Addendum No. 2
TO WILSONVILLE POLICE/PUBLIC WORKS SRGP
SEISMIC IMPROVEMENT PROJECT
CONTRACT DOCUMENTS, PROJECT PLANS AND SPECIFICATIONS

DATE: March 4, 2019

ADDRESSEE: PLAN HOLDERS

RE: REVISIONS TO CONTRACT DOCUMENTS, PROJECT PLANS AND SPECIFICATIONS

Prior Addenda: 1

The following Addenda to the Contract Documents, Project Plans and Specifications shall be considered merged with the original bid package as if they were whole.

Add the following documents to the Contract Documents, Project Plans and Specifications.

- Geotechnical Engineering Report by GeoDesign Inc. dated June 7, 2018
- Hazardous Materials Survey by APEX Environmental Consulting dated October 2018

Acknowledgement of receipt of this ADDENDUM within the bid submittal is required.

BIDDERS ARE HIGHLY ENCOURAGE TO ATTEND THE OPTIONAL PRE-BID MEETING SCHEDULED FOR FRIDAY, MARCH 8, 2019 AT 9:00 AM AT THE POLICE/PUBLIC WORKS BUILDING – 30000 SW TOWN CENTER LOOP E, WILSONVILLE, OR.
REPORT OF GEOTECHNICAL ENGINEERING SERVICES

City of Wilsonville - Police/Public Works Building
30000 Town Center Loop East
Wilsonville, Oregon

For
City of Wilsonville
June 7, 2018

GeoDesign Project: CWilson-14-01
June 7, 2018

City of Wilsonville
29799 SW Town Center Loop East
Wilsonville, OR 97070

Attention: Delora Kerber

Report of Geotechnical Engineering Services
City of Wilsonville - Police/Public Works Building
30000 Town Center Loop East
Wilsonville, Oregon
GeoDesign Project: CWilson-14-01

GeoDesign, Inc. is pleased to submit this geotechnical engineering report for the planned improvements to the City of Wilsonville’s police/public works building located at 30000 Town Center Loop East in Wilsonville, Oregon. Our services for this project were conducted in accordance with our proposal dated February 2, 2018.

We appreciate the opportunity to be of service to you. Please call if you have questions regarding this report.

Sincerely,

GeoDesign, Inc.

Brett A. Shipton, P.E., G.E.
Principal Engineer

GJS:BAS:kt

Attachments
One copy submitted (via email only)
Document ID: CWilson-14-01-060718-geor.docx
© 2018 GeoDesign, Inc. All rights reserved.
TABLE OF CONTENTS

APPENDICES (continued)

Appendix B
- Site-Specific Seismic Hazard Evaluation B-1
- Quaternary Fault Map Figure B-1
- Historical Seismicity Map Figure B-2
- Site Response Spectra Figure B-3
- Site-Specific Response Spectra Figure B-4
- Design Response Spectrum Figure B-5
ACRONYMS AND ABBREVIATIONS

AC  asphalt concrete
AOS  apparent opening size
ASCE  American Society of Civil Engineers
ASTM  American Society for Testing and Materials
BGS  below ground surface
CRBG  Columbia River Basalt Group
CSZ  Cascadia Subduction Zone
fps  feet per second
g  gravitational acceleration (32.2 feet/second²)
GMM  ground motion model
H:V  horizontal to vertical
IBC  International Building Code
km  kilometers
MCE  maximum considered earthquake
MCEr  risk-targeted maximum considered earthquake
OSHA  Occupational Safety and Health Administration
pcf  pounds per cubic foot
pci  pounds per cubic inch
PGA  peak ground acceleration
psf  pounds per square foot
PSHA  probabilistic seismic hazard analysis
psi  pounds per square inch
SOSSC  State of Oregon Structural Specialty Code
SPT  standard penetration test
USGS  U.S. Geological Survey
UST  underground storage tank
1.0 INTRODUCTION

GeoDesign, Inc. is pleased to submit this geotechnical engineering report for the planned improvements to the City of Wilsonville's existing police/public works building located at 30000 Town Center Loop East in Wilsonville, Oregon. Figure 1 shows the site relative to existing topographic and physical features.

Improvements will include a seismic upgrade of the existing building. The building is a two-story structure that has a footprint of approximately 5,200 square feet. We understand that existing column loads are 32 kips and that gravity loads will not increase. We have assumed that seismic loads will be on the order of 40 kips.

Acronyms and abbreviations used herein are defined above, immediately following the Table of Contents.

2.0 PURPOSE AND SCOPE OF SERVICES

The purpose of our services was to evaluate subsurface conditions and provide geotechnical engineering recommendations for the proposed improvements. Specifically, we performed the following scope of services:

- Reviewed readily available, published geologic data and our in-house files for existing information on subsurface conditions in the site vicinity.
- Coordinated and managed a field investigation, including locating utilities, coordinating with existing tenants, and scheduling subcontractors.
- Completed a subsurface exploration program consisting of two borings drilled to a depth of 41.5 feet BGS.
- Maintained continuous logs of the explorations and collected samples at representative intervals.
- Completed a laboratory testing program consisting of the following tests:
  - Nine moisture content determinations in general accordance with ASTM D2216
  - Three particle-size analyses in general accordance with ASTM D1140
  - One Atterberg limits test in general accordance with ASTM D4318
- Provided recommendations for site preparation and grading, including demolition, temporary and permanent slopes, fill placement criteria, suitability of on-site soil for fill, subgrade preparation, and recommendations for wet weather construction.
- Provided recommendations for excavation and excavation support.
- Evaluated groundwater conditions at the site and provided general recommendations for dewatering during construction and subsurface drainage.
- Provided recommendations for retrofitting the existing foundations for seismic loading, including helical anchors and micropiles for underpinning the foundations and enlarged bearing surfaces for existing shallow foundations
- Evaluated allowable seismic bearing pressures for footings.
- Provided recommendations for use in design of conventional retaining walls, including backfill and drainage requirements, static and dynamic lateral earth pressures, passive pressures, and friction coefficients.
• Provided seismic design recommendations in accordance with the procedures outlined in ASCE 41-13.
• Completed a site-specific seismic evaluation in accordance with the 2014 SOSSC.
• Prepared this geotechnical engineering report that presents our findings, conclusions, and recommendations.

3.0 SITE CONDITIONS

3.1 GEOLOGY
The site is located on the northern margin of the Central Willamette Valley physiographic province. Tertiary marine sedimentary and volcanic bedrock units form the western and eastern margins, respectively, of a depositional basin. The geologic profile is mapped as Miocene (14.5 million years before present) to recent Valley unconsolidated sediments (Burns et al., 1997). The geologic unit is a compilation of generally unconsolidated modern stream deposits, fine-grained catastrophic flood deposits, and Miocene to Pleistocene Age fluvial and lacustrine sediments. The flood deposits in the site vicinity generally consist of a thin cover of fine sand and silt overlying reworked gravel and cobbles from flood waters entering the Central Willamette Valley from the Tualatin and Portland basins located to the north. The flood deposits range in thickness from less than 20 feet to 50 feet (Gannett and Caldwell, 1998; Schlicker and Finlayson, 1979).

The flood deposits overlie fluvial and lacustrine sediments that consist of poorly to well-cemented conglomerate, sandstone, siltstone, and claystone equivalent to the Troutdale Formation and Sandy River Mudstone described in the Portland Basin located to the north of the site (Gannett and Caldwell, 1998; Burns et al., 1997; Schlicker and Finlayson, 1979; Hart and Newcomb, 1965). The fluvial and lacustrine sediments range in thickness from 285 to 315 feet in the site vicinity.

The bedrock unit that forms the bottom of the basin and underlies the Valley unconsolidated sediments is the CRBG. The CRBG is middle Miocene (16.5 million to 15 million years before present) in age and consists of a series of basalt flows that originated from southeastern Washington and northeastern Oregon. The CRBG is considered the geologic basement unit for this report (Gannett and Caldwell, 1998; Burns et al., 1997; Schlicker and Finlayson, 1979; Hart and Newcomb, 1965).

According to the Natural Resources Conservation Service’s web soil survey, the near-surface soil in the existing and proposed channel areas is Woodburn silt loam. The soil’s parent material consists of stratified glaciolacustrine deposits and is described as moderately well-drained. The typical soil profile of the Woodburn silt loam consists of silt loam to silty clay loam from the ground surface to 5 feet BGS.

3.2 SURFACE CONDITIONS
The site is bound by Town Center Loop East to the west, SW Wilsonville Road to the south, and municipal office buildings to the north and east. The site is currently occupied by a two-story building with AC parking lots to the north and south. The ground surface at the site generally
grades downward from an approximate elevation of 180 feet in the northern portion of the site to an approximate elevation of 170 feet in the southern portion of the site.

3.3 **SUBSURFACE CONDITIONS**

Our subsurface explorations consisted of drilling two borings (B-1 and B-2) to a depth of 41.5 feet BGS. The approximate locations of our explorations are shown on Figure 2. A description of our field exploration and laboratory testing programs, explorations logs, and results of laboratory testing are presented in Appendix A.

The borings were drilled in the paved parking areas and encountered approximately 2 inches of AC over approximately 4 to 6 inches of aggregate base at the surface. Our explorations generally encountered undocumented fill over native silt, sand, and clay to the maximum depth explored. The following sections summarize each of the subsurface units encountered in the explorations.

3.3.1 **Undocumented Fill**

Undocumented fill was encountered under the pavement section in boring B-1 and extends to an approximate depth of 7 feet BGS. The undocumented fill consists of silt with sand and trace gravel and organics. SPT results indicate that the undocumented fill is medium stiff to stiff in consistency. Laboratory testing indicates that the moisture content of the undocumented fill was 29 percent at the time of our explorations.

3.3.2 **Upper Silt**

Native silt with varying sand content underlies the undocumented fill in boring B-1 and the pavement section in boring B-2 and extends to depths between approximately 22.5 and 36 feet BGS. SPT results indicate that the silt is medium stiff to stiff in consistency. Laboratory testing indicates that the silt is non-plastic and that the moisture content of the silt was approximately 27 to 38 percent at the time of our explorations.

3.3.3 **Silty Sand**

Silty sand underlies the upper silt layer in boring B-2 and extends to an approximate depth of 28 feet BGS. SPT results indicate that the silty sand is medium dense in consistency.

3.3.4 **Clay with Gravel**

Clay with gravel underlies the upper silt in boring B-1 and the silty sand in boring B-2 and extends to an approximate depth of 35 feet BGS in boring B-2 and to the maximum explored depth of 41.5 feet BGS in boring B-1. SPT results indicate that the clay is very stiff in consistency. Laboratory testing indicates that the moisture content of the clay was approximately 22 percent at the time of our explorations.

3.3.5 **Lower Silt**

Silt with varying sand content underlies the clay in boring B-2 and extends to the maximum explored depth of 41.5 feet BGS. SPT results indicate that the silt is stiff to very stiff in consistency.
3.3.6 Groundwater
Groundwater was not encountered in the borings during our explorations. Perched groundwater zones are likely to develop in the upper soil at the site, particularly during extended periods of wet weather. The depth to groundwater may fluctuate in response to prolonged rainfall, seasonal changes, changes in surface topography, and other factors not observed during this study.

4.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the results of our subsurface explorations and engineering analyses, it is our opinion that the site can be developed as proposed. We anticipate that the following factors will influence the design and construction of the proposed development:

- The proposed new footings can be supported on shallow foundations bearing on firm native soil or on structural fill over firm native soil.
- The on-site soil is suitable for use as structural fill, provided it is properly moisture conditioned.
- The soil at the site will likely be sensitive to small changes in moisture content and difficult, if not impossible, to adequately compact during wet weather or when the moisture content of the soil is more than a few percent above the optimum required for compaction.
- The base of the excavation is above the regional groundwater table. We do not anticipate extensive construction dewatering.

5.0 SITE DEVELOPMENT RECOMMENDATIONS

5.1 SITE PREPARATION

5.1.1 Demolition
Demolition includes the complete removal of the existing structures, concrete footings, pavement, utilities, and various other former site improvements that may be encountered during construction. We recommend that all abandoned underground vaults, USTs, septic tanks, manholes, utility lines, foundation elements, and other subsurface structures that are beneath new structural components be entirely removed.

Voids resulting from the removal of improvements should be backfilled with compacted structural fill, as discussed in the “Structural Fill” section. Utility lines abandoned under new structural components should be completely removed and backfilled with structural fill. Firm subgrade should be exposed at the bottom of the excavations before backfilling, and the sides of the temporary excavations should be sloped at a minimum of 1.5H:1V.

Demolished material should be transported off site for disposal. Soft soil encountered during site preparation should be replaced with structural fill.

5.1.2 Undocumented Fill
Undocumented fill was observed at the site in boring B-1. It is possible that additional undocumented fill is present at other locations. Any undocumented fill that is encountered
should be removed from the influence zone of new building foundations. Undocumented fill should be evaluated during construction where it exists beneath existing foundations, pavements, and floor slabs.

The exposed subgrade should be closely evaluated by a geotechnical engineer during the construction process. Soil processing, including moisture conditioning and the removal of roots, cobbles, and other deleterious material from the soil, may be required to use the excavated material as structural fill. Compaction should be performed as described in the “Structural Fill” section.

5.1.3 Wet Weather/Wet Soil Grading

The soil present at this site can easily be disturbed. If not carefully executed, site preparation, utility trench work, and excavations can create extensive soft areas and significant repair costs can result. Earthwork planning, regardless of the time of year, should include considerations for minimizing subgrade disturbance. Trafficability of the soil may be difficult during or after extended wet periods or when the moisture content of the surface soil is more than a few percentage points above optimum. Wet subgrade should be assumed to be present under existing building slabs and pavements regardless of the time of year. When wet, the surficial soil is easily disturbed and may provide inadequate support for construction equipment. If construction occurs during the wet season or wet subgrade is present, site preparation activities may need to be accomplished using track-mounted equipment, loading removed material into trucks supported on granular haul roads, or working progressively across the site over unexposed surfaces. A qualified geotechnical engineer should evaluate the subgrade by probing with a steel rod rather than by proof rolling. Wet soil that has been disturbed during site preparation activities or soft or loose zones identified during probing should be removed and replaced with structural fill.

The base rock thickness for building slab areas is intended to support post-construction design loads. This design base rock thickness may not support construction traffic construction when the subgrade soil is wet. Accordingly, if construction is planned for periods when the subgrade soil is wet, staging and haul roads with increased thicknesses of base rock will be required. The amount of staging and haul road areas, as well as the required thickness of granular material, will vary with the contractor’s sequencing of the project and the type/frequency of construction equipment. Based on our experience, between 8 and 12 inches of granular material is generally required in staging areas and between 12 and 18 inches in haul road areas. The actual thickness will depend on the contractor’s means and methods and, accordingly, should be the contractor’s responsibility.

The granular material should meet the requirements for imported granular material or stabilization material, as described in the “Structural Fill” section. We recommend that a geotextile be placed as a barrier between the subgrade and imported granular material in areas of repeated construction traffic. The geotextile should have a minimum Mullen burst strength of 250 psi for puncture resistance and an AOS between U.S. Standard No. 70 and No. 100 sieves.
5.2 EXCAVATION
Shallow soil at the site consists of fine-grained native and fill soil, and excavations should be achievable with conventional excavation equipment. Shoring will be required for excavations deeper than 4 feet. A wide variety of shoring and dewatering systems are available. Consequently, we recommend that the contractor be responsible for selecting the appropriate shoring and dewatering systems.

If box shoring is used, it should be understood that box shoring is a safety feature used to protect workers and does not prevent caving. If the excavations are left open for extended periods of time, caving of the sidewalls may occur. The presence of caved material will limit the ability to properly backfill and compact the trenches. The contractor should be prepared to fill voids between the box shoring and the sidewalls of the trenches with sand or gravel before caving occurs.

If shoring is used, we recommend that the type and design of the shoring system be the responsibility of the contractor, who is in the best position to choose a system that fits the overall plan of operation.

All excavations should be made in accordance with applicable OSHA requirements and regulations of the state, county, and local jurisdiction. While this report describes certain approaches to excavation and dewatering, the contract documents should specify that the contractor is responsible for selecting excavation and dewatering methods, monitoring the excavations for safety, and providing shoring (as required) to protect personnel and adjacent structural elements.

Groundwater was not encountered in the borings during the our explorations. However, dewatering might be required to control perched groundwater conditions. We anticipate that perched groundwater, if encountered, will diminish over time and can be addressed using sumps and pumps internal to the excavation.

5.3 PERMANENT SLOPES
While not anticipated for the project, permanent cut or fill slopes should not exceed a gradient of 2H:1V, unless specifically evaluated for stability. Upslope buildings, access roads, and pavements should be set back a minimum of 5 feet from the crest of such slopes. Slopes should be planted with appropriate vegetation to provide protection against erosion as soon as possible after grading. Surface water runoff should be collected and directed away from slopes to prevent water from running down the face of the slope.

5.4 STRUCTURAL FILL
Structural fill includes fill beneath foundations, slabs, pavements, other areas intended to support structures, or within the influence zones of structures. Fill should only be placed over a subgrade that has been prepared in conformance with the “Site Preparation” section. All material used as structural fill should be free of organic matter or other unsuitable material. Structural fill should have a maximum particle size of 3 inches. A brief characterization of some of the acceptable materials and our recommendations for their use as structural fill is provided below.
5.4.1 Native Soil
The native on-site soil is suitable for use as general structural fill, provided it is properly moisture conditioned; free of debris, organic material, and particles over 3 inches in diameter. We anticipate that some moisture conditioning may be required to dry the soil to a moisture content near optimum. This will require an extended period of dry weather, typically experienced between early July and mid-October. It will be difficult, if not impossible, to adequately compact on-site soil during the rainy season or during prolonged periods of rainfall.

When used as structural fill, the on-site soil should be placed in lifts with a maximum uncompacted thickness of 6 to 8 inches and compacted to not less than 92 percent of the maximum dry density for fine-grained soil and 95 percent of the maximum dry density for granular soil, as determined by ASTM D1557.

5.4.2 Imported Granular Material
Imported granular material used for structural fill should be pit- or quarry-run rock, crushed rock, or crushed gravel and sand. Imported granular material should be fairly well-graded between coarse and fine material, should have less than 5 percent by dry weight passing the U.S. Standard No. 200 sieve, and should have at least two mechanically fractured faces.

