MOORE TWINING ASSOCIATES, INC.

December 20, 2021 G46703.01

City of Sand City
c/o Mr. Leon D. Gomez
Harris and Associates
450 Lincoln Avenue, Suite 103
Salinas, CA 93901

Subject: Geotechnical Engineering Investigation
Proposed Pavement Improvements
City Hall and Pendergrass Way
Sand City, California

Dear Mr. Gomez:

We are pleased to present the results of this geotechnical engineering investigation conducted for the pavement improvements planned at the above referenced project location.

1.0 SITE AND PROJECT DESCRIPTION

The project description is based on information provided by Mr. Leon Gomez with Harris & Associates, who is the contract City Engineer for Sand City, and includes review of an exhibit titled City Hall & Calabrese Park Improvement Project (transmitted May 11, 2021) showing the roadway and parking lots proposed for pavement rehabilitation. Also, the information provided by Leon Gomez during conference calls on May 12, August 19, and October 22, 2021 describing the scope of work needed and presenting preliminary pavement rehabilitation options for Pendergrass Way and the four parking lots in the vicinity of City Hall were considered.

We understand that the rehabilitation project will include improvements to Pendergrass Way (a public roadway) that runs the perimeter of the City Hall buildings and improvements. The existing roadways range in width from 12 to 35 feet (12 foot wide section is a single lane portion east of City Hall). The total length of the roadway evaluated for this investigation is about 800 feet. Based on information provided by Mr. Leon Gomez a maximum traffic Index (TI) of 7 will be used for design of the pavement sections along Pendergrass Way.

The City Hall complex includes also five individual parking lots located adjacent to the above referenced roadway. The five lots occupy about 14,075 square feet inn total areas. As requested, all or a portion of these parking lots were evaluated for various pavement rehabilitation options. We also understand a minimum TI of 5 will be used for design of the pavement sections at the above referenced parking areas.

PH: 559.268.7021
FX: 559.268.7126
2527 Fresno Street
Fresno, CA 93721

Based on initial discussions, four pavement rehabilitation options were requested for evaluation. We understand the project could involve the following pavement improvement treatments:

1) Reconstruction which would involve the removal of the existing asphalt concrete pavements then replacement with a new asphalt concrete (AC) surface layer over Class 2 aggregate base (AB) where failed and poor condition or off-grade pavements are identified;

2) In-place recycling of existing asphalt pavements to serve as a base for a new asphalt wear surface where poor or failed condition pavements are identified;

3) Placement of a thin overlay over the existing asphalt wear surface as a major maintenance to existing fair condition pavements; and/or

4) Application of typical maintenance treatments of crack filling and a surface slurry seal over good condition pavements.

2.0 PURPOSE OF SAMPLING AND TESTING

The purpose of our services was to conduct a limited subsurface investigation in order to sample and test the subgrade soils and provide recommendations for design and preparation of the pavement improvements for the reconstruction or maintenance of the roadways and parking lot pavements described in the slope of this report. Our services did not include an evaluation of proposed underground utilities, curbs, gutters or sidewalks; or any recommendations for permanent buildings retaining structures or slabs-on-grade. Also this investigation did not include evaluation of infiltration characteristics for storm water disposal or treatment systems (infiltration testing was included as an option in the proposal dated August 26, 2021 but was not authorized at this time).

3.0 FIELD EXPLORATION

The field exploration included, as the base scope of work, four (4) test borings drilled within the existing asphaltic paved Pendergrass Way roadway segments. The borings were spaced around the 800 lineal foot roadway in order to measure the pavement thicknesses, log the near surface soils and obtain samples. Additionally, five (5) test borings were drilled within the existing asphaltic paved parking lots. The borings were drilled by coring the existing asphalt concrete surface with a concrete coring rig equipped with a 4 inch barrel. The underlying soils were then explored and sampled using a 4 inch diameter hand auger. The borings were conducted to final depths ranging from 1.8 to 5 feet below the pavement surface. The approximate boring and core locations are shown on Drawing No. 2 in Appendix A included as an attachment to this report.

During the drilling, bulk samples of soil were obtained for laboratory testing. The test borings were drilled by a Moore Twining staff engineer. The soils encountered in the test borings were logged

during drilling by a field engineer under the supervision of a Registered Geotechnical Engineer from our firm. The field soil classification was in accordance with the Unified Soil Classification System consisted of particle size, color, and other distinguishing features of the soil.

At the completion of drilling and sampling operations, the boring holes were backfilled with soil cuttings and topped with cold patch asphalt.

4.0 EXISTING PAVEMENT SECTION THICKNESS AND SUBGRADE SOIL

The pavement materials and thicknesses encountered in the cores are reported in the following table. The approximate locations of the cores are shown on Drawing No. 2 in Appendix A.

Table No. 1
Existing Pavement Section Thicknesses

Location	AC Section Thickness (inches) ; Material Notes	AB Section Thickness; Materials
B-1	2¼; ⅜ inch max aggregate	none
B-2	1¾; ⅜ inch max aggregate	6 inches
B-3	4; ⅜ inch max aggregate	6 inches
B-4	2; ⅜ inch max aggregate	3 inches
A-1	2¼; ⅜ inch max aggregate	none : 18 inch layer of gravel with sand and 3 inch cobble under asphalt layer
A-2	1¼ ; AC only had fine aggregates, second AC layer at 1.5 feet BSG	5 inches
A-3	2¾; ⅜ inch max aggregate	5 inches
A-4	2¼; ⅜ inch max aggregate	5 inches
A-5	1½; ⅜ inch max aggregate	10 inches

Notes:
1 - The asphalt concrete was measured on four (4) sides of the core to the nearest 1/4 inch, and the four measurements were averaged and rounded to the nearest 1/4 inch.
2 - The aggregate base thicknesses were measured to the nearest ½ inch.

Based on the findings from the test borings, the subgrade soils encountered below the existing pavement sections consisted of poorly graded sands with silt to the maximum depths explored 5.5 feet below surface ground (BSG) at all locations explored.

Detailed descriptions of the soils encountered at each test boring are presented on the logs of borings in Appendix B. The stratification lines shown on the logs represent the approximate boundary between soil types; the actual in-situ transition may be gradual.

5.0 LABORATORY TEST RESULTS

The laboratory tests conducted on the poorly graded sands encountered included sieve analysis, moisture contents, modified proctor, organic content, and R-value testing. Sieve analyses conducted on bulk samples collected from borings B-1 and A-2 from below the existing pavements to depths of about 0.5 to 5 feet BSG indicated the subgrade soils contained about 0.6 to 10.7 percent gravel and about 2.4 to 8.7 percent fines (silt and clay). Two R-value tests conducted on bulk samples collected from B-1 and A-4 both indicated an R-value of 71. We noticed some organic material in the subgrade soil collected at A-3. As result a loss of ignition test was performed on this sample to determined the amount of organic content in the subgrade. The results showed at 0.9 percent organic content by weight, indicating the organic content noted at this location should not be an issue for the subgrade soils to support the pavements.

Laboratory test results and details are presented in Appendix C.

6.0 EVALUATION

The data and methodology used to develop recommendations for project design and preparation of construction specifications are summarized in the following subsections. The evaluation was based upon the subsurface soil conditions determined from this investigation and our understanding of the proposed pavement rehabilitation options requested.

6.1 Pavement Rehabilitation Options: As requested, several options for pavement rehabilitation are provided in this report including: 1) replacement pavements consisting of a two layer pavement with a new asphalt concrete section over a new layer of Class 2 aggregate base; 2) new asphalt concrete wear surface placed over a subgrade of recycled/blended existing asphalt concrete, aggregate base and subgrade soils; 3) an overlay over the existing pavements sections that do not show structural distress; and 4) application of typical maintenance treatments of crack filling and a surface slurry seal over good condition pavements. The following sections go more into details for each of the rehabilitation options mentioned above and how each option was evaluated for the roadway and parking lot field investigation findings.

Details for the treatment options for the asphaltic concrete pavement structural sections are presented in the "Recommendations" section of this report for the proposed asphaltic concrete (AC) pavements.

6.1.1 Replacement Pavements: New pavement sections are anticipated where existing pavements show significant structural distress or failure, and where the existing pavement surface needs to be reconstructed to adjust surface grades. Reconstruction/replacement would involve the removal of the existing pavement section to expose the underlying native sands then replacement with a new asphalt concrete surface layer over a new Class 2 aggregate base. To evaluate new or replacement pavements the following subgrade design procedures were utilized.

For the subgrade soils, an R-value of 71 were determined based on the results. Thus the subgrade soils encountered consisted of poorly graded sands and poorly graded sands with silts which have excellent pavement support characteristics

The structural sections were designed using the gravel equivalent method in accordance with the California Department of Transportation Highway Design Manual. The analysis was based on traffic index values (TI) ranging from 5.0 for the parking areas to 7.0 for Pendergrass roadways as requested by Sand City. The appropriate paving section should be determined by the project civil engineer or applicable design professional based on the actual vehicle loading (TI) values. If traffic loading is anticipated to be greater than assumed, Moore Twining should be contacted to re-evaluate the pavement sections for the increased traffic.

We understand that Pendergrass Way has an assigned design traffic index (TI) of 7.0. Using the subgrade conditions and design procedures a TI of 7.0 requires at least 3.5 inches of asphalt concrete over at least 4 inches of Class II aggregate base. For evaluation of existing roadway pavement sections found during this investigations, these minimum sections were used to conclude if the existing Pendergrass Way pavements meet this design TI or not; and to consider when recommending pavement rehabilitation options.

For parking lot pavements a range of TI values are provided for new pavements with a minimum of 5.0. For evaluation of existing parking lot pavement sections found during this investigations, equivalent sections using a TI of 5.0 were used to conclude if the parking lot pavements were originally placed with sufficient thicknesses to meet a minimum design or not; and to consider when recommending pavement rehabilitation options. Using the subgrade conditions and design procedures a TI of 5.0 requires at least 3 inches of asphalt concrete over at least 4 inches of Class II aggregate base. Note that actual traffic on parking lot pavements may exceed the TI of 5.0 used for this evaluation. The appropriate TI for these parking lots should be considered by the City and design engineers when evaluating appropriate rehabilitation options.

6.1.2 In-Place Pavement Recycling Based on our experience with previous Sand City pavement rehabilitation projects, in-place pulverization and mixing with the underlying subgrade soils as part of the pavement reconstruction followed by re-grading and placement of a new HMA wear surface was considered. This method can result in a new pavement with a full design life without the costs of removing and exporting existing pavement materials and soils and importing

a whole new pavement structural section. The recycled material would not be expected to have the same support characteristics as Class 2 aggregate base, so AC wear surface sections need to be thicker than replacement sections. The Recommendations section of this report does include sections for new AC wear surface over a 6 to 12 inch section of the existing AC and AB materials processed as described below.

