CITY OF BREMERTON

West Kitsap Way Planning Study

Appendix I

Pavement Investigation Analysis

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February 14, 2024
HWA Project No. 2022-048-21

Psomas Inc.
3131 Elliott Avenue
Seattle, Washington 98121

Attn: **John Davies**

Subject: **West Kitsap Way Planning Study**
Pavement Investigation
Bremerton, Washington

Mr. Davies:

In accordance with your request, HWA GeoSciences Inc. (HWA) completed a pavement engineering investigation in support of the West Kitsap Way Planning Study in Bremerton, Washington. The purpose of our investigation was to assess pavement layer thicknesses and subgrade support conditions along the alignment to develop new pavement rehabilitation and reconstruction recommendations.

PROJECT DESCRIPTION

We understand that this project will reconstruct about 1.4 miles of W Kitsap Way, from State Route 3 to Chico Way NW. The project will focus on improving mobility and safety performance of multi-modal travel on West Kitsap Way. The location of the project alignment is shown in Figure 1, Site and Vicinity Map.

SITE CONDITIONS

West Kitsap Way is situated at the northwestern corner of Bremerton, Washington. The roadway is a northwest-southeast trending arterial roadway with two travel lanes in each direction, separated by a 5-foot-wide median that serves as a stormwater gutter at several locations along the alignment. The median widens to a turn lane in the western third of the alignment. The alignment climbs gradually from State Route 3 to about 500 feet east of Austin Drive, near the middle of the alignment, then gradually slopes downward to the west where it flattens near Harlow Drive. The roadway is paved with Portland Cement Concrete (PCC) panels. Hot Mix Asphalt (HMA) overlay patches exist above the PCC where concrete panels have settled or broken. Wide shoulders, approximately one lane width, paved with HMA, exist along both sides of the roadway. Pavement distress observed in the PCC panels consists of low to high severity

longitudinal and transverse cracking, corner breaks, and deteriorated, wide spaced joints between panels.

GEOLOGY

Geologic information for the project area was obtained from the *Preliminary geomorphic map of the Kitsap Peninsula, Washington, 1:26,000-scale* (Haugerud, R.A., 2009) and the *Geologic map of surficial deposits in the Seattle 30' by 60' quadrangle, Washington* (Yount, J.C., Minard, J.P, and Dembroff, G.R., 1993). According to these maps, the project alignment is underlain by fill soils or modified land from the intersection at State Route 3 along the uphill portion to the bend in the roadway east of Austin Drive. West of this location to Lakehurst Drive NW, the project area is mapped as a glaciated surface on the geomorphic map and as Fraser age glacial till on the regional geologic map. West of Lakehurst Drive, the area is mapped as a kame-kettle surface that surrounds the east and north side of Kitsap Lake. Kame-kettle deposits are mapped as continental glacial outwash on the 1:100,000 scale geologic map of the area.

PAVEMENT CORES

Pavement layer thicknesses and shallow subgrade support conditions were investigated in sixteen pavement cores, designated C-1 through C-16. All pavement cores, except for C-9, were performed using a 6-inch outside diameter core barrel. Pavement core C-9 was drilled with a 4-inch outside diameter core barrel so that unconfined compressive strength laboratory testing could be performed. The cores were completed between January 15 and 17, 2024.

The approximate locations of the pavement cores are shown on Figures 2A through 2C, Site and Exploration Plans. Appendix A provides photographic logs of the pavement cores. Pavement coring and subsurface explorations through each core hole were performed by two geologists from HWA. All core holes were backfilled with compacted soils and patched with Aquaphalt. Table 1 provides the HMA, PCC, and crushed gravel base thickness encountered in each pavement core along with notes on subgrade conditions encountered.

Table 1. Pavement Core Results.

Designation	Lane	HMA Thickness, in.	PCC Thickness, in.	Crushed Gravel Base Thickness, in.	Subgrade Notes
C-1	SB OL	6.5	8.0	-	Medium dense, sandy gravel with silt.
C-2	NB OL	-	7.75	-	Dense, silty, sandy gravel.
C-3	SB OL	-	8.0	-	Medium dense, sandy gravel with silt.
C-4	NB OL	-	7.75	-	Loose to medium dense, silty sand with gravel.
C-5	SB OL	-	8.0	-	Medium dense to dense, silty, sandy gravel.
C-6	NB OL	-	8.0	-	Medium dense, silty, sandy gravel with cobbles.
C-7	WB OL	3.0	8.25	-	Medium dense, sandy gravel with silt.
C-8	EB OL	2.0	8.0	-	Medium dense, sandy gravel with silt.
C-9	EB OL	-	7.5	-	Medium dense, sandy gravel and silty sand.
C-10	WB OL	-	7.75	-	Medium dense, sandy gravel with silt.
C-11	EB OL	-	8.25	-	Medium dense, sandy gravel.
C-12	WB OL	1.5	8.0	-	Loose, sandy gravel with silt over medium stiff, sandy silt.
C-13	EB OL	-	8.0	-	Dense, sandy gravel with silt.
C-14	WB OL	-	7.75	-	Medium dense, sandy gravel.
C-15	EB OL	4.5	-	-	Very dense, sandy gravel with cobbles.
C-16	WB	6.5	-	5.5	Medium dense, sand with gravel.

As indicated in Table 1 and the pavement core logs in Appendix A, the thickness of the existing PCC along W Kitsap Way is about 8 inches, with varying thickness of HMA overlay, where present. Granular fill soils were encountered below the PCC in all pavement core locations. Pavement core C-15 was performed on Northlake Way NW and encountered 4.5 inches of HMA over granular fill soils. Pavement core C-16 was performed on Chico Way NW and encountered 6.5 inches of HMA over 5.5 inches of Crushed Surfacing Top Course (CSTC) overlying sandy fill soils.

Pavement coring confirmed the existence of fill soils in the eastern portion of the alignment as shown on the logs for pavement cores C-1 through C-6. Excavations made below the PCC in these cores did not penetrate through the fill soils.

Gravel fill was observed and penetrated in excavations made below the PCC in pavement cores C-7 through C-12. In this portion of the alignment, gravel fill extended to depths of about 1.1 to 1.8 feet. Continental glacial outwash, or Vashon recessional outwash, was observed below the gravel fill in these cores, along a portion of the alignment where a cut had been made in the natural topography to construct this portion of W Kitsap Way.