When used as structural fill, imported granular material should be placed in lifts with a maximum uncompacted thickness of 8 to 12 inches and compacted to not less than 95 percent of the maximum dry density, as determined by ASTM D1557. During the wet season or when wet subgrade conditions exists, the initial lift should be approximately 18 inches in uncompacted thickness and should be compacted by rolling with a smooth-drum roller without using vibratory action.

5.4.3 Aggregate Base Rock
Imported granular material used as base rock for building floor slabs should consist of ¾- or 1½-inch-minus material and should have less than 5 percent by dry weight passing the U.S. Standard No. 200 sieve. The material should consist of clean, crushed rock or crushed gravel and sand that is fairly well graded between coarse and fine and should have at least two mechanically fractured faces.

The aggregate base rock material should be placed in lifts with a maximum uncompacted thickness of 8 to 12 inches and compacted to not less than 95 percent of the maximum dry density, as determined by ASTM D1557.

5.4.4 Trench Backfill
Trench backfill for the utility pipe base and pipe zone should consist of crushed, well-graded, granular material with a maximum particle size of 1 inch and less than 5 percent by dry weight passing the U.S. Standard No. 200 sieve. The material should be free of roots, organic matter, and other unsuitable material. Backfill for the pipe base and pipe zone should be compacted to at least 90 percent of the maximum dry density, as determined by ASTM D1557, or as recommended by the pipe manufacturer.
Within building, pavement, and other structural areas, trench backfill placed above the pipe zone should consist of imported granular material as specified above. The backfill should be compacted to at least 92 percent of the maximum dry density, as determined by ASTM D1557, at depths greater than 2 feet below the finished subgrade and 95 percent of the maximum dry density, as determined by ASTM D1557, within 2 feet of finished subgrade. In all other areas, trench backfill above the pipe zone should be compacted to at least 92 percent of the maximum dry density, as determined by ASTM D1557.

5.4.5 Stabilization Material
Stabilization material used in staging areas, or as trench stabilization material, should consist of 4- or 6-inch-minus pit- or quarry-run rock, crushed rock, or crushed gravel and sand. The material should have a maximum particle size of 6 inches, should have less than 5 percent by dry weight passing the U.S. Standard No. 4 sieve, and should have at least two mechanically fractured faces. The material should be free of organic matter and other deleterious material. Stabilization material should be placed in lifts between 12 and 24 inches thick and compacted to a well-keyed, firm condition.

5.4.6 Drain Rock
Drain rock should consist of angular, granular material with a maximum particle size of 2 inches and should meet the specifications provided in OSSC 00430.11 (Granular Drain Backfill Material). The material should be free of roots, organic matter, and other unsuitable material; should have less than 2 percent by dry weight passing the U.S. Standard No. 200 sieve (washed analysis); and should have at least two mechanically fractured faces. Drain rock should be placed in lifts with a maximum uncompacted thickness of 8 to 12 inches and compacted to a well-keyed, firm condition.

6.0 DESIGN RECOMMENDATIONS

6.1 SHALLOW FOUNDATIONS
6.1.1 Bearing Capacity
Footings established on firm, undisturbed native soil or structural fill over firm, undisturbed native silt and sand soil should be evaluated using an allowable bearing pressure of 3,000 psf. This bearing pressure is a net bearing pressures and applies to the total of dead and long-term live loads and may be doubled when considering seismic or wind loads. The weight of the footing and any overlying backfill can be ignored in calculating footing loads. The allowable bearing pressure includes a factor of safety of 3; accordingly, an ultimate bearing capacity of 9,000 psf can be used for footings on native silt.

Any new foundations should not be established on undocumented fill that may be encountered in portions of the site. Removed material should be replaced with structural fill as described in the "Structural Fill" section. Based on our review of the explorations, fine-grained native silt will be present at the base of new or enlarged footings in many locations. Accordingly, we recommend a minimum of 3 inches of gravel be placed in the base of all new or enlarged footings after evaluation of the subgrade by GeoDesign and prior to forming and rebar placement regardless of the time of year construction occurs.
6.1.2 Settlement
Since static loads are not expected to increase, long-term settlement is not expected. Seismic loads are short-term loads and are not expected to cause consolidation settlement.

6.1.3 Resistance to Sliding
Lateral loads can be resisted by passive earth pressure on the sides of footings and by friction on the base of footings. We recommend that a friction coefficient of 0.30 be used to compute the frictional resistance for footings bearing on native silt soil and 0.40 for footings in contact with granular pads.

An ultimate equivalent fluid unit weight of 350 pcf is recommended to compute passive earth pressure acting on footings constructed in direct contact with compacted structural fill or native soil. This value is based on the assumptions that the adjacent confining structural fill or native soil is level and that groundwater remains below the base of the footing. The top 1 foot of soil should be neglected when calculating lateral earth pressures unless the foundation area is covered with pavement or is inside a building.

6.1.4 Subgrade Evaluation
All footing subgrades should be evaluated by a member of our geotechnical staff to evaluate bearing conditions. Observations should also evaluate whether all loose or soft material, organics, unsuitable fill, prior topsoil zones, and softened subgrades (if present) have been removed. Localized deepening of footing excavations may be required to penetrate debris, fill, or deleterious material.

6.2 MICROPILE AND ANCHOR RECOMMENDATIONS
Micropiles or anchors may be used to resist uplift or overturning. These elements will achieve the majority of their capacity through skin friction in the underlying medium stiff to very stiff silt and clay. Various types of anchors are available. Depending on the construction technique and anchor type, we anticipate that an allowable skin friction of 1 to 4 kips per square foot is achievable in the native silt and clay. This does not include a factor of safety. A factor of safety of 2 is typical for compressive loads and 1.5 is typical for short-term tensile loads if the anchors or micropiles are load tested to confirm their capacity.

Design and construction of anchor systems are typically completed by specialty contractors who are responsible for selection of the appropriate depth, bond length, and grouting methods based on the loads provided by the structural engineer. Due to variable construction techniques and anchor types, we recommend the contractor be responsible for selecting the length and appropriate design skin friction.

We recommend that all anchors be tested in accordance with Recommendations for Prestressed Rock and Soil Anchors (Post-Tensioning Institute, 2014).

6.3 FLOOR SLABS
Satisfactory subgrade support for building floor slabs supporting floor loads of up to 150 psf can be obtained provided the subgrade is prepared in accordance with the “Site Preparation” section. A minimum 6-inch-thick layer of crushed rock (imported granular material) should be placed and
compacted over the prepared subgrade to provide a firm surface and to assist as a capillary break. The imported granular material should be crushed rock or crushed gravel and sand meeting the requirements outlined in the “Structural Fill” section. The imported granular material should be placed in one lift and compacted to not less than 95 percent of the maximum dry density, as determined by ASTM D1557. Floor slab base rock contaminated with excessive fines (greater than 5 percent by dry weight passing the U.S. Standard No. 200 sieve) should be replaced.

A subgrade modulus of 100 pci may be used to design the floor slab constructed on subgrade prepared as recommended in the “Site Preparation” section. Settlement of floor slabs supporting the anticipated design loads and constructed as recommended is not expected to exceed approximately ½ inch.

Vapor barriers are often required by flooring manufacturers to protect flooring and flooring adhesives. Many flooring manufacturers will warrant their product only if a vapor barrier is installed according to their recommendations. Selection and design of an appropriate vapor barrier (if needed) should be based on discussions among members of the design team. We can provide additional information to assist you with your decision.

6.4 PERMANENT RETAINING STRUCTURES

Our retaining wall design recommendations are based on the following assumptions: (1) the walls are conventional, cantilevered retaining walls, (2) the walls are less than 10 feet in height, (3) the retained soil is level, and (4) adequate drainage is provided behind the wall to prevent hydrostatic pressures from developing. Re-evaluation of our recommendations will be required if the retaining wall design criteria for the project varies from these assumptions.

6.4.1 Wall Design Parameters

For unrestrained retaining walls, an active pressure of 35 pcf equivalent fluid pressure should be used for design. For unrestrained retaining walls, a superimposed seismic lateral force should be calculated based on a dynamic force of $6H^2$ pounds per lineal foot of wall (where $H$ is the height of the wall in feet) and applied a distance of 0.6$H$ above the base of the wall. Where retaining walls are restrained from rotation prior to being backfilled, a pressure of 55 pcf equivalent fluid pressure should be used for design. Upon request, we can provide recommendations for seismic lateral forces acting on walls restrained from rotation, which will depend on specific wall types and configurations.

If surcharges (e.g., retained slopes, building foundations, vehicles, steep slopes, terraced walls, etc.) are located within a horizontal distance from the back of a wall equal to twice the height of the wall, additional pressures will need to be accounted for in the wall design. Figure 3 presents additional pressures resulting from some common loading scenarios. Our office should be contacted for additional pressures resulting from alternate loading scenarios.

The base of the wall footing excavations should extend a minimum of 18 inches below lowest adjacent grade. The footing excavations should then be lined with a minimum 6-inch-thick layer of compacted imported granular material, as described in the “Structural Fill” section. At
locations where there is a slope in front of the retaining wall, we recommend that a 3-foot-wide, horizontal bench be placed between the wall and the top of the slope.

Settlement of up to 1 percent of the wall height commonly occurs immediately adjacent to the wall as the wall rotates and develops active lateral earth pressures. Consequently, we recommend that construction of flatwork adjacent to retaining walls be postponed at least four weeks after construction, unless survey data indicates that settlement is complete prior to that time.

The retaining wall footings should also be designed in accordance with the “Shallow Foundations” section.

6.4.2 Wall Drainage and Backfill
The above design parameters have been provided assuming drains will be installed to prevent hydrostatic pressures from developing. If a drainage system is not installed, our office should be contacted for revised design forces.

The backfill material placed behind the walls and extending a horizontal distance of ½H (where H is the height of the retaining wall) should consist of imported granular material as specified in the “Structural Fill” section. The wall backfill should be compacted to a minimum of 95 percent of the maximum dry density, as determined by ASTM D1557. However, backfill located within a horizontal distance of 3 feet from the retaining walls should only be compacted to approximately 92 percent of the maximum dry density, as determined by ASTM D1557. Backfill placed within 3 feet of the wall should be compacted in lifts less than 6 inches thick using hand-operated tamping equipment (such as a jumping jack or vibratory plate compactor). If flatwork (sidewalks or pavements) will be placed atop the wall backfill, we recommend that the upper 2 feet of material be compacted to 95 percent of the maximum dry density, as determined by ASTM D1557.

A minimum 12-inch-wide zone of drain rock, extending from the base of the wall to within 6 inches of finished grade, should be placed against the back of all retaining walls. Geotextile filter fabric should be installed between the drain rock and fill/native soil to prevent the migration of fines into the drain rock. Perforated collector pipes that are 4 to 6 inches in diameter should be embedded at the base of the drain rock. The geotextile should meet the requirements of OSSC 02320.20 (Geotextile Property Values) for drainage. The drain rock should meet the requirements provided in the “Structural Fill” section. The perforated collector pipes should be sloped to drain (minimum slope of 0.5 percent) toward a suitable discharge at an appropriate location away from the base of the wall. The discharge pipe(s) should not be tied directly into stormwater drain systems, unless measures are taken to prevent backflow into the wall’s drainage system.

6.5 DRAINAGE CONSIDERATIONS
We recommend that roof drains be connected to a tightline leading to storm drain facilities. Pavement surfaces and open space areas should be sloped such that surface water runoff is collected and routed to suitable discharge points. We also recommend that ground surfaces adjacent to buildings be sloped to facilitate positive drainage away from the buildings.
6.6 SEISMIC DESIGN CRITERIA

6.6.1 IBC Parameters

We understand that the seismic upgrades will be designed and constructed in accordance with the procedures outlined in ASCE 41-13. Base shear forces can be computed using the parameters provided in Table 1. These parameters were obtained from USGS seismic design maps (USGS, 2014). Based on our calculations, the site class is D.

<table>
<thead>
<tr>
<th>Seismic Hazard Level</th>
<th>( S_s ) (g)</th>
<th>( S_1 ) (g)</th>
<th>( S_{xs} ) (g)</th>
<th>( S_{x1} ) (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BSE-1N</td>
<td>Not applicable</td>
<td>Not applicable</td>
<td>0.696</td>
<td>0.433</td>
</tr>
<tr>
<td>BSE-2N</td>
<td>0.923</td>
<td>0.408</td>
<td>1.044</td>
<td>0.650</td>
</tr>
<tr>
<td>BSE-1E</td>
<td>0.283</td>
<td>0.107</td>
<td>0.446</td>
<td>0.254</td>
</tr>
<tr>
<td>BSE-2E</td>
<td>0.683</td>
<td>0.301</td>
<td>0.856</td>
<td>0.541</td>
</tr>
</tbody>
</table>

GeoDesign also completed a site-specific seismic hazard evaluation based on the 2014 SOSSC. This evaluation is presented in Appendix B.

7.0 OBSERVATION OF CONSTRUCTION

Satisfactory foundation and earthwork performance depends to a large degree on quality of construction. Sufficient observation of the contractor’s activities is a key part of determining that the work is completed in accordance with the construction drawings and specifications. Subsurface conditions observed during construction should be compared with those encountered during the subsurface exploration. Recognition of changed conditions often requires experience; therefore, qualified personnel should visit the site with sufficient frequency to detect if subsurface conditions change significantly from those anticipated.

We recommend that GeoDesign be retained to observe earthwork activities, including footing subgrade preparation, performing laboratory compaction and field moisture-density tests, and observation of subgrade and base rock for floor slabs.

8.0 LIMITATIONS

We have prepared this report for use by the City of Wilsonville and members of the design and construction teams for the proposed project. The data and report may be used for bidding or estimating purposes, but our report, conclusions, and interpretations should not be construed as a warranty of the subsurface conditions.

We have made recommendations based on subsurface explorations completed at the site that indicate the soil conditions at only the specific locations and only to the depths penetrated. These observations do not necessarily reflect soil types, strata thickness, or water level variations that may exist between exploration locations. If subsurface conditions differing from those described are observed during excavation and construction, re-evaluation will be necessary.
When the design has been finalized, we recommend the final design and specifications be reviewed by our firm to see that our recommendations have been interpreted and implemented as intended. If there are changes in the grades, location, configuration, or type of construction for the building, the conclusions and recommendations presented may not be applicable. If design changes are made, we request that we be retained to review our conclusions and recommendations and to provide a written modification or verification.

The scope of our services does not include services related to construction safety precautions, and our recommendations are not intended to direct the contractor's methods, techniques, sequences, or procedures, except as specifically described in our report for consideration in design.

Within the limitations of scope, schedule, and budget, our services have been executed in accordance with the generally accepted practices in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

We appreciate the opportunity to be of service to you. Please call if you have questions concerning this report or if we can provide additional services.

Sincerely,

GeoDesign, Inc.

Gregory J. Schaertl (California)
Project Engineer

Brett A. Shipton, P.E., G.E.
Principal Engineer
REFERENCES

Burns, Scott, Growney, Lawrence, Brodersen, Brett, Yeats, Robert S., Popowski, Thomas A., 1997, Map showing faults, bedrock geology, and sediment thickness of the western half of the Oregon City 1:100,000 quadrangle, Washington, Multnomah, Clackamas, and Marion Counties, Oregon, Oregon Department of Geology and Mineral Industries, IMS-75, scale 1:100,000.


VICINITY MAP
BASED ON AERIAL
PHOTOGRAPH OBTAINED FROM
GOOGLE EARTH PRO®

0
2000
4000

VICINITY MAP

CWILSON-14-01
JUNE 2018
POLICE/PUBLIC WORKS BUILDING
WILSONVILLE, OR

FIGURE 1
SITE PLAN

POLICE/PUBLIC WORKS BUILDING
WILSONVILLE, OR

SITE PLAN BASED ON AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH PRO®, MAY 14, 2018

(SCALE IN FEET)

LEGEND:

--- — SITE BOUNDARY

B-1 — BORING
NOT TO SCALE

NOTES:
1. FIGURE SHOULD BE USED IN CONJUNCTION WITH REPORT TEXT.
2. THESE GUIDELINES APPLY TO RIGID WALLS WITH POISSON'S RATIO ASSUMED TO BE 0.5 FOR BACKFILL MATERIALS.
3. LATERAL PRESSURES FROM ANY COMBINATION OF ABOVE LOADS MAY BE DETERMINED BY THE PRINCIPLE OF SUPERPOSITION.
APPENDIX A

FIELD EXPLORATIONS

GENERAL
Subsurface conditions at the site were explored by drilling two borings (B-1 and B-2) to a depth of 41.5 feet BGS. Drilling services were provided by Western States Soil Conservation, Inc. of Hubbard, Oregon, using mud rotary drilling methods. The exploration logs are presented in this appendix.

The approximate locations of our explorations are shown on Figure 2. The locations of the explorations were determined in the field by pacing from existing site features. This information should be considered accurate only to the degree implied by the methods used.

SOIL SAMPLING
We collected representative samples of the various soils encountered in the explorations for geotechnical laboratory testing. Soil samples were collected from the borings by conducting SPTs in general conformance with ASTM D1586. The sampler was driven with a 140-pound hammer free-falling 30 inches. The hammer was lifted using an automatic-trip hammer. The number of blows required to drive the sampler 1 foot, or as otherwise indicated, into the soil is shown adjacent to the sample symbols on the exploration logs. Disturbed samples were collected from the split barrel for subsequent classification and index testing. Higher quality, relatively undisturbed samples were collected using a standard Shelby tube in general accordance with ASTM D1587, the Standard Practice for Thin-walled Tube Sampling of Soils. Sampling methods and intervals are shown on the exploration logs.

The average efficiency of the automatic SPT hammer used by Western States Soil Conservation, Inc. was 81.4 percent. The calibration testing results are presented at the end of this appendix.

SOIL CLASSIFICATION
The soil samples were classified in accordance with the “Exploration Key” (Table A-1) and “Soil Classification System” (Table A-2), which are presented in this appendix. The exploration logs indicate the depths at which the soils or their characteristics change, although the change actually could be gradual. If the change occurred between sample locations, the depth was interpreted. Classifications are shown on the exploration logs.

LABORATORY TESTING

CLASSIFICATION
The soil samples were classified in the laboratory to confirm field classifications. The laboratory classifications are shown on the exploration logs if those classifications differed from the field classifications.
MOISTURE CONTENT
The natural moisture content of select soil samples was determined in general accordance with ASTM D2216. The natural moisture content is a ratio of the weight of the water to dry soil in a test sample and is expressed as a percentage. The test results are presented in this appendix.