The pulverization equipment and procedures will need to be evaluated by a contractor experienced with in-place pavement recycling. The pavement materials will need to be broken down (reduced) to a maximum size of 1 inch and blended thoroughly into the subgrade soils to allow fine grading for final paving. Thicker asphalt concrete pavements are anticipated to require more effort (such as use of a high speed milling machine) to pulverize and blend with the subgrade soils. An evaluation of any existing shallow utility lines and final targeted grades should also be conducted in determining the application of full depth reclamation. Conflicts with existing concrete curb and gutter should be evaluated.

6.1.3 Pavement Overlays As an alternative to removing and replacing the pavement section, where structural distresses are not too severe, a thin asphalt concrete overlay can be considered. Thin overlays typically consist of placing a 1.5 to 2 inch layer of new AC material over the existing pavements. The actual overlay thickness should be determined based on maximum aggregate of the asphalt used for the overlay. Also, since an overlay will raise to grade of the exiting wear surface, selected or entire areas may require surface milling of 1 inch or more so the completed overlay surface can match perimeter grades of gutters, drain inlets and pavements to remain.

Note that an overlay can only prolong the life of existing fair to good condition pavements. Our experience is that well-maintained overlays may extend the functional use of the pavement about 5 to 8 years or so depending on the actual traffic It should be noted that the performance of pavements where rehabilitation or maintenance other than removal and replacement are performed would be expected to require more repairs (such as overlays and dig out and replacement) in the future as the distress shown by the existing asphalt pavements will eventually translate to the overlay.

If a pavement design life of 20 years pavement is needed, the preceding pavement replacement or pavement recycling options should be performed in accordance with the recommendations in this report.

6.1.4 Maintenance Treatments : For pavements in good condition and found to have sufficient thickness to meet the design traffic index for a new pavement, major rehabilitation may not be required. The pavements with just environmental type distresses such as block cracking and weathering of pavement surfaces (no structural distress) can be improved by applying a maintenance treatment consisting of a crack seal followed by a surface slurry seal to address environmental distresses only.

Maintenance treatment would consist of first sealing the block, trench patch and construction joint cracks in the existing pavements. Sealing of cracks prolongs the life of the pavements by restricting migration of surface water directly into the subgrade soils. Once cracks are sealed and material is

cured, a slurry seal is applied to asphalt pavement surface. The slurry prolongs the life of the pavement by filling in oil-sand matrix that is eroded under weathering action over time.

Note that maintenance treatments do not specifically increase the structural capacity of the pavements hence increase the life of a pavement. However, maintenance including crack and slurry seals does reduce the degradation of a pavement. So although the recommended maintenance does not increase the design life, it will prolong the life of a properly designed pavement.

6.2 Existing Pavement Sections and Conditions: Using the pavement rehabilitation options described, the existing pavement sections thickness encountered and the types of pavement distress noted at the surface were evaluated for each of the pavements within the scope of this investigation. Drawing No. 3 in Appendix A illustrates these pavement locations and the recommended pavement rehabilitation options.

6.2.1 Pendergrass Way: Four (4) borings were drilled in each of three segments of Pendergrass Way which were designated as California to Park; Park to Ocean, and Ocean to California(see Drawing 3 in Appendix A). Asphalt concrete thicknesses ranging from 1¾ to 4 inches were measured at the roadway locations. Considering the minimum AC thickness of 3½ inches required to meet the design TI of 7.0, only one segment of Pendergrass Way (segment from Park Avenue to Ocean View) was noted to have a section of 4 inches AC over 6 inches AB that meets the minimum pavement design. The other older segments had AC thicknesses that are 1¼ to 1¾ inches less than the minimum design AC thickness of 3½ inches. Also no aggregate base (AB) was encountered in B-1 which was the west segment of the perimeter roadway.

Observed surface conditions showed the older segments of Pendergrass Way had some structural distresses noted including medium high severity alligator, block, longitudinal, and transverse cracking, suggesting structural failure. The narrow singe lane east segment was particularly noted to exhibit advanced structural distress.

Considering the sections found and the surface distresses noted, it is recommended that the East and West segments of Pendergrass Way be rehabilitated by pavement replacement or in-place recycling. However the new pavements in the north segment which meet section design and have not exhibited any notable distress, could receive a maintenance treatment since the pavements are in good condition.

Drawing No. 3 in Appendix A shows the recommended areas for pavement replacement and the areas that meet the design Traffic index (TI).

6.2.2 West City Hall Parking Lot: The City Hall Parking Lot West is located to the west of Pendergrass Way (see Drawing Nos. 2 and 3 in Appendix) and includes two ages of pavements. A boring (A-1) was placed in the newer pavement which covers the center area of this

lot. An asphalt concrete thicknesses of 2¼ inches with no AB was measured in this lot. Considering the minimum AC/AB thickness of 3 inches AC over 4 inches AB required to meet the minimum design TI of 5.0, this lot does not have the section to meet the minimum recommended pavement design.

The west portion of the parking lot area was in fair condition with a longitudinal joint separating the two ages of pavements and low severity joint reflect cracking. Also the test boring A-1 in this location revealed a sandy gravel layer with cobble (3" round material) encountered under the asphalt to a depth of about 1.8 feet BSG. The presence of this lager material suggests that in-place recycling may be difficult and is not recommended for this west lot.

To meet the minimum design TI of 5.0, a new pavement treatment would be the best approach. However, as an option, a minimum thickness overlay of 2 inches could be applied to increase the overall thickness of the pavement to meet and exceed the required design AC thickness.

6.2.3 Calabrese Parking Lot: Boring A-5 placed in this parking area (five angled stalls east of the roadway) indicated an asphalt concrete thicknesses of 1½ inches with 10 inches of AB was measured for the pavement. Considering the minimum AC/AB thickness of 3 inches AC over 4 inches AB required to meet the minimum design TI of 5.0, this pavement does not have the minimum AC section to meet the minimum recommended pavement design.

To meet the minimum design TI of 5.0, a new pavement treatment would be the best approach. However, as an option, an minimum thickness overlay of 1.5 inches could be applied to increase the overall thickness of the pavement wear surface to 3 inches to meet and exceed the required design AC thickness.

However the pavement appeared to be in a fair condition, with only minor environmental distress in the form of low severity longitudinal/transverse and block cracking, also some material shrinkage cracking. So as an option, the application of a typical maintenance treatment of crack filling and a surface slurry seal could reduce the environmental distresses noted and extend the life of these pavements.

6.2.4 City Hall Parking Lot East: Boring A-2 placed in this lot adjacent and west of the City Hall building indicated an asphalt concrete thicknesses of 1¼ inches underlain by 5 inches of AB. Further at location A-2 a second layer of asphalt was encountered at a depth of approximately 1.5 feet BSG. The second layer of asphalt appeared to have a thickness of 1 inch and was not underlain by any aggregate base. The depth to the second layer of asphalt is a concern in that the depth may vary across the parking lot area. So depending on the former level and extent of this buried AC layer in-place recycling depth may need to be adjusted.

Also the pavements in this lot were noted to have medium high severity alligator, block, longitudinal, and transverse cracking, suggesting at least some structural failure. These more severe

distress types noted appear to be a result of settlement of the weak fill layer between the two asphalt layers.

Considering the structural distress and the wear surface thickness of only 1¼ inches (thinnest measured during this investigation), it is recommended that the City Hall East Lot be rehabilitated by pavement replacement or in-place recycling.

6.2.5 Police Parking Lot West: Boring A-3 placed in this small parking area indicated an asphalt concrete thicknesses of 2¾ inches with 5 inches of AB. Considering the minimum AC/AB thickness of 3 inches AC over 4 inches of AB required to meet the minimum design TI of 5.0, although this pavement does not have the minimum AC section to meet the minimum recommended pavement design, the section is only ¼ less than the target value. Also the pavement appeared to be in a good to fair condition, with only minor environmental distress in the form of low severity longitudinal/transverse and block cracking, also some material shrinkage cracking. To meet the design TI a minimum 1½ inch overlay would need to be applied. However, considering the existing thickness it may be appropriate to apply a typical maintenance treatment of crack filling and a surface slurry seal to address the minor environmental distresses noted and just extend the life of these pavements.

6.2.6 Police Parking Lot East Lot: Boring A-4 placed in this larger parking area indicated an asphalt concrete thicknesses of 2¼ inches with 5 inches of AB. Considering the minimum AC/AB thickness of 3 inches AC over 4 inches AB required to meet the minimum design TI of 5.0, although this pavement does not have the minimum AC section to meet the minimum recommended pavement design, the section is only ¾ less than the target value. Also the pavement appeared to be in a good to fair condition, with only minor environmental distress in the form of low severity longitudinal/transverse and block cracking, also some material shrinkage cracking. To meet the design TI a minimum 1½ inch overlay would need to be applied. However, considering the existing thickness it may be appropriate to apply a typical maintenance treatment of crack filling and a surface slurry seal to address the minor environmental distresses noted and just extend the life of these pavements.

7.0 RECOMMENDATIONS

Based on the evaluation of the field and laboratory data and our geotechnical experience in the vicinity of the project, the following recommendations are presented for use in the project design and construction. However, this report should be considered in its entirety. When applying the recommendations for design, the background information, procedures used and findings should be considered. The recommended design consultation and construction monitoring by Moore Twining are integral to the proper application of the recommendations.

Where the requirements of a governing agency differ from the recommendations of this report, the more stringent recommendations should be applied to the project.

7.1 General

7.1.1 Moore Twining should be provided the opportunity to review the final grading and pavement plans so that any relevant recommendations can be reconsidered (if needed) based on the plan details.

7.1.2 A preconstruction meeting including, as a minimum, the owner, general contractor, earthwork contractor, paving subcontractor, and Moore Twining should be scheduled by the general contractor at least one week prior to the start of demolition. The purpose of the meeting should be to discuss critical project requirements and scheduling.

7.1.3 Contractor(s) bidding on this project should determine if the data are adequate for accurate bid purposes. If the data are not sufficient, the Contractor should conduct supplemental studies and collect more data as required to prepare accurate bids.

7.1.4 A demolition plan should be prepared to identify existing improvements such as underground utilities, pavements, etc. that are to be demolished and removed as part of the project.