Excavations below the PCC or HMA pavement in pavement cores C-13 through C-16 were all terminated within granular fill soils.

As indicated previously, pavement core C-9 was drilled using a 3.75-inch inside diameter core barrel and sampled for unconfined compression strength testing at HWA's laboratory. The pavement core was tested in accordance with ASTM C39 and C1231. The compressive strength of the core was 9,410 psi and the Field and Laboratory Concrete Test Report is presented in Appendix B.

CONCLUSIONS AND RECOMMENDATIONS

The results of our pavement core investigations indicate that the existing PCC panels are approximately 8 inches thick, typically founded on medium dense to dense, granular fill soils. Many of the existing panels and the joints between them are severely distressed producing a poor ride quality. As indicated in Table 1 and the pavement core logs, there are areas where HMA has been placed over the PCC panels. The HMA overlay is also highly distressed and exhibits high severity reflective cracking from the PCC distresses below. In our opinion, the PCC needs to be removed and a new pavement section constructed, or the panels need to be fractured or rubblized and a new HMA pavement constructed above. Preliminary recommendations for these options are presented in the following sections. We recommend that Falling Weight Deflectometer (FWD) testing be performed prior to final pavement design to evaluate the pavement response to loading and to provide subgrade resilient modulus values for use in design.

DESIGN OPTIONS FOR BASE PREPARATION

Rubblization: This method is generally reserved for concrete pavement that has severe durability problems such as alkali-silica reactivity or D-cracking, which is caused by freeze/thaw

deterioration of aggregates in the concrete. Rubblization breaks the existing concrete into small fragments ranging in size from sand to pieces approximately 8 inches in size. Concrete panels observed in the project area did not appear to exhibit these types of distresses; therefore, full rubblization is likely not warranted.

Crack & Seat: This method is generally reserved for Jointed Plain Concrete Pavement (JPCP), which is what the existing panels appear to consist of. Crack & Seat is accomplished using a resonant breaker known as a guillotine-style breaker. A multi-head-breaker (MHB) can also be used. This method typically produces crack spacing of 12 to 60 inches and can be used when the roadway needs to be opened to traffic at the end of the work shift. After the panels have been cracked, a 35 to 50-ton proof roller is used to seat the cracked pavement to the subgrade prior to construction of a new HMA structure above.

Break & Seat: Break & Seat also utilizes a resonant breaker or MHB and can be used on JPCP or Continuously Reinforced Concrete Pavement (CRPC). This method generally has crack spacing of 6 to 24-inches and uses more fracture energy that severs reinforcing steel and produces more spalling of the concrete. After panels have been cracked, a 35 to 50-ton proof roller is used to seat cracked panels into the subgrade prior to construction of a new HMA structure above. The high energy and frequency of this method can increase the risk of destabilizing soft subgrade soils; however, our investigations did not encounter such conditions.

Rubblization, Crack and Seat and Break and Seat methods have advantages if grade change of the roadway can be accomplished without affecting drainage and tie-ins to existing driveways and business entrances. However, these methods are generally very loud, produce some shaking, and can affect local homeowners and businesses during construction. Additionally, these methods do not produce homogenous base material. Pavement along the alignment appears to be JPCP that has good subgrade support conditions. For this reason, the Crack and Seat method appears to be the most appropriate option to minimize reflective cracking in new HMA constructed above the existing PCC panels.

Full Depth Reconstruction: Alternatively, the existing concrete panels could be broken and removed, and a new pavement structure constructed. Site preparation for pavement reconstruction should begin with the excavation of all existing materials down to a depth sufficient to accommodate the new structure. The exposed soils should be thoroughly compacted and evaluated by a geotechnical engineer or qualified earthworks inspector. If loose, pumping, or otherwise unsuitable soils are encountered at the bottom of the pavement section, they should be over-excavated as directed by the geotechnical engineer and backfilled using Crushed Surfacing Base Course (CSBC) per the recommendations in the following section.

STRUCTURAL FILL AND COMPACTION

Imported structural fill for areas of over-excavation and as pavement base should consist of Crushed Surfacing Base Course, as described in Section 9-03.9(3) of the WSDOT *Standard Specifications* (WSDOT, 2024).

Structural fill should be placed in loose, horizontal, lifts of not more than 8 inches in thickness and compacted to at least 95 % of the maximum dry density, as determined using test method ASTM D 1557 (modified Proctor). At the time of placement, the moisture content of the CSBC should be at or within 2 percent of optimum. The procedure required to achieve the specified minimum relative compaction depends on the size and type of compaction equipment, the number of passes, thickness of the layer being compacted, and the soil moisture-density properties.

DESIGN TRAFFIC FOR PAVEMENT RECONSTRUCTION

Current design traffic parameters were provided by Psomas consisting of an Average Daily Traffic (ADT) value of 10,000 with 10% heavy truck traffic. We assumed an Equivalent Single Axle Load (ESAL) value of 1.0 for heavy trucks and 0.0008 for all other vehicles. Using a 20-year design life and 0.5 percent annual volume growth, we calculate an ESAL value of 3,856,255. A value of 4,000,000 was used for design. The pavement recommendations presented in this report are based on these traffic calculations. If additional traffic count information is obtained that varies appreciably from these values, the recommendations given in this report should be reviewed and revised as necessary.

NEW PAVEMENT DESIGN

New pavement design is based on the design method given in the 1993 AASHTO Design Guide (AASHTO, 1993) using the following parameters:

- Reliability = 90%
- Initial Serviceability = 4.5
- Terminal Serviceability = 3.0
- Overall Standard Deviation = 0.5
- Subgrade Resilient Modulus = 10 ksi (based on conditions encountered in cores)

This results in a required AASHTO Structural Number (SN) of 4.1. For pavement design, we assumed the following layer coefficients:

- Structural Coefficient of HMA = 0.44
- Structural Coefficient of Crack and Seat PCC = 0.2
- Structural Coefficient of CSBC = 0.14

Table 2 provides the required HMA layer thickness assuming that the existing PCC panels are 8 inches thick, and the Crack and Seat method is performed.