ATTERBERG LIMITS
Atterberg limits testing was performed on a select soil sample in general accordance with ASTM D4318. Atterberg limits include the liquid limit, plastic limit, and the plasticity index of soil. These index properties are used to classify soil and for correlation with other engineering properties of soil. The test results are presented in this appendix.

PARTICLE-SIZE ANALYSIS
Particle-size analysis was performed on select soil samples in general accordance with ASTM D1140. This test is a quantitative determination of the amount of material finer than the U.S. Standard No. 200 sieve expressed as a percentage of soil weight. The test results are presented in this appendix.
<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>SAMPLING DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Symbol]</td>
<td>Location of sample obtained in general accordance with ASTM D 1586 Standard Penetration Test with recovery</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Location of sample obtained using thin-wall Shelby tube or Geoprobe® sampler in general accordance with ASTM D 1587 with recovery</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Location of sample obtained using Dames &amp; Moore sampler and 300-pound hammer or pushed with recovery</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Location of sample obtained using Dames &amp; Moore and 140-pound hammer or pushed with recovery</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Location of sample obtained using 3-inch-O.D. California split-spoon sampler and 140-pound hammer</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Location of grab sample</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Rock coring interval</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Water level during drilling</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Water level taken on date shown</td>
</tr>
</tbody>
</table>

**Graphic Log of Soil and Rock Types**

- **Observed contact between soil or rock units (at depth indicated)**
- **Inferred contact between soil or rock units (at approximate depths indicated)**

### GEOTECHNICAL TESTING EXPLANATIONS

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATT</td>
<td>Atterberg Limits</td>
</tr>
<tr>
<td>CBR</td>
<td>California Bearing Ratio</td>
</tr>
<tr>
<td>CON</td>
<td>Consolidation</td>
</tr>
<tr>
<td>DD</td>
<td>Dry Density</td>
</tr>
<tr>
<td>DS</td>
<td>Direct Shear</td>
</tr>
<tr>
<td>HYD</td>
<td>Hydrometer Gradation</td>
</tr>
<tr>
<td>MC</td>
<td>Moisture Content</td>
</tr>
<tr>
<td>MD</td>
<td>Moisture-Density Relationship</td>
</tr>
<tr>
<td>NP</td>
<td>Nonplastic</td>
</tr>
<tr>
<td>OC</td>
<td>Organic Content</td>
</tr>
<tr>
<td>P</td>
<td>Pushed Sample</td>
</tr>
<tr>
<td>PP</td>
<td>Pocket Penetrometer</td>
</tr>
<tr>
<td>P200</td>
<td>Percent Passing U.S. Standard No. 200 Sieve</td>
</tr>
<tr>
<td>RES</td>
<td>Resilient Modulus</td>
</tr>
<tr>
<td>SIEV</td>
<td>Sieve Gradation</td>
</tr>
<tr>
<td>TOR</td>
<td>Torvane</td>
</tr>
<tr>
<td>UC</td>
<td>Unconfined Compressive Strength</td>
</tr>
<tr>
<td>VS</td>
<td>Vane Shear</td>
</tr>
<tr>
<td>kPa</td>
<td>Kilopascal</td>
</tr>
</tbody>
</table>

### ENVIRONMENTAL TESTING EXPLANATIONS

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA</td>
<td>Sample Submitted for Chemical Analysis</td>
</tr>
<tr>
<td>P</td>
<td>Pushed Sample</td>
</tr>
<tr>
<td>PID</td>
<td>Photoionization Detector Headspace Analysis</td>
</tr>
<tr>
<td>ppm</td>
<td>Parts per Million</td>
</tr>
<tr>
<td>ND</td>
<td>Not Detected</td>
</tr>
<tr>
<td>NS</td>
<td>No Visible Sheen</td>
</tr>
<tr>
<td>SS</td>
<td>Slight Sheen</td>
</tr>
<tr>
<td>MS</td>
<td>Moderate Sheen</td>
</tr>
<tr>
<td>HS</td>
<td>Heavy Sheen</td>
</tr>
</tbody>
</table>
### Relative Density - Coarse-Grained Soil

<table>
<thead>
<tr>
<th>Relative Density</th>
<th>Standard Penetration Resistance</th>
<th>Dames &amp; Moore Sampler (140-pound hammer)</th>
<th>Dames &amp; Moore Sampler (300-pound hammer)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Loose</td>
<td>0 – 4</td>
<td>0 – 11</td>
<td>0 – 4</td>
</tr>
<tr>
<td>Loose</td>
<td>4 – 10</td>
<td>11 – 26</td>
<td>4 – 10</td>
</tr>
<tr>
<td>Medium Dense</td>
<td>10 – 30</td>
<td>26 – 74</td>
<td>10 – 30</td>
</tr>
<tr>
<td>Dense</td>
<td>30 – 50</td>
<td>74 – 120</td>
<td>30 – 47</td>
</tr>
<tr>
<td>Very Dense</td>
<td>More than 50</td>
<td>More than 120</td>
<td>More than 47</td>
</tr>
</tbody>
</table>

### Consistency - Fine-Grained Soil

<table>
<thead>
<tr>
<th>Consistency</th>
<th>Standard Penetration Resistance</th>
<th>Dames &amp; Moore Sampler (140-pound hammer)</th>
<th>Dames &amp; Moore Sampler (300-pound hammer)</th>
<th>Unconfined Compressive Strength (tsf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Soft</td>
<td>Less than 2</td>
<td>Less than 3</td>
<td>Less than 2</td>
<td>Less than 0.25</td>
</tr>
<tr>
<td>Soft</td>
<td>2 – 4</td>
<td>3 – 6</td>
<td>2 – 5</td>
<td>0.25 – 0.5</td>
</tr>
<tr>
<td>Medium Stiff</td>
<td>4 – 8</td>
<td>6 – 12</td>
<td>5 – 9</td>
<td>0.50 – 1.0</td>
</tr>
<tr>
<td>Stiff</td>
<td>8 – 15</td>
<td>12 – 25</td>
<td>9 – 19</td>
<td>1.0 – 2.0</td>
</tr>
<tr>
<td>Very Stiff</td>
<td>15 – 30</td>
<td>25 – 65</td>
<td>19 – 31</td>
<td>2.0 – 4.0</td>
</tr>
<tr>
<td>Hard</td>
<td>More than 30</td>
<td>More than 65</td>
<td>More than 31</td>
<td>More than 4.0</td>
</tr>
</tbody>
</table>

### Primary Soil Divisions

#### Coarse-Grained Soil

- **Gravel**
  - (more than 50% of coarse fraction retained on No. 4 sieve)
  - Clean Gravel (<5% fines)
  - Gravel with fines (≥5% and ≤12% fines)
  - Gravel with fines (>12% fines)
  - GW or GP
  - GW-GM or GP-GM
  - GW-GC or GP-GC
  - GM
  - GC
  - GC-GM

- **Sand**
  - (50% or more of coarse fraction passing No. 4 sieve)
  - Clean Sand (<5% fines)
  - Sand with fines (≥5% and ≤12% fines)
  - Sand with fines (>12% fines)
  - SW or SP
  - SW-SM or SP-SM
  - SW-SC or SP-SC
  - SM
  - SC
  - SC-SM

#### Fine-Grained Soil

- **Silt and Clay**
  - Liquid limit less than 50
  - ML
  - CL
  - CL-ML
  - OL
  - MH
  - CH
  - OH

- **Organic Silt or Organic Clay**
  - PT
  - MH
  - OH

### Moisture Classification

<table>
<thead>
<tr>
<th>Term</th>
<th>Field Test</th>
<th>Silt and Clay In: Fine-Grained Soil</th>
<th>Sand and Gravel In: Coarse-Grained Soil</th>
</tr>
</thead>
<tbody>
<tr>
<td>dry</td>
<td>very low moisture, dry to touch</td>
<td>&lt;5 trace</td>
<td>&lt;5 trace</td>
</tr>
<tr>
<td>moist</td>
<td>damp, without visible moisture</td>
<td>5 – 12 minor</td>
<td>5 – 15 minor</td>
</tr>
<tr>
<td>wet</td>
<td>visible free water, usually saturated</td>
<td>&gt; 12 some</td>
<td>&gt; 30 sandy/gravelly</td>
</tr>
</tbody>
</table>
ASPHALT CONCRETE (2.0 inches).
AGGREGATE BASE (6.0 inches).
Medium stiff, gray SILT with sand (ML), trace gravel and organics (woody debris); moist, medium plasticity - FILL.

stiff, light red-brown, without gravel at 5.0 feet
Stiff, light yellow-brown SILT (ML), trace to minor sand; moist, nonplastic, micaceous.
medium stiff to stiff at 10.0 feet
minor sand at 11.0 feet
Stiff, interbeds of trace to minor sand (1 to 2 inches thick) at 15.0 feet
medium stiff to stiff at 20.0 feet
Stiff, light yellow-brown SILT with sand (ML); moist, sand is fine, micaceous.

BLOW COUNT
MOISTURE CONTENT %
RQD% CORE REC%

INSTALLATION AND COMMENTS


LOGGED BY: J. Hook
COMPLETED: 05/09/18

DRILLED BY: Western States Soil Conservation, Inc.
BORING METHOD: mud rotary (see document text)
BORING BIT DIAMETER: 3 7/8 inches

FIGURE A-1
Surface elevation was not measured at the time of exploration.

(continued from previous page)

light gray-brown at 35.0 feet

Very stiff, light gray-brown with orange mottled CLAY with gravel (CL), minor sand; moist, gravel is subangular to subrounded and partially decomposed (40%).

Exploration completed at a depth of 41.5 feet.

Hammer efficiency factor is 81.4 percent.
ASPHALT CONCRETE (2.0 inches).

AGGREGATE BASE (4.0 inches).

Medium stiff, light yellow-brown SILT (ML), minor to with sand; moist, nonplastic, sand is fine, micaceous.

with sand to sandy at 7.5 feet

interbeds of minor to with sand (1 to 2 inches thick) at 10.0 feet

Stiff, light yellow-brown SILT with sand (ML); moist, sand is fine, micaceous.

Medium dense, light yellow-brown, silty SAND (SM); moist, fine, micaceous.

Very stiff, light gray-brown with orange mottled CLAY with gravel (CL), minor sand, trace silt; moist, gravel is subangular and partially decomposed.
### MATERIAL DESCRIPTION

<table>
<thead>
<tr>
<th>DEPTH FEET</th>
<th>GRAPHIC LOG</th>
<th>MATERIAL DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>30.0</td>
<td></td>
<td>(30%).</td>
</tr>
<tr>
<td>32.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>35.0</td>
<td></td>
<td>Very stiff, light yellow-brown, sandy SILT (ML); moist, sand is fine, micaceous.</td>
</tr>
<tr>
<td>37.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40.0</td>
<td></td>
<td>light gray-brown with orange mottles; coarse at 40.0 feet</td>
</tr>
<tr>
<td>41.0</td>
<td></td>
<td>Stiff, light yellow-brown SILT with sand (ML); moist to wet, sand is fine, micaceous.</td>
</tr>
<tr>
<td>42.5</td>
<td></td>
<td>Exploration completed at a depth of 41.5 feet.</td>
</tr>
<tr>
<td>45.0</td>
<td></td>
<td>Hammer efficiency factor is 81.4 percent.</td>
</tr>
<tr>
<td>47.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>52.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>55.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>57.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Surface elevation was not measured at the time of exploration.*
<table>
<thead>
<tr>
<th>SAMPLE INFORMATION</th>
<th>MOISTURE CONTENT (PERCENT)</th>
<th>DRY DENSITY (PCF)</th>
<th>SIEVE</th>
<th>ATTERBERG LIMITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXPLORATION NUMBER</td>
<td>SAMPLE DEPTH (FEET)</td>
<td>ELEVATION (FEET)</td>
<td>GRAVEL (PERCENT)</td>
<td>SAND (PERCENT)</td>
</tr>
<tr>
<td>B-1</td>
<td>2.5</td>
<td>29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-1</td>
<td>7.5</td>
<td>38</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-1</td>
<td>15.0</td>
<td>31</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-1</td>
<td>25.0</td>
<td>28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-2</td>
<td>2.5</td>
<td>27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-2</td>
<td>5.0</td>
<td>31</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-2</td>
<td>10.0</td>
<td>37</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-2</td>
<td>15.0</td>
<td>27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-2</td>
<td>30.0</td>
<td>22</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Summary of SPT Test Results

Project: WSSC-8-03, Test Date: 5/9/2018
EMX: Maximum Energy

<table>
<thead>
<tr>
<th>Start Depth</th>
<th>Final Depth</th>
<th>N Value</th>
<th>N60 Value</th>
<th>Average EMX ft-lb</th>
<th>Average ETR %</th>
</tr>
</thead>
<tbody>
<tr>
<td>25.00</td>
<td>26.50</td>
<td>12</td>
<td>16</td>
<td>290.01</td>
<td>82.9</td>
</tr>
<tr>
<td>30.00</td>
<td>31.50</td>
<td>16</td>
<td>21</td>
<td>280.85</td>
<td>80.2</td>
</tr>
<tr>
<td>35.00</td>
<td>36.50</td>
<td>26</td>
<td>35</td>
<td>287.04</td>
<td>82.0</td>
</tr>
<tr>
<td>40.00</td>
<td>41.50</td>
<td>29</td>
<td>39</td>
<td>282.85</td>
<td>80.8</td>
</tr>
</tbody>
</table>

Overall Average Values: 284.81, 81.4
Overall Maximum Value: 295.59, 84.5
Overall Minimum Value: 268.85, 76.8

Standard Deviation: 6.09, 1.7
APPENDIX B

SITE-SPECIFIC SEISMIC HAZARD EVALUATION

INTRODUCTION

The information in this appendix summarizes the results of a site-specific seismic hazard evaluation for the planned improvements to the City of Wilsonville’s existing police/public works building located at 30000 Town Center Loop East in Wilsonville, Oregon. The improvements include a seismic upgrade to the existing two-story building.

This seismic hazard evaluation was performed in accordance with the requirements of the 2014 SOSSC and ASCE 7-10.

SITE CONDITIONS

REGIONAL GEOLOGY

A detailed description of the geologic setting is presented in the main report.

SUBSURFACE CONDITIONS

A detailed description of site subsurface conditions is presented in the main report.

SEISMIC SETTING

Earthquake Source Zones

Three scenario earthquakes were considered for this study consistent with the local seismic setting. Two of the possible earthquake sources are associated with the CSZ, and the third event is a shallow, local crustal earthquake that could occur in the North American plate. The three earthquake scenarios are discussed below.

Regional Events

The CSZ is the region where the Juan de Fuca Plate is being subducted beneath the North American Plate. This subduction is occurring in the coastal region between Vancouver Island and northern California. Evidence has accumulated suggesting that this subduction zone has generated eight great earthquakes in the last 4,000 years, with the most recent event occurring approximately 300 years ago (Weaver and Shedlock, 1991). The fault trace is mapped approximately 50 to 120 km off the Oregon Coast. Two types of subduction zone earthquakes are possible and considered in this study:

1. An interface event earthquake on the seismogenic part of the interface between the Juan de Fuca Plate and the North American Plate on the CSZ. This source is reportedly capable of generating earthquakes with a moment magnitude of between 8.5 and 9.0.
2. A deep intraplate earthquake on the seismogenic part of the subducting Juan de Fuca Plate. These events typically occur at depths of between 30 and 60 km. This source is capable of generating an event with a moment magnitude of up to 7.5.
Local Events
A significant earthquake could occur on a local fault near the site within the design life of the facility. Such an event would cause ground shaking at the site that could be more intense than the CSZ events, though the duration would be shorter. Figure B-1 shows the locations of faults with potential Quaternary movement within a 20-mile radius of the site (USGS, 2006). Figure B-2 shows the interpreted locations of seismic events that occurred between 1898 and 2017 (NCEDC, 2016; PNSN, 2017). The most significant faults in the site vicinity are the Canby-Molalla fault, the Newberg fault, the Oatfield fault, and the Portland Hills fault. A discussion of these faults is provided below.

**Canby-Molalla Fault**
The mapped trace of the north-northwest-striking Canby-Molalla fault is based on a linear series of northeast-trending discontinuous aeromagnetic anomalies that probably represent significant offset of Eocene basement and volcanic rocks of the Miocene Columbia River Basalt beneath Neogene sediments that fill the northern Willamette River Basin. The fault has little geomorphic expression across the gently sloping floor of the Willamette Valley, but a small, laterally restricted berm associated with the fault may suggest young deformation. Deformation of probable Missoula flood deposits in a high-resolution seismic reflection survey conducted across the aeromagnetic anomaly east of Canby suggests possible Holocene deformation. Sense of displacement of the Canby-Molalla fault is poorly known, but the fault shows apparent right-lateral separation of several transverse magnetic anomalies, and down-west vertical displacement is also apparent in water well logs (Personius, 2002a).

**Newberg Fault**
The Newberg fault is part of the Gales Creek-Mount Angel structural zone, a northwest-striking zone of dextral-reverse faults that has been active at least since the Miocene when they controlled the emplacement of Miocene CRBG lava flows in the northern Willamette Valley. The fault primarily is mapped in the subsurface on the basis of water well, aeromagnetic, and gravity data. Unequivocal evidence of displacement in Quaternary deposits has not been described, but most of the fault trace is covered by a thick sequence of silty sediment deposited by the Missoula Floods that may have buried evidence of pre-latest Quaternary displacement (Personius, 2002b).

**Oatfield Fault**
The northwest-striking Oatfield fault forms northeast-facing escarpments in volcanic rocks of the Miocene Columbia River Basalt Group in the Tualatin Mountains and northern Willamette Valley. The fault may be part of the Portland Hills-Clackamas River structural zone. The Oatfield fault is primarily mapped as a very high-angle, reverse fault with apparent down-to-the-southwest displacement, but a few kilometer-long reach of the fault with down-to-the-northeast displacement is mapped in the vicinity of the Willamette River. This apparent change in displacement direction along strike may reflect a discontinuity in the fault trace or could reflect the right-lateral, strike-slip displacement that characterizes other parts of the Portland Hills-Clackamas River structural zone. The fault has also been modeled as a 70-degree, east-dipping reverse fault. Reverse displacement with a right-lateral, strike-slip component is consistent with the tectonic setting, mapped geologic relations, and microseismicity in the area. Fault scarps on
surficial deposits have not been described, but exposures in a light rail tunnel showing offset of approximately 1 M, Boring Lava across the fault indicate Quaternary displacement (Personius, 2002c).

