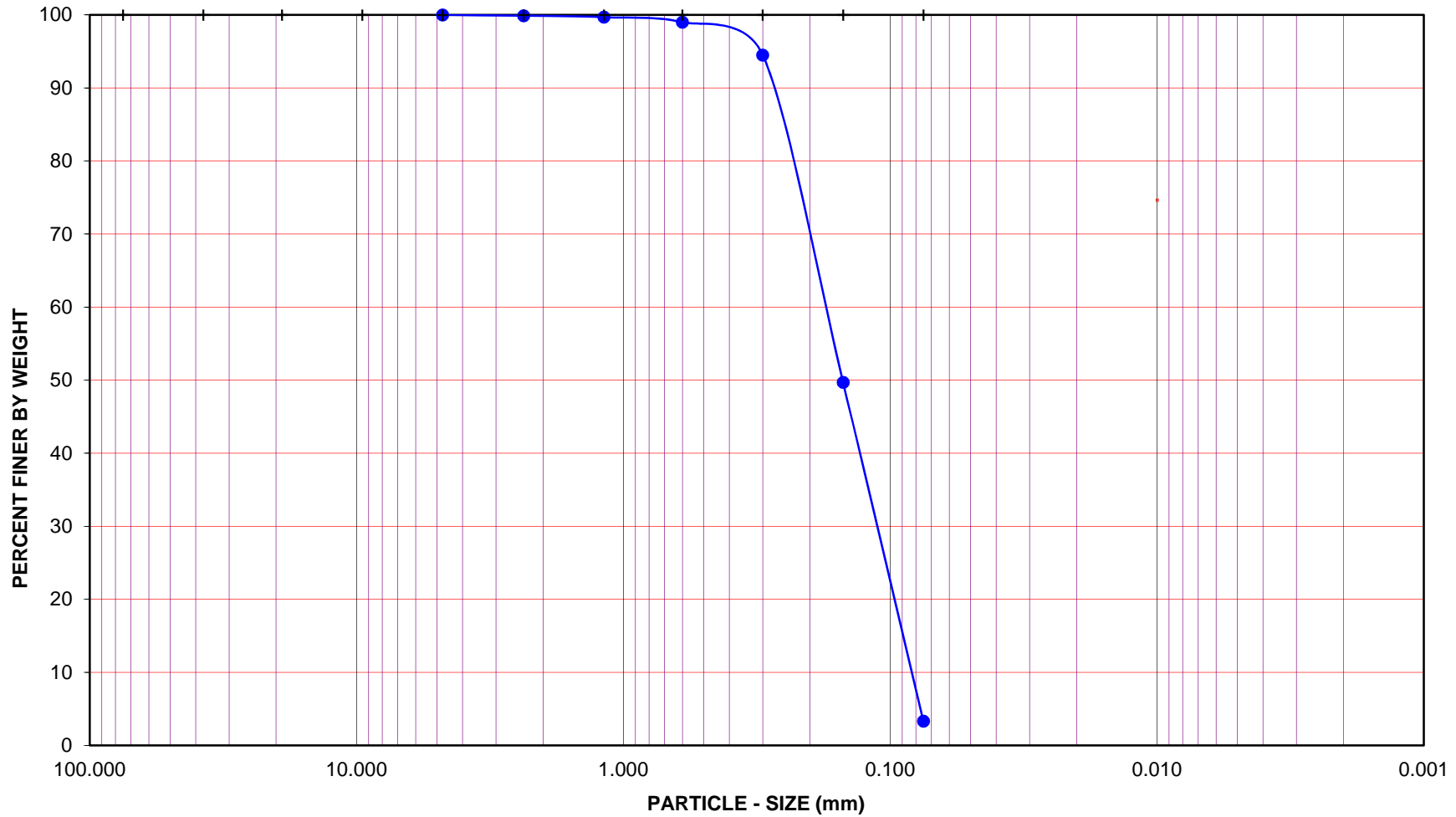
GRAVEL				SAND				FINES	
COARSE		FINE		COARSE	MEDIUM	FINE		SILT	CLAY

U.S. STANDARD SIEVE OPENING

U.S. STANDARD SIEVE NUMBER

HYDROMETER

3.0" 1 1/2" 3/4" 3/8" #4 #8 #16 #30 #50 #100 #200



Project Name: Pillar Point Harbor

Project No.: 5720.180

Station ID: 8 Top

Sample ID: PPIHVC18-8T

Date, Time: 06/18/19, 13:55

Soil Type : SP

Soil Identification: Olive gray poorly-graded sand (SP)

GR:SA:FI : (%) 0 : 97 : 3

Jul-19



Leighton

**PARTICLE - SIZE
DISTRIBUTION
ASTM D 6913**



**PARTICLE-SIZE DISTRIBUTION (GRADATION)
of SOILS USING SIEVE ANALYSIS**
ASTM D 6913

Project Name: Pillar Point Harbor

Tested By: ACS/OHF Date: 06/26/19

Project No.: 5720.180

Checked By: J. Ward Date: 07/11/19

Station ID: Bottom Comp

Date, Time: 06/19/19, 10:40

Sample ID: PPIHVC18-Bot

Soil Identification: Yellowish brown silty, clayey sand (SC-SM)

Container No.:	CT	Moisture Content of Total Air - Dry Soil	
		Wt. of Air-Dry Soil + Cont. (g)	0.0
Wt. of Air-Dried Soil + Cont.(g)	727.4	Wt. of Dry Soil + Cont. (g)	0.0
Wt. of Container (g)	244.0	Wt. of Container No._____ (g)	1.0
Dry Wt. of Soil (g)	483.4	Moisture Content (%)	0.0