Table 2. Structure Requirements for New HMA Pavement over Crack and Seat PCC

Material Description	Minimum Layer Thickness (inches)	WSDOT Standard Specification
HMA	6	5-04 & 9-02.1
Crack and Seat PCC	8	N/A

Table 3 provides the design requirements for a new HMA pavement assuming that the existing PCC panels are removed.

Table 3. Structure Requirements for New HMA Pavement

Material Description	Minimum Layer Thickness (inches)	WSDOT Standard Specification
HMA	8	5-04 & 9-02.1
CSBC	6	9-03.9(3)

We recommend that the asphaltic layers consist of HMA Class ½-inch and that the longitudinal joints in the HMA wearing course coincide with a lane line or an edge line.

HMA BINDER SELECTION

The selection of the optimum asphalt binder type for the prevailing climate is critical to ensure long-term pavement performance. Use of the wrong binder can result in low temperature cracking or permanent deformation at high temperatures.

Based on the climate in Bremerton and traffic loading, we recommend Superpave Performance Grade binder PG 58H-22 be used.

PLACEMENT OF HMA

Placement of HMA should be in accordance with Section 5-04 of the WSDOT *Standard Specifications* (WSDOT, 2024). Particular attention should be paid to the following:

- HMA should not be placed until the engineer has accepted the previously constructed pavement layers.
- HMA should not be placed on any frozen or wet surface.
- HMA should not be placed when precipitation is anticipated before the pavement can be compacted, or before any other weather conditions which could prevent proper handling and compaction of HMA.
- HMA should not be placed when the average surface temperatures are less than 45^{o} F.

- HMA temperature behind the paver should be in excess of 240^{o} F. Compaction should be completed before the mix temperature drops below 180^{o} F. Comprehensive temperature records should be kept during the HMA placement.
- Sufficient tack coat must be applied uniformly and allowed to break and set before placing HMA above an existing HMA layer in order to create a strong bond between layers. The surface of the pavement should be thoroughly cleaned prior to tack coat application. Improper tack coat application can cause unbonded layers and will lead to premature pavement distress/failure.
- For cold joints, tack coat should be applied to the edge to be joined and the paver screed should be set to overlap the first mat by 1 to 2 inches.

DRAINAGE

It is essential to the satisfactory performance of the roadway that good drainage is provided to prevent water ponding on or alongside, or accumulating beneath, the pavement. Water ponding can cause saturation of the pavement and subgrade layers and lead to premature failure. The surface of the pavement should be sloped to convey water from the pavement to appropriate drainage facilities.

WET WEATHER EARTHWORK

Some of the soils encountered contained a high fines content and will likely be difficult to place/compact or traverse with construction equipment during periods of wet weather. We recommend all earthwork activities occur during the dry summer months to avoid extra costs and problems associated with earthwork in wet conditions. General recommendations relative to earthwork performed in wet weather or in wet conditions are presented below. These recommendations should be incorporated into the contract specifications.

- Earthwork should be performed in small areas to minimize exposure to wet weather. Excavation or the removal of unsuitable soil should be followed promptly by the placement and compaction of structural fill material. The size and type of construction equipment used may need to be limited to prevent soil disturbance.
- The ground surface within the construction area should be graded to promote run-off of surface water and to prevent the ponding of water.
- The ground surface within the construction area should be sealed by a smooth drum roller, or equivalent, and under no circumstances should soil be left uncompacted and exposed to moisture infiltration.
- Excavation and placement of fill material should be monitored to determine that the work is being accomplished in accordance with the project specifications and that the weather conditions do not adversely impact the quality of work.

CONDITIONS AND LIMITATIONS

We have prepared this report for Psomas and the City of Bremerton for use in design of this project. Experience shows that soil and groundwater conditions can vary significantly over small distances. Inconsistent conditions may occur between explorations that may not be detected by a geotechnical study of this nature. If, during future site operations, subsurface conditions are encountered which vary appreciably from those described herein, HWA should be notified to review the recommendations made in this report, and revise, if necessary. If there is a substantial lapse of time between submission of this report and the start of construction, or if conditions change due to construction operations, it is recommended that this report be reviewed to determine the applicability of the conclusions and recommendations considering the changed conditions and time lapse.

We recommend HWA be retained to monitor construction, evaluate subgrade soil conditions as they are exposed, and verify that subgrade preparation, paving, and compaction are accomplished in accordance with the specifications.

Within the limitations of scope, schedule and budget, HWA attempted to execute these services in accordance with generally accepted professional principles and practices in the fields of geotechnical and pavement engineering at the time the report was prepared. No warranty, express or implied, is made. The scope of our work did not include environmental assessments or evaluations regarding the presence or absence of wetlands or hazardous or toxic substances in the soil, surface water, or ground water at this site.

We appreciate this opportunity to provide geotechnical and pavement engineering services on this project. If you have any questions or if we may be of further assistance, please contact the undersigned at (425) 774-0106.

Sincerely,

HWA GEOSCIENCES INC.

Bryan K. Hawkins, P.E.
Senior Geotechnical Engineer

ATTACHMENTS:

Figure 1	Site and Vicinity Map
Figures 2A – 2C	Site and Exploration Plans
Appendix A	Pavement Core Logs
Appendix B	Laboratory Testing

REFERENCES:

AASHTO, 1993, *AASHTO Guide for Design of Pavement Structures.*

Haugerud, Ralph A., 2009, *Preliminary geomorphic map of the Kitsap Peninsula, Washington*, U.S. Geological Survey, Open-File Report 2009-1033.

WSDOT 2024, *Standard Specifications for Road, Bridge, and Municipal Construction.*

Yount, James C., Minard, James P., Dembroff, Glenn R., 1993, *Geologic Map of Surficial Deposits in the Seattle 30' x 60' Quadrangle*, Open-File Report 93-233.