**Portland Hills Fault**
The northwest-striking Portland Hills fault forms the prominent linear northeastern margin of the Tualatin Mountains (Portland Hills) and the southwestern margin of the Portland Basin; this basin may be a right-lateral pull-apart basin in the forearc of the CSZ or a piggyback synclinal basin formed between antiformal uplifts of the Portland fold belt. The fault is part of the Portland Hills-Clackamas River structural zone, which controlled the deposition of Miocene CRBG lavas in the region. The crest of the Portland Hills is defined by the northwest-striking Portland Hills anticline. Sense of displacement on the Portland Hills fault is poorly known and controversial. The fault was originally mapped as a down-to-the-northeast normal fault. The fault has also been mapped as part of a regional-scale zone of right-lateral oblique slip faults and as a steep escarpment caused by asymmetrical folding above a southwest-dipping blind thrust. Reverse displacement with a right-lateral strike-slip component may be most consistent with the tectonic setting, mapped geologic relations, aeromagnetic data, and microseismicity in the area. Fault scarps on surficial Quaternary deposits have been described along the fault trace, but some geomorphic (steep, linear escarpment, triangular facets, over-steepened and knick-pointed tributaries) and geophysical (aeromagnetic, seismic reflection, and ground-penetrating radar) evidence suggest Quaternary displacement. (Personius, 2017).

**Table B-1. Significant Crustal Faults**

<table>
<thead>
<tr>
<th>Source</th>
<th>Closest Mapped Distance</th>
<th>Mapped Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canby-Molalla Fault</td>
<td>6.1</td>
<td>50</td>
</tr>
<tr>
<td>Newburg Fault</td>
<td>15.6</td>
<td>5</td>
</tr>
<tr>
<td>Oatfield Fault</td>
<td>16.0</td>
<td>29</td>
</tr>
<tr>
<td>Portland Hills Fault</td>
<td>17.5</td>
<td>49</td>
</tr>
</tbody>
</table>

1. Reported by USGS (USGS, 2014)

**SEISMIC RESPONSE ANALYSIS**

**TARGET BEDROCK SPECTRUM**
In order to complete a site response analysis, a target bedrock spectrum is required. The target bedrock spectrum was taken as the spectrum corresponding to a shear wave velocity of approximately 2,500 fps (Site Class B).

The target bedrock spectrum was determined using Next Generation Attenuation West 2 (NGA-West2) coded in the EZ-FRISK 8.0 software application. The values represent the average horizontal component considering 5 percent damping. The relationships, excluding Idriss (2014), include basin amplification components to model basins, such as the relatively shallow
Portland Basin. The attenuation relationships and weighting used in analysis is presented in Table B-2. In our opinion, the use of five attenuation relationships addresses epistemic uncertainty at the site.

Table B-2. Attenuation Relationships Weights for Seismic Sources

<table>
<thead>
<tr>
<th>Faulting Type</th>
<th>Ground Motion Prediction Equation</th>
<th>2014 USGS Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shallow Faults and Shallow Crustal Background Seismicity</td>
<td>Abrahamson et al. (2014)</td>
<td>0.22</td>
</tr>
<tr>
<td></td>
<td>Boore et al. (2014)</td>
<td>0.22</td>
</tr>
<tr>
<td></td>
<td>Campbell and Bozorgnia (2014)</td>
<td>0.22</td>
</tr>
<tr>
<td></td>
<td>Chiou and Youngs (2014)</td>
<td>0.22</td>
</tr>
<tr>
<td></td>
<td>Idriss (2014)</td>
<td>0.12</td>
</tr>
<tr>
<td>Subduction (CSZ)</td>
<td>Zhao et al. (2006)</td>
<td>0.3</td>
</tr>
<tr>
<td></td>
<td>BC Hydro (Abrahamson et al., 2016)</td>
<td>0.3</td>
</tr>
<tr>
<td></td>
<td>Atkinson-Macias (2009)</td>
<td>0.1</td>
</tr>
<tr>
<td></td>
<td>Atkinson and Boore (2003) Global Model</td>
<td>0.3</td>
</tr>
<tr>
<td>Deep Intraslab</td>
<td>Atkinson and Boore (2003) Cascadia Model</td>
<td>0.1667</td>
</tr>
<tr>
<td></td>
<td>Zhao et al. (2006)</td>
<td>0.33</td>
</tr>
<tr>
<td></td>
<td>BC Hydro (Abrahamson et al., 2016)</td>
<td>0.33</td>
</tr>
<tr>
<td></td>
<td>Atkinson and Boore (2003) Global Model</td>
<td>0.1667</td>
</tr>
</tbody>
</table>

The 2014 USGS fault source parameters were used in conjunction with the NGA-West2 attenuation relationships.

GMMs used in the hazard calculation compute the average horizontal component of ground motions. Therefore, scaling factors were applied to adjust the PSHA MCE site response results to the maximum rotated component as described in ASCE 7-10 (C21.2). According to ASCE 7-10 supplement 1, a scale factor of 1.1 should be used for periods of 0.2 second and shorter, a scale factor of 1.3 should be used for periods of 1.0 second, and a scaling factor of 1.5 was used for periods greater than 5 seconds (with averaging in between 0.2 and 1 second and between 1 second and 1.5 seconds).

The results of the PSHA MCE site response were also modified with risk coefficients using Method 2 outlined in ASCE 7-10 Section 21.2.1.2. A risk coefficient of $C_{\text{ns}} = 0.899$ was applied to the spectrum at periods of 0.2 second or less and a risk coefficient of $C_{\text{ns}} = 0.871$ was applied to the spectrum at periods greater than 1 second. Linear interpolation was used to compute risk coefficients between periods of 0.2 and 1 second. The intent of this is to achieve a 1 percent collapse of the structure in a 50-year period.

The target bedrock spectrum used in analysis is presented in Table B-3.
Table B-3. Target Bedrock Spectrum

<table>
<thead>
<tr>
<th>Period (seconds)</th>
<th>MCE Target Bedrock Spectrum (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.01</td>
<td>0.376</td>
</tr>
<tr>
<td>0.02</td>
<td>0.397</td>
</tr>
<tr>
<td>0.03</td>
<td>0.429</td>
</tr>
<tr>
<td>0.05</td>
<td>0.506</td>
</tr>
<tr>
<td>0.075</td>
<td>0.662</td>
</tr>
<tr>
<td>0.1</td>
<td>0.780</td>
</tr>
<tr>
<td>0.15</td>
<td>0.860</td>
</tr>
<tr>
<td>0.2</td>
<td>0.825</td>
</tr>
<tr>
<td>0.25</td>
<td>0.773</td>
</tr>
<tr>
<td>0.3</td>
<td>0.732</td>
</tr>
<tr>
<td>0.4</td>
<td>0.652</td>
</tr>
<tr>
<td>0.5</td>
<td>0.576</td>
</tr>
<tr>
<td>0.75</td>
<td>0.460</td>
</tr>
<tr>
<td>1</td>
<td>0.392</td>
</tr>
<tr>
<td>1.5</td>
<td>0.274</td>
</tr>
<tr>
<td>2</td>
<td>0.218</td>
</tr>
<tr>
<td>3</td>
<td>0.136</td>
</tr>
<tr>
<td>4</td>
<td>0.101</td>
</tr>
<tr>
<td>5</td>
<td>0.077</td>
</tr>
<tr>
<td>7.5</td>
<td>0.046</td>
</tr>
<tr>
<td>10</td>
<td>0.034</td>
</tr>
</tbody>
</table>

**BASE GROUND MOTIONS**

Six recorded base ground motions were selected to represent the local seismic setting. Based on deaggregation at the assumed fundamental period of the building, ground motions are generally controlled by a crustal event (approximately 75 percent of hazard) and the CSZ interface event (approximately 25 percent of hazard). Based on the deaggregation, we selected two time-histories for the CSZ and four time-histories for the crustal event. Table B-4 provides the ground motions selected for this study.
Table B-4. Selected Ground Motions

<table>
<thead>
<tr>
<th>Ground Motion/Year/Recording Station</th>
<th>Magnitude</th>
<th>Distance (km)</th>
<th>Component</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Crustal Records</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>San Fernando/1971/LA – Hollywood Stor FF</td>
<td>6.6</td>
<td>22.8</td>
<td>090</td>
</tr>
<tr>
<td>Imperial Valley-06/1979/El Centro Array #3</td>
<td>6.5</td>
<td>12.9</td>
<td>140</td>
</tr>
<tr>
<td>Superstition Hills-02/2008/Westmorland Fire Station</td>
<td>6.5</td>
<td>13.0</td>
<td>90</td>
</tr>
<tr>
<td>Darfield New Zealand/2010/Christchurch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cashmere High School</td>
<td>7.0</td>
<td>17.6</td>
<td>10E</td>
</tr>
<tr>
<td><strong>Subduction Zone Records</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maule 2010/Colegio Las Americas Tohoku</td>
<td>8.8</td>
<td>81.9</td>
<td>NS</td>
</tr>
<tr>
<td>Tohoku 2011/Tsukuba City Hall</td>
<td>9.0</td>
<td>106.9</td>
<td>004</td>
</tr>
</tbody>
</table>

**SITE CONDITION MODELING**

We determined acceleration response spectra for the postulated scenarios discussed above by performing a site-specific seismic response analysis. An equivalent linear seismic response analysis as described in ASCE 7-10 Section 21.1.2. The site response analysis was performed using the SHAKE 91+ module of the EZ-FRISK 8.0 software package.

**Soil Model**

The input soil model used in our analysis is based on the findings of the subsurface exploration program. A detailed description of site subsurface conditions is provided in the main report. Table B-5 provides a summary of the soil model used in our analysis. The acceleration response spectra produced by our equivalent linear seismic response analysis is presented on Figure B-3.
## Table B-5. Input Soil Profile

<table>
<thead>
<tr>
<th>Depth Interval (feet)</th>
<th>Subsurface Unit</th>
<th>Shear Wave Velocity (fps)</th>
<th>Modulus Reduction Curve</th>
<th>Damping Curve</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 30</td>
<td>Silt</td>
<td>600-800</td>
<td>Various (Vucetic and Dobry, 1991)</td>
<td>Various (Vucetic and Dobry, 1991)</td>
</tr>
<tr>
<td>30 to 35</td>
<td>Sand</td>
<td>500</td>
<td>Darendeli 2004</td>
<td>Darendeli 2004</td>
</tr>
<tr>
<td>35 to 45</td>
<td>Clay</td>
<td>1,000</td>
<td>Sun et al. 1988</td>
<td>Various (Vucetic and Dobry, 1991)</td>
</tr>
<tr>
<td>45 to 50</td>
<td>Silt</td>
<td>1,000</td>
<td>Various (Vucetic and Dobry, 1991)</td>
<td>Various (Vucetic and Dobry, 1991)</td>
</tr>
<tr>
<td>50 to 100</td>
<td>Clay</td>
<td>1,000</td>
<td>Sun et al. 1988</td>
<td>Various (Vucetic and Dobry, 1991)</td>
</tr>
</tbody>
</table>

1. Ground motions input at the base of this layer

### Deterministic MCE <sub>r</sub> Response Spectrum

The deterministic approach considers the maximum ground acceleration that may occur at the site as a result of a characteristic earthquake on all known active faults in the region. ASCE 7-10 Section 21.2.2 requires that the spectral response at each period be calculated as an 84<sup>th</sup> percentile 5 percent damped spectral response acceleration in the direction of maximum horizontal response. However, the lower limit is computed in accordance with Figure 21.2-1 in ASCE 7-10 where \( F_a \) and \( F_v \) are determined using Tables 11.4-1 and 11.4-2 in ASCE 7-10. Figure B-4 shows the deterministic lower limit as prescribed by ASCE 7-10 Section 21.2.2.

### Site-Specific MCE <sub>r</sub> Response Spectrum

As outlined in ASCE 7-10 Section 21.2.3, the site-specific MCE <sub>r</sub> shall be taken as the lesser of the probabilistic MCE <sub>r</sub> and the deterministic MCE <sub>r</sub>. Figure B-4 shows the site-specific design response spectrum.

### Design Response Spectrum

ASCE 7-10 Section 21.3 states that the site-specific MCE <sub>r</sub> response spectrum is reduced to two-thirds of the acceleration at any period. However, the lower bound for design ground motions is 80 percent of the generalized response spectrum as outlined in ASCE 7-10 Section 11.4.5.

### Design Acceleration Parameters

To develop the final design response spectrum, the lesser of the values obtained from the probabilistic MCE and the deterministic MCE are taken at each period. The parameter \( S_{ds} \) is taken from the site-specific response spectrum at a period of 0.2 second but shall not be smaller than 90 percent of the peak spectral acceleration taken at any period larger than 0.2 second. The
parameter $S_D$ is taken as the greater of the spectral acceleration at 1 second or two times the acceleration at 2 seconds. Figure B-5 shows the design response spectrum.

GEOLOGIC HAZARDS

In addition to ground shaking, site-specific geologic conditions can influence the potential for earthquake damage. Deep deposits of loose or soft alluvium can amplify ground motions, resulting in increased seismic loads on structures. Other geologic hazards are related to soil failure and permanent ground deformation. Permanent ground deformation could result from liquefaction, lateral spreading, landsliding, and fault rupture. The following sections provide additional discussion regarding potential seismic hazards that could affect the planned development.

SURFACE FAULT RUPTURE
The closest mapped fault is the Canby-Molalla fault zone, which is approximately 6.1 km southwest of the site. Quaternary faults are not mapped directly beneath the site; therefore, it is our opinion that the probability of fault rupture beneath the site is low.

LIQUEFACTION
Liquefaction is caused by a rapid increase in pore water pressure that reduces the effective stress between soil particles to near zero. Granular soil, which relies on interparticle friction for strength, is susceptible to liquefaction until the excess pore pressure can dissipate. In general, loose, saturated sand soil with low silt and clay content is the most susceptible to liquefaction. Soil susceptible to liquefaction was not encountered in the explorations. Consequently, liquefaction is not considered a site hazard.

LATERAL SPREADING
Since liquefaction is not expected, the site is also not susceptible to lateral spreading under design levels of ground shaking.

GROUND MOTION AMPLIFICATION
Soil capable of significantly amplifying ground motions beyond the levels determined by our site-specific seismic response analysis were not encountered during the subsurface exploration program. The main report provides a detailed description of the subsurface conditions encountered. We conclude that the level of amplification determined by our response analysis is appropriate and the building can be designed using the levels of ground shaking prescribed by ASCE 7-10.

LANDSLIDE
Earthquake-induced landsliding generally occurs in steeper slopes comprised of relatively weak soil deposits. The site and surrounding area are relatively flat, and landslides are unlikely during postulated seismic scenarios.
**SETTLEMENT**

Settlement due to earthquakes is most prevalent in relatively deep deposits of dry, clean sand. We do not anticipate that significant settlement in addition to liquefaction-induced settlement will occur during design levels of ground shaking.

**SUBSIDENCE/UPLIFT**

Subduction zone earthquakes can cause vertical tectonic movements. The movements reflect coseismic strain release accumulation associated with interplate coupling in the subduction zone. Based on our review of the literature, the locked zone of the CSZ is located in excess of 60 miles from the site. Consequently, we do not anticipate that subsidence or uplift is a significant design concern.

**LURCHING**

Lurching is a phenomenon generally associated with very high levels of ground shaking, which cause localized failures and distortion of the soil. The anticipated ground accelerations shown on Figure B-3 are below the threshold required to induce lurching of the site soil.

**SEICHE AND TSUNAMI**

The site is inland and elevated away from tsunami inundation zones and away from large bodies of water that may develop seiches. Seiches and tsunamis are not considered a hazard in the site vicinity.

**REFERENCES**


NCEDC (2016), Northern California Earthquake Data Center. UC Berkeley Seismological Laboratory. Dataset. doi:10.7932/NCEDC.


FROM: http://earthquakes.usgs.gov/hazards/qfaults/
HISTORICAL EARTHQUAKES 1898-1969 PROVIDED BY THE ANSS COMPREHENSIVE CATALOG, NCEDC (2016)
ASCE 7-10 Site Class D Response Spectrum

$S_{MS} = 1.044 \, \text{g}, \quad S_{M1} = 0.650 \, \text{g}

ASCE 7-10 Section 11.4.3 (Red Line)

Site-Specific Probabilistic Response Spectrum

$S_{MS} = 0.792 \, \text{g}, \quad S_{M1} = 0.455 \, \text{g}

ASCE 7-10 Section 21.1.1

Average from site response study (Black Line)

USGS Bedrock Spectrum Corrected per ASCE 7-10 Section 21.2 (Blue Line)

NOTES:
1. 5 percent damping
2. Values correspond to $MCF_R$

NOTES:
1. 5 percent damping
2. Values correspond to $MCF_R$
0.8 x Site Class D Response Spectrum
ASCE 7-10 Section 11.4.3 (Purple Line)

NOTES:
1. 5 percent damping
2. Values correspond to 2/3 MCEₚ
3. Design response spectrum is the envelope of the curves presented

Site-Specific Response Spectrum
S₀ₛ = 0.528 g, S₀₁ = 0.303 g
ASCE 7-10 Section 21.2.3 (Blue Line)

Design Response Spectrum
(Dashed Yellow Line)
HAZARDOUS MATERIALS SURVEY
For

Wilsonville Public works & Police
30000 Town Center Loop E
Wilsonville OR 97070

Produced for:
City of Wilsonville
29799 Town Center Loop E
Wilsonville, OR 97070

APEX ENVIRONMENTAL CONSULTING
PO Box 1445
Wilsonville, OR 97070
(503) 682-9737

October 2018
Inspection Summary

SURVEY SCOPE OF WORK

INVESTIGATION SUMMARY

ASBESTOS QUANTITIES  TABLE 1

ASBESTOS SAMPLING INVENTORY  TABLE 2

LEAD CONTAINING PAINT RESULTS

LEAD CONTAINING PAINT SAMPLE INVENTORY  TABLE 3

LABORATORY RESULTS

CERTIFICATIONS
1.0 SCOPE OF WORK

Apex Environmental provided an asbestos survey investigation of the seismic upgrades and renovation of the Wilsonville Public Works and Police building. The purpose of this investigation was to document known and suspect asbestos-containing materials within the subject space that may be impacted by the upcoming renovation of the areas. All materials suspected to be impacted by the renovation were tested for asbestos. Apex has compiled this report to include following the scope of work.