After Wet Sieve	Container No.	CT
	Wt. of Dry Soil + Container (g)	540.7
	Wt. of Container (g)	244.0
	Dry Wt. of Soil Retained on # 200 Sieve (g)	296.7

U. S. Sieve Size		Cumulative Weight Dry Soil Retained (g)	Percent Passing (%)
(in.)	(mm.)		
1 1/2"	37.5		
1"	25.0		
3/4"	19.0		
1/2"	12.5		
3/8"	9.5	0.0	100.0
#4	4.75	0.8	99.8
#8	2.36	14.4	97.0
#16	1.18	44.0	90.9
#30	0.600	76.0	84.3
#50	0.300	118.1	75.6
#100	0.150	225.0	53.5
#200	0.075	293.2	39.3
PAN			

GRAVEL: **0 %**

SAND: **61 %**

FINES: **39 %**

GROUP SYMBOL: **SC-SM**

Cu = D60/D10 = _____

Cc = (D30)²/(D60*D10) = _____

Remarks: _____

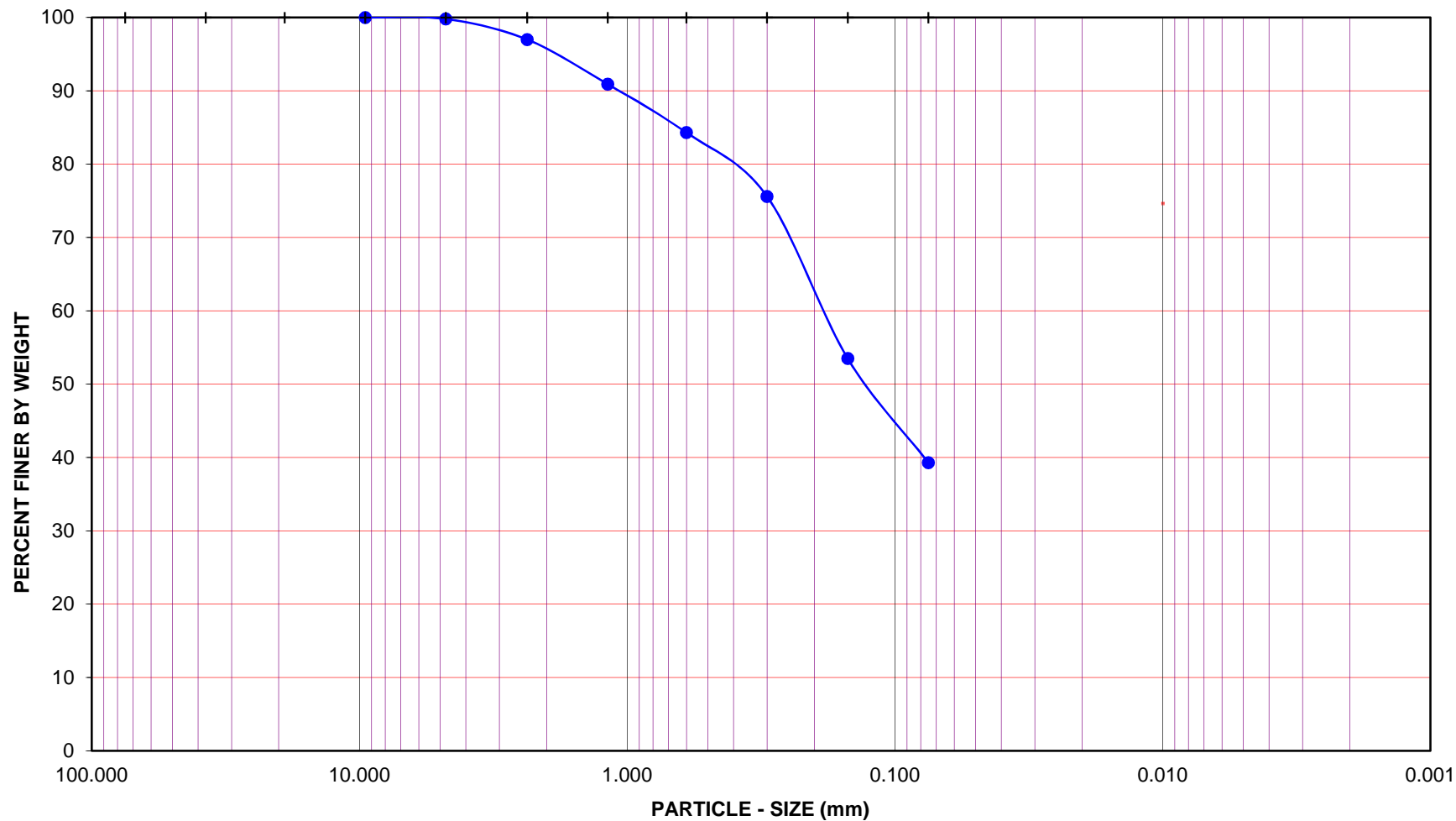
GRAVEL				SAND						FINES	
COARSE		FINE		COARSE	MEDIUM	FINE				SILT	CLAY

U.S. STANDARD SIEVE OPENING

U.S. STANDARD SIEVE NUMBER

HYDROMETER

3.0" 1 1/2" 3/4" 3/8" #4 #8 #16 #30 #50 #100 #200



Project Name: Pillar Point Harbor

Project No.: 5720.180

Station ID: Bottom Comp

Sample ID: PPIHVC18-Bot

Date, Time: 06/19/19, 10:40

Soil Type : SC-SM

Soil Identification: Yellowish brown silty, clayey sand (SC-SM)