HWA GeoSciences Inc.
DBE/MWBE

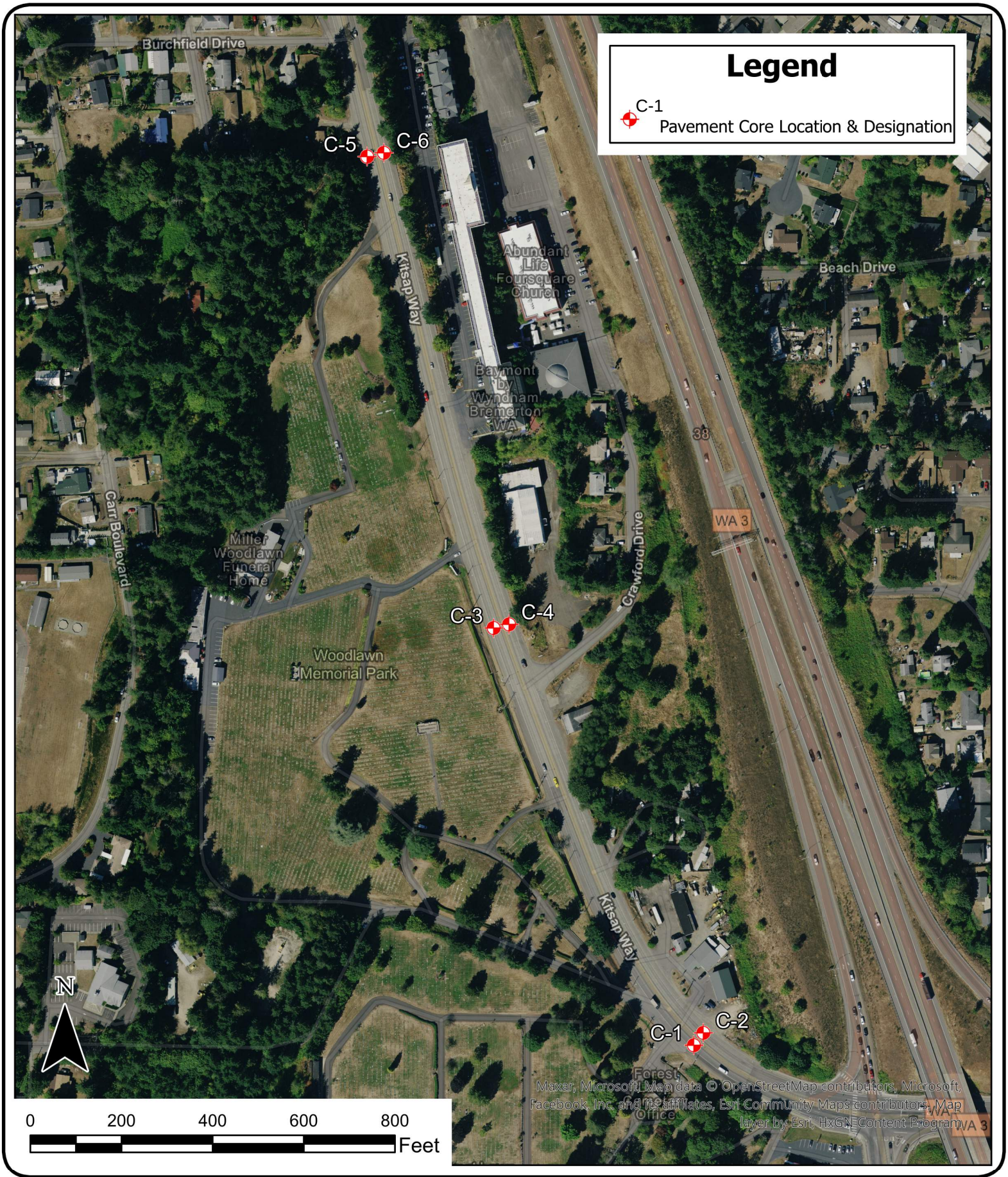
SITE AND VICINITY MAP

WEST KITSAP WAY PLANNING STUDY
PAVEMENT INVESTIGATION
BREMERTON, WASHINGTON

FIGURE NO.: 1

DRAWN BY.: RM
CHECK BY.: BKH

PROJECT #: 2022-048



GeoSciences Inc. DBE/MWBE

SITE & EXPLORATION PLAN

WEST KITSAP WAY PLANNING STUDY
PAVEMENT INVESTIGATION
BREMERTON, WASHINGTON

FIGURE NO.: 2A

DRAWN BY.: RM
CHECK BY.: BKH

PROJECT # 2022-048

HWA GeoSciences Inc. DBE/MWBE

SITE & EXPLORATION PLAN

WEST KITSAP WAY PLANNING STUDY
PAVEMENT INVESTIGATION
BREMERTON, WASHINGTON

FIGURE NO.: 2B

DRAWN BY.: RM
CHECK BY.: BKH

PROJECT # 2022-048

HWA GeoSciences Inc. DBE/MWBE

SITE & EXPLORATION PLAN

WEST KITSAP WAY PLANNING STUDY
PAVEMENT INVESTIGATION
BREMERTON, WASHINGTON

FIGURE NO.: 2C

DRAWN BY.: RM
CHECK BY.: BKH

PROJECT # 2022-048

Appendix A

Pavement Core Logs

RELATIVE DENSITY OR CONSISTENCY VERSUS SPT N-VALUE

COHESIONLESS SOILS			COHESIVE SOILS		
Density	N (blows/ft)	Approximate Relative Density(%)	Consistency	N (blows/ft)	Approximate Undrained Shear Strength (psf)
Very Loose	0 to 4	0 - 15	Very Soft	0 to 2	<250
Loose	4 to 10	15 - 35	Soft	2 to 4	250 - 500
Medium Dense	10 to 30	35 - 65	Medium Stiff	4 to 8	500 - 1000
Dense	30 to 50	65 - 85	Stiff	8 to 15	1000 - 2000
Very Dense	over 50	85 - 100	Very Stiff	15 to 30	2000 - 4000
			Hard	over 30	>4000

USCS SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP DESCRIPTIONS	
Coarse Grained Soils	Gravel and Gravelly Soils	Clean Gravel (little or no fines)	GW	Well-graded GRAVEL
			GP	Poorly-graded GRAVEL
	More than 50% of Coarse Fraction Retained on No. 4 Sieve	Gravel with Fines (appreciable amount of fines)	GM	Silty GRAVEL
			GC	Clayey GRAVEL
More than 50% Retained on No. 200 Sieve Size	Sand and Sandy Soils	Clean Sand (little or no fines)	SW	Well-graded SAND
			SP	Poorly-graded SAND
	50% or More of Coarse Fraction Passing No. 4 Sieve	Sand with Fines (appreciable amount of fines)	SM	Silty SAND
			SC	Clayey SAND
Fine Grained Soils	Silt and Clay	Liquid Limit Less than 50%	ML	SILT
			CL	Lean CLAY
			OL	Organic SILT/Organic CLAY
50% or More Passing No. 200 Sieve Size	Silt and Clay	Liquid Limit 50% or More	MH	Elastic SILT
			CH	Fat CLAY
			OH	Organic SILT/Organic CLAY
Highly Organic Soils			PT	PEAT