1. Inspect and sample accessible suspect asbestos-containing building materials (ACBM) in accordance with state and federal regulations (OSHA and ASHARA). Limited destructive testing performed.
2. Collect bulk samples of suspect asbestos materials to be analyzed by PLM (Polarized Light Microscopy) by an accredited NVLAP Laboratory.
3. Collect representative samples of paint for lead analysis using Atomic Absorption (AA) methodology.
4. Create a report that outlines the presence, location, quantity, and condition of positive ACBMs and results of lead-based paint utilizing information found within this survey.

CERTIFICATION/LIMITATIONS

Apex Environmental has conducted a physical inspection of the building and compiled this report consistent with the survey scope and certifies that the information is correct and accurate within the standards of professional quality and contractual obligations. Apex has performed this investigation in accordance with state and federal regulations that apply.

The results of this survey do not apply beyond the planned renovation described above and as shown in the drawings submitted to Apex prepared by Oh Planning and Architecture dated September 11, 2018. Materials located in areas not included in this inspection should be considered suspect and tested if impact is anticipated. Should the scope of the renovation change during the course of construction the City of Wilsonville and their representatives should be contacted to determine if materials contain asbestos or are lead-based paint. Building materials should be assumed to contain asbestos unless testing shows otherwise.

Jose Godinez
AHERA Inspector
15876

Tulla Stocker
AHERA Inspector
43633 IR

Jose Godînez
Tulla Stocker

Signature
Signature

Apex Environmental

CLIENT: City of Wilsonville
2.0 INSPECTION SUMMARY

Apex Environmental conducted an Asbestos survey of suspect asbestos-containing materials at the following site:

Seismic Upgrades & Renovation  
Public Works, and Police 1st & 2nd level  
30000 Town Center Loop E, Wilsonville, Oregon

The survey team consisted of Jose Godinez (AHERA Inspector), and Tulla Stocker (AHERA Inspector). All sampling was conducted in accordance with the Oregon Department of Environmental Quality (DEQ) and Occupational Safety and Health Administration (OSHA) testing protocol. The survey characterized the extent of suspect asbestos-containing materials in the building. This survey was performed to document asbestos containing materials within the building to accommodate the upcoming renovation of the subject areas.

Results for samples collected by Apex indicate that there is asbestos in the black window caulking. The tables below summarize the asbestos containing materials in the subject space and the materials that tested positive. Fiberglass insulation was observed above the ceilings, however this material was determined to be non-suspect insulation.

<table>
<thead>
<tr>
<th>Material Description</th>
<th>Location</th>
<th>Approximate Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black Window caulking</td>
<td>Windows throughout</td>
<td>500 Linear Feet</td>
</tr>
</tbody>
</table>
Materials testing negative for asbestos

<table>
<thead>
<tr>
<th>Material Description</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellow mastic under carpet</td>
<td>Underneath the carpet throughout first and second floor</td>
</tr>
<tr>
<td>Blue 12” x 12” VCT and mastic</td>
<td>Break room 2nd floor</td>
</tr>
<tr>
<td>Rubber divider between door</td>
<td>At door entrances throughout first and second floor</td>
</tr>
<tr>
<td>2’x4’ lay in ceiling tiles</td>
<td>Throughout first and second floor ceiling</td>
</tr>
<tr>
<td>Beige 12” x 12” VCT and mastic</td>
<td>Break room 2nd floor/ 1st floor hallway</td>
</tr>
<tr>
<td>Red filling compound between pipe penetrations</td>
<td>Work room 2nd floor</td>
</tr>
<tr>
<td>Gypsum wallboard, joint compound, and plaster</td>
<td>First and second floors</td>
</tr>
<tr>
<td>Gray linoleum and black mastic</td>
<td>Bathrooms and showers on first and second floors</td>
</tr>
<tr>
<td>Yellow mastic behind wall trim</td>
<td>2nd floor restrooms</td>
</tr>
<tr>
<td>Putty on duct seams</td>
<td>Air duct above ceiling first and second floor</td>
</tr>
<tr>
<td>Spray on coating on sink</td>
<td>Break room sink on second floor</td>
</tr>
<tr>
<td>Black &amp; tan Vinyl cove base and white mastic</td>
<td>Throughout first and second floor</td>
</tr>
<tr>
<td>12” x 12” cream VCT and mastic</td>
<td>Work room 2nd floor</td>
</tr>
<tr>
<td>Grout</td>
<td>Men’s and women’s shower 1st floor</td>
</tr>
<tr>
<td>Cinderblock and grout</td>
<td>Work room 1st floor, and exterior</td>
</tr>
<tr>
<td>Stucco</td>
<td>Perimeter exterior walls</td>
</tr>
<tr>
<td>Black tar</td>
<td>Exterior wood stairs/deck</td>
</tr>
<tr>
<td>Built up roofing</td>
<td>North and south ends</td>
</tr>
<tr>
<td>Fiberglass insulation*</td>
<td>Above ceilings</td>
</tr>
</tbody>
</table>

*non suspect
2.1 COLLECTION AND ANALYTICAL METHOD

Samples were collected of accessible suspect asbestos-containing materials. All analytical methods utilized were in accordance with EPA “Interim Method of the Determination of Asbestos in Bulk Insulation Samples.” Bulk samples were delivered to the laboratory of CA Labs, accompanied by proper sample chain-of-custody documentation. CA Labs is accredited and participates in the National Voluntary Laboratory Accreditation Program (NVLAP).

Samples were analyzed by Polarized Light Microscopy (PLM) to a quantitation limit of 1 percent. A homogenous area is considered not to contain asbestos only if the results of all samples collected from the area show asbestos in amounts of less than 1%. The number of samples collected of each homogeneous material was determined using the Occupational Safety and Health Administration (OSHA) requirements.

Asbestos Containing Window caulk

Asbestos containing window caulk was observed in perimeter of the interior window frames on both the first and second floors. If this material is impacted it must be removed by a certified abatement contractor prior to renovation or disturbance and disposed of per DEQ regulations (OAR 340-032-5650) the window caulk appeared to be in good condition at the time of this inspection.

Limitations

No environmental investigation can eliminate all uncertainty. Samples collected for analysis may not be representative of all site conditions. Observations, findings, and conclusions included in this report are based solely on the site conditions at the time of investigation and do not imply a warrantee or guarantee for the site. Nothing in this report constitutes a legal opinion or service and should not be relied on as such.
<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Material Description</th>
<th>Location</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>CW-01</td>
<td>Roofing</td>
<td>North end</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-02</td>
<td>Roofing</td>
<td>South end</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-03</td>
<td>Gypsum wallboard, joint compound, and plaster</td>
<td>Open office U02</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-04</td>
<td>Gypsum wallboard, joint compound, and plaster</td>
<td>Open office U02</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-05</td>
<td>2’ x 4’ drop ceiling tile</td>
<td>Open office U02</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-06</td>
<td>2’ x 4’ drop ceiling tile</td>
<td>Open office U02</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-07</td>
<td>Black vinyl cove base and black mastic</td>
<td>Open office U02</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-08</td>
<td>Black vinyl cove base and black mastic</td>
<td>Open office U02</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-09</td>
<td>Yellow mastic under carpet</td>
<td>Outside break room</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-10</td>
<td>Yellow mastic under carpet</td>
<td>Outside break room</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-11</td>
<td>Black divider between door and clear mastic</td>
<td>Outside break room</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-12</td>
<td>Black divider between door and clear mastic</td>
<td>Outside break room</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-13</td>
<td>Blue 12” x 12” VCT and grey mastic</td>
<td>Break room</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-14</td>
<td>Blue 12” x 12” VCT and grey mastic</td>
<td>Break room</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-15</td>
<td>Beige 12” x 12” VCT and grey mastic</td>
<td>Break room</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-16</td>
<td>Beige 12” x 12” VCT and grey mastic</td>
<td>Break room</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-17</td>
<td>Grey coating under sink</td>
<td>Break room</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-18</td>
<td>Grey coating under sink</td>
<td>Break room</td>
<td>NAD</td>
</tr>
</tbody>
</table>

NAD: No asbestos detected
# Table 2
City of Wilsonville
Public Works Building
Sampling Inventory (continued)

<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Material Description</th>
<th>Location</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>CW-19</td>
<td>Tan cove base with white mastic</td>
<td>Break room</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-20</td>
<td>Tan cove base with white mastic</td>
<td>Break room</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-21</td>
<td>Cream 12” x 12” VCT and grey mastic</td>
<td>Work room</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-22</td>
<td>Cream 12” x 12” VCT and grey mastic</td>
<td>Work room</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-23</td>
<td>Red compound inside pipe</td>
<td>Work room</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-24</td>
<td>Red compound inside pipe</td>
<td>Work room</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-25</td>
<td>Cinderblock and grout</td>
<td>Work room</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-26</td>
<td>Cinderblock and grout</td>
<td>Work room</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-27</td>
<td>Green putty on duct seams</td>
<td>Open office U07 above ceiling</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-28</td>
<td>Green putty on duct seams</td>
<td>Open office U07 above ceiling</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-29</td>
<td>Black Caulk</td>
<td><strong>Interior break room window</strong></td>
<td>5% CH</td>
</tr>
<tr>
<td>CW-30</td>
<td>Black Caulk</td>
<td>Interior break room window</td>
<td>N/A</td>
</tr>
<tr>
<td>CW-31</td>
<td>Black cove base with brown mastic</td>
<td>1st floor storage room</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-32</td>
<td>Black cove base with brown mastic</td>
<td>1st floor storage room</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-33</td>
<td>Beige 12” x 12” VCT with yellow mastic</td>
<td>1st floor hallway</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-34</td>
<td>Beige 12” x 12” VCT with yellow mastic</td>
<td>1st floor hallway</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-35</td>
<td>Gypsum wallboard and joint compound</td>
<td>1st floor hallway</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-36</td>
<td>Gypsum wallboard and joint compound</td>
<td>1st floor hallway</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-37</td>
<td>Grout in shower</td>
<td>Women’s restroom 1st floor</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-38</td>
<td>Grout in shower</td>
<td>Women’s restroom 1st floor</td>
<td>NAD</td>
</tr>
</tbody>
</table>

NAD: No Asbestos Detected
N/A: Not Analyzed Due to Previous Positive
CH: Chrysotile Asbestos
<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Material Description</th>
<th>Location</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>CW-39</td>
<td>Grey linoleum with black and yellow</td>
<td>Men’s restroom 1&lt;sup&gt;st&lt;/sup&gt; floor</td>
<td>NAD</td>
</tr>
<tr>
<td></td>
<td>mastic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CW-40</td>
<td>Grey linoleum with black and yellow</td>
<td>Men’s restroom 1&lt;sup&gt;st&lt;/sup&gt; floor</td>
<td>NAD</td>
</tr>
<tr>
<td></td>
<td>mastic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CW-41</td>
<td>Yellow mastic behind wall trim</td>
<td>Men’s restroom 2&lt;sup&gt;nd&lt;/sup&gt; floor</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-42</td>
<td>Yellow mastic behind wall trim</td>
<td>Men’s restroom 2&lt;sup&gt;nd&lt;/sup&gt; floor</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-43</td>
<td>Exterior cinderblocks and grout</td>
<td>Exterior main entrance</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-44</td>
<td>Exterior cinderblocks and grout</td>
<td>Exterior main entrance</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-45</td>
<td>Stucco</td>
<td>North exterior wall</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-46</td>
<td>Stucco</td>
<td>West exterior wall</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-47</td>
<td>Stucco</td>
<td>East exterior wall</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-48</td>
<td>Stucco</td>
<td>South exterior wall</td>
<td>VOID</td>
</tr>
<tr>
<td>CW-49</td>
<td>Black coating/tar</td>
<td>Exterior ramp/deck</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-50</td>
<td>Black coating/tar</td>
<td>Exterior ramp/deck</td>
<td>NAD</td>
</tr>
</tbody>
</table>

NAD: No asbestos detected
N/A: Not analyzed due previous positive
CH: Chrysotile asbestos
Lead-Containing Paint

No “safe” level of lead in paint has been determined by OR-OSHA or the Center for Disease Control, therefore based upon the sample results all exterior painted surfaces are presumed to contain some level of lead. Sample PWPOP-04 revealed 241.77 parts per million of lead in the paint. All interior samples showed levels less than the analytical methods limit of detection.

The current OR-OSHA Lead in Construction Regulations apply to all construction work where work is performed impacting lead painted surfaces (including manual demolition, scraping, drilling, welding, etc.) where an employee may be exposed. The regulation outlines “trigger” tasks and appropriate personal protective equipment and engineering controls to be utilized when performing these tasks. This standard applies to work involving any amount of lead. Personal exposure assessment must be performed and appropriate personal protective equipment (PPE) worn when impacting these surfaces. PPE may be reduced based upon exposure assessments.

<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Sample Description</th>
<th>Location</th>
<th>Results (parts per million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PWPOP-01</td>
<td>Cream paint on gypsum</td>
<td>Office area</td>
<td>&lt;86.92</td>
</tr>
<tr>
<td>PWPOP-02</td>
<td>Blue/gray paint on wall</td>
<td>Storage area/break room</td>
<td>&lt;98.14</td>
</tr>
<tr>
<td>PWPOP-03</td>
<td>Brown paint on trim</td>
<td>Printer room</td>
<td>&lt;97.85</td>
</tr>
<tr>
<td>PWPOP-04</td>
<td>Red paint on wood wall</td>
<td>Building exterior</td>
<td>241.77</td>
</tr>
</tbody>
</table>

<: less than the limit of detection
Asbestos containing window caulk
GENERAL NOTES

1. THIS DRAWING IS DIAGRAMMATIC. IT SHOULD BE USED FOR GENERAL INFORMATION AND SAMPLE LOCATIONS ONLY. CONTRACTOR IS TO FIELD VERIFY ALL MATERIAL LOCATIONS AND QUANTITIES.

2. THE BLACK WINDOW CAULKING TESTED POSITIVE FOR ASBESTOS. ALL WINDOW CAULKING MUST BE REMOVED BY A CERTIFIED ABATEMENT CONTRACTOR IF RENOVATION IMPACTS WINDOWS.

3. BASED UPON THE AGE OF THE BUILDINGS ALL PAINT SHOULD BE CONSIDERED LEAD CONTAINING. FOLLOW OSHA AND EPA RRP REGULATIONS IF IMPACTING.
ASBESTOS AND LEAD INVESTIGATION - LOWER FLOOR

1/16" = 1'-0"

GENERAL NOTES

1. THIS DRAWING IS DIAGRAMMATIC. IT SHOULD BE USED FOR GENERAL INFORMATION AND SAMPLE LOCATIONS ONLY. CONTRACTOR IS TO FIELD VERIFY ALL MATERIAL LOCATIONS AND QUANTITIES.

2. THE BLACK WINDOW CAULKING TESTED POSITIVE FOR ASBESTOS. ALL WINDOW CAULKING MUST BE REMOVED BY A CERTIFIED ABATEMENT CONTRACTOR IF RENOVATION IMPACTS WINDOWS.

3. BASED UPON THE AGE OF THE BUILDINGS ALL PAINT SHOULD BE CONSIDERED LEAD CONTAINING. FOLLOW OSHA AND EPA RRP REGULATIONS IF IMPACTING.

<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Material Description</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>CW-31</td>
<td>Black cover base with brown music</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-32</td>
<td>Black cover base with brown music</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-33</td>
<td>Beige 12&quot;x12&quot; floor tile with yellow music</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-34</td>
<td>Beige 12&quot;x12&quot; floor tile with yellow music</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-35</td>
<td>Gypsum wallboard and joint compound</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-36</td>
<td>Gypsum wallboard and joint compound</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-37</td>
<td>Grot in women's shower</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-38</td>
<td>Grot in women's shower</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-39</td>
<td>Grey floor with black and yellow music</td>
<td>NAD</td>
</tr>
<tr>
<td>CW-40</td>
<td>Grey floor with black and yellow music</td>
<td>NAD</td>
</tr>
</tbody>
</table>

NAD: No Asbestos Detected
LABORATORY RESULTS
Analysis and Method

Summary of polarizing light microscopy (PLM / Stereomicroscopy bulk asbestos analysis) using the methods described in 40CFR Part 763 Appendix E to Subpart E (Interim and EPA 600 / R-93 / 116 (Improved). The sample is first viewed with the aid of stereomicroscopy. Numerous liquid slide preparations are created for analysis under the polarized microscope where identifications and quantifications are preformed. Calibrated liquid refractive oils are used as liquid mounting medium. These oils are used for identification (dispersion staining). A calibrated visual estimation is reported, should any asbestiform mineral be present. Other techniques such as acid washing are used in conjugation with refractive oils for detection of smaller quantities of asbestos. All asbestos percentages are based on calibrated visual estimation traceable to NIST standards for regulated of asbestos. Traceability to measurement and calibration is achieved by using known amounts and types of asbestos from standards where analyst and laboratory accuracy are measured. As little as 0.001% asbestos can be detected in favorable samples, while detection in unfavorable samples may approach the detection limit of 0.50% (well above the laboratory definition of trace).

Discussion

Vermiculite containing samples may have trace amounts of actinolite-tremolite, where not found be PLM should be analyzed using TEM methods and / or water separation techniques. Suspected actinolite/vermiculite presence will be indicated through the sample comment section of this report. Fibrous talc containing samples may even contain a related asbestos fiber known as anthophyllite. Under certain conditions the same fiber may actually contain both talc and anthophyllite (a phenomenon called intergrowth). Again, TEM detection methods are recommended. CA Labs PLM report comments will denote suspected amounts of asbestiform anthophyllite with talc, where further analysis is recommended.

Some samples (floor tiles, surfacings, etc.) may contain fibers too small to be detectable by PLM analysis and should be analyzed by TEM bulk protocols.

A "trace asbestos" will be reported if the analyst observes far less than 1% asbestos. CA Labs defines "trace asbestos" as a few fibers detected by the analyst in several preparations and will indicate as such under these circumstances.