GR:SA:FI : (%) 0 : 61 : 39

Jul-19



Leighton

**PARTICLE - SIZE
DISTRIBUTION
ASTM D 6913**



**PARTICLE-SIZE DISTRIBUTION (GRADATION)
of SOILS USING SIEVE ANALYSIS**
ASTM D 6913

Project Name: Pillar Point Harbor

Tested By: ACS/OHF Date: 06/26/19

Project No.: 5720.180

Checked By: J. Ward Date: 07/11/19

Station ID: Mid Comp

Date, Time: 06/19/19, 10:40

Sample ID: PPIHVC18-Mid

Soil Identification: Olive brown silty sand (SM)

Container No.:	PHD	Moisture Content of Total Air - Dry Soil	
		Wt. of Air-Dry Soil + Cont. (g)	0.0
Wt. of Air-Dried Soil + Cont.(g)	822.4	Wt. of Dry Soil + Cont. (g)	0.0
Wt. of Container (g)	214.9	Wt. of Container No._____ (g)	1.0
Dry Wt. of Soil (g)	607.5	Moisture Content (%)	0.0

After Wet Sieve	Container No.	PHD
	Wt. of Dry Soil + Container (g)	659.8
	Wt. of Container (g)	214.9
	Dry Wt. of Soil Retained on # 200 Sieve (g)	444.9

U. S. Sieve Size		Cumulative Weight Dry Soil Retained (g)	Percent Passing (%)
(in.)	(mm.)		
1 1/2"	37.5		
1"	25.0		
3/4"	19.0		
1/2"	12.5	0.0	100.0
3/8"	9.5	3.5	99.4
#4	4.75	9.9	98.4
#8	2.36	38.3	93.7
#16	1.18	87.0	85.7
#30	0.600	145.7	76.0
#50	0.300	195.8	67.8
#100	0.150	328.5	45.9
#200	0.075	442.3	27.2
PAN			

GRAVEL: **2 %**

SAND: **71 %**

FINES: **27 %**

GROUP SYMBOL: **SM**

$C_u = D_{60}/D_{10} =$ _____

$C_c = (D_{30})^2/(D_{60} \cdot D_{10}) =$ _____

Remarks: _____

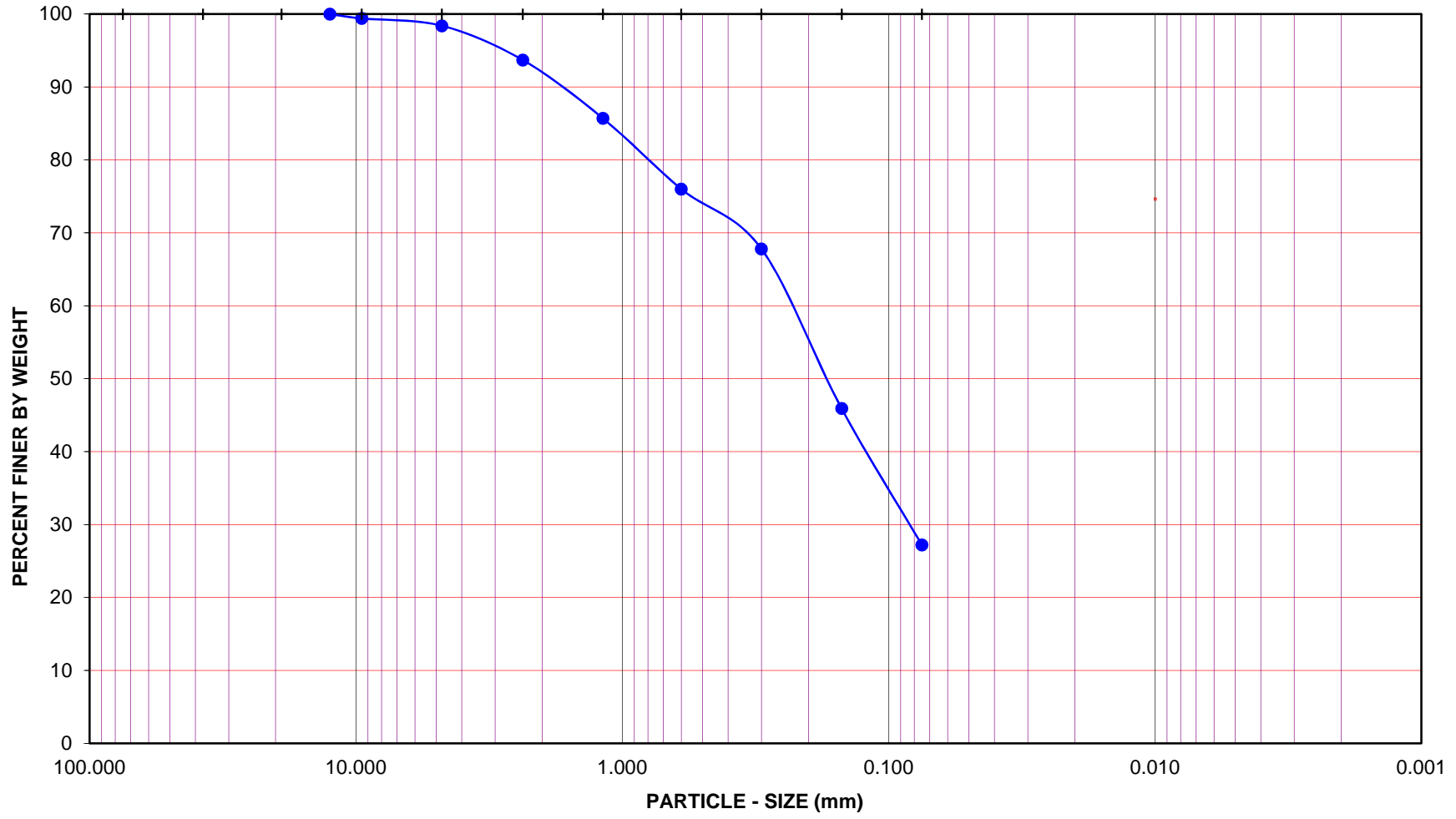
GRAVEL				SAND				FINES	
COARSE		FINE		COARSE	MEDIUM	FINE		SILT	CLAY