TEST SYMBOLS

%F	Percent Fines
AL	Atterberg Limits: PL = Plastic Limit, LL = Liquid Limit
CBR	California Bearing Ratio
CN	Consolidation
DD	Dry Density (pcf)
DS	Direct Shear
GS	Grain Size Distribution
K	Permeability
MD	Moisture/Density Relationship (Proctor)
MR	Resilient Modulus
OC	Organic Content
pH	pH of Soils
PID	Photoionization Device Reading
PP	Pocket Penetrometer (Approx. Comp. Strength, tsf)
Res.	Resistivity
SG	Specific Gravity
CD	Consolidated Drained Triaxial
CU	Consolidated Undrained Triaxial
UU	Unconsolidated Undrained Triaxial
TV	Torvane (Approx. Shear Strength, tsf)
UC	Unconfined Compression

SAMPLE TYPE SYMBOLS

- 2.0" OD Split Spoon (SPT) (140 lb. hammer with 30 in. drop)
- Shelby Tube
- Non-standard Penetration Test (3.0" OD Split Spoon with Brass Rings)
- Small Bag Sample
- Large Bag (Bulk) Sample
- Core Run
- 3-1/4" OD Split Spoon

GROUNDWATER SYMBOLS

- Groundwater Level (measured at time of drilling)
- Groundwater Level (measured in well or open hole after water level stabilized)

COMPONENT DEFINITIONS

COMPONENT	SIZE RANGE
Boulders	Larger than 12 in
Cobbles	3 in to 12 in
Gravel	3 in to No 4 (4.5mm)
Coarse gravel	3 in to 3/4 in
Fine gravel	3/4 in to No 4 (4.5mm)
Sand	No. 4 (4.5 mm) to No. 200 (0.074 mm)
Coarse sand	No. 4 (4.5 mm) to No. 10 (2.0 mm)
Medium sand	No. 10 (2.0 mm) to No. 40 (0.42 mm)
Fine sand	No. 40 (0.42 mm) to No. 200 (0.074 mm)
Silt and Clay	Smaller than No. 200 (0.074mm)

COMPONENT PROPORTIONS

PROPORTION RANGE	DESCRIPTIVE TERMS
< 5%	Clean
5 - 12%	Slightly (Clayey, Silty, Sandy)
12 - 30%	Clayey, Silty, Sandy, Gravelly
30 - 50%	Very (Clayey, Silty, Sandy, Gravelly)
Components are arranged in order of increasing quantities.	

NOTES: Soil classifications presented on exploration logs are based on visual and laboratory observation.
Soil descriptions are presented in the following general order:

Density/consistency, color, modifier (if any) GROUP NAME, additions to group name (if any), moisture content. Proportion, gradation, and angularity of constituents, additional comments. (GEOLOGIC INTERPRETATION)

Please refer to the discussion in the report text as well as the exploration logs for a more complete description of subsurface conditions.

MOISTURE CONTENT

DRY	Absence of moisture, dusty, dry to the touch.
MOIST	Damp but no visible water.
WET	Visible free water, usually soil is below water table.

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West Kitsap Way Planning Study
Pavement Investigation
Bremerton, WA

LEGEND OF TERMS AND SYMBOLS USED ON EXPLORATION LOGS

PROJECT NO.: 2022-048 FIGURE: A-1

EXCAVATION COMPANY: HWA GeoSciences Inc.
EXCAVATING EQUIPMENT: 6-inch Diameter Core Barrel
STREET: W Kitsap Way, SB OL, 7' from fogline

LOCATION: See Figure 2A
DATE COMPLETED: 1/17/24
LOGGED BY: S. Pemble

DEPTH (feet)	SYMBOL	USCS SOIL CLASS.	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT(%)	OTHER TESTS
0			6.5 inches Hot Mix Asphalt. 2 Lifts: 3.25" x 3.25" Cored on medium severity longitudinal crack. Lifts are bonded. Cracked through upper lift. Lower lift has a hariline crack. **(HMA)**				
1			8 inches Portland Cement Concrete. Cracked through. Poor condition. **(PCC)**				
2		GP GM	Medium dense, brown, sandy, rounded GRAVEL with silt, moist. **(FILL)**				
3			Corehole was terminated at 2 feet below ground surface. No groundwater seepage was observed during the exploration.				

PAVEMENT CORE PHOTO

NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GeoSciences Inc.

West Kitsap Way Planning Study
Pavement Investigation
Bremerton, WA

PAVEMENT CORE
C- 1

PROJECT NO.: 2022-048 FIGURE: A-2

EXCAVATION COMPANY: HWA GeoSciences Inc.
EXCAVATING EQUIPMENT: 6-inch Diameter Core Barrel
STREET: W Kitsap Way, NB OL, 4' from fogline

LOCATION: See Figure 2A
DATE COMPLETED: 1/16/24
LOGGED BY: S. Pemble

DEPTH (feet)	SYMBOL	USCS SOIL CLASS.	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT(%)	OTHER TESTS
0			7.75 inches Portland Cement Concrete. No cracking at this location. Good condition. **(PCC)**				
1		GM	Dense, brown, silty, sandy, fine to coarse, rounded GRAVEL, moist. **(FILL)**				
2			Corehole was terminated at 1.5 feet below ground surface. No groundwater seepage was observed during the exploration.				
3							

PAVEMENT CORE PHOTO

NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GEOSCIENCES INC.