Quantification of <1% will actually be reported as <=1% (allowable variance close to 1% is high). Such results are ideal for point counting, and the technique is mandatory for friable samples (NESHAP, Nov. 1990 and clarification letter 8 May 1991) under 1% percent asbestos and the "trace asbestos". In order to make all initial PLM reports issued from CA Labs NESHAP compliant, all <1% asbestos results (except floor tiles) will be point counted at no additional charge.

Qualifications

CA Labs is accredited by the National Voluntary Accreditation Program (NVLAP) for selected test methods for airborne fiber analysis (TEM), and for bulk asbestos fiber analysis (PLM). All analysts have a college degree in a natural science (geology, biology, or environmental science) or are recognized by a state professional board in one these disciplines. Extensive in-house training programs are used to augment education background of the analyst. The group leader of polarized light has received supplemental McCrone Research training for asbestos identification. This report is not covered by the scope of AIHA accreditation. Analysis performed at CA Labs, LLC 12232 Industriplex, Suite 32 Baton Rouge, LA 70809.
# Overview of Project Sample Material Containing Asbestos

<table>
<thead>
<tr>
<th>Customer Project:</th>
<th>Public Works/ Police</th>
<th>CA Labs Project #:</th>
<th>CBR18105053Amend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample #</td>
<td>Layer #</td>
<td>Analysts Physical Description of Subsample</td>
<td>Asbestos type / calibrated visual estimate percent</td>
</tr>
<tr>
<td>CW-29</td>
<td>1</td>
<td>Black Sealant</td>
<td>5% Chrysotile</td>
</tr>
<tr>
<td>CW-30</td>
<td>1</td>
<td>Black Sealant</td>
<td>5% Chrysotile</td>
</tr>
<tr>
<td>CW-48</td>
<td>1</td>
<td>No Sample Submitted</td>
<td></td>
</tr>
</tbody>
</table>

---

**Glossary of abbreviations (non-asbestos fibers and non-fibrous minerals):**

- ca - carbonate
- gypsum - gypsum
- bi - binder
- or - organic
- ma - matrix
- ms - mica
- ve - vermiculite
- ot - other

- fg - fiberglass
- qu - quartz
- mw - mineral wool
- wo - wollastinite
- ta - talc
- sy - synthetic
- ce - cellulose
- br - brucite
- ka - kaolin (clay)

---

This report relates to the items tested. This report is not to be used by the customer to claim product certification, approval or endorsement by NVLAP, NIST, AIHA LAP, LLC, or any other agency of the federal government. This report may not be reproduced except in full without written permission from CA Labs. These results are submitted pursuant to CA Labs' current terms and sale, condition of sale, including the company's standard warranty and limitations of liability provisions and no responsibility or liability is assumed for the manner in which the results are used or interpreted. Unless notified in writing to return the samples covered by this report, CA Labs will store the samples for a period of ninety (90) days before discarding. A shipping or handling fee may be assessed for the return of any samples.
## Polarized Light Asbestiform Materials Characterization

<table>
<thead>
<tr>
<th>Sample #</th>
<th>Comment</th>
<th>Layer #</th>
<th>Analysts Physical Description of Subsample</th>
<th>Homogeneous (Y/N)</th>
<th>Asbestos type / calibrated visual estimate percent</th>
<th>Non-asbestos fiber type / percent</th>
<th>Non-fibrous type / percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>CW-01</td>
<td></td>
<td>1</td>
<td>White Fibrous Insulation</td>
<td>Y</td>
<td>None Detected</td>
<td>100% fg</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>White Drywall</td>
<td>Y</td>
<td>None Detected</td>
<td>3% ce</td>
<td>97% qu, gy</td>
</tr>
<tr>
<td>CW-02</td>
<td></td>
<td>1</td>
<td>Green Covering</td>
<td>Y</td>
<td>None Detected</td>
<td>10% sy</td>
<td>90% qu, ma</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>White Fibrous Insulation</td>
<td>Y</td>
<td>None Detected</td>
<td>100% fg</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>White Drywall</td>
<td>Y</td>
<td>None Detected</td>
<td>3% ce</td>
<td>97% qu, gy</td>
</tr>
<tr>
<td>CW-03</td>
<td></td>
<td>1</td>
<td>White Compound</td>
<td>Y</td>
<td>None Detected</td>
<td>100% qu, mi, pe, ca</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>White Drywall with Paper</td>
<td>N</td>
<td>None Detected</td>
<td>10% ce</td>
<td>90% qu, gy</td>
</tr>
</tbody>
</table>

**Baton Rouge NVLAP Lab Code 200772-0 TEM/PLM**

**TDH 30-0370**

**LDEQ**

**Analysis Method:** Interim (40CFR Part 763 Appendix E to Subpart E) / Improved (EPA-600 / R-93/116)

**Preparation Method:** HCL acid washing for carbonate based samples, chemical reduction for organically bound components, oil immersion for identification of asbestos types by dispersion attaining / becke line method.

**Approved Signatories:**

Daniel LaCour  
Senior Analyst  
Alicia Stretz  
Laboratory Director  
Chris Williams

1. Fire Damage significant fiber damage - reported percentages reflect unaltered fibers
2. Fire Damage no significant fiber damages affecting fibrous percentages
3. Actinolite in association with Vermiculite
4. Layer not analyzed - attached to previous positive layer and contamination is suspected
5. Not enough sample to analyze
6. Anthophyllite in association with Fibrous Talc
7. Contamination suspected from other building materials
8. Favorable scenario for water separation on vermiculite for possible analysis by another method
9. < 1% Result point counted positive
10. TEM analysis suggested
### Polarized Light Asbestiform Materials Characterization

**Customer Info:**
- **Attn:** Tulla Stocker
- **APEX Environmental Consulting**
- **P.O. Box 1445**
- **Wilsonville, OR 97070**

**Phone #** 503-682-9737

**Fax #** 503-682-0525

<table>
<thead>
<tr>
<th>Sample #</th>
<th>Comment</th>
<th>Layer #</th>
<th>Analysts Physical Description of Subsample</th>
<th>Homogeneous (Y/N)</th>
<th>Asbestos type / calibrated visual estimate percent</th>
<th>Non-asbestos fiber type / percent</th>
<th>Non-fibrous type / percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>CW-04</td>
<td></td>
<td></td>
<td>White Surfaced White</td>
<td></td>
<td>HOMEGENEUS</td>
<td>100% qu, mi, pe, bi, ca</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Compound</td>
<td>N</td>
<td>None Detected</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>White Drywall with Paper</td>
<td>N</td>
<td>None Detected</td>
<td>10% ce</td>
<td>90% qu, gy</td>
</tr>
<tr>
<td>CW-05</td>
<td></td>
<td></td>
<td>White Surfacing</td>
<td>Y</td>
<td>None Detected</td>
<td>20% fg</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>70% ce</td>
<td>10% qu, pe</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>White Surfacing</td>
<td>Y</td>
<td>None Detected</td>
<td>20% fg</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>Tan Ceiling Tile</td>
<td>Y</td>
<td>None Detected</td>
<td>70% ce</td>
<td>10% qu, pe</td>
</tr>
<tr>
<td>CW-06</td>
<td></td>
<td></td>
<td>Black Cove Base</td>
<td>Y</td>
<td>None Detected</td>
<td>20% fg</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>70% ce</td>
<td>10% qu, pe</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>White Surfacing</td>
<td>Y</td>
<td>None Detected</td>
<td>20% fg</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>Tan Ceiling Tile</td>
<td>Y</td>
<td>None Detected</td>
<td>70% ce</td>
<td>10% qu, pe</td>
</tr>
<tr>
<td>CW-07</td>
<td></td>
<td></td>
<td>Black Cove Base</td>
<td>Y</td>
<td>None Detected</td>
<td>20% fg</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>70% ce</td>
<td>10% qu, pe</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>Black Cove Base</td>
<td>Y</td>
<td>None Detected</td>
<td>20% fg</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>Black Cove Base</td>
<td>Y</td>
<td>None Detected</td>
<td>70% ce</td>
<td></td>
</tr>
</tbody>
</table>

**CA Labs Project #:** CBR18105053Amend

**Date:** 10/23/2018

**Turnaround Time:** 2 day/8 hr

**Samples Received:** 10/18/2018

**Date Of Sampling:** 10/16/2018

**Purchase Order #:**

**Laboratory Director:** Chris Williams

**Approved Signatories:**
- Daniel LaCour
- Alicia Stretz
- Chris Williams

---

1. Fire Damage significant fiber damage - reported percentages reflect unaltered fibers
2. Fire Damage no significant fiber damage affecting fibrous percentages
3. Actinolite in association with Vermiculite
4. Layer not analyzed - attached to previous positive layer and contamination is suspected
5. Not enough sample to analyze
6. Anthophyllite in association with Fibrous Talc
7. Contamination suspected from other building materials
8. Favorable scenario for water separation on vermiculite for possible analysis by another method
9. < 1% Result point counted positive
10. TEM analysis suggested
## Polarized Light Asbestiform Materials Characterization

**Customer Info:**

- **Attn:** Tulla Stocker
- **APEX Environmental Consulting**
- P.O. Box 1445
- Wilsonville, OR 97070

**Phone #** 503-682-9737

**Fax #** 503-682-0525

---

### Sample Analysis Report

<table>
<thead>
<tr>
<th>Sample #</th>
<th>Comment</th>
<th>Layer</th>
<th>Analysts Physical Description of Subsample</th>
<th>Homogeneous (Y/N)</th>
<th>Asbestos type / calibrated visual estimate percent</th>
<th>Non-asbestos fiber type / percent</th>
<th>Non-fibrous type / percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>CW-08</td>
<td>2 White Mastic</td>
<td>Y</td>
<td>None Detected</td>
<td></td>
<td>100% qu, bi, ca</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CW-09</td>
<td>1 Black Cove Base</td>
<td>Y</td>
<td>None Detected</td>
<td></td>
<td>100% qu, ma</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CW-10</td>
<td>1 Black Sealant</td>
<td>Y</td>
<td>None Detected</td>
<td></td>
<td>100% qu, ma</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CW-11</td>
<td>1 Clear Mastic</td>
<td>Y</td>
<td>None Detected</td>
<td></td>
<td>100% qu, bi</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**Analysis Method:**

- Interim (40CFR Part 763 Appendix E to Subpart E) / Improved (EPA-600 / R-93/116)

**Preparation Method:**

- HCL acid washing for carbonate based samples, chemical reduction for organically bound components, oil immersion for identification of asbestos types by dispersion attaining / becke line method.

**Approved Signatories:**

- Daniel LaCour: Analyst
- Alicia Stretz: Analyst
- Chris Williams: Laboratory Director

---

1. Fire Damage significant fiber damage - reported percentages reflect unaltered fibers
2. Fire Damage no significant fiber damages effecting fibrous percentages
3. Actinolite in association with Vermiculite
4. Layer not analyzed - attached to previous positive layer and contamination is suspected
5. Not enough sample to analyze
6. Amphophyllite in association with Fibrous Talc
7. Contamination suspected from other building materials
8. Favorable scenario for water separation on vermiculite for possible analysis by another method
9. < 1% Result point counted positive
10. TEM analysis suggested
## Polarized Light Asbestiform Materials Characterization

### Customer Info
- **Atttn:** Tulla Stocker
- **APEX Environmental Consulting**
- **P.O. Box 1445**
- **Wilsonville, OR 97070**
- **Phone #** 503-682-9737
- **Fax #** 503-682-0525

### Customer Project:
- **Public Works/Police**

### CA Labs Project #:
- **CBR18105053Amend**

### Date:
- **10/23/2018**

### Turnaround Time:
- **2 day/8 hr**

### Samples Received:
- **10/18/2018**

### Date Of Sampling:
- **10/16/2018**

### Purchase Order #:

### Laboratory Director
- **Chris Williams**

### CA Labs, L.L.C.
- **12232 Industriplex, Suite 32**
- **Baton Rouge, LA 70809**
- **Phone 225-751-5632**
- **Fax 225-751-5634**

### CA Labs
- **Dedicated to Quality**
- **Crisp Analytical, L.L.C.**
- **1929 Old Denton Road**
- **Carrollton, TX 75006**
- **Phone 972-242-2754**
- **Fax 972-242-2798**

### Sample # | Comment | Layer # | Analysts Physical Description of Subsample | Homogeneous (Y/N) | Asbestos type / calibrated visual estimate percent | Non-asbestos fiber type / percent | Non-fibrous type / percent
---|---|---|---|---|---|---|---
**CW-12** | Black Sealant | 1 | Y | None Detected | | | 100% qu, ma
| Clear Mastic | 2 | Y | None Detected | | | 100% qu, bi
**CW-13** | Blue Floor Tile | 1 | Y | None Detected | | | 100% qu, ma, ca
| Gray Mastic | 2 | Y | None Detected | | | 100% qu, bi
**CW-14** | Blue Floor Tile | 1 | Y | None Detected | | | 100% qu, ma, ca
| Gray Mastic | 2 | Y | None Detected | | | 100% qu, bi
**CW-15** | Tan Floor Tile | 1 | Y | None Detected | | | 100% qu, ma, ca

*Analysis Method: Interim (40CFR Part 763 Appendix E to Subpart E) / Improved (EPA-600 / R-93/116)*

*Preparation Method: HCL acid washing for carbonate based samples, chemical reduction for organically bound components, oil immersion for identification of asbestos types by dispersion attaining / becke line method.*

*Approved Signatories:*
- **Daniel LaCour** Analyst
- **Alicia Stretz** Senior Analyst
- **Chris Williams** Laboratory Director

1. Fire Damage significant fiber damage - reported percentages reflect unaltered fibers
2. Fire Damage no significant fiber damages effecting fibrous percentages
3. Actinolite in association with Vermiculite
4. Layer not analyzed - attached to previous positive layer and contamination is suspected
5. Not enough sample to analyze
6. Anthophyllite in association with Fibrous Talc
7. Contamination suspected from other building materials
8. Favorable scenario for water separation on Vermiculite for possible analysis by another method
9. < 1% Result point counted positive
10. TEM analysis suggested
# Polarized Light Asbestiform Materials Characterization

<table>
<thead>
<tr>
<th>Sample #</th>
<th>Comment</th>
<th>Layer #</th>
<th>Analysts Physical Description of Subsample</th>
<th>Homogeneous (Y/N)</th>
<th>Asbestos type / calibrated visual estimate percent</th>
<th>Non-asbestos fiber type / percent</th>
<th>Non-fibrous type / percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>CW-16</td>
<td></td>
<td>1</td>
<td>Tan Floor Tile</td>
<td>Y</td>
<td>None Detected</td>
<td>100% qu, bi</td>
<td></td>
</tr>
<tr>
<td>CW-17</td>
<td></td>
<td>1</td>
<td>Gray Sealant</td>
<td>Y</td>
<td>None Detected</td>
<td>5% ce</td>
<td>95% qu, bi</td>
</tr>
<tr>
<td>CW-18</td>
<td></td>
<td>1</td>
<td>Gray Sealant</td>
<td>Y</td>
<td>None Detected</td>
<td>5% ce</td>
<td>95% qu, ma, bi</td>
</tr>
<tr>
<td>CW-19</td>
<td></td>
<td>1</td>
<td>Tan Cove Base</td>
<td>Y</td>
<td>None Detected</td>
<td>100% qu, ma</td>
<td></td>
</tr>
<tr>
<td>CW-16</td>
<td></td>
<td>2</td>
<td>Gray Mastic</td>
<td>Y</td>
<td>None Detected</td>
<td>100% qu, bi</td>
<td></td>
</tr>
<tr>
<td>CW-17</td>
<td></td>
<td>2</td>
<td>Gray Mastic</td>
<td>Y</td>
<td>None Detected</td>
<td>100% qu, bi</td>
<td></td>
</tr>
<tr>
<td>CW-19</td>
<td></td>
<td>2</td>
<td>White Mastic</td>
<td>Y</td>
<td>None Detected</td>
<td>100% qu, bi</td>
<td></td>
</tr>
</tbody>
</table>

## Analysis Method:
Interim (40CFR Part 763 Appendix E to Subpart E) / Improved (EPA-600 / R-93/116)

## Preparation Method:
HCL acid washing for carbonate based samples, chemical reduction for organically bound components, oil immersion for identification of asbestos types by dispersion attaining / becke line method.

**LDEQ**

1. Fire Damage significant fiber damage - reported percentages reflect unaltered fibers
2. Fire Damage no significant fiber damages affecting fibrous percentages
3. Actinolite in association with Vermiculite
4. Layer not analyzed - attached to previous positive layer and contamination is suspected
5. Not enough sample to analyze
6. Anthophyllite in association with Fibrous Talc
7. Contamination suspected from other building materials
8. Favorable scenario for water separation on vermiculite for possible analysis by another method
9. < 1% Result point counted positive
10. TEM analysis suggested

Approved Signatories:

- Daniel LaCour, Senior Analyst
- Alicia Stretz, Laboratory Director
- Chris Williams, Laboratory Director

---

Date: 10/23/2018

Samples Received: 10/18/2018

Date Of Sampling: 10/16/2018

---

CA Labs Project #: CBR18105053Amend

CA Labs

12232 Industriplex, Suite 32
Baton Rouge, LA 70809
Phone 225-751-5632
Fax 225-751-5634

---

Crisp Analytical, L.L.C.

1929 Old Denton Road
Carrollton, TX 75006
Phone 972-242-2754
Fax 972-242-2798

---

CA Labs, L.L.C.

Dedicated to Quality

Crisp Analytical, L.L.C.

CA Labs

12232 Industriplex, Suite 32
Baton Rouge, LA 70809
Phone 225-751-5632
Fax 225-751-5634

---

Customer Info:

Attn: Tulla Stocker
APEX Environmental Consulting
P.O. Box 1445
Wilsonville, OR 97070

Phone # 503-682-9737
Fax # 503-682-0525

---

Crisp Analytical, L.L.C.

1929 Old Denton Road
Carrollton, TX 75006
Phone 972-242-2754
Fax 972-242-2798

---

Crisp Analytical, L.L.C.