U.S. STANDARD SIEVE OPENING

U.S. STANDARD SIEVE NUMBER

HYDROMETER

3.0" 1 1/2" 3/4" 3/8" #4 #8 #16 #30 #50 #100 #200



Project Name: Pillar Point Harbor

Project No.: 5720.180

Station ID: Mid Comp

Sample ID: PPIHVC18-Mid

Date, Time: 06/19/19, 10:40

Soil Type : SM

Soil Identification: Olive brown silty sand (SM)

GR:SA:FI : (%) 2 : 71 : 27

Jul-19



**PARTICLE - SIZE
DISTRIBUTION
ASTM D 6913**



**PARTICLE-SIZE DISTRIBUTION (GRADATION)
of SOILS USING SIEVE ANALYSIS**
ASTM D 6913

Project Name: Pillar Point Harbor

Tested By: ACS/OHF Date: 06/21/19

Project No.: 5720.180

Checked By: J. Ward Date: 07/10/19

Station ID: Top Comp

Date, Time: 06/19/19, 10:40

Sample ID: PPIHVC18-Top

Soil Identification: Olive gray silty sand (SM)

Container No.:	VO	Moisture Content of Total Air - Dry Soil	
		Wt. of Air-Dry Soil + Cont. (g)	0.0
Wt. of Air-Dried Soil + Cont.(g)	752.7	Wt. of Dry Soil + Cont. (g)	0.0
Wt. of Container (g)	234.7	Wt. of Container No._____ (g)	1.0
Dry Wt. of Soil (g)	518.0	Moisture Content (%)	0.0

After Wet Sieve	Container No.	VO
	Wt. of Dry Soil + Container (g)	647.7
	Wt. of Container (g)	234.7
	Dry Wt. of Soil Retained on # 200 Sieve (g)	413.0

U. S. Sieve Size		Cumulative Weight Dry Soil Retained (g)	Percent Passing (%)
(in.)	(mm.)		
1 1/2"	37.5		
1"	25.0		
3/4"	19.0		
1/2"	12.5		
3/8"	9.5	0.0	100.0
#4	4.75	1.6	99.7
#8	2.36	17.4	96.6
#16	1.18	48.4	90.7
#30	0.600	91.8	82.3
#50	0.300	134.8	74.0
#100	0.150	275.3	46.9
#200	0.075	407.6	21.3
PAN			

GRAVEL: **0 %**

SAND: **79 %**

FINES: **21 %**

GROUP SYMBOL: **SM**

Cu = D60/D10 = _____

Cc = (D30)²/(D60*D10) = _____

Remarks: _____

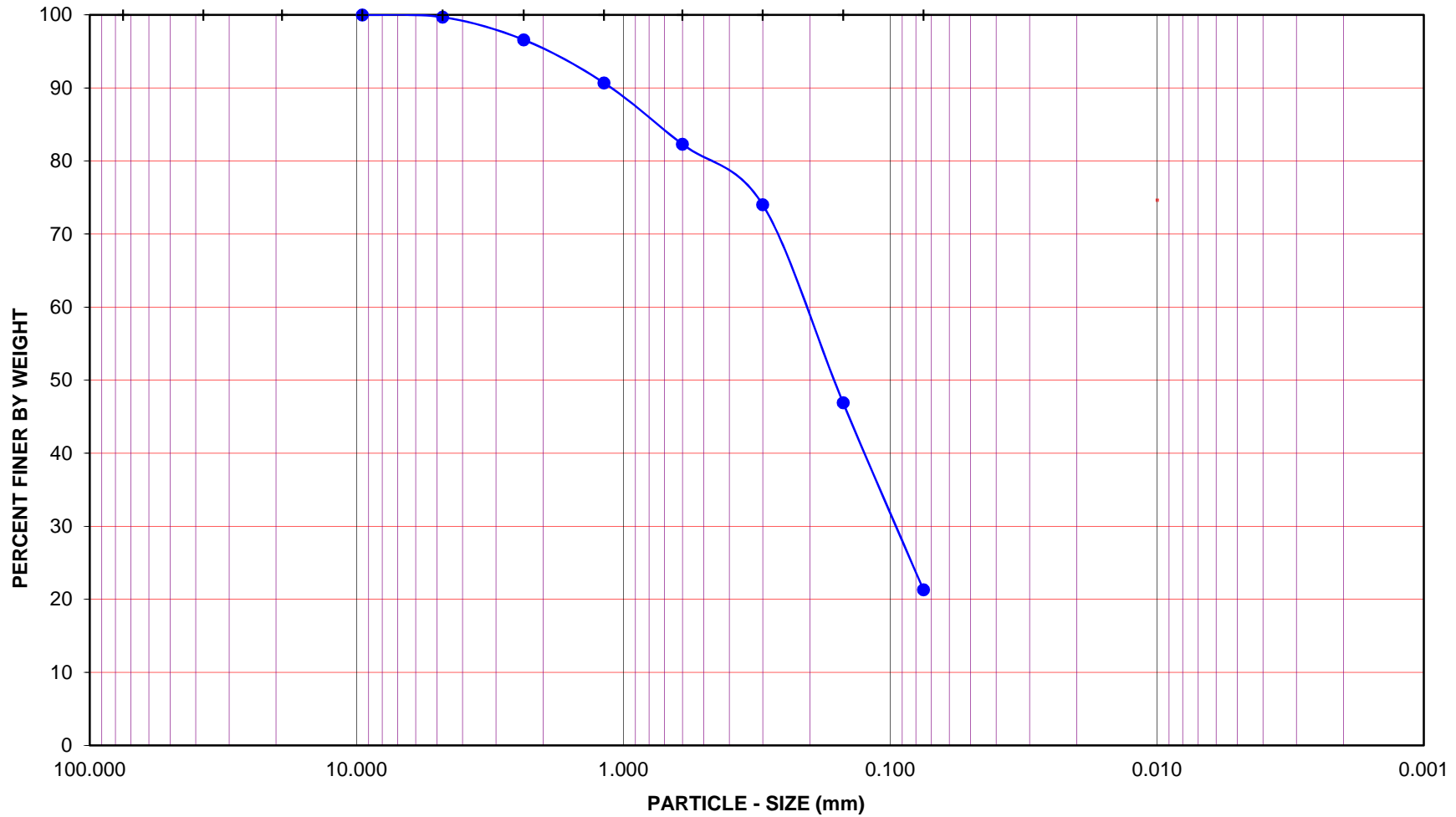
GRAVEL				SAND				FINES	
COARSE		FINE		COARSE	MEDIUM	FINE		SILT	CLAY