7.1.5 The Contractor should be required to protect existing improvements, including existing utilities, in place. Any damage resulting from the work should be repaired at no cost to the Owner.

7.1.6 The curbs where pavements meet irrigated landscape areas or uncovered open areas should be extended to the bottom of the aggregate base section. This should reduce subgrade moisture from irrigation and runoff from migrating into the base section and reducing the life of the pavements. If an increased risk of wetting of the subgrade soils and an accelerated distress to the pavement is acceptable to the owner, the deepened curbs September be omitted.

7.1.7 If actual pavement subgrade materials are significantly different from those tested for this study due to unanticipated grading or soil importing, the pavement sections should be re-evaluated for the changed subgrade conditions.

7.1.8 Pavement section design assumes that proper maintenance, such as sealing and repair of localized distress, will be performed on an as needed basis for longevity and safety.

7.1.9 Pavement materials and pavement construction should conform to the City of Sand City specifications.

7.1.10 The asphaltic concrete, including the joint density, should be compacted to an average relative compaction of 93 percent, with no single test value being below a relative compaction of 91 percent and no single test value being above a relative compaction of 97 percent of the referenced laboratory density according to ASTM D2041.

7.2 Site Preparation for In-Place Recycling and New Pavements

7.2.1 Where in-place recycling of the existing asphalt concrete roadway is planned, areas of the proposed pavement replacement should be prepared by processing (i.e., pulverizing/milling) the existing asphalt concrete materials and base layers to a particle size of less than 2 inches. The pulverized materials should be thoroughly blended with the underlying base material and subgrade soils to a depth of 12 inches below the existing pavement grade to generate a subbase material with the following gradation and R-value requirements. The recycled materials should be processed and blended as necessary to achieve the specified gradation.

Percent Passing 2-Inch Sieve	100
Percent Passing 3/4-Inch Sieve	80 - 100
Percent Passing No. 4 Sieve	50 - 100
Percent Passing No. 200 Sieve	less than 20
R-Value	Minimum 60

Considering the length of roadway to be constructed, a minimum of one sample per 20,000 square feet of material of the processed/recycled subbase material should be collected and tested to confirm the gradation and R-value properties prior to placement of the overlying asphalt concrete section.

7.2.3 Recycled onsite materials used as aggregate subbase should have a minimum thickness of 6 inches below new pavements (can be up to 12 inches depending on mixing depth and final grade). The materials should be moisture-conditioned to within two (2) percent of optimum moisture content at the time of compaction. The processed aggregate subbase should be compacted to a minimum of 95 percent relative compaction based on the maximum dry density determined in accordance with ASTM D 1557.

7.2.4 Where the existing pavement materials (i.e., asphalt concrete, base, etc.) are planned to be removed in order to achieve the subgrade elevation for a new pavement section, the subgrade soils should be scarified to a depth of 12 inches, moisture conditioned to within two (2) percent of optimum moisture content and compacted to a minimum of 95 percent relative compaction (based on the maximum dry density determined in accordance with ASTM D 1557) prior to placement of aggregate base or asphalt concrete.

7.2.5 Prior to placement of the asphalt concrete, the prepared section should be proof-rolled under the observations of Moore Twining to confirm a firm, non-yielding condition.

7.3 Engineered Fill

7.3.1 The onsite granular subgrade soils and existing pavement materials which are processed as an aggregate subbase in accordance with the recommendations of this report will be suitable for use as engineered fill material, provided they are free of organics, debris and the moisture content of the materials is within two percent of optimum moisture content at the time of placement. If soils other than those considered in this report are encountered, Moore Twining should be notified to provide alternate recommendations.

7.3.2 Import fill soil (if needed) should be non-recycled and granular in nature with the following acceptance criteria recommended.

Percent Passing 3-Inch Sieve	100
Percent Passing No. 4 Sieve	85 - 100
Percent Passing No. 200 Sieve	20 - 40
Organics	Less than 3 percent by weight
R-Value	Minimum 60

Prior to importing fill, the Contractor shall submit test data that demonstrates that the proposed import soils comply with the recommended criteria for both geotechnical and environmental compliance. Also, prior to being transported to the site, the import material shall be certified by the Contractor and the supplier (to the satisfaction of the Owner) that the soils do not contain any environmental contaminates regulated by local, state or federal agencies having jurisdiction.

7.3.3 Onsite processed aggregate subbase material, native soils and imported engineered fill soil should be placed in loose lifts approximately 8 inches

thick, moisture-conditioned to between two percent below to two percent above optimum moisture content, and compacted to a dry density of at least 92 percent of the maximum dry density as determined by ASTM Test Method D1557. The upper 12 inches of fill and subgrade compacted in pavement areas should be compacted to a minimum of 95 percent relative compaction. Additional lifts should not be placed if the previous lift did not meet the required dry density or if soil conditions are not stable.

7.3.4 In-place density testing should be conducted in accordance with ASTM D 6938 (nuclear methods) at a frequency of at least:

Table No. 2
Area and Minimum Test Frequency

Area	Minimum Test Frequency
Pavement Areas, Mass Grading, Subgrade, Subbase and Aggregate Base	1 test per 2,500 square feet per compacted lift
Utility Lines	1 test per 150 feet per compacted lift

7.3.5 All utility trench backfill should be moisture conditioned and compacted as engineered fill.

7.3.6 Aggregate base shall comply with State of California Department of Transportation requirements for a Class 2 aggregate base. Aggregate base shall be compacted to a minimum relative compaction of 95 percent of the maximum dry density as determined by ASTM Test Method D1557.

7.4 New Asphaltic Concrete (AC) Pavements

Based on the findings of this investigation, recommendations are provided below for new asphaltic concrete pavements for two options: 1). asphalt concrete supported over a 12-inch thick recycled onsite aggregate subbase material (Section 7.4.1); or 2). asphalt concrete supported over a new Class 2 aggregate base layer (Section 7.4.2).

7.4.1 The following pavement sections are provided for pavements supported over a 12 inch layer of onsite recycled aggregate subbase prepared in accordance

with the recommendations included in Section 7.2 of this report based on an R-value of 60 for the subbase, a minimum asphaltic concrete thickness of 4 inches, and traffic index values ranging from 5.0 to 7.0. The actual traffic index values applicable to the site should be determined by the project civil engineer.

Table No. 3
Asphaltic Concrete Pavement over Onsite Recycled Aggregate Subbase

Traffic Index	AC thickness, inches	Onsite Recycled Aggregate Subbase*, inches
5.0	4.0	6-12
5.5	4.5	6-12
6.0	5.0	6-12
6.5	5.5	6-12
7.0	6.0	6-12

AC - Asphaltic Concrete compacted as recommended in this report
Recycled Aggregate Subbase -Recycled pavement blended with onsite base and subgrade soils (See recommendations) compacted to at least 95 percent relative compaction (ASTM D1557)
* - the 12 inches must have a minimum of 6 inches of recycled materials; but compaction should extend to 12 inches.

7.4.2 The following pavement sections are based on an R-value of 50 for the onsite subgrade soils, a minimum asphaltic concrete thickness of 3 inches, and traffic index values ranging from 5.0 to 7.0. The actual traffic index values applicable to the site should be determined by the project civil engineer.

Table No. 4
Asphaltic Concrete over New Class 2 Aggregate Base Layer

Traffic Index	AC thickness, inches	AB thickness, inches	Compacted Subgrade, inches
5.0	3.0	4.0	12
5.5	3.0	4.0	12
6.0	3.0	4.0	12
6.5	3.5	4.5	12
7.0	4.0	4.5	12

AC - Asphaltic Concrete compacted as recommended in this report
AB - Class II Aggregate Base compacted to at least 95 percent relative compaction (ASTM D1557)
Subgrade - Subgrade soils compacted to at least 95 percent relative compaction (ASTM D1557)

The pavement recommendations assume that proper maintenance will be performed on an as needed basis for longevity and safety. When properly performed, regular maintenance of asphaltic concrete pavements can maintain the integrity of the pavements and maximize the serviceable life of the pavement. See section 7.5 for maintenance treatment recommendations.

7.4.3 It is recommended that the base 2 inch thick course of asphaltic concrete consist of a ¾ inch maximum medium gradation. The top course or surface wear course should consist of a ½ inch maximum medium gradation.

7.5 AC Overlays

If an overlay is planned , the existing pavements may require milling to a maximum depth of 1 inch so the completed overlay surface can match the perimeter grades of gutters, drain inlets and pavements to remain. The overlay thickness should be between 1.5 to 2 inches (determine overlay thickness based on Caltrans minimum overlay thickness based on maximum aggregate in the asphalt mix design). Also at the edges of the overlay, verify that the minimum AC section is maintained per Table 4 above per the design TI after transition milling to match surface grades.

7.5.1 All pavement rehabilitation work and installation should comply with the requirements of this report, the project plans and specifications, Caltrans requirements and the City of Sand City, County of Monterey, whichever is more stringent.

7.5.2 Prior to placement of the overlay or slurry seals, pavements exhibiting fatigue failure such as areas with severe alligator or starting potholes (Pendergrass Way west of A-3) should be repaired out and replaced with a new pavement section in accordance with the thickness requirements for new pavement designs in Table No. 4. At a minimum, where overlays are performed adjacent to pavement areas that are dug out and replaced, the pavement reinforcing should be extended below the top course of asphalt for a minimum of three (3) feet horizontally beyond the joint between the overlay and the edge of the pavement section to be reconstructed (i.e., 3 foot minimum overlap). A detail should be included on the plan showing the overlap.

7.5.3 The pavement surface to be overlayed should be cleaned by sweeping, flushing or other means to remove all loose particles of paving, all dirt and all other extraneous material.

7.5.4 The pavement cracks in the surface to be overlayed should be cleaned of grasses, debris, etc. and sealed prior to application of the leveling course. Cracks should be filled with hot pour rubberized crack filler or other crack filler as specified by the project civil engineer. Other areas of cracks may exist at the time of construction. All cracks must be filled in preparation for the overlay. The Contractor shall visit the project site and observe the site conditions prior to providing a bid for this work.

7.5.5 After cleaning the surface and sealing / filling of the cracks, edge grinding, etc. a tack coat should be applied to a dry surface followed by a leveling course of compacted asphalt concrete.

7.5.6 The completed overlay should be cored at the locations and frequency required by the specifications to verify proper thickness.

7.5.7 The locations, elevations and thickness of the overlay, transitions, slopes and drainage patterns should be determined by the appropriate design professional. These conditions should be included on the design drawings. These areas should include all transition areas, such as along gutters, ADA ramps, drain inlets, landscape islands, etc., that could potentially result in ponding of water, etc. after the construction of the overlay. In addition, special attention will be required in the areas of existing curbs and other

vertical transitions as these relate to ADA laws and regulations, drainage design, etc.

