

APPENDIX 'A'

GEOTECHNICAL REPORT



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"Engineering and Testing Solutions That Work for You"

February 22, 2023

File No.: 23-035-01

WSP Canada Inc.
1600 Buffalo Place
Winnipeg, Manitoba
R3T 6B8

ATTENTION: Richard Hawkins, C.E.T.

RE: City of Winnipeg RFP No. 526-2022.3, 2023 Warde/Pandora Avenue Pavement Renewals (23-C-05)

Introduction

ENG-TECH Consulting Limited (ENG-TECH) was retained by WSP Canada Inc. (WSP) to complete a pavement coring and testing program for a future rehabilitation project along sections of Warde Avenue and Pandora Avenue in Winnipeg, Manitoba.

Scope of Work

The scope of work for the project entailed recovering a total of thirty-two (32) cores through the existing pavement structure, documenting findings in accordance with Appendix B – Site Investigation Requirements for Public Works Street Projects and providing a report outlining the work conducted, including photographs and pavement core summary tables showing the pavement core thicknesses and locations using UTM coordinates.

The sections of road from which cores were recovered were as follows:

- Warde Avenue (St Mary's Road to Dakota Street) – 20 cores
- Pandora Avenue (Wayota Street to Ravenhurst Street) – 12 cores

Field Program

ENG-TECH conducted the coring program on the local streets between February 1st and 9th, 2023 across the site locations previously stated. The cores were obtained by ENG-TECH at locations determined by WSP using a 100mm and 150mm diameter diamond end core barrels at mid slab locations. ENG-TECH repaired the core apertures with a City of Winnipeg approved material (cold mix asphalt) that has been accepted on previous street renewal projects.

Laboratory Program

ENG-TECH measured core thicknesses and photographed the pavement structure. The core thicknesses, pavement structure and UTM coordinates are outlined in Tables 1 and 2 below. Photographs of each core are shown in the attached Photographs 1 to 32. ENG-TECH also determined concrete compressive strengths in accordance with CSA A23.2-14C – moist condition on select cores from locations determined by WSP. The compressive strength results are shown on the attached Obtaining and Testing Drilled Cores reports.

Closure

ENG-TECH trusts this is all the information required. If you have any questions, please contact the undersigned.

Sincerely,
ENG-TECH Consulting Limited



Darci Babisky, C.E.T.
Operations Manager - Laboratory

Enclosures: Table 1 – Summary of Pavement Structure – Warde Avenue (St Mary's Road to Dakota Street)
Table 2 – Summary of Pavement Structure – Pandora Avenue (Wayota Street to Ravenhurst Street)
Obtaining and Testing Drilled Cores report (Ref. No. 23-35-1-1,2) (5 pages)
Photographs of Cores (32 cores) (32 pages)

Email: WSP Canada Inc. Contact Group

Table 1 - Summary of Pavement Core Structure
Warde Avenue (St Mary's Road to Dakota Street)

Core No.	Date Collected	Lane	Test Hole Location		Pavement Surface		
			UTM (N)	14U (E)	Type	Core Diameter (mm)	Thickness (mm)
1	February 1, 2023	Westbound	5519364	636909	Asphalt	150	73
					Concrete	150	190
2	February 1, 2023	Westbound	5519332	636852	Asphalt	150	65
					Concrete	150	204
3	February 1, 2023	Westbound	5519303	636802	Asphalt	150	57
					Concrete	150	211
4	February 1, 2023	Westbound	5519272	636744	Asphalt	150	57
					Concrete	150	215
5	February 2, 2023	Westbound	5519247	636701	Asphalt	100	77
					Concrete	100	205
6	February 2, 2023	Westbound	5519182	636584	Asphalt	150	50
					Concrete	150	160
7	February 2, 2023	Westbound	5519108	636455	Asphalt	100	50
					Concrete	100	200
8	February 2, 2023	Westbound	5519053	636355	Asphalt	150	57
					Concrete	150	194
9	February 2, 2023	Westbound	5518926	636130	Asphalt	100	28
					Concrete	100	215
10	February 3, 2023	Westbound	5518885	636056	Asphalt	150	110
					Concrete	150	190

Core No.	Date Collected	Lane	Test Hole Location		Pavement Surface		
			UTM (N)	14U (E)	Type	Core Diameter (mm)	Thickness (mm)
11	February 3, 2023	Westbound	5518811	635925	Asphalt	150	40
					Concrete	150	160
12	February 3, 2023	Eastbound	5518768	635803	Asphalt	150	145
					Concrete	150	0
13	February 3, 2023	Eastbound	5518836	635978	Asphalt	100	33
					Concrete	100	206
14	February 3, 2023	Eastbound	5519128	636491	Asphalt	150	74
					Concrete	150	232
15	February 9, 2023	Eastbound	5519159	636555	Asphalt	150	115
					Concrete	150	170
16	February 9, 2023	Eastbound	5519176	636579	Asphalt	150	80
					Concrete	150	218
17	February 9, 2023	Eastbound	5519205	636635	Asphalt	150	57
					Concrete	150	208
18	February 9, 2023	Eastbound	5519318	636835	Asphalt	150	100
					Concrete	150	185
19	February 9, 2023	Eastbound	5519361	636912	Asphalt	150	80
					Concrete	150	190
20	February 9, 2023	Eastbound	5519381	636948	Asphalt	100	75
					Concrete	100	190

Notes: Core No.'s 1 to 4, 7, 8, 10, 13, 17 and 18 contained reinforcing steel bars.