CA Labs

12232 Industriplex, Suite 32
Baton Rouge, LA 70809
Phone 225-751-5632
Fax 225-751-5634

---

1. Fire Damage significant fiber damage - reported percentages reflect unaltered fibers
2. Fire Damage no significant fiber damages affecting fibrous percentages
3. Actinolite in association with Vermiculite
4. Layer not analyzed - attached to previous positive layer and contamination is suspected
5. Not enough sample to analyze
6. Anthophyllite in association with Fibrous Talc
7. Contamination suspected from other building materials
8. Favorable scenario for water separation on vermiculite for possible analysis by another method
9. < 1% Result point counted positive
10. TEM analysis suggested
### Polarized Light Asbestiform Materials Characterization

**Customer Info:**
- **Attn:** Tulla Stocker
- **APEX Environmental Consulting**
- **P.O. Box 1445**
- **Wilsonville, OR 97070**

**Phone #**
- 503-682-9737

**Fax #**
- 503-682-0525

**Sample #**

<table>
<thead>
<tr>
<th>Sample #</th>
<th>Comment</th>
<th>Layer #</th>
<th>Analysts Physical Description of Subsample</th>
<th>Homogeneous (Y/N)</th>
<th>Asbestos type / calibrated visual estimate percent</th>
<th>Non-asbestos fiber type / percent</th>
<th>Non-fibrous type / percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>CW-20</td>
<td></td>
<td>1</td>
<td>Tan Cove Base</td>
<td>Y</td>
<td>None Detected</td>
<td>100% qu, ma</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>White Mastic</td>
<td>Y</td>
<td>None Detected</td>
<td>100% qu, bi</td>
<td></td>
</tr>
<tr>
<td>CW-21</td>
<td></td>
<td>1</td>
<td>Tan Floor Tile</td>
<td>Y</td>
<td>None Detected</td>
<td>100% qu, ma, ca</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>Gray and Yellow Mastic</td>
<td>N</td>
<td>None Detected</td>
<td>100% qu, bi</td>
<td></td>
</tr>
<tr>
<td>CW-22</td>
<td></td>
<td>1</td>
<td>Tan Floor Tile</td>
<td>Y</td>
<td>None Detected</td>
<td>100% qu, ma, ca</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>Gray and Yellow Mastic</td>
<td>N</td>
<td>None Detected</td>
<td>100% qu, bi</td>
<td></td>
</tr>
<tr>
<td>CW-23</td>
<td></td>
<td>1</td>
<td>Red Sealant</td>
<td>Y</td>
<td>None Detected</td>
<td>4% wo</td>
<td>96% qu, ma, bi</td>
</tr>
</tbody>
</table>

**Analysis Method:** Interim (40CFR Part 763 Appendix E to Subpart E) / Improved (EPA-600 / R-93/116)

**Preparation Method:** HCL acid washing for carbonate based samples, chemical reduction for organically bound components, oil immersion for identification of asbestos types by dispersion attaining / becke line method.

**Approved Signatories:**
- **Daniel LaCour**
  - Senior Analyst
- **Alicia Stretz**
  - Laboratory Director
- **Chris Williams**

---

1. Fire Damage significant fiber damage - reported percentages reflect unaltered fibers
2. Fire Damage no significant fiber damages affecting fibrous percentages
3. Actinolite in association with Vermiculite
4. Layer not analyzed - attached to previous positive layer and contamination is suspected
5. Not enough sample to analyze
6. Anthophyllite in association with Fibrous Talc
7. Contamination suspected from other building materials
8. Favorable scenario for water separation on Vermiculite for possible analysis by another method
9. < 1% Result point counted positive
10. TEM analysis suggested
## Polarized Light Asbestiform Materials Characterization

<table>
<thead>
<tr>
<th>Sample #</th>
<th>Comment</th>
<th>Layer #</th>
<th>Analysts Physical Description of Subsample</th>
<th>Homogeneous (Y/N)</th>
<th>Asbestos type / calibrated visual estimate percent</th>
<th>Non-asbestos fiber type / percent</th>
<th>Non-fibrous type / percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>CW-24</td>
<td></td>
<td>1</td>
<td>Red Sealant</td>
<td>Y</td>
<td>None Detected</td>
<td>4% wo</td>
<td>96% qu, ma, bi</td>
</tr>
<tr>
<td>CW-25</td>
<td></td>
<td>1</td>
<td>Gray Grout</td>
<td>Y</td>
<td>None Detected</td>
<td></td>
<td>100% qu, ma, ca</td>
</tr>
<tr>
<td>CW-26</td>
<td></td>
<td>1</td>
<td>Gray Grout</td>
<td>Y</td>
<td>None Detected</td>
<td></td>
<td>100% qu, ma, ca</td>
</tr>
<tr>
<td>CW-27</td>
<td></td>
<td>1</td>
<td>Gray Sealant</td>
<td>Y</td>
<td>None Detected</td>
<td>3% ce</td>
<td>97% qu, bi</td>
</tr>
<tr>
<td>CW-28</td>
<td></td>
<td>1</td>
<td>Gray Sealant</td>
<td>Y</td>
<td>None Detected</td>
<td>3% ce</td>
<td>97% qu, bi</td>
</tr>
<tr>
<td>CW-29</td>
<td></td>
<td>1</td>
<td>Black Sealant</td>
<td>Y</td>
<td>5% Chrysotile</td>
<td></td>
<td>95% qu, ma, bi</td>
</tr>
<tr>
<td>CW-30</td>
<td></td>
<td>1</td>
<td>Black Sealant</td>
<td>Y</td>
<td>5% Chrysotile</td>
<td></td>
<td>95% qu, ma, bi</td>
</tr>
</tbody>
</table>

### Analysis Method:
- **Interim (40CFR Part 763 Appendix E to Subpart E)** / Improved (EPA-600 / R-93/116)

### Preparation Method:
- HCL acid washing for carbonate based samples, chemical reduction for organically bound components, oil immersion for identification of asbestos types by dispersion attaining / becke line method.

### Approved Signatories:

1. Fire Damage significant fiber damage - reported percentages reflect unaltered fibers
2. Fire Damage no significant fiber damages effecting fibrous percentages
3. Actinolite in association with Vermiculite
4. Layer not analyzed - attached to previous positive layer and contamination is suspected
5. Not enough sample to analyze
6. Anthophyllite in association with Fibrous Talc
7. Contamination suspected from other building materials
8. Favorable scenario for water separation on vermiculite for possible analysis by another method
9. < 1% Result point counted positive
10. TEM analysis suggested

---

Page 9 of 13
### Polarized Light Asbestiform Materials Characterization

<table>
<thead>
<tr>
<th>Sample #</th>
<th>Com.</th>
<th>Layer</th>
<th>Analysts Physical Description of Subsample</th>
<th>Homogeneous (Y/N)</th>
<th>Asbestos type / calibrated visual estimate percent</th>
<th>Non-asbestos fiber type / percent</th>
<th>Non-fibrous type / percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>CW-31</td>
<td></td>
<td>1</td>
<td>Black Cove Base</td>
<td>Y</td>
<td>None Detected</td>
<td>100% qu, ma</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>Tan and Brown Mastic</td>
<td>N</td>
<td>None Detected</td>
<td>100% qu, bi</td>
<td></td>
</tr>
<tr>
<td>CW-32</td>
<td></td>
<td>1</td>
<td>Black Cove Base</td>
<td>Y</td>
<td>None Detected</td>
<td>100% qu, ma</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>Tan and Brown Mastic</td>
<td>N</td>
<td>None Detected</td>
<td>100% qu, bi</td>
<td></td>
</tr>
<tr>
<td>CW-33</td>
<td></td>
<td>1</td>
<td>Tan Floor Tile</td>
<td>Y</td>
<td>None Detected</td>
<td>100% qu, ma, ca</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>Yellow Mastic</td>
<td>Y</td>
<td>None Detected</td>
<td>100% qu, bi</td>
<td></td>
</tr>
<tr>
<td>CW-34</td>
<td></td>
<td>1</td>
<td>Tan Floor Tile</td>
<td>Y</td>
<td>None Detected</td>
<td>100% qu, ma, ca</td>
<td></td>
</tr>
</tbody>
</table>

**Analysis Method:** Interim (40CFR Part 763 Appendix E to Subpart E) / Improved (EPA-600 / R-93/116)

**Preparation Method:** HCL acid washing for carbonate based samples, chemical reduction for organically bound components, oil immersion for identification of asbestos types by dispersion attaining becke line method.

**LDEQ**

- ca - carbonate
- gypsum - gypsum
- bi - binder
- or - organic
- ma - matrix
- mi - mica
- ve - vermiculite
- ot - other
- pe - perlite
- qu - quartz
- fg - fiberglass
- mw - mineral wool
- wo - wollastinite
- br - brucite
- ka - kaolin (clay)
- sy - synthetic
- pa - pyrophyllite (clay)

Approved Signatories:

- Daniel LaCour: Analyst
- Alicia Stretz: Senior Analyst
- Chris Williams: Laboratory Director

1. Fire Damage significant fiber damage - reported percentages reflect unaltered fibers
2. Fire Damage no significant fiber damages effecting fibrous percentages
3. Actinolite in association with Vermiculite
4. Layer not analyzed - attached to previous positive layer and contamination is suspected
5. Not enough sample to analyze
6. Anthophyllite in association with Fibrous Talc
7. Contamination suspected from other building materials
8. Favorable scenario for water separation on Vermiculite for possible analysis by another method
9. < 1% Result point counted positive
10. TEM analysis suggested
# Polarized Light Asbestiform Materials Characterization

<table>
<thead>
<tr>
<th>Sample #</th>
<th>Comment</th>
<th>Layer #</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample #</th>
<th>Analysts Physical Description of Subsample</th>
<th>Asbestos type / calibrated visual estimate percent</th>
<th>Non-asbestos fiber type / percent</th>
<th>Non-fibrous type / percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Yellow Mastic</td>
<td>Y None Detected</td>
<td></td>
<td>100% qu, bi</td>
<td></td>
</tr>
<tr>
<td>CW-35</td>
<td>1 White Compound</td>
<td>Y None Detected</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 White Drywall with Paper</td>
<td>N None Detected</td>
<td>10% ce</td>
<td>90% qu, gy</td>
<td></td>
</tr>
<tr>
<td>CW-36</td>
<td>1 White Compound</td>
<td>Y None Detected</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 White Drywall with Paper</td>
<td>N None Detected</td>
<td>10% ce</td>
<td>90% qu, gy</td>
<td></td>
</tr>
<tr>
<td>CW-37</td>
<td>1 Gray Grout</td>
<td>Y None Detected</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CW-38</td>
<td>1 Gray Grout</td>
<td>Y None Detected</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**CA Labs Project #:** CBR18105053Amend
**Date:** 10/23/2018
**Turnaround Time:** 2 day/8 hr
**Samples Received:** 10/18/2018
**Date Of Sampling:** 10/16/2018
**Purchase Order #:**

---

**Analysis Method:** Interim (40CFR Part 763 Appendix E to Subpart E) / Improved (EPA-600 / R-93/116)

---

1. Fire Damage significant fiber damage - reported percentages reflect unaltered fibers
2. Fire Damage no significant fiber damages effecting fibrous percentages
3. Actinolite in association with Vermiculite
4. Layer not analyzed - attached to previous positive layer and contamination is suspected
5. Not enough sample to analyze
6. Anthophyllite in association with Fibrous Talc
7. Contamination suspected from other building materials
8. Favorable scenario for water separation on vermiculite for possible analysis by another method
9. < 1% Result point counted positive
10. TEM analysis suggested

---

**Approved Signatories:**

Daniel LaCour  
Senior Analyst

Alicia Stretz  
Laboratory Director

Chris Williams
Polarized Light Asbestiform Materials Characterization

<table>
<thead>
<tr>
<th>Customer Info:</th>
<th>Customer Project:</th>
<th>CA Labs Project #:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tulla Stocker</td>
<td>Public Works/ Police</td>
<td>CBR18105053Amend</td>
</tr>
<tr>
<td>APEX Environmental Consulting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P.O. Box 1445</td>
<td>Date: 10/23/2018</td>
<td></td>
</tr>
<tr>
<td>Wilsonville, OR 97070</td>
<td>Turnaround Time: 2 day/8 hr</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Samples Received: 10/18/2018</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Date Of Sampling: 10/16/2018</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Purchase Order #:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample #</th>
<th>Com</th>
<th>Layer #</th>
<th>Analysts Physical Description of Subsample</th>
<th>Homogeneous (Y/N)</th>
<th>Asbestos type / calibrated visual estimate percent</th>
<th>Non-asbestos fiber type / percent</th>
<th>Non-fibrous type / percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>CW-39</td>
<td>1</td>
<td>Gray Vinyl Flooring</td>
<td>Y</td>
<td>None Detected</td>
<td>100% qu, ma</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Black and Yellow Mastic</td>
<td>N</td>
<td>None Detected</td>
<td>100% qu, bi</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CW-40</td>
<td>1</td>
<td>Gray Vinyl Flooring</td>
<td>Y</td>
<td>None Detected</td>
<td>100% qu, ma</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Black and Yellow Mastic</td>
<td>N</td>
<td>None Detected</td>
<td>100% qu, bi</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CW-41</td>
<td>1</td>
<td>Yellow Mastic</td>
<td>Y</td>
<td>None Detected</td>
<td>100% qu, bi</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CW-42</td>
<td>1</td>
<td>Yellow Mastic</td>
<td>Y</td>
<td>None Detected</td>
<td>100% qu, bi</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CW-43</td>
<td>1</td>
<td>Red Surfaced Gray Grout</td>
<td>N</td>
<td>None Detected</td>
<td>100% qu, ma, bi, ca</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Baton Rouge NVLAP Lab Code 200772-0 TEM/PLM

LDEQ

Analysis Method: Interim (40CFR Part 763 Appendix E to Subpart E) / Improved (EPA-600 / R-93/116)
Preparation Method: HCL acid washing for carbonate based samples, chemical reduction for organically bound components, oil immersion for identification of asbestos types by dispersion attaining / becke line method.

Approved Signatories:

Daniel LaCour  
Senior Analyst

Alicia Stretz  
Laboratory Director

Chris Williams

1. Fire Damage significant fiber damage - reported percentages reflect unaltered fibers
2. Fire Damage no significant fiber damages affecting fibrous percentages
3. Actinolite in association with Vermiculite
4. Layer not analyzed - attached to previous positive layer and contamination is suspected
5. Not enough sample to analyze
6. Anthophyllite in association with Fibrous Talc
7. Contamination suspected from other building materials
8. Favorable scenario for water separation on vermiculite for possible analysis by another method
9. < 1% Result point counted positive
10. TEM analysis suggested
## Polarized Light Asbestiform Materials Characterization

**Customer Info:**
Attn: Tulla Stocker  
APEX Environmental Consulting  
P.O. Box 1445  
Wilsonville, OR 97070  

**Phone #** 503-682-9737  
**Fax #** 503-682-0525  

**CA Labs Project #:** CBR18105053Amend  
**Date:** 10/23/2018  
**Turnaround Time:** 2 day/8 hr  
**Samples Received:** 10/18/2018  
**Date Of Sampling:** 10/16/2018  

### Table

<table>
<thead>
<tr>
<th>Sample #</th>
<th>Comment</th>
<th>Layer #</th>
<th>Analysts Physical Description of Subsample</th>
<th>Homogeneous (Y/N)</th>
<th>Asbestos type / calibrated visual estimate percent</th>
<th>Non-asbestos fiber type / percent</th>
<th>Non-fibrous type / percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>CW-44</td>
<td></td>
<td>1</td>
<td>Red Surfaced Gray Grout</td>
<td>N</td>
<td>None Detected</td>
<td></td>
<td>100% qu, ma, bi, ca</td>
</tr>
<tr>
<td>CW-45</td>
<td></td>
<td>1</td>
<td>Tan Surfaced Brown Stucco</td>
<td>N</td>
<td>None Detected</td>
<td></td>
<td>100% qu, ma, bi, ca</td>
</tr>
<tr>
<td>CW-46</td>
<td></td>
<td>1</td>
<td>Tan Surfaced Brown Stucco</td>
<td>N</td>
<td>None Detected</td>
<td></td>
<td>100% qu, ma, bi, ca</td>
</tr>
<tr>
<td>CW-47</td>
<td></td>
<td>1</td>
<td>Tan Surfaced Brown Stucco</td>
<td>N</td>
<td>None Detected</td>
<td></td>
<td>100% qu, ma, bi, ca</td>
</tr>
<tr>
<td>CW-48</td>
<td></td>
<td></td>
<td>No Sample Submitted</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CW-49</td>
<td></td>
<td>1</td>
<td>Black Sealant</td>
<td>Y</td>
<td>None Detected</td>
<td></td>
<td>100% qu, ma, bi</td>
</tr>
<tr>
<td>CW-50</td>
<td></td>
<td>1</td>
<td>Black Sealant</td>
<td>Y</td>
<td>None Detected</td>
<td></td>
<td>100% qu, ma, bi</td>
</tr>
</tbody>
</table>

**Baton Rouge NVLAP Lab Code 200772-0 TEM/PLM**  
**TDH 30-0370**  

**LDEQ**  
Analysis Method: Interim (40CFR Part 763 Appendix E to Subpart E) / Improved (EPA-600 / R-93/116)  
Preparation Method: HCL acid washing for carbonate based samples, chemical reduction for organically bound components, oil immersion for identification of asbestos types by dispersion attaining / becke line method.

---

1. Fire Damage significant fiber damage - reported percentages reflect unaltered fibers  
2. Fire Damage no significant fiber damages effecting fibrous percentages  
3. Actinolite in association with Vermiculite  
4. Layer not analyzed - attached to previous positive layer and contamination is suspected  
5. Not enough sample to analyze  
6. Anthophyllite in association with Fibrous Talc  
7. Contamination suspected from other building materials  
8. Favorable scenario for water separation on Vermiculite for possible analysis by another method  
9. < 1% Result point counted positive  
10. TEM analysis suggested

---

**Approved Signatories:**

- Daniel LaCour  
  Analyst  
- Alicia Stretz  
  Analyst  
- Chris Williams  
  Laboratory Director

---

Page 13 of 13
Atomic Absorption Lead Report

Analysis Method: Lead in Paint analyzed by Atomic Absorption (AA)/SW-846-7420; This analysis is not covered by the scope of accreditation by NVLAP.

Sample Prep Method: Samples are dissolved in nitric acid, extracted, and analyzed on a properly calibrated AA; Absorbency curve was calculated, bandwidth corrected, and wavelength at the time of the analysis was measured and recorded.