7.5.8 It is recommended that the overlay asphaltic concrete consist of a ½ inch maximum medium gradation for the higher traffic roadway. For lower traffic parking lots the overlay should consist of a ⅜ inch maximum medium gradation.

7.6 Maintenance Treatment (Crak and Slurry Seals)

Given the current performance of the pavements on the parking areas and newer Pendergrass Way segment (see Drawing No. 3 for specific areas) , a slurry seal may be used to prolong the pavement life in these segments. If the pavement surface is to receive a slurry seal, the surface of the asphaltic should be monitored on a regular basis to review visual distress and performance to determine an appropriate time for maintenance and repair. Regular observations and assessment of the overall pavement condition should be conducted every year. Depending on the performance of the pavement, maintenance such as crack sealing, dig out and replacement, or maintenance overlay applications should be anticipated with ongoing use.

7.6.1 The pavement surface to be slurry should be cleaned by sweeping, flushing or other means to remove all loose particles of paving, all dirt, loose or damaged lane and parking stall striping, and all other extraneous material.

7.6.2 Existing pavement cracks should be cleaned of grasses, debris, etc. and sealed prior to application of the surface seal. Cracks should be filled with hot pour rubberized crack filler or other crack filler as specified by the project civil engineer. Other areas of cracks may exist at the time of construction. All cracks must be filled in preparation for the slurry seal. The Contractor shall visit the project site and observe the site conditions prior to providing a bid for this work.

7.6.3 The surface slurry seal material should be selected, mixed and applied per the State of California Standard Specifications Sections 37 (Bituminous Seals) and 94 (Asphalt Emulsions).

8.0 DESIGN CONSULTATION

Moore Twining should be provided the opportunity to review those portions of the contract drawings and specifications that pertain to earthwork operations and pavements prior to finalization to determine whether they are consistent with our recommendations. This service is not part of this

current contractual agreement. If Moore Twining is not afforded the opportunity for review, we assume no liability for the misinterpretation of our conclusions and recommendations. This review is documented by a formal plan/specification review report provided by Moore Twining.

9.0 CONSTRUCTION MONITORING

9.1 It is recommended that Moore Twining be retained to observe the excavation, earthwork, and paving phases of work to determine that the subsurface conditions are compatible with those used in the analysis and design.

9.2 Moore Twining can conduct the necessary observation and field testing to provide results so that action necessary to remedy indicated deficiencies can be taken in accordance with the plans and specifications. Upon completion of the work, a written summary of our observations, field testing and conclusions will be provided regarding the conformance of the completed work to the intent of the plans and specifications. This service is not, however, part of this current contractual agreement.

9.3 In the event that the earthwork operations for this project are conducted such that the construction sequence is not continuous, (or if construction operations disturb the surface soils) it is recommended that the exposed subgrade that will receive pavements be tested to verify adequate compaction and/or moisture conditioning. If adequate compaction, stability, or moisture contents are not verified, the fill soils should be over-excavated, scarified, moisture conditioned and compacted are recommended in the Recommendations of this report.

9.4 The construction monitoring is an integral part of this investigation. This phase of the work provides Moore Twining the opportunity to verify the subsurface conditions interpolated from the soil borings and make alternative recommendations if the conditions differ from those anticipated.

9.5 If Moore Twining is not afforded the opportunity to provide engineering observation and field-testing services during construction activities related to earthwork and pavements; then, Moore Twining will not be responsible for compliance of any aspect of the construction with our recommendations or performance of the pavements if the recommendations of this report are not followed. It is recommended that if a firm other than Moore Twining is selected to conduct these services that they provide evidence of professional liability insurance satisfactory to the Owner. After their review, the firm should, in writing, state that they understand and agree with the recommendations of this report and agree to conduct sufficient observations and testing to ensure the construction complies with this report's recommendations. Moore Twining should be notified, in writing, if another firm is selected to conduct observations and field-testing services prior to construction.

9.6 Upon the completion of work, a final report should be prepared by Moore Twining. This report is essential to ensure that the recommendations presented are incorporated into the project construction, and to note any deviations from the project plans and specifications. The client should notify Moore Twining upon the completion of work to prepare a final report summarizing the observations during site preparation activities relative to the recommendations of this report. This service is not, however, part of this current contractual agreement.

10.0 NOTIFICATION AND LIMITATIONS

10.1 The recommendations presented in this report are based on the information provided regarding the proposed construction, and the results of the field and laboratory investigation, combined with interpolation of the subsurface conditions between boring locations. The nature and extent of subsurface variations between borings September not become evident until construction.

10.2 If variations or undesirable conditions are encountered during construction, Moore Twining should be notified promptly so that these conditions can be reviewed and our recommendations reconsidered where necessary. It should be noted that unexpected conditions frequently require additional expenditures for proper construction of the project.

10.3 If the proposed construction is relocated or redesigned, or if there is a substantial lapse of time between the submission of our report and the start of work (over 12 months) at the site, or if conditions have changed due to natural cause or construction operations at or adjacent to the site, the recommendations contained in this report should be considered invalid unless the changes are reviewed and our recommendations modified or approved in writing.

10.4 Changed site conditions, or relocation of proposed structure, should require additional field and laboratory investigations to determine if our recommendations are applicable considering the changed conditions or time lapse.

10.5 The recommendations contained in this report are valid only for the project discussed in Section 1.0, Site and Project Description. The use of the information and recommendations contained in this report for structures on this site not discussed herein or for structures on other sites not discussed in this report is not recommended. The entity or entities that use or cause to use this report or any portion thereof for another structure or site not covered by this report shall hold Moore Twining, its officers and employees harmless from any and all claims and provide Moore Twining's defense in the event of a claim.

10.6 This report is issued with the understanding that it is the responsibility of the client to transmit the information and recommendations of this report to developers, owners, buyers, architects, engineers, designers, contractors, subcontractors, and other parties having interest in the project so that the steps necessary to carry out these recommendations in the design, construction and maintenance of the project are taken by the appropriate party.

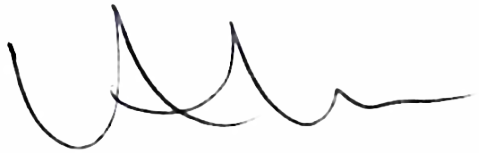
10.7 This report presents the results of a geotechnical engineering investigation for new pavements only and should not be construed as an environmental audit or study.

10.8 Our professional services were performed, our findings obtained, and our recommendations prepared in accordance with generally-accepted engineering principles and practices. This warranty is in lieu of all other warranties either expressed or implied.

10.9 Reliance on this report by a third party (i.e., that is not a party to our written agreement) is at the party's sole risk. If the project and/or site are purchased by another party, the purchaser must obtain written authorization and sign an agreement with Moore Twining in order to rely upon the information provided in this report for design or construction of the project.

We appreciate the opportunity to be of service to the City of Sand City and Harris and Associates. If you have any questions regarding this report, or if we can be of further assistance, please contact us at your convenience.

Sincerely,
MOORE TWINING ASSOCIATES, INC.
Geotechnical Engineering Division



Alan Villegas, EIT
Staff Engineer

Scott W. Krauter, RGE
Assistant Manager

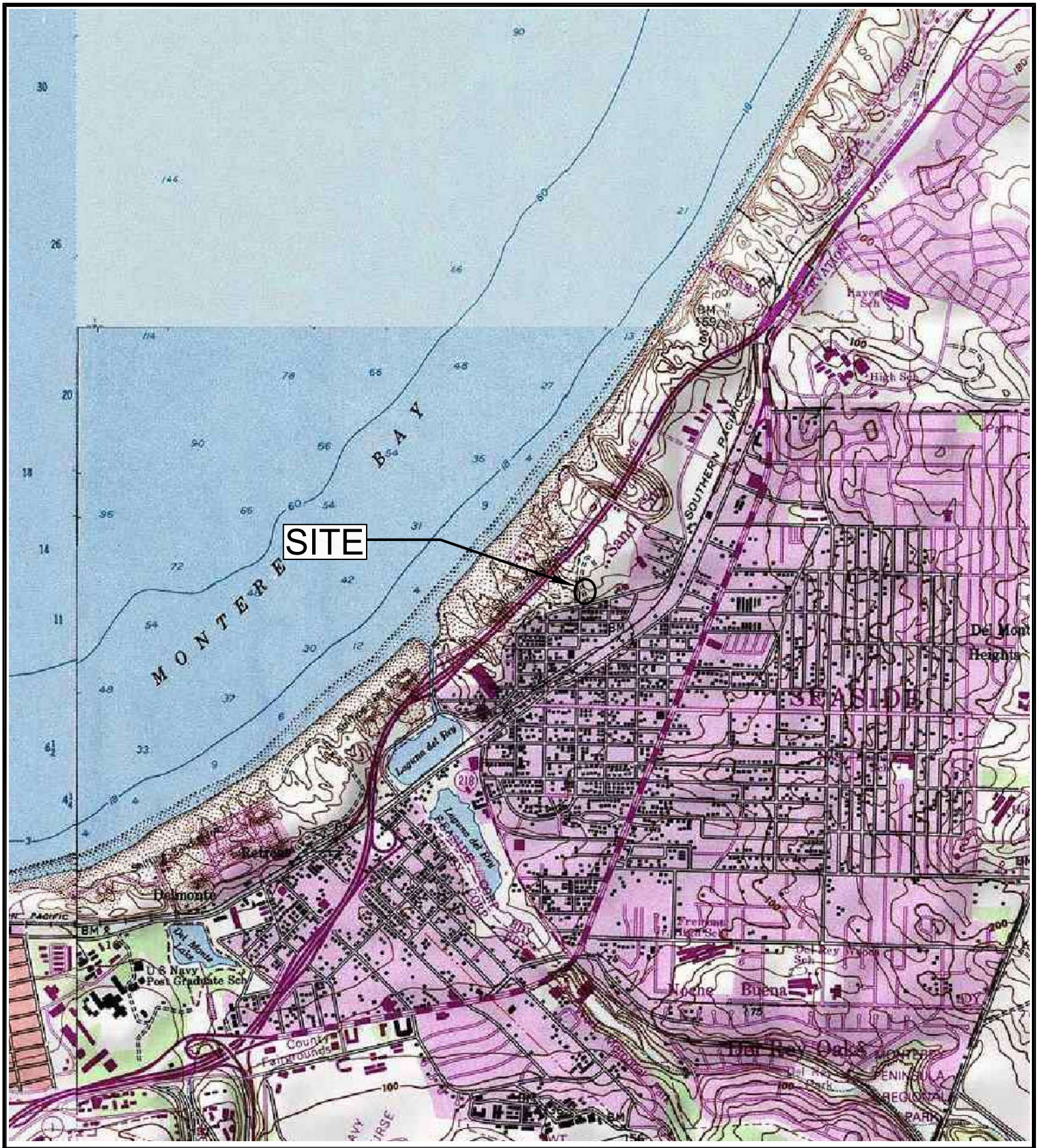
APPENDIX A

DRAWINGS

Drawing No. 1 - Site Location Map

Drawing No. 2 - Test Boring Location Map

Drawing No. 3 - Pavement Rehabilitation Option Map



SOURCE: U.S.G.S. TOPOGRAPHIC MAP, 7 ½ MINUTE SERIES
SEASIDE, CALIFORNIA QUADRANGLE 1981, PHOTOREVISED 1983

0 2000
APPROXIMATE SCALE
IN FEET

SITE LOCATION MAP
PROPOSED PAVEMENT IMPROVEMENTS
CITY HALL AND PENDERGRASS WAY
SAND CITY, CALIFORNIA

FILE NO.: 46703-01-01	DATE: 09/29/21
DRAWN BY: RM	APPROVED BY:
PROJECT NO. G46703.01	DRAWING NO. 1

MOORE TWINING ASSOCIATES, INC.