West Kitsap Way Planning Study
Pavement Investigation
Bremerton, WA

PAVEMENT CORE
C- 2

PROJECT NO.: 2022-048 FIGURE: A-3

EXCAVATION COMPANY: HWA GeoSciences Inc.
EXCAVATING EQUIPMENT: 6-inch Diameter Core Barrel
STREET: W Kitsap Way, SB OL, 6.5' from fogline

LOCATION: See Figure 2A
DATE COMPLETED: 1/17/24
LOGGED BY: S. Pemble

DEPTH (feet)	SYMBOL	USCS SOIL CLASS.	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT(%)	OTHER TESTS
0			8 inches Portland Cement Concrete. No cracking at this location. Good condition. **(PCC)**				
1		GP GM	Medium dense, brown, sandy, rounded GRAVEL with silt, moist. **(FILL)**				
2			Corehole was terminated at 1.75 feet below ground surface. No groundwater seepage was observed during the exploration.				
3							

PAVEMENT CORE PHOTO

NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GeoSciences Inc.

West Kitsap Way Planning Study
Pavement Investigation
Bremerton, WA

PAVEMENT CORE
C- 3

PROJECT NO.: 2022-048 FIGURE: A-4

EXCAVATION COMPANY: HWA GeoSciences Inc.
EXCAVATING EQUIPMENT: 6-inch Diameter Core Barrel
STREET: W Kitsap Way, NB OL, 5.5' from fogline

LOCATION: See Figure 2A
DATE COMPLETED: 1/16/24
LOGGED BY: S. Pemble

DEPTH (feet)	SYMBOL	USCS SOIL CLASS.	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT(%)	OTHER TESTS
0			7.75 inches Portland Cement Concrete. No cracking at this location. Good condition. **(PCC)**				
1		SM	Loose to medium dense, olive brown, silty SAND with fine gravel, moist. **(FILL)**				
			Becomes dense.				
2			Corehole was terminated at 2 feet below ground surface. No groundwater seepage was observed during the exploration.				
3							

PAVEMENT CORE PHOTO

NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GEOSCIENCES INC.

West Kitsap Way Planning Study
Pavement Investigation
Bremerton, WA

PAVEMENT CORE
C- 4

PROJECT NO.: 2022-048 FIGURE: A-5

EXCAVATION COMPANY: HWA GeoSciences Inc.
EXCAVATING EQUIPMENT: 6-inch Diameter Core Barrel
STREET: W Kitsap Way, SB OL, 5' from fogline

LOCATION: See Figure 2A
DATE COMPLETED: 1/17/24
LOGGED BY: S. Pemble

DEPTH (feet)	SYMBOL	USCS SOIL CLASS.	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT(%)	OTHER TESTS
0			8 inches Portland Cement Concrete. No cracking at this location. Good condition. **(PCC)**				
1		GM	Medium dense to dense, brown, silty, sandy, rounded GRAVEL, wet. **(FILL)**				
2			Corehole was terminated at 1 foot below ground surface due to heavy groundwater seepage. Groundwater seepage was observed at 0.7 feet below ground surface.				
3							

PAVEMENT CORE PHOTO

NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GEOSCIENCES INC.

West Kitsap Way Planning Study
Pavement Investigation
Bremerton, WA

PAVEMENT CORE
C- 5

PROJECT NO.: 2022-048 FIGURE: A-6

EXCAVATION COMPANY: HWA GeoSciences Inc.
EXCAVATING EQUIPMENT: 6-inch Diameter Core Barrel
STREET: W Kitsap Way, NB OL, 6' from fogline

LOCATION: See Figure 2A
DATE COMPLETED: 1/15/24
LOGGED BY: S. Pemble

DEPTH (feet)	SYMBOL	USCS SOIL CLASS.	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT(%)	OTHER TESTS
0			8 inches Portland Cement Concrete. No cracking at this location. Good condition. **(PCC)**				
1		GM	Medium dense, brown, silty, sandy, rounded GRAVEL with scattered cobbles, moist. **(FILL)**				
2			Corehole was terminated at 2 feet below ground surface. No groundwater seepage was observed during the exploration.				
3							

PAVEMENT CORE PHOTO

NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GEOSCIENCES INC.

West Kitsap Way Planning Study
Pavement Investigation
Bremerton, WA

PAVEMENT CORE
C- 6

PROJECT NO.: 2022-048 FIGURE: A-7

EXCAVATION COMPANY: HWA GeoSciences Inc.
EXCAVATING EQUIPMENT: 6-inch Diameter Core Barrel
STREET: W Kitsap Way, WB OL, 6' from fogline

LOCATION: See Figure 2B
DATE COMPLETED: 1/17/24
LOGGED BY: S. Pemble

DEPTH (feet)	SYMBOL	USCS SOIL CLASS.	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT(%)	OTHER TESTS
0			3 inches Hot Mix Asphalt. 1 Lift. Cored on medium severity longitudinal crack. Cracked through full depth of HMA. **(HMA)**				
			8.25 inches Portland Cement Concrete. Good condition. **(PCC)**				
1		GP GM	Medium dense, brown, sandy, fine rounded GRAVEL with silt, moist. **(FILL)**				
2		SM	Medium dense to dense, brown and gray mottled, silty SAND with gravel, moist. **(CONTINENTAL GLACIAL OUTWASH)**				
3			Corehole was terminated at 2 feet below ground surface. No groundwater seepage was observed during the exploration.				

PAVEMENT CORE PHOTO

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GeoSciences Inc.

West Kitsap Way Planning Study
Pavement Investigation
Bremerton, WA

PAVEMENT CORE
C- 7

PROJECT NO.: 2022-048 FIGURE: A-8

EXCAVATION COMPANY: HWA GeoSciences Inc.
EXCAVATING EQUIPMENT: 6-inch Diameter Core Barrel
STREET: W Kitsap Way, EB OL, 5.5' from fogline

LOCATION: See Figure 2B
DATE COMPLETED: 1/15/24
LOGGED BY: S. Pemble

DEPTH (feet)	SYMBOL	USCS SOIL CLASS.	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT(%)	OTHER TESTS
0			2 inches Hot Mix Asphalt. 1 Lift. No cracking at this location. Bonded to PCC below. **(HMA)**				
			8 inches Portland Cement Concrete. Good condition. **(PCC)**				
1		GP GM	Medium dense, brown, sandy, rounded GRAVEL with silt, moist. **(FILL)**				
		ML	Medium stiff, gray, fine sandy SILT, moist to wet. **(CONTINENTAL GLACIAL OUTWASH)**				
2			Corehole was terminated at 2 feet below ground surface. Slow groundwater seepage was observed at 2 feet below ground surface.				
3							

PAVEMENT CORE PHOTO

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GeoSciences Inc.