Client Information: Apex Environmental
P.O. Box 1445
Wilsonville, OR 97070

Client Project: City of Wilsonville
PWPO

CA Labs Project #: CBR18115492
Date: 11/09/2018

Phone: 503-682-9737
Fax: 503-682-0525

Turnaround Time: 8 hr
Attn: Tulla Stocker

Samples Received: 11/09/2018

<table>
<thead>
<tr>
<th>Sample#</th>
<th>Sample Concentration: parts per million (ppm)</th>
<th>Weight Percent:</th>
</tr>
</thead>
<tbody>
<tr>
<td>PWPOP-01</td>
<td>&lt;86.92</td>
<td>&lt;0.0087</td>
</tr>
<tr>
<td>PWPOP-02</td>
<td>&lt;98.14</td>
<td>&lt;0.0098</td>
</tr>
<tr>
<td>PWPOP-03</td>
<td>&lt;97.85</td>
<td>&lt;0.0098</td>
</tr>
<tr>
<td>PWPOP-04</td>
<td>241.77</td>
<td>0.0242</td>
</tr>
<tr>
<td>Lab Blank</td>
<td>&lt; 1.00</td>
<td>----</td>
</tr>
</tbody>
</table>

Quality Control:
Duplicate: __0__ RPD
Spike: __105__% Recovery

NVLAP # 200772-0
Approved Signatories:

Sidney Pinkerton
Analyst

Christopher Williams
Laboratory Director

Alicia Stretz
Senior Analyst

Notes:
The current guidelines for lead in paint from the Consumer Products Safety Council (CPSC) is 0.06% by weight; the Housing and Urban Development (HUD) guideline is 0.5% by weight.

This test report relates only to the items tested. This test reports relates only to the items tested. NVLAP accreditation does not imply endorsement by any US Government agency. This report may not be reproduced except in full without written permission from CA Labs.

These results are submitted pursuant to CA Labs’ current terms and condition of sale, including the company's standard warranty and limitation of liability provisions and no responsibility or liability is assumed for the manner in which the results are used or interpreted. Unless notified in writing to return the samples covered by this report, CA Labs will store the samples for a period of ninety (90) days before discarding. A shipping and handling fee may be assessed for the return of any samples.

Analysis performed at CA Labs, LLC. 12232 Industriplex Blvd, Suite 32, Baton Rouge, LA 70809. Phone 225-751-5632, fax 225-751-5634, after hours mobile 225-993-3471.
ATOMIC ABSORPTION
LEAD ANALYSIS
LABORATORY ANALYSIS REPORT

Apex Environmental
P.O. Box 1445
Wilsonville, OR 97070
reference number: CBR18115492

LABORATORY ANALYSIS:

Summary of lead analysis by atomic absorption in all relevant media using the method described in SW-846-7420. All analysts have received the necessary in-house and extramural training to perform analysis of samples for the presence of lead. A duplicate analysis is performed on greater than ten percent of all samples. A spiked concentration sample is analyzed with each sample group for instrument calibration. All analysts are required to participate in quality control analysis rounds. Instrument calibrations are performed on a daily, weekly, and monthly basis.

This report must not be used to claim product endorsement or any agency of the U.S. Government. This test relates only to the items described and tested herein. This report may not be reproduced except in full, without written permission by CA Labs. This method is not covered under the scope of accreditation of NVLAP.

METHOD:

The procedure for paint chip analysis follows AOAC5.009(974.02) and SW-846-7420. The analysis of soil, wipes, and wastewater for the presence of lead is also referenced by SW-846-7420. Methodology for the analysis of lead in air samples follows NIOSH Method 7082.

Analysis performed at CA Labs, LLC. 12232 Industriplex Blvd, Suite 32, Baton Rouge, LA 70809. Phone 225-751-5632, fax 225-751-5634, after hours mobile 225-993-3471.
BULK SAMPLE FIELD FORM

TYPE OF ANALYSIS: CLM

Proj. Site # ___________________________ Date: 10/27 __________ Inspector: __________

Apex Client: ____________________________________________

Facility/Site: Wilsonville Police ____________________________

Samples delivered undamaged By: __________________________ Signature: __________

Samples received undamaged By: Ashley Thibodeaux Signature: __________ 10-28-18 10:00

☐ Analyze All Samples
☐ Progressive Analysis (analyze to first positive for each material code and type)
☐ Same Day ☐ 24 hour ☐ 2 Day
☐ 3 days ☐ 5 days

<table>
<thead>
<tr>
<th>Sample #</th>
<th>Material Code</th>
<th>Type</th>
<th>Material Description (Texture/Color)</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>6W - 01</td>
<td>Roof</td>
<td>1</td>
<td>Roof cone</td>
<td>Roof</td>
</tr>
<tr>
<td>6W</td>
<td></td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Apex Environmental Consulting Services, Inc.
PO Box 1445
Wilsonville, OR 97070
(503)662-9737
**BULK SAMPLE FIELD FORM**

**TYPE OF ANALYSIS:** AA

Proj. Site #: ____________________  Date: 11/7  Inspector: 

Apex Client: city of Wilsonville

Facility/Site: 9.00

Samples delivered undamaged By: ____________________  Signature: ________

Samples received undamaged By: Ashley Thibodeau  Signature: ________  11/9/18 10:30

**Turnaround time (check one)**

☐ Same Day  ☐ 24 hour  ☐ 2 Day
☐ 3 days  ☐ 5 days

☐ Analyze All Samples
☐ Progressive Analysis  (analyze to first positive for each material code and type)

<table>
<thead>
<tr>
<th>Sample #</th>
<th>Material Code</th>
<th>Type</th>
<th>Material Description (Texture/Color)</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>PUGP-01</td>
<td></td>
<td></td>
<td>cemant grown</td>
<td>office area</td>
</tr>
<tr>
<td>-02</td>
<td></td>
<td></td>
<td>Blue/grey glass</td>
<td>Storage area/Break room</td>
</tr>
<tr>
<td>-03</td>
<td></td>
<td></td>
<td>Brown paint</td>
<td>Printer room</td>
</tr>
<tr>
<td>-04</td>
<td></td>
<td></td>
<td>red paint</td>
<td>exterior wall</td>
</tr>
</tbody>
</table>

Apex Environmental Consulting Services, Inc.
PO Box 1445
Wilsonville, OR 97070
(503)682-9737
M&C Environmental Training

Asbestos Inspector
Refresher Training Course

Tulla Stocker

has successfully completed the Asbestos Inspector Refresher course approved by the California Division of Occupational Safety and Health for purposes of certification required by Title 8, Article 2.7 Chapter 3.2, Section 341.16 and the accreditation required under the Toxic Substances Control Act, Title II. Conducted by M&C Environmental Training, Inc., 1619 Beverly Place, Berkeley, California 94707. Tel. #(510) 525 - 1388

Course Approval Number: CA-003-06

| Location:  | Oakland, California | Expiration: | April 5, 2019 |
| Dates:    | April 5, 2018      |             |              |
| Director of Training: | John McGinnis |

Certificate Number 43633 IR
M&C Environmental Training

Asbestos Project Designer
Refresher Training Course

Tulla Stocker

has successfully completed the Asbestos Project Designer Refresher course approved by the California Division of Occupational Safety and Health for purposes of certification required by Title 8, Article 2.7 Chapter 3.2, Section 341.16 and the accreditation required under the Toxic Substances Control Act, Title II. Conducted by M&C Environmental Training, Inc., 1619 Beverly Place, Berkeley, California 94707. Tel. #(510) 525 - 1388

Course Approval Number: CA-003-10

Location: Oakland, California
Dates: April 4, 2018
Director of Training: John McGinnis

Expiration: April 4, 2019

Certificate Number 43622 DR
M&C Environmental Training

Asbestos Management Planner
Refresher Training Course

Tulla Stocker

has successfully completed the Asbestos Management Planner Refresher course approved by the California Division of Occupational Safety and Health for purposes of certification required by Title 8, Article 2.7 Chapter 3.2, Section 341.16 and the accreditation required under the Toxic Substances Control Act, Title II. Conducted by M&C Environmental Training, Inc., 1619 Beverly Place, Berkeley, California 94707. Tel. #(510) 525 - 1388

Course Approval Number: CA-003-08

<table>
<thead>
<tr>
<th>Location:</th>
<th>Oakland, California</th>
<th>Expiration:</th>
<th>April 5, 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dates:</td>
<td>April 5, 2018</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Director of Training: John McGinnis

Certificate Number 43656 PR
M&C Environmental Training

Asbestos Contractor/Supervisor
Refresher Training Course

Tulla Stocker

has successfully completed the Asbestos Contractor/Supervisor Refresher course approved by the California Division of Occupational Safety and Health for purposes of certification required by Title 8, Article 2.7 Chapter 3.2, Section 341.16 and the accreditation required under the Toxic Substances Control Act, Title II. Conducted by M&C Environmental Training, Inc., 1619 Beverly Place, Berkeley, California 94707. Tel. #(510) 525 - 1388

Course Approval Number: CA-003-04

Location: Oakland, California
Dates: April 6, 2018
Director of Training: John McGinnis

Expiration: April 6, 2019
Certificate Number 43668 SR
State of Oregon
Oregon Health Authority

Tulla R. Stocker

Risk Assessor

is certified by the Oregon Health Authority to conduct Lead-Based Paint Activities

Certification Number: 1062-Indv-R
Issuance Date: 6/20/2017
Expiration Date: 6/30/2020
State of Oregon
Oregon Health Authority

Apex Environmental is certified by the Oregon Health Authority to conduct Lead-Based Paint Activities

Certification Number: 1154-LBP FIRM
Issuance Date: 6/20/2017
Date of Expiration: 6/30/2020
Certificate of Completion

Compliance Solutions

Tulla Stocker has successfully completed training and passed all testing requirements for 40-Hour HAZWOPER as per 29 CFR 1910.120(e) presented this Thursday, September 20, 2018.

Certificate Number: 754961558

Compliance Solutions Occupational Trainers, Inc.

Jeffrey E. Kline
President/CEO
Certificate of Completion

This is to certify that

Jose Godinez

has satisfactorily completed
4 hours of refresher training as an
AHERA Building Inspector

to comply with the training requirements of
TSCA Title II, 40 CFR 763 (AHERA)

EPA Provider # 1085

170313
Certificate Number

Nov 14, 2018
Date(s) of Training
Expires in 1 year.

Exam Score (if applicable):

ARGUS PACIFIC
TRAINING + CONSULTING
A Terracon Company

ARGUS PACIFIC, INC / 21905 64th AVE W, SUITE 100 / MOUNTLAKE TERRACE, WASHINGTON 98043 / 206.285.3373 / ARGUSPACIFIC.COM
Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 200772-0

CA Labs L.L.C.
Baton Rouge, LA

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

Asbestos Fiber Analysis

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated January 2009).

2018-01-01 through 2018-12-31

Effective Dates

For the National Voluntary Laboratory Accreditation Program

[Signature]
SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

CA Labs L.L.C.
12232 Industripex, Suite 32
Baton Rouge, LA 70809-7105
Mr. Christopher Williams
Phone: 225-751-5632  Fax: 225-751-5634
Email: calabsbr@calabsinc.com
http://www.calabsinc.com

ASBESTOS FIBER ANALYSIS

Bulk Asbestos Analysis

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>18/A01</td>
<td>EPA -- 40 CFR Appendix E to Subpart E of Part 763, Interim Method of the Determination of Asbestos in Bulk Insulation Samples</td>
</tr>
<tr>
<td>18/A03</td>
<td>EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials</td>
</tr>
</tbody>
</table>

Airborne Asbestos Analysis

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>18/A02</td>
<td>U.S. EPA's &quot;Interim Transmission Electron Microscopy Analytical Methods-Mandatory and Nonmandatory-and Mandatory Section to Determine Completion of Response Actions&quot; as found in 40 CFR, Part 763, Subpart E, Appendix A.</td>
</tr>
</tbody>
</table>

Effective 2018-01-01 through 2018-12-31

For the National Voluntary Laboratory Accreditation Program
Mr. Christopher Williams  
CA Laboratories LLC  
12232 Industriplex Blvd Ste 32  
Baton Rouge, Louisiana  70809  

Re: Annual Scope of Accreditation  

Dear Mr. Williams:  

The Louisiana Department of Environmental Quality’s laboratory accreditation program, in accordance with Louisiana Administrative Code, Title 33, Part I, Subpart 3, Laboratory Accreditation, accredits this laboratory for Fiscal Year 2018. This accreditation does not constitute an endorsement of the suitability of the listed methods for any specific purpose. The laboratory is accredited for the method as identified on the application for accreditation; if the method is partially identified on the application for accreditation, the laboratory is accredited for the versions listed on the current application or referenced in the laboratory standard operating procedure.  

Louisiana Environmental Laboratory Accreditation Program (LELAP) accreditation is granted for those methods/analytes for which “STATE” is indicated as the type of accreditation. Accreditation is dependent on the laboratory’s successful ongoing compliance with regulations as outlined in the Louisiana Administrative Code, Title 33, Part I, Subpart 3, Laboratory Accreditation.  

The accreditation certificate is the property of the State of Louisiana. Should your accreditation be suspended or revoked, your laboratory must return the certificate of accreditation to the department and delete any electronic copies until your accreditation status is restored.  

LAC 33:1.5313.A requires that the laboratory report include all relevant information. Therefore, the certificate number shall be placed in the upper right corner of all laboratory reports. If the test report includes results of any test for which the laboratory is not accredited, the unaccredited results must be clearly identified as such.
We request that you examine the scope of accreditation attachment for accuracy and completeness. If you find that an analyte for which you expected to be accredited is not listed, please examine your records to ensure that:

1. You have met the requirements for successful participation in proficiency test studies as outlined in LAC 33:1.4711.

2. In the case of accreditation by recognition, the requested analyte must be listed for the requested method and matrix on both the certificate issued by the Primary Accreditation Body and on the Louisiana application form.

If after reviewing this information, the scope and/or certificate are inaccurate, please notify us immediately.

If you have any questions, please contact your assigned assessor Grant Aucoin, Environmental Scientist at (225) 219-3301.

Sincerely,

Cheryl Sonnier Nolan
Administrator
Public Participation and Permit Support Services Division

24 May 2017
Date

CSN:PB:gra
Is hereby granting a Louisiana Environmental Laboratory Accreditation to

CA Laboratories LLC
12232 Industriplex Blvd Ste 32
Baton Rouge, Louisiana 70809
Agency Interest No. 165918
Activity No. ACC20170001

According to the Louisiana Administrative Code, Title 33, Part I, Subpart 3, LABORATORY ACCREDITATION, the State of Louisiana formally recognizes that this laboratory is technically competent to perform the environmental analyses listed on the scope of accreditation detailed in the attachment.

The laboratory agrees to perform all analyses listed on this scope of accreditation according to the Part I, Subpart 3 requirements and acknowledges that continued accreditation is dependent on successful ongoing compliance with the applicable requirements of Part I. Please contact the Department of Environmental Quality, Louisiana Environmental Laboratory Accreditation Program (LEAP) to verify the laboratory’s scope of accreditation and accreditation status.

Accreditation by the State of Louisiana is not an endorsement or a guarantee of the validity of the data generated by the laboratory. To be accredited initially and maintain accreditation, the laboratory agrees to participate in two single-blind, single-concentration PT studies, where available, per year for each field of testing for which it seeks accreditation or maintains accreditation as required in LAC 33:1.4711.

Issued Date: 26 Mar 2017
Effective Date: July 1, 2017
Expiration Date: June 30, 2018
Certificate Number: 05069

Cheryl Sommier Nolan
Administrator
Public Participation and Permit Support Services Division
### Air Emissions

<table>
<thead>
<tr>
<th>Analyte</th>
<th>Method Name</th>
<th>Method Code</th>
<th>Type</th>
<th>AB</th>
</tr>
</thead>
<tbody>
<tr>
<td>100173 - Asbestos by Phase Contrast Microscopy</td>
<td>NIOSH 7400 (A Rules)</td>
<td>899</td>
<td>State</td>
<td>LA</td>
</tr>
<tr>
<td>100171 - Asbestos by Transmission Electron Microscopy</td>
<td>EPA Level II Contract #68-02-3266</td>
<td>2020</td>
<td>NVLAP</td>
<td>LA</td>
</tr>
<tr>
<td>100131 - Airborne Asbestos</td>
<td>40 CFR Part 763, Subpart E, Appendix A (Mandatory TEM)</td>
<td>2062</td>
<td>NVLAP</td>
<td>LA</td>
</tr>
<tr>
<td>100172 - Asbestos by Polarized Light Microscopy</td>
<td>EPA 600/R-93/116</td>
<td>10294583</td>
<td>NVLAP</td>
<td>LA</td>
</tr>
</tbody>
</table>

### Non Potable Water

<table>
<thead>
<tr>
<th>Analyte</th>
<th>Method Name</th>
<th>Method Code</th>
<th>Type</th>
<th>AB</th>
</tr>
</thead>
<tbody>
<tr>
<td>NONE</td>
<td>NONE</td>
<td>NONE</td>
<td>NONE</td>
<td>NONE</td>
</tr>
</tbody>
</table>

### Solid Chemical Materials

<table>
<thead>
<tr>
<th>Analyte</th>
<th>Method Name</th>
<th>Method Code</th>
<th>Type</th>
<th>AB</th>
</tr>
</thead>
<tbody>
<tr>
<td>100095 - Asbestos in Bulk Insulation</td>
<td>40 CFR 763, Subpart E, Appendix E (Section 1.PLM)</td>
<td>2004</td>
<td>NVLAP</td>
<td>LA</td>
</tr>
<tr>
<td>100172 - Asbestos by Polarized Light Microscopy</td>
<td>EPA 600/R-93/116</td>
<td>10294583</td>
<td>NVLAP</td>
<td>LA</td>
</tr>
<tr>
<td>100171 - Asbestos by Transmission Electron Microscopy</td>
<td>EPA 600/R-93/116</td>
<td>10294583</td>
<td>NVLAP</td>
<td>LA</td>
</tr>
</tbody>
</table>

### Biological Tissue

<table>
<thead>
<tr>
<th>Analyte</th>
<th>Method Name</th>
<th>Method Code</th>
<th>Type</th>
<th>AB</th>
</tr>
</thead>
<tbody>
<tr>
<td>NONE</td>
<td>NONE</td>
<td>NONE</td>
<td>NONE</td>
<td>NONE</td>
</tr>
</tbody>
</table>

Clients and Customers are urged to verify the laboratory's current certification status with the Louisiana Environmental Laboratory Accreditation Program.

Page 1 of 1