U.S. STANDARD SIEVE OPENING

U.S. STANDARD SIEVE NUMBER

HYDROMETER

3.0" 1 1/2" 3/4" 3/8" #4 #8 #16 #30 #50 #100 #200



Project Name: Pillar Point Harbor

Project No.: 5720.180

Station ID: Top Comp

Sample ID: PPIHVC18-Top

Date, Time: 06/19/19, 10:40

Soil Type : SM

Soil Identification: Olive gray silty sand (SM)

GR:SA:FI : (%) 0 : 79 : 21

Jul-19



Leighton

**PARTICLE - SIZE
DISTRIBUTION
ASTM D 6913**



**PARTICLE-SIZE DISTRIBUTION (GRADATION)
of SOILS USING SIEVE ANALYSIS**
ASTM D 6913

Project Name: Pillar Point Harbor

Tested By: OHF/ACS Date: 06/26/19

Project No.: 5720.180

Checked By: J. Ward Date: 07/11/19

Station ID: Surfers Beach

Date, Time: 06/19/19, 9:40

Sample ID: SBREF18-1

Soil Identification: Olive gray poorly-graded sand (SP)

Container No.:	F	Moisture Content of Total Air - Dry Soil	
		Wt. of Air-Dry Soil + Cont. (g)	0.0
Wt. of Air-Dried Soil + Cont.(g)	696.0	Wt. of Dry Soil + Cont. (g)	0.0
Wt. of Container (g)	137.7	Wt. of Container No._____ (g)	1.0
Dry Wt. of Soil (g)	558.3	Moisture Content (%)	0.0

After Wet Sieve	Container No.	F
	Wt. of Dry Soil + Container (g)	690.5
	Wt. of Container (g)	137.7
	Dry Wt. of Soil Retained on # 200 Sieve (g)	552.8

U. S. Sieve Size		Cumulative Weight Dry Soil Retained (g)	Percent Passing (%)
(in.)	(mm.)		
1 1/2"	37.5		
1"	25.0		
3/4"	19.0		
1/2"	12.5		
3/8"	9.5		
#4	4.75		
#8	2.36	0.0	100.0
#16	1.18	0.3	99.9
#30	0.600	2.2	99.6
#50	0.300	43.2	92.3
#100	0.150	459.7	17.7
#200	0.075	552.4	1.1
PAN			

GRAVEL: **0 %**

SAND: **99 %**

FINES: **1 %**

GROUP SYMBOL: **SP**

$C_u = D_{60}/D_{10} = 1.69$

$C_c = (D_{30})^2/(D_{60} \cdot D_{10}) = 0.90$

Remarks:

GRAVEL				SAND				FINES	
COARSE		FINE		COARSE	MEDIUM	FINE		SILT	CLAY

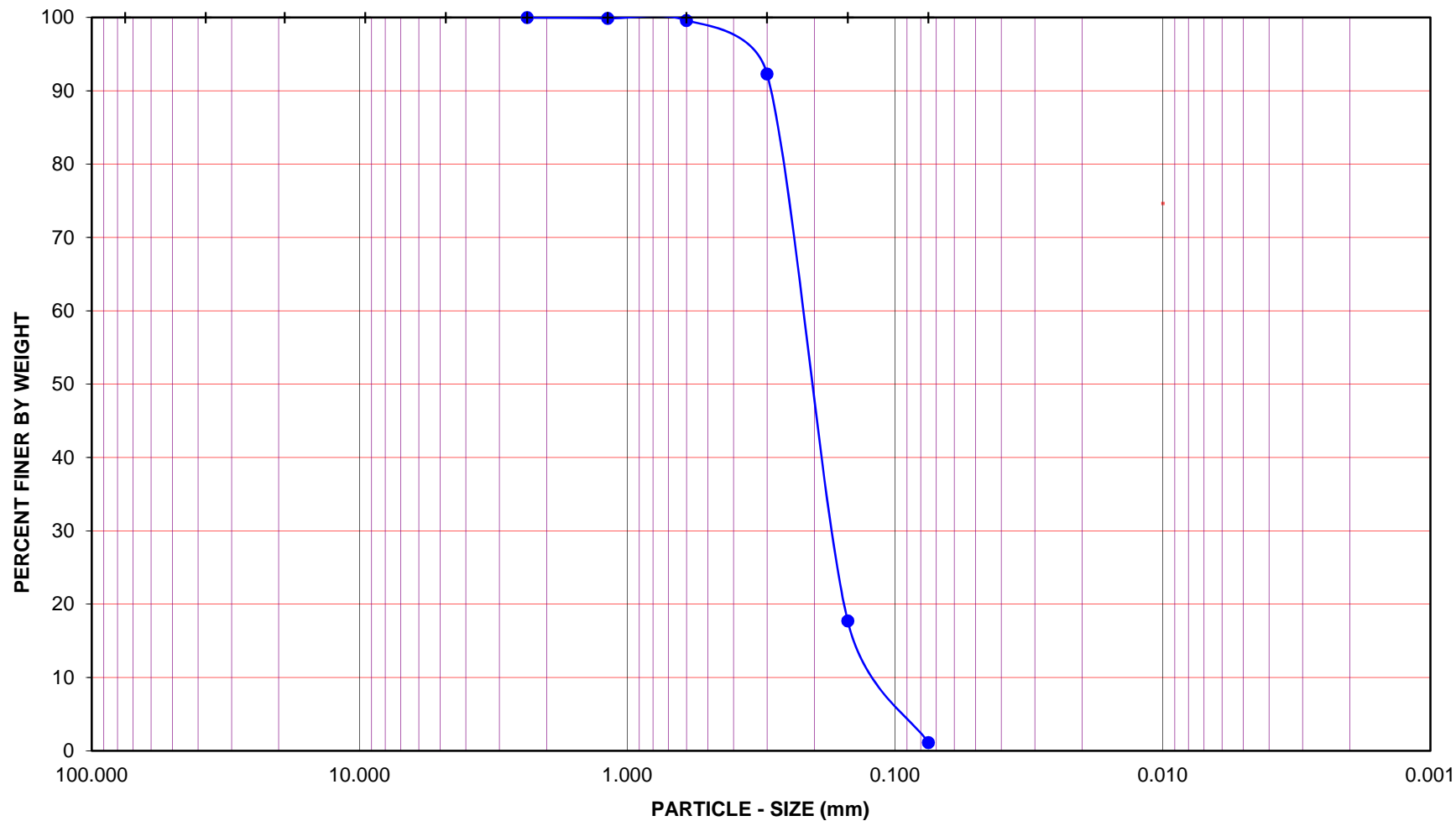
U.S. STANDARD SIEVE OPENING

3.0" 1 1/2" 3/4" 3/8"

U.S. STANDARD SIEVE NUMBER

#4 #8 #16 #30 #50 #100 #200

HYDROMETER



Project Name: Pillar Point Harbor

Project No.: 5720.180

Station ID: Surfers Beach

Sample ID: SBREF18-1

Date, Time: 06/19/19, 9:40

Soil Type : SP

Soil Identification: Olive gray poorly-graded sand (SP)

GR:SA:FI : (%) 0 : 99 : 1

Jul-19



Leighton

**PARTICLE - SIZE
DISTRIBUTION
ASTM D 6913**



**PARTICLE-SIZE DISTRIBUTION (GRADATION)
of SOILS USING SIEVE ANALYSIS**
ASTM D 6913

Project Name: Pillar Point Harbor

Tested By: OHF/ACS Date: 06/26/19

Project No.: 5720.180

Checked By: J. Ward Date: 07/11/19

Station ID: Surfers Beach

Date, Time: 06/19/19, 9:32

Sample ID: SBREF18-2

Soil Identification: Olive gray poorly-graded sand (SP)

Container No.:	VIP	Moisture Content of Total Air - Dry Soil	
		Wt. of Air-Dry Soil + Cont. (g)	0.0
Wt. of Air-Dried Soil + Cont.(g)	706.2	Wt. of Dry Soil + Cont. (g)	0.0
Wt. of Container (g)	219.5	Wt. of Container No._____ (g)	1.0
Dry Wt. of Soil (g)	486.7	Moisture Content (%)	0.0

After Wet Sieve	Container No.	VIP
	Wt. of Dry Soil + Container (g)	701.9
	Wt. of Container (g)	219.5
	Dry Wt. of Soil Retained on # 200 Sieve (g)	482.4

U. S. Sieve Size		Cumulative Weight Dry Soil Retained (g)	Percent Passing (%)
(in.)	(mm.)		
1 1/2"	37.5		
1"	25.0		
3/4"	19.0		
1/2"	12.5		
3/8"	9.5		
#4	4.75		
#8	2.36		
#16	1.18	0.0	100.0
#30	0.600	0.5	99.9
#50	0.300	31.9	93.4
#100	0.150	400.6	17.7
#200	0.075	481.9	1.0
PAN			

GRAVEL: **0 %**

SAND: **99 %**

FINES: **1 %**

GROUP SYMBOL: **SP**

$C_u = D_{60}/D_{10} =$ 1.69

$C_c = (D_{30})^2/(D_{60}*D_{10}) =$ 0.90

Remarks:

GRAVEL				SAND				FINES	
COARSE		FINE		COARSE	MEDIUM	FINE		SILT	CLAY

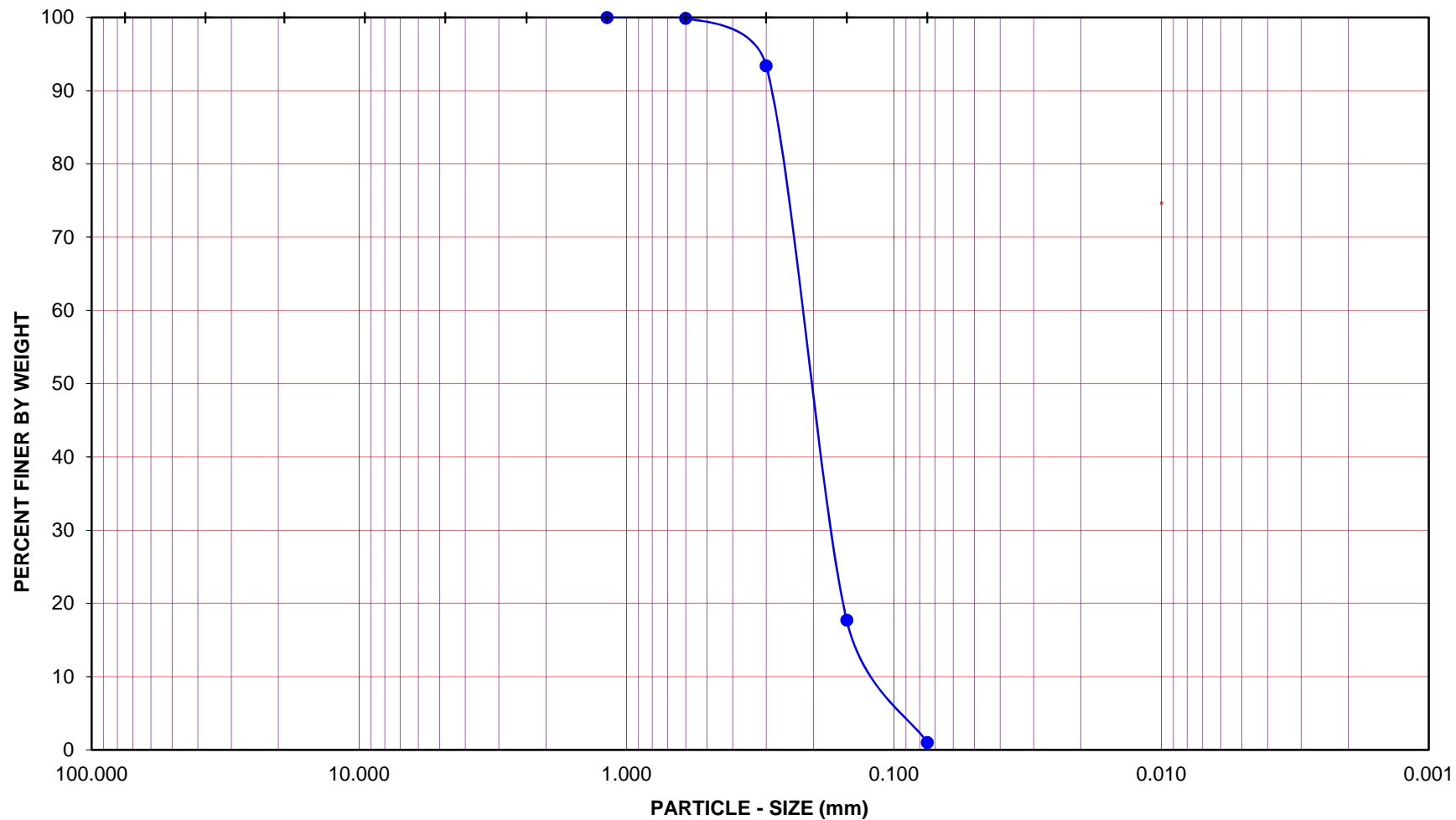
U.S. STANDARD SIEVE OPENING

3.0" 1 1/2" 3/4" 3/8"

U.S. STANDARD SIEVE NUMBER

#4 #8 #16 #30 #50 #100 #200

HYDROMETER



Project Name: Pillar Point Harbor

Project No.: 5720.180

Station ID: Surfers Beach

Sample ID: SBREF18-2

Date, Time: 06/19/19, 9:32

Soil Type : SP

Soil Identification: Olive gray poorly-graded sand (SP)

GR:SA:FI : (%) 0 : 99 : 1

Jul-19



Leighton

**PARTICLE - SIZE
DISTRIBUTION
ASTM D 6913**



**PARTICLE-SIZE DISTRIBUTION (GRADATION)
of SOILS USING SIEVE ANALYSIS**
ASTM D 6913

Project Name: Pillar Point Harbor

Tested By: OHF/ACS Date: 06/26/19

Project No.: 5720.180

Checked By: J. Ward Date: 07/11/19

Station ID: Surfers Beach

Date, Time: 06/19/19, 9:26

Sample ID: SBREF18-3

Soil Identification: Olive gray poorly-graded sand (SP)

Container No.:	GE	Moisture Content of Total Air - Dry Soil	
		Wt. of Air-Dry Soil + Cont. (g)	0.0
Wt. of Air-Dried Soil + Cont.(g)	776.5	Wt. of Dry Soil + Cont. (g)	0.0
Wt. of Container (g)	250.3	Wt. of Container No._____ (g)	1.0
Dry Wt. of Soil (g)	526.2	Moisture Content (%)	0.0