N

0 60

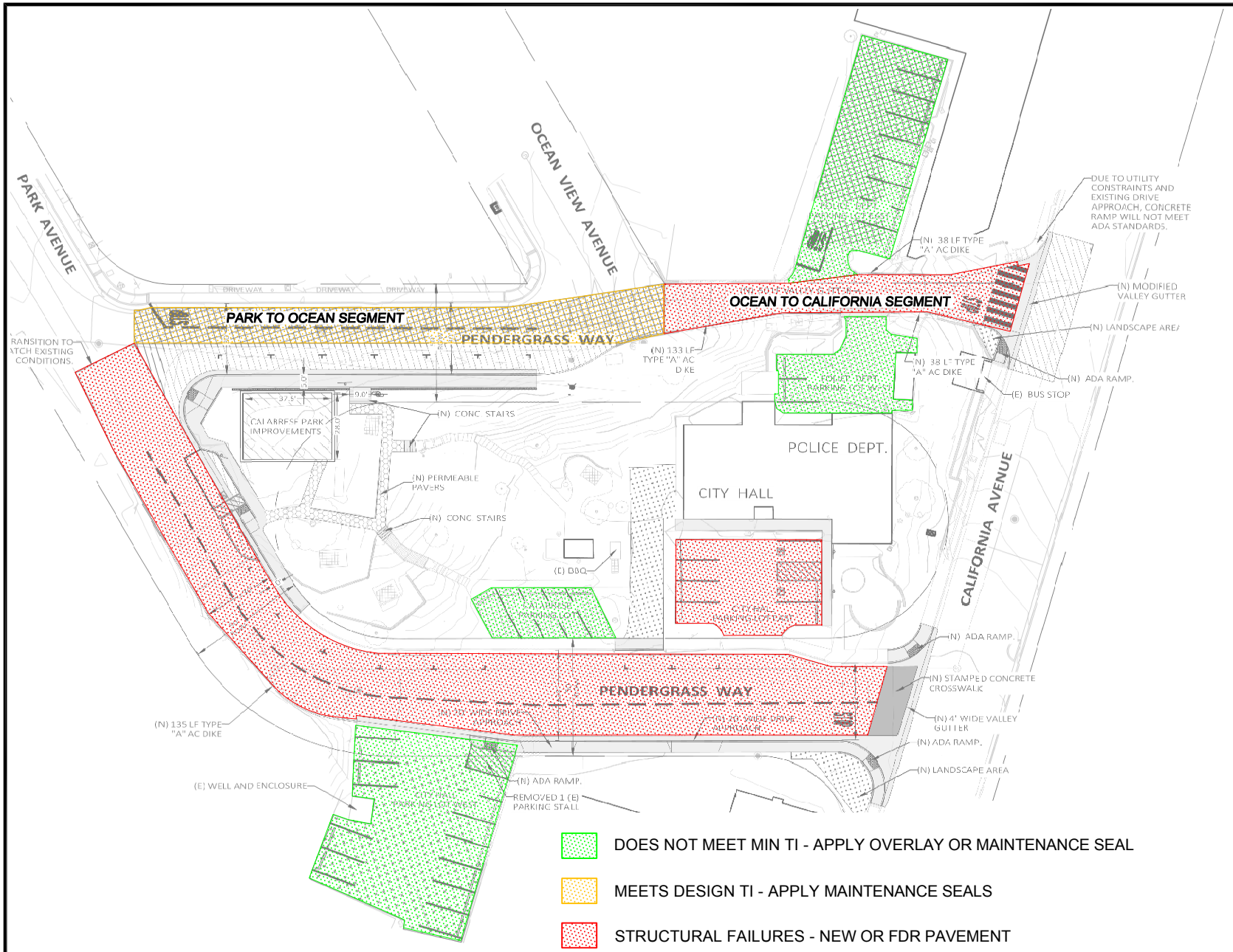
APPROXIMATE SCALE IN FEET

APPROXIMATE TEST BORING LOCATION

TEST BORING LOCATION MAP
PROPOSED PAVEMENT IMPROVEMENTS
CITY HALL AND PENDERGRASS WAY
SAND CITY, CALIFORNIA

FILE NO. 46703-01-02	DATE DRAWN: 12/20/21
DRAWN BY: RM	APPROVED BY:
PROJECT NO. G46703.01	DRAWING NO. 2

MOORE TWINING ASSOCIATES, INC.



DOES NOT MEET MIN TI - APPLY OVERLAY OR MAINTENANCE SEAL

MEETS DESIGN TI - APPLY MAINTENANCE SEALS

STRUCTURAL FAILURES - NEW OR FDR PAVEMENT

N

0 60

APPROXIMATE SCALE IN FEET

PAVEMENT REHABILITATION MAP
PROPOSED PAVEMENT IMPROVEMENTS
CITY HALL AND PENDERGRASS WAY
SAND CITY, CALIFORNIA

FILE NO. 46703-01-02	DATE DRAWN: 12/20/21
DRAWN BY: RM	APPROVED BY:
PROJECT NO. G46703.02	DRAWING NO. 3

MOORE TWINING ASSOCIATES, INC.
Since 1898

APPENDIX B

LOGS OF BORINGS

This appendix contains the final logs of borings. These logs represent our interpretation of the contents of the field logs and the results of the field and laboratory tests.

The logs and related information depict subsurface conditions only at these locations and at the particular time designated on the logs. Soil conditions at other locations September differ from conditions occurring at these test boring locations. Also, the passage of time September result in changes in the soil conditions at these test boring locations.

In addition, an explanation of the abbreviations used in the preparation of the logs and a description of the Unified Soil Classification System are provided at the end of Appendix B.

MOORE TWINING ASSOCIATES, INC.

Test Boring: B-1

Project: Pendergrass Way and City Hall Improvements

Project Number: G46703.01

Drilled By: J.M.

Drill Type: Coring Machine with 4" Barrel

Auger Type: Hand-Auger

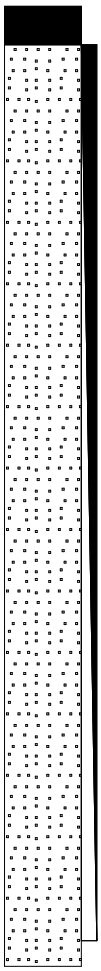
Hammer Type: N/A

Logged By: A.V.

Date: September 1, 2021

Elevation:

Depth to Groundwater First Encountered During Drilling: N/E

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
0		AC	Asphalt Concrete = 2.25 inches			
		SP	POORLY GRADED SAND; moist, fine to coarse grained, brown	Gravel=0.6% Sand=97.0% -#200=2.4% Rv=71		
1						
2						
3						
4						
5			Bottom of Boring B-1 at 5 feet.			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: B-2

Project: Pendergrass Way and City Hall Improvements

Project Number: G46703.01

Drilled By: J.M.

Drill Type: Coring Machine with 4" Barrel

Auger Type: Hand-Auger

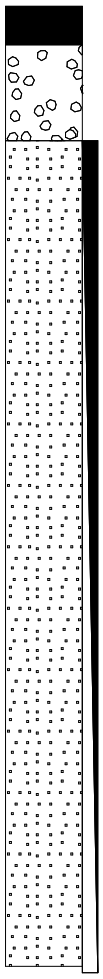
Hammer Type: N/A

Logged By: A.V.

Date: September 1, 2021

Elevation:

Depth to Groundwater First Encountered During Drilling: N/E

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
0		AC	Asphalt Concrete = 1.75 inches			
		AB	Aggregate Base = 6 inches			
1		SP	POORLY GRADED SAND; moist, fine to coarse grained, light brown, with rootlets			1.9
2						
3						
4						
5			Bottom of Boring B-2 at 5 feet.			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: B-3

Project: Pendergrass Way and City Hall Improvements

Project Number: G46703.01

Drilled By: J.M.

Drill Type: Coring Machine with 4" Barrel

Auger Type: Hand-Auger

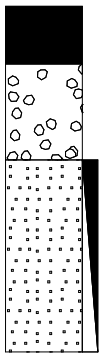
Hammer Type: N/A

Logged By: A.V.

Date: September 1, 2021

Elevation:

Depth to Groundwater First Encountered During Drilling: N/E

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
0		AC	Asphalt Concrete = 4 inches			
		AB	Aggregate Base = 6 inches			
1		SP	POORLY GRADED SAND ; moist, fine to coarse grained, light brown			
2			Boring B-3 terminated at 1.8 feet due to caving soils.			
3						
4						
5						

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: B-4

Project: Pendergrass Way and City Hall Improvements

Project Number: G46703.01

Drilled By: J.M.

Drill Type: Coring Machine with 4" Barrel

Auger Type: Hand-Auger

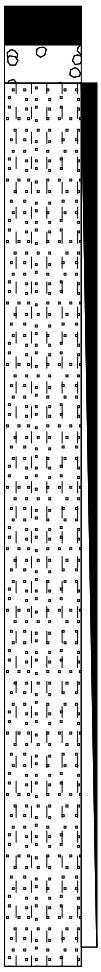
Hammer Type: N/A

Logged By: A.V.