West Kitsap Way Planning Study
Pavement Investigation
Bremerton, WA

PAVEMENT CORE
C- 8

PROJECT NO.: 2022-048 FIGURE: A-9

EXCAVATION COMPANY: HWA GeoSciences Inc.
EXCAVATING EQUIPMENT: 4-inch Diameter Core Barrel
STREET: W Kitsap Way, EB OL, 5' from fogline

LOCATION: See Figure 2B
DATE COMPLETED: 1/17/24
LOGGED BY: S. Pemble

DEPTH (feet)	SYMBOL	USCS SOIL CLASS.	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT(%)	OTHER TESTS
0			7.5 inches Portland Cement Concrete. No cracking at this location. Good condition. Unconfined compressive strength = 9400 psi. **(PCC)**		S-1		Compression
		GP GM	Medium dense, brown, sandy, fine, rounded GRAVEL, moist. **(FILL)**				
1		SM	Medium dense, olive brown, silty SAND with scattered fine gravel, moist.				
		ML	Medium stiff, gray, fine sandy SILT, moist. **(CONTINENTAL GLACIAL OUTWASH)**				
2			Corehole was terminated at 1.75 feet below ground surface. No groundwater seepage was observed during the exploration.				
3							

PAVEMENT CORE PHOTO

NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GeoSciences Inc.

West Kitsap Way Planning Study
Pavement Investigation
Bremerton, WA

PAVEMENT CORE
C- 9

PROJECT NO.: 2022-048 FIGURE: A-10

EXCAVATION COMPANY: HWA GeoSciences Inc.
EXCAVATING EQUIPMENT: 6-inch Diameter Core Barrel
STREET: W Kitsap Way, WB OL, 5' from fogline

LOCATION: See Figure 2B
DATE COMPLETED: 1/15/24
LOGGED BY: S. Pemble

DEPTH (feet)	SYMBOL	USCS SOIL CLASS.	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT(%)	OTHER TESTS
0			7.75 inches Portland Cement Concrete. No cracking at this location. Good condition. **(PCC)**				
1		GP GM	Medium dense, brown, sandy, rounded, fine to coarse GRAVEL with silt, moist. **(FILL)**				
		SM	Medium dense, olive brown, silty, fine SAND, moist. **(CONTINENTAL GLACIAL OUTWASH)**				
2			Corehole was terminated at 2 feet below ground surface. No groundwater seepage was observed during the exploration.				
3							

PAVEMENT CORE PHOTO

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GeoSciences Inc.

West Kitsap Way Planning Study
Pavement Investigation
Bremerton, WA

PAVEMENT CORE
C-10

PROJECT NO.: 2022-048 FIGURE: A-11

EXCAVATION COMPANY: HWA GeoSciences Inc.
EXCAVATING EQUIPMENT: 6-inch Diameter Core Barrel
STREET: W Kitsap Way, EB OL, 5.5' from fogline

LOCATION: See Figure 2B
DATE COMPLETED: 1/16/24
LOGGED BY: S. Pemble

DEPTH (feet)	SYMBOL	USCS SOIL CLASS.	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT(%)	OTHER TESTS
0			8.25 inches Portland Cement Concrete. No cracking at this location. Good condition. **(PCC)**				
1		GP	Medium dense, brown, sandy, fine to coarse, rounded GRAVEL, moist. **(FILL)**				
2		SM	Medium dense, gray and brown mottled, silty, fine SAND, moist. **(CONTINENTAL GLACIAL OUTWASH)**				
3			Corehole was terminated at 2 feet below ground surface. No groundwater seepage was observed during the exploration.				

PAVEMENT CORE PHOTO

NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GeoSciences Inc.

West Kitsap Way Planning Study
Pavement Investigation
Bremerton, WA

PAVEMENT CORE
C-11

PROJECT NO.: 2022-048 FIGURE: A-12

EXCAVATION COMPANY: HWA GeoSciences Inc.
EXCAVATING EQUIPMENT: 6-inch Diameter Core Barrel
STREET: W Kitsap Way, WB OL, 6' from fogline

LOCATION: See Figure 2B
DATE COMPLETED: 1/15/24
LOGGED BY: S. Pemble

DEPTH (feet)	SYMBOL	USCS SOIL CLASS.	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT(%)	OTHER TESTS
0			1.5 inches Hot Mix Asphalt. 1 Lift. No crack at core location. HMA is bonded to PCC below. **(HMA)**				
			8 inches Portland Cement Concrete. Good condition. **(PCC)**				
1		GP GM	Loose, brown, sandy, fine to coarse, rounded GRAVEL with silt, moist. **(FILL)**				
		ML	Medium stiff, gray, sandy SILT with scattered gravel, cobbles, and clots of clay, moist. **(CONTINENTAL GLACIAL OUTWASH)**				
2			Corehole was terminated at 1.7 feet below ground surface due to refusal on cobble. No groundwater seepage was observed during the exploration.				
3							

PAVEMENT CORE PHOTO

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GEOSCIENCES INC.

West Kitsap Way Planning Study
Pavement Investigation
Bremerton, WA

PAVEMENT CORE
C-12

PROJECT NO.: 2022-048 FIGURE: A-13

EXCAVATION COMPANY: HWA GeoSciences Inc.
EXCAVATING EQUIPMENT: 6-inch Diameter Core Barrel
STREET: W Kitsap Way, EB OL, 5' from fogline

LOCATION: See Figure 2C
DATE COMPLETED: 1/16/24
LOGGED BY: S. Pemble

DEPTH (feet)	SYMBOL	USCS SOIL CLASS.	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT(%)	OTHER TESTS
0			8 inches Portland Cement Concrete. No cracking at this location. Good condition. **(PCC)**				
		GP GM	Dense, brown, sandy, rounded GRAVEL with silt, moist. **(FILL)**				
1		GM	Dense, brown, silty, sandy, rounded GRAVEL, moist.				
2			Corehole was terminated at 1.6 feet below ground surface. No groundwater seepage was observed during the exploration.				
3							

PAVEMENT CORE PHOTO

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HWA GeoSciences Inc.