After Wet Sieve	Container No.	GE
	Wt. of Dry Soil + Container (g)	771.5
	Wt. of Container (g)	250.3
	Dry Wt. of Soil Retained on # 200 Sieve (g)	521.2

U. S. Sieve Size		Cumulative Weight Dry Soil Retained (g)	Percent Passing (%)
(in.)	(mm.)		
1 1/2"	37.5		
1"	25.0		
3/4"	19.0		
1/2"	12.5		
3/8"	9.5		
#4	4.75		
#8	2.36		
#16	1.18	0.0	100.0
#30	0.600	4.3	99.2
#50	0.300	142.0	73.0
#100	0.150	476.6	9.4
#200	0.075	520.6	1.1
PAN			

GRAVEL: **0 %**

SAND: **99 %**

FINES: **1 %**

GROUP SYMBOL: **SP**

$C_u = D_{60}/D_{10} = 1.67$

$C_c = (D_{30})^2/(D_{60} \cdot D_{10}) = 1.07$

Remarks:

GRAVEL				SAND				FINES		
COARSE		FINE		COARSE	MEDIUM	FINE		SILT		CLAY

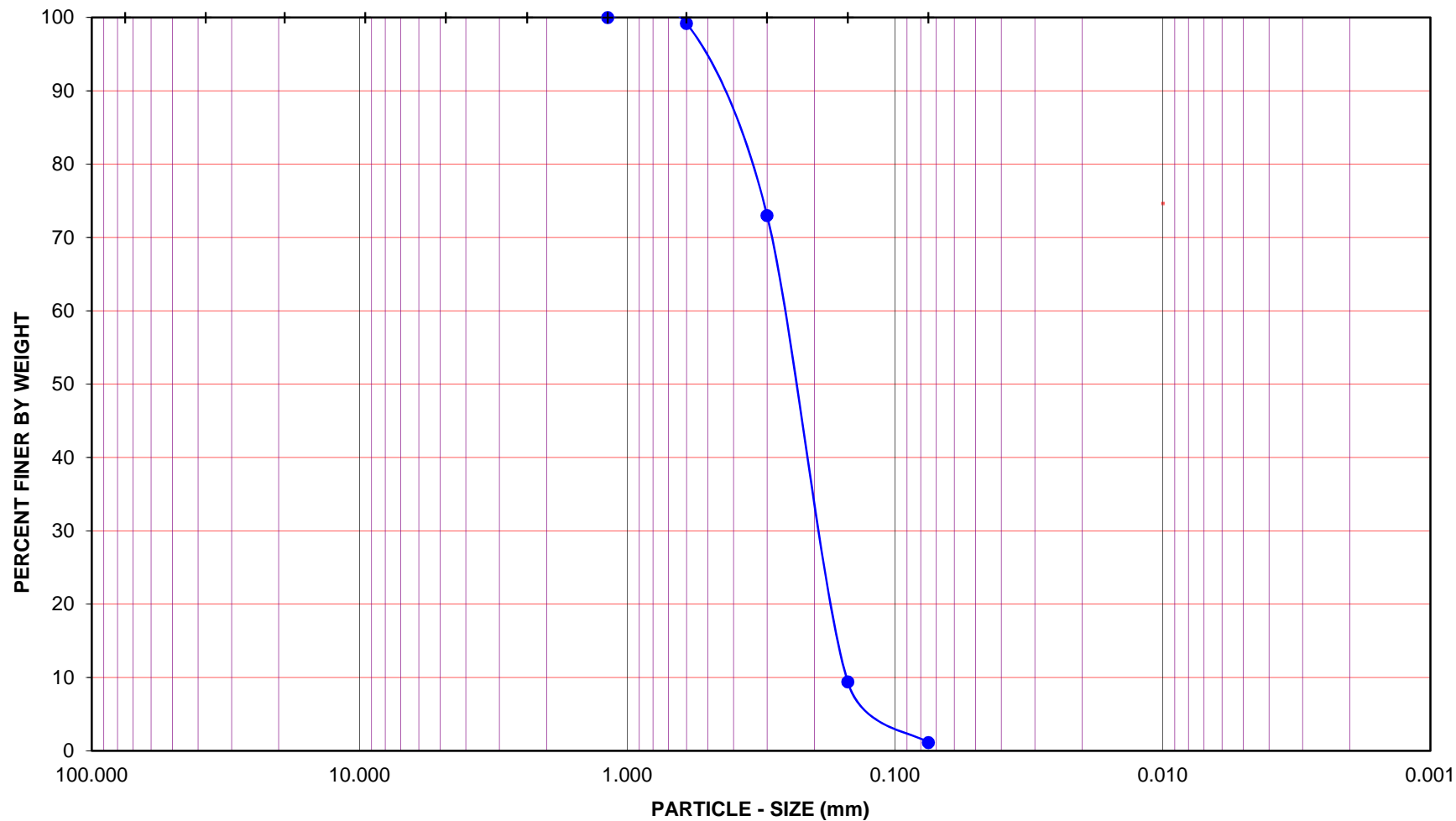
U.S. STANDARD SIEVE OPENING

3.0" 1 1/2" 3/4" 3/8"

U.S. STANDARD SIEVE NUMBER

#4 #8 #16 #30 #50 #100 #200

HYDROMETER



Project Name: Pillar Point Harbor

Project No.: 5720.180

Station ID: Surfers Beach

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Soil Type : SP

Soil Identification: Olive gray poorly-graded sand (SP)

GR:SA:FI : (%) 0 : 99 : 1



Leighton

**PARTICLE - SIZE
DISTRIBUTION
ASTM D 6913**

Jul-19