Date: September 1, 2021

Elevation:

Depth to Groundwater First Encountered During Drilling: N/E

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
0		AC	Asphalt Concrete = 2 inches			
		AB	Aggregate Base = 3 inches			
1		SP-SM	POORLY GRADED SAND WITH SILT; moist, fine to coarse grained, brown, with rootlets			
2						
3						
4						
5			Bottom of Boring B-4 at 5 feet.			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: A-1

Project: Pendergrass Way and City Hall Improvements

Project Number: G46703.01

Drilled By: J.M.

Drill Type: Coring Machine with 4" Barrel

Auger Type: Hand-Auger

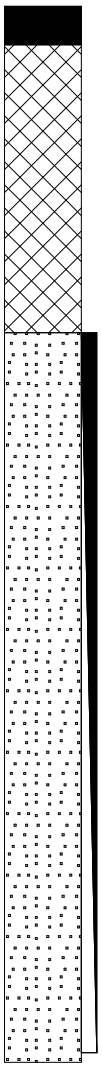
Hammer Type: N/A

Logged By: A.V.

Date: September 1, 2021

Elevation:

Depth to Groundwater First Encountered During Drilling: N/E

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
0		AC	Asphalt Concrete = 2.25 inches			
		FILL	FILL - POORLY GRADED GRAVEL WITH SAND; moist, fine to coarse grained, brown, with 3-inch cobble			
1						
		SP	POORLY GRADED SAND; moist, fine to coarse grained, brown			
2						
3						
4						
5			Bottom of Boring A-1 at 5.5 feet.			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: A-2

Project: Pendergrass Way and City Hall Improvements

Project Number: G46703.01

Drilled By: J.M.

Drill Type: Coring Machine with 4" Barrel

Auger Type: Hand-Auger

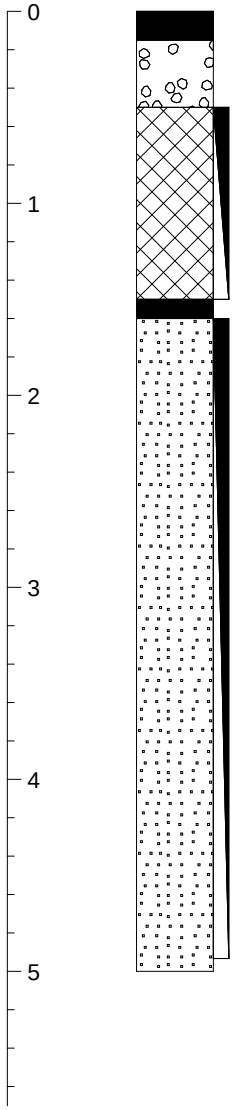
Hammer Type: N/A

Logged By: A.V.

Date: September 1, 2021

Elevation:

Depth to Groundwater First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
		AC	Asphalt Concrete = 1.2 inches			
		AB	Aggregate Base = 5 inches			
		FILL	POORLY GRADED SAND WITH SILT; moist, fine to coarse grained, brown, trace asphalt debris and roots			
		AC	Asphalt Concrete = 1-1.5 inches			
		SP	POORLY GRADED SAND; moist, fine to coarse grained, brown	Gravel=10.7% Sand=80.6% -#200=8.7%		
			Bottom of Boring A-2 at 5 feet.			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: A-3

Project: Pendergrass Way and City Hall Improvements

Project Number: G46703.01

Drilled By: J.M.

Drill Type: Coring Machine with 4" Barrel

Auger Type: Hand-Auger

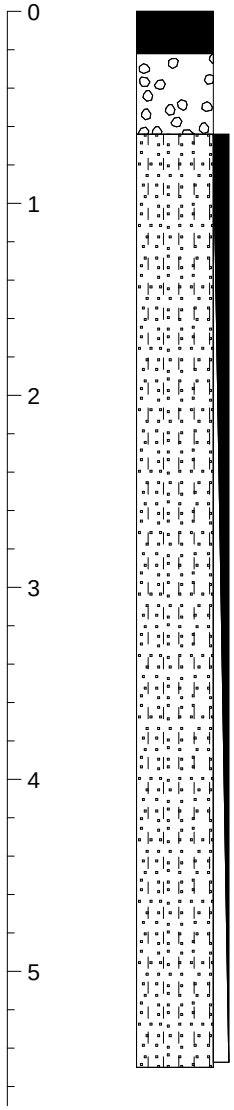
Hammer Type: N/A

Logged By: A.V.

Date: September 1, 2021

Elevation:

Depth to Groundwater First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
		AC	Asphalt Concrete = 2.75 inches			
		AB	Aggregate Base = 5 inches			
		SP-SM	POORLY GRADED SAND; moist, fine to coarse grained, brown, trace organics	LOI=0.9%		1.5
			Bottom of Boring A-3 at 5.5 feet.			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: A-4

Project: Pendergrass Way and City Hall Improvements

Project Number: G46703.01

Drilled By: J.M.

Drill Type: Coring Machine with 4" Barrel

Auger Type: Hand-Auger

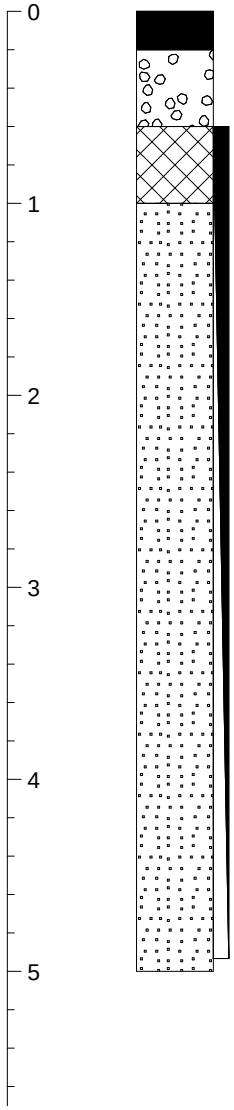
Hammer Type: N/A

Logged By: A.V.

Date: September 1, 2021

Elevation:

Depth to Groundwater First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
		AC	Asphalt Concrete = 2.3 inches			
		AB	Aggregate Base = 5 inches			
		FILL	FILL - POORLY GRADED SAND WITH SILt; moist, fine to coarse grained, brown, traces of gravel and brick debris			
		SP	POORLY GRADED SAND; moist, fine to coarse grained, brown	Rv=71		
			Bottom of Boring A-4 at 5 feet.			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: A-5

Project: Pendergrass Way and City Hall Improvements

Project Number: G46703.01

Drilled By: J.M.

Drill Type: Coring Machine with 4" Barrel

Auger Type: Hand-Auger

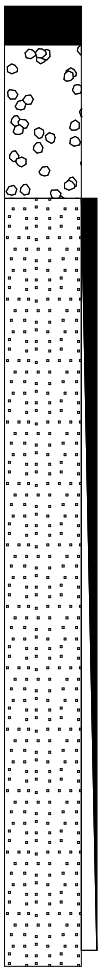
Hammer Type: N/A

Logged By: A.V.

Date: September 1, 2021

Elevation:

Depth to Groundwater First Encountered During Drilling: N/E

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
0		AC	Asphalt Concrete = 1.7 inches			
		AB	Aggregate Base = 10 inches			
1		SP	POORLY GRADED SAND; moist, fine to coarse grained, light brown			
2						
3						
4						
5			Bottom of Boring A-5 at 5 feet.			

Notes:

Figure Number

KEY TO SYMBOLS

Symbol	Description
Strata symbols	
	Pavement Section Thickness
	SP: Poorly graded sand
	Aggregate Base
	SP-SM: Poorly graded sand with silt
	Fill
Soil Samplers	
	Bulk/Grab sample

Notes:

1. Cores and test borings were drilled on September 1, 2021, using a coring machine equipped with a 4-inch barrel, and a 4-inch hand auger.

2. Groundwater was not encountered during drilling.

3. Boring locations were located by pace with reference to the existing site features.

4. These logs are subject to the limitations, conclusions, and recommendations in this report.

5. Results of tests conducted on samples recovered are reported

6 On the logs. Abbreviations used are:

AMSL =	Above mean sea level
O.D. =	Outside diameter
Rv =	R-value
LOI =	Loss of Ignition
N/A =	Not applicable
N/E =	None encountered
BSG =	below site grade