West Kitsap Way Planning Study
Pavement Investigation
Bremerton, WA

PAVEMENT CORE
C-13

PROJECT NO.: 2022-048 FIGURE: A-14

EXCAVATION COMPANY: HWA GeoSciences Inc.
EXCAVATING EQUIPMENT: 6-inch Diameter Core Barrel
STREET: W Kitsap Way, WB OL, 4.75' from fogline

LOCATION: See Figure 2C
DATE COMPLETED: 1/15/24
LOGGED BY: S. Pemble

DEPTH (feet)	SYMBOL	USCS SOIL CLASS.	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT(%)	OTHER TESTS
0			7.75 inches Portland Cement Concrete. No cracking at this location. Good condition. **(PCC)**				
1		GP	Medium dense, brown, sandy, fine to coarse, rounded GRAVEL, moist. **(FILL)**				
		GM	Medium dense, brown, silty, sandy, fine to coarse, rounded GRAVEL, moist.				
2			Corehole was terminated at 1.8 feet below ground surface. No groundwater seepage was observed during the exploration.				
3							

PAVEMENT CORE PHOTO

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GeoSciences Inc.

West Kitsap Way Planning Study
Pavement Investigation
Bremerton, WA

PAVEMENT CORE
C-14

PROJECT NO.: 2022-048 FIGURE: A-15

EXCAVATION COMPANY: HWA GeoSciences Inc.
EXCAVATING EQUIPMENT: 6-inch Diameter Core Barrel
STREET: W Kitsap Way, EB OL, 3' from fogline

LOCATION: See Figure 2C
DATE COMPLETED: 1/16/24
LOGGED BY: S. Pemble

DEPTH (feet)	SYMBOL	USCS SOIL CLASS.	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT(%)	OTHER TESTS
0			4.5 inches Hot Mix Asphalt. 2 Lifts: 1.5" x 3" Cored on medium severity longitudinal crack. Cracked through full depth of HMA. Lifts are bonded. **(HMA)**				
		GP	Very dense, brown, sandy, fine, rounded GRAVEL with scattered cobbles, moist. **(FILL)**				
1			Corehole was terminated at 1 foot below ground surface due to very dense gravel. No groundwater seepage was observed during the exploration.				
2							
3							

PAVEMENT CORE PHOTO

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GEOSCIENCES INC.

West Kitsap Way Planning Study
Pavement Investigation
Bremerton, WA

PAVEMENT CORE
C-15

PROJECT NO.: 2022-048 FIGURE: A-16

EXCAVATION COMPANY: HWA GeoSciences Inc.
EXCAVATING EQUIPMENT: 6-inch Diameter Core Barrel
STREET: W Kitsap Way, WB, 5' from fogline

LOCATION: See Figure 2C
DATE COMPLETED: 1/15/24
LOGGED BY: S. Pemble

DEPTH (feet)	SYMBOL	USCS SOIL CLASS.	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTURE CONTENT(%)	OTHER TESTS
0			6.5 inches Hot Mix Asphalt. 3 Lifts: 1.25" x 2" x 3.25" Cored on low to medium severity longitudinal crack. Cracked through upper lift. Lifts are bonded. **(HMA)**				
			5.5 inches Crushed Surfacing Top Course. Very dense, brown, sandy, fine, crushed GRAVEL, moist. **(CSTC)**				
1		SP	Medium dense, olive brown, SAND with fine to coarse gravel, moist. **(FILL)**				
2			Corehole was terminated at 1.75 feet below ground surface. No groundwater seepage was observed during the exploration.				
3							

PAVEMENT CORE PHOTO

NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

GeoSciences Inc.

West Kitsap Way Planning Study
Pavement Investigation
Bremerton, WA

PAVEMENT CORE
C-16

PROJECT NO.: 2022-048 FIGURE: A-17

Appendix B

Laboratory Testing

FIELD AND LABORATORY CONCRETE TEST REPORT

[X] ASTM C 31, C 39, C 143, C172, C231, C1064, C1231

[ ] AASHTO T23, T22, T119, T141, T152, T309

HWA GEOSCIENCES INC. DBE/MWBE

CLIENT: ***Psomas*** **TEST/SET #** C-9

PROJECT: ***West Kitsap Way Planning Study*** DATE CAST: *N/A*

HWA PROJECT NO: ***2022-048*** HWA TASK NO.: DATE REC'D: *N/A*

DESCRIPTION OF CONCRETE PLACEMENT REPRESENTED BY THIS TEST:

4-inch Diameter Pavement Core at Location of Core-9

COMPRESSIVE STRENGTH TEST DATA

CYLINDER I.D. NUMBER	AGE (days)	CYL. WEIGHT (grams)	TEST DATE (mm/dd/yy)	CYL. HEIGHT (d"x l")	DIAMETER (inches)	X-SECT. AREA (sq. in.)	MAX. LOAD (lbs)	COMPR. STRENGTH (psi)	FRAC. TYPE	TECH.
C-9A	*N/A*		*1/17/24*	*7.24*	*3.75*	*11.04*	*103922*	*9410*	*2*	*RM*
			28 Day Average Compressive Strength							

Cap used: ☐ Un-Bonded ☐ Sulfur ☐ Other. Specified Minimum: N/A

1 2 3 4 5 6

INFO. FROM SUPPLIER TICKET

Supplier Name: _____ Max: Agg. Size (in): _____ Time Batched: _____

Plant Number: _____ Cement Type: _____ Arrival Time: _____

Mix Code / No.: _____ Load Volume (yd^3): _____ Start Unloading: _____

Truck Number: _____ Cum. Volume (yd^3): _____ End Unloading: _____

Ticket Number: Admixtures:

FIELD TEST DATA

Slump (inches): _____ Specified Slump (min-max): _____ Time Sampled: _____

Entrained Air (%): _____ Specified Ent. Air (min-max): _____ Time Cyls Cast: _____

Conc. Temp. (F): _____ Ambient Air Temperature (F): _____ Cast By: _____

Water Added: Initial Curing Temp (min-max): Mold Type:

MISCELLANEOUS INFORMATION / COMMENTS

Contractor / SubContractor: _____

Concrete Placement Method: _____

Field test results reported to _____

Field test results reported to _____

Additonal slump tests on the following truckloads:

HWA also visually assessed the following truckloads:

Additional air tests on the following truckloads:

Printed Date: February 14, 2024 Reviewed By: B. Hawkins