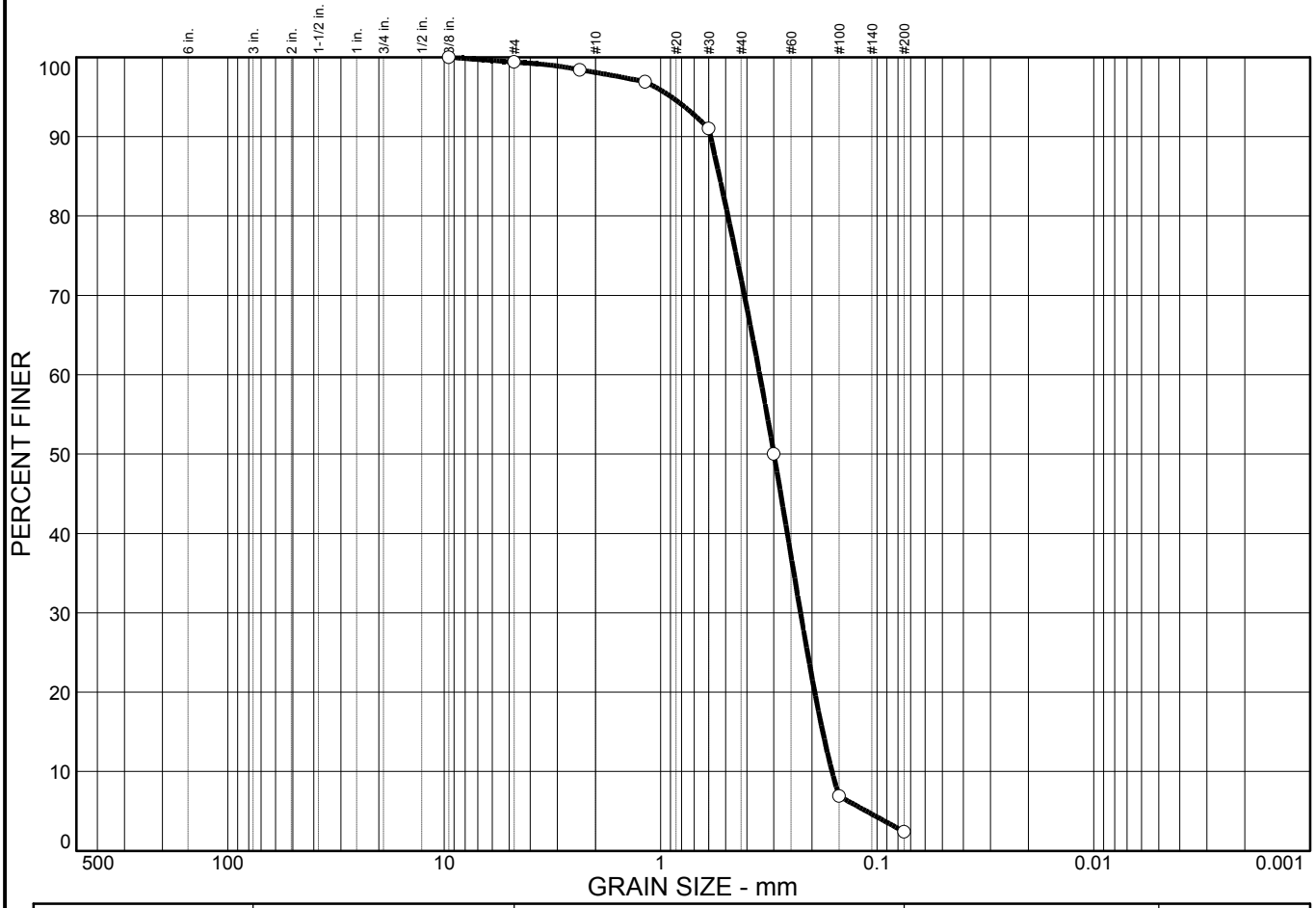
APPENDIX C

RESULTS OF LABORATORY TESTS

This appendix contains the individual results of the following tests. The results of the moisture content and dry density tests are included on the test boring logs in Appendix B. These data, along with the field observations, were used to prepare the final test boring logs in Appendix B.

These Included:	To Determine:
Moisture Content (ASTM D2216)	Moisture contents representative of field conditions at the time the sample was taken.
Grain-Size Distribution (ASTM D422)	Size and distribution of soil particles, i.e., sand, gravel and fines (silt and clay).
R-Value (ASTM D2844)	The capacity of a subgrade or subbase to support a pavement section designed to carry a specified traffic load.
Moisture-Density Relationship (D1557)	The Optimum moisture content for compacting soil and maximum dry unit weight (density) for a given compactive effort.
Lost of Ignition (D2974)	The percent of organic content by weight.

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.6	97.0	2.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
#4	99.4		
#8	98.4		
#16	96.9		
#30	91.0		
#50	50.0		
#100	6.9		
#200	2.4		

* (no specification provided)

Material Description

Poorly graded sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.536 D_{60}= 0.349 D_{50}= 0.300
D_{30}= 0.226 D_{15}= 0.179 D_{10}= 0.162
C_u= 2.16 C_c= 0.91

Classification

USCS= SP AASHTO=

Remarks

Sample No.: B-1 **Source of Sample:** **Date:** 9/2/21
Location: **Elev./Depth:** 0.2-5'

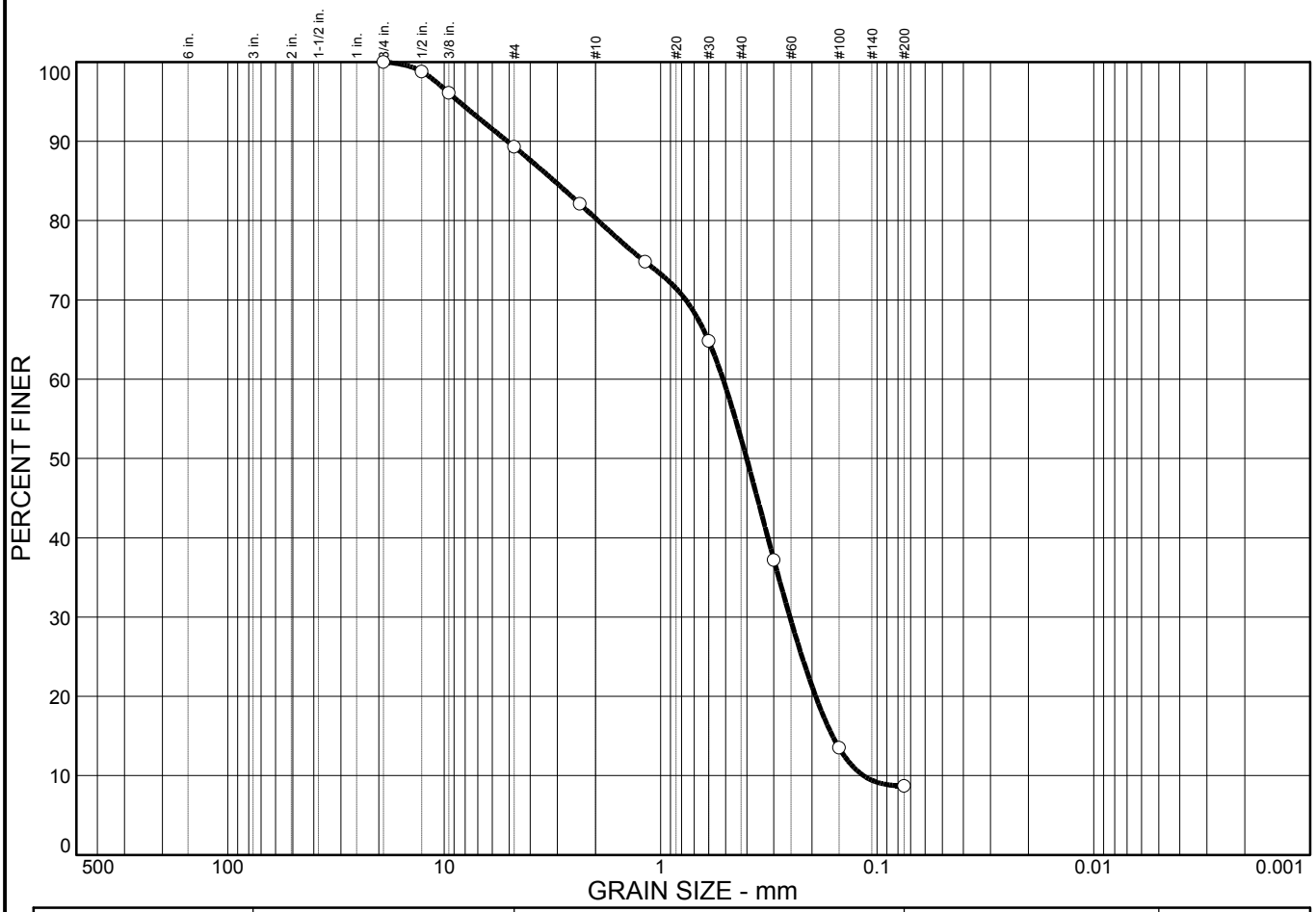
Moore Twining Associates, Inc.

Fresno, CA

Client:
Project: Sand City Hall Pavement Rehabilitation

Project No: G46703.01 **Figure**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	10.7	80.6	8.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	98.8		
3/8 in.	96.1		
#4	89.3		
#8	82.1		
#16	74.8		
#30	64.8		
#50	37.2		
#100	13.5		
#200	8.7		

* (no specification provided)

Material Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 3.10 D_{60}= 0.516 D_{50}= 0.401
D_{30}= 0.253 D_{15}= 0.161 D_{10}= 0.116
C_u= 4.46 C_c= 1.07

Classification

USCS= AASHTO=

Remarks

Sample No.: A-2 **Source of Sample:** **Date:** 9/2/21
Location: **Elev./Depth:** 0.5-1.5'

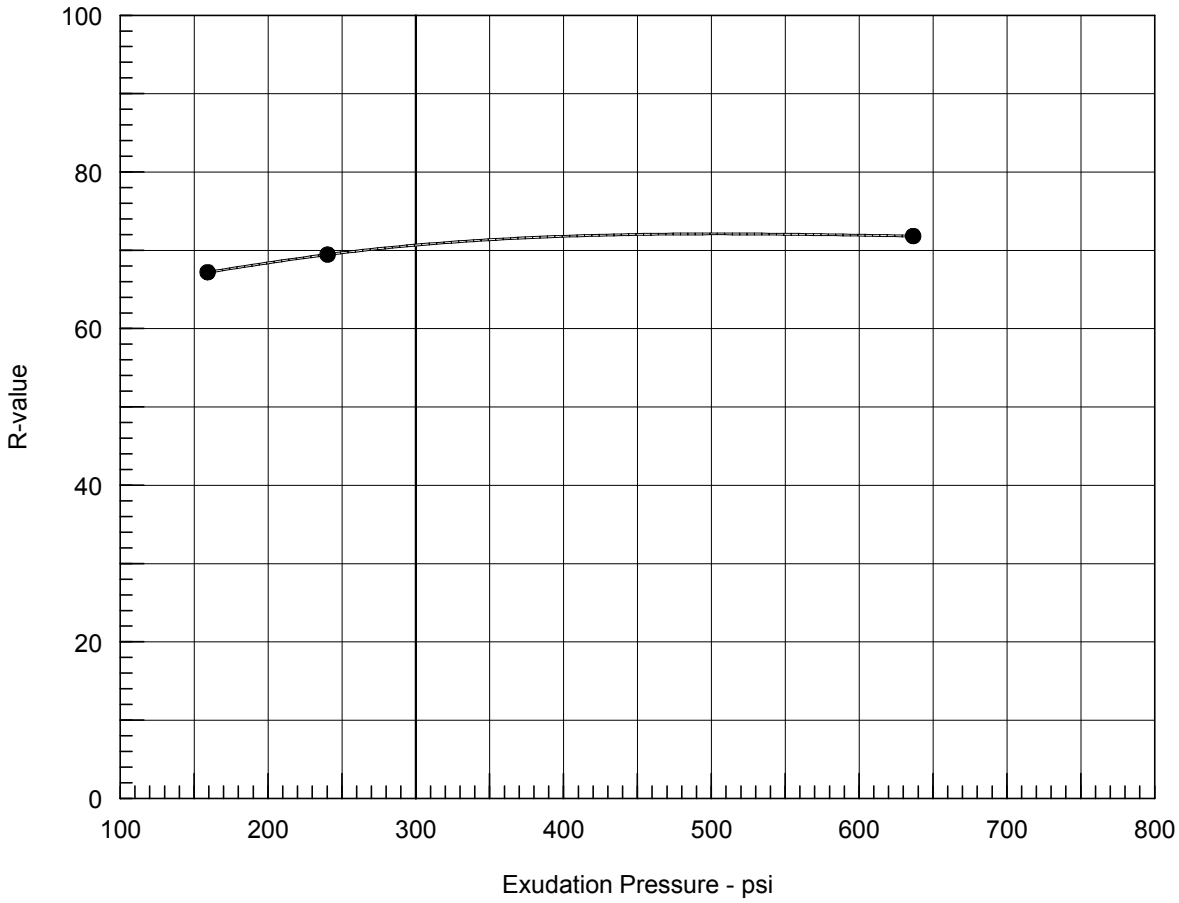
Moore Twining Associates, Inc.

Fresno, CA

Client:
Project: Sand City Hall Pavement Rehabilitation

Project No: G46703.01 **Figure**

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - ASTM D 2844

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psi	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	300	106.1	14.3	0.00	25	2.54	637	72	72
2	200	102.8	15.4	0.00	30	2.60	159	65	67
3	300	104.6	14.9	0.00	27	2.56	240	68	69

Test Results	Material Description
R-value at 300 psi exudation pressure = 71	Poorly graded sand

Project No.: G46703.01
Project: Sand City Hall Pavement Rehabilitation
Sample Number: B-1 **Depth:** 0.2-5'
Date: 9/24/2021

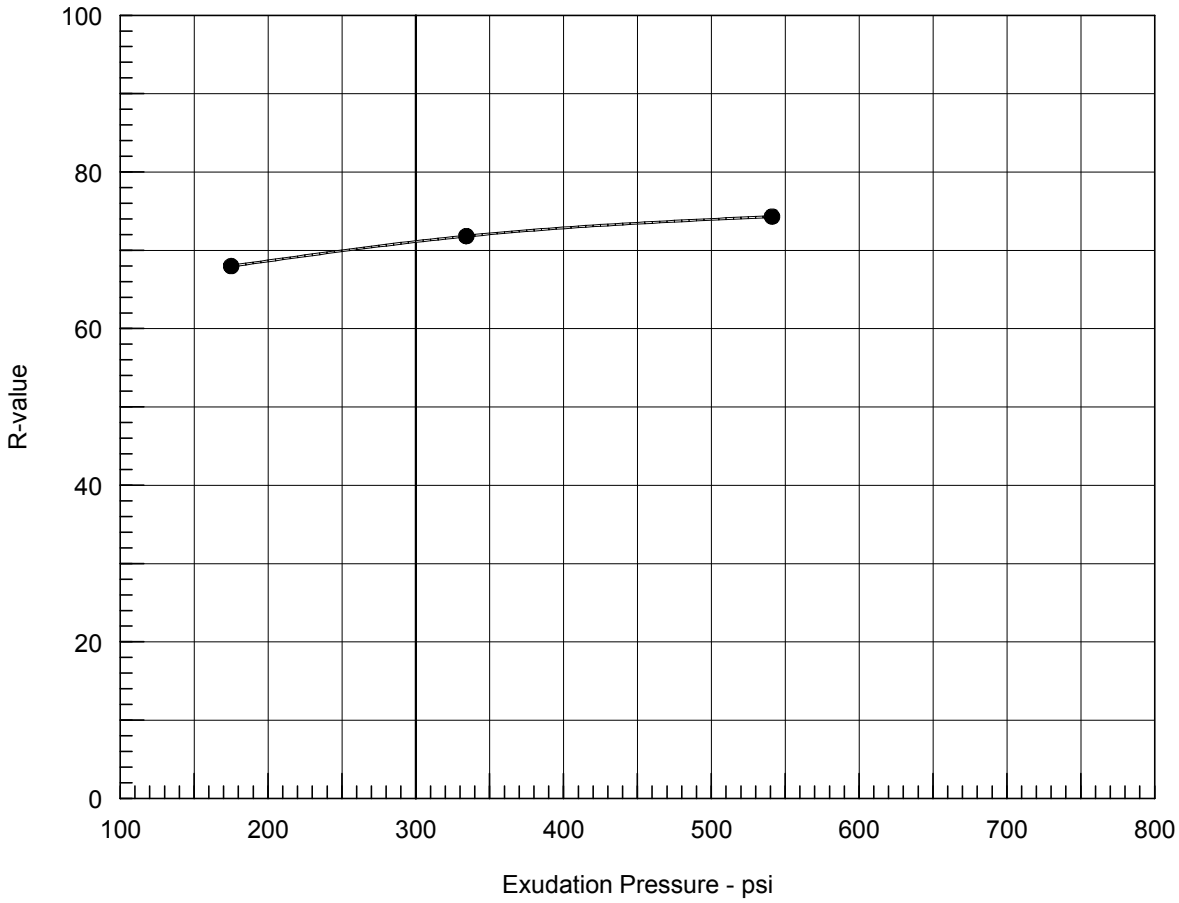
Tested by: MS
Checked by: MS
Remarks:

R-VALUE TEST REPORT

Moore Twining Associates, Inc.

Figure NA

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - ASTM D 2844

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psi	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	250	102.0	15.7	0.00	31	2.57	175	66	68
2	300	104.6	14.6	0.00	26	2.55	334	72	72
3	300	105.1	14.1	0.00	24	2.54	541	74	74

Test Results	Material Description
R-value at 300 psi exudation pressure = 71	Poorly graded sand

Project No.: G46703.01
Project: Sand City Hall Pavement Rehabilitation
Sample Number: A-4 **Depth:** 1-5'
Date: 9/24/2021

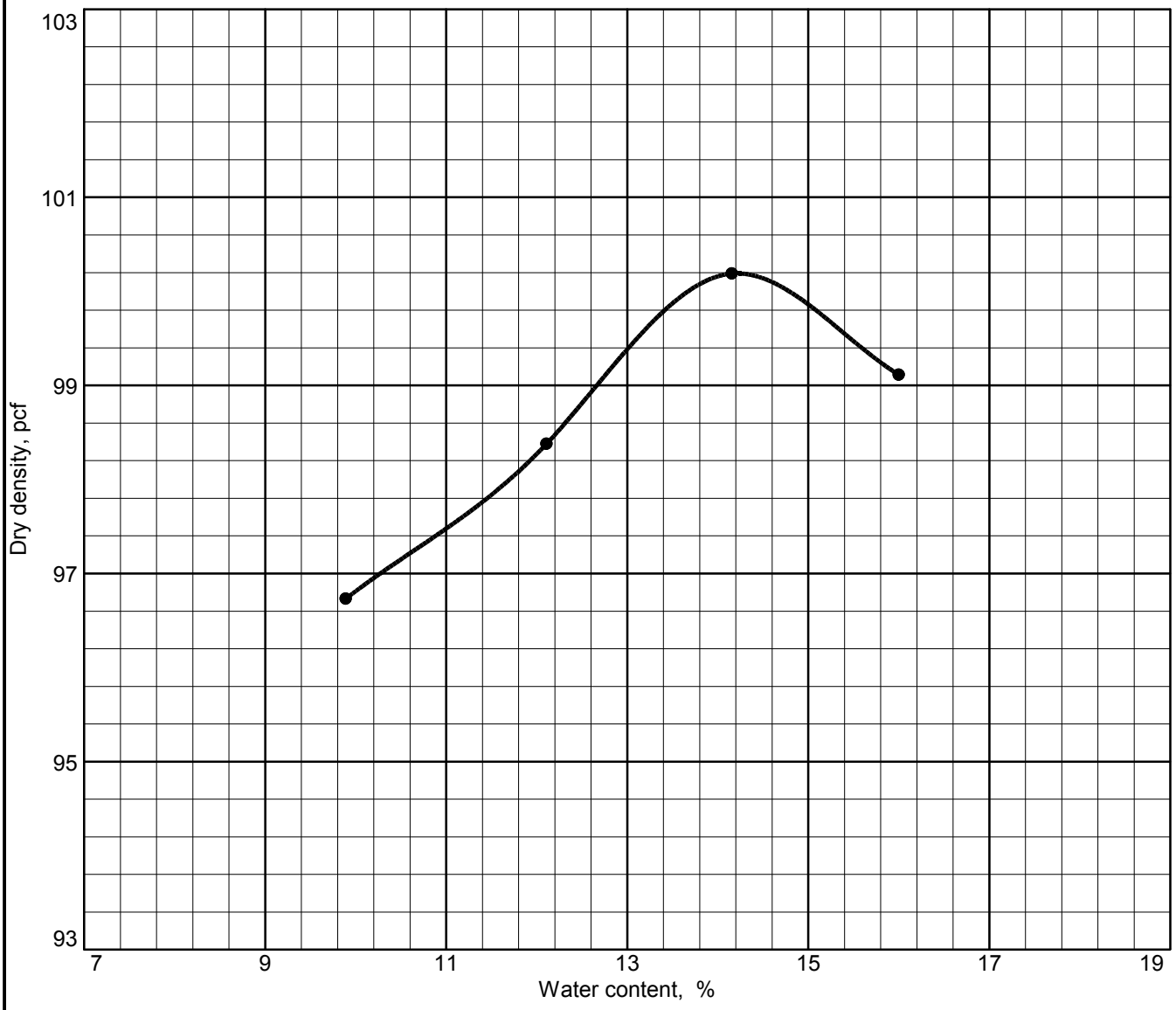
Tested by: MS
Checked by: MS
Remarks:

R-VALUE TEST REPORT

Moore Twining Associates, Inc.

Figure NA

COMPACTION TEST REPORT



Test specification: ASTM D 1557-12 Method A Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
0.7-5'								

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 100.2 pcf Optimum moisture = 14.2 %	Poorly graded sand

Project No. G46703.01 **Client:**

Project: Sand City Hall Pavement Rehabilitation

● **Source:** **Sample No.:** B-2 **Elev./Depth:** 0.7-5'

Remarks:

Moore Twining Associates, Inc.

Fresno, CA

Figure

MOORE TWINING ASSOCIATES, INC.

Project No:	Sand City Hall Pavement Rehabilitation	Report Date:	9/24/2021
Project:	G46703.01		

Materials Testing Report
ASTM D2974

Sample Location:	A-3 @ 0.7-5.5'		
Sampled By:	AV	Tested By:	AL
Sample Date:	9/2/2021	Date Tested:	9/8/2021
Material Description:	Poorly graded sand		

Start Weight, gm:	100.0
Final Weight, gm:	99.25
Tare Weight, gm	13.93
Percent of Organic, %:	0.9

www.mooretwining.com
PH: 559.268.7021
FX: 559.268.7126
2527 Fresno Street
Fresno, CA 93721