Core No.	Date Collected	Lane	Test Hole Location		Pavement Surface		
			UTM (N)	14U (E)	Type	Core Diameter (mm)	Thickness (mm)
1	February 6, 2023	Eastbound	5528725	644745	Asphalt	150	112
					Concrete	150	210
2	February 6, 2023	Eastbound	5528732	644967	Asphalt	150	68
					Concrete	150	185
3	February 6, 2023	Eastbound	5528737	645093	Asphalt	150	71
					Concrete	150	185
4	February 6, 2023	Eastbound	5528741	645301	Asphalt	150	77
					Concrete	150	195
5	February 6, 2023	Eastbound	5528741	645383	Asphalt	100	110
					Concrete	100	195
6	February 6, 2023	Eastbound	5528744	645590	Asphalt	150	100
					Concrete	150	190
7	February 8, 2023	Eastbound	5528752	645867	Asphalt	150	120
					Concrete	150	200
8	February 8, 2023	Eastbound	5528751	645778	Asphalt	150	69
					Concrete	150	199
9	February 8, 2023	Westbound	5528748	645479	Asphalt	100	100
					Concrete	100	198
10	February 8, 2023	Westbound	5528744	645266	Asphalt	150	95
					Concrete	150	200
11	February 8, 2023	Westbound	5528736	644840	Asphalt	150	50
					Concrete	150	199
12	February 8, 2023	Westbound	5528723	644560	Asphalt	100	68
					Concrete	100	192

Notes: Core No.'s 1, 2, 8 and 9 contained reinforcing steel bars.



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File No.: 23-035-01

Ref. No.: 23-35-1-1

Attention: Richard Hawkins, C.E.T.

Project: City of Winnipeg RFP No. 526-2022.3, 2023 WARDE/PANDORA AVENUE PAVEMENT RENEWALS (23-C-05)

Date Cored: See comments Cored By: ENG-TECH (Kyle Zebiere) Page: 1 of 3
Date Received: Feb 9/23 Received By: ENG-TECH (Kyle Zebiere) Structure: Road pavement
Age of Concrete: - Concrete Design Strength: 32 Mpa Test Method: CSA A23.2-14C, 9C
Core Conditioning: As per CSA A23.2-14C Clause 7.3.1 (moist) Direction of Load: Parallel
Strength Specification: Minimum 85% of design strength on an average of 3 cores - no single less than 75% as per CSA A23.1 Clause 4.4.2.2.2.2

Core No.	Location on Structure	Length		Average Diameter (mm)	Date Tested (m/d/y)	Compressive Strength (MPa)	Type of Fracture	Tested By ENG-TECH
		Cored (mm)	Tested (mm)					
1	Westbound Warde Avenue, centreline of lane, Northing: 5519364, Easting: 636909	190	-	150	-	-	-	-
2	Westbound Warde Avenue, centreline of lane, Northing: 5519332, Easting: 636852	204	-	150	-	-	-	-
3	Westbound Warde Avenue, 0.2 meters South of centreline of lane, Northing: 5519303, Easting: 636802	211	-	150	-	-	-	-
4	Westbound Warde Avenue, 0.3 meters North of centreline of lane, Northing: 5519272, Easting: 636744	215	-	150	-	-	-	-
5	Westbound Warde Avenue, centreline of lane, Northing: 5519247, Easting: 636701	205	184	100	Feb 13/23	57.6*	-	Kyle Zebiere
6	Westbound Warde Avenue, 0.2 meters North of centreline of lane, Northing: 5519182, Easting: 636584	160	-	150	-	-	-	-

Reporting of these results constitutes a testing service only. Engineering interpretation or evaluation of the test results is provided only on written request.

*Denotes corrected strength for Length/Diameter ratio less than 2.0 to 1.0. Type of fracture indicated when cylinder fails to meet 85% of design strength or if different than Type 1.

Deviations from test procedure: None

Email: WSP Canada Inc. Contact Group

ENG-TECH Consulting Limited

Per

Darci Babisky, C.E.T.
Operations Manager - Laboratory
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File No.: 23-035-01
Ref. No.: 23-35-1-1
Date Cored: See comments
Page: 2 of 3

Core No.	Location on Structure	Length		Average Diameter (mm)	Date Tested (m/d/y)	Compressive Strength (MPa)	Type of Fracture	Tested By ENG-TECH
		Cored (mm)	Tested (mm)					
7	Westbound Warde Avenue, 1.0 meter South of centreline of lane, Northing: 5519108, Easting: 636455	200	114	100	Feb 13/23	41.8*	-	Kyle Zebiere
8	Westbound Warde Avenue, 0.2 meters North of centreline of lane, Northing: 5519053, Easting: 636355	194	-	150	-	-	-	-
9	Westbound Warde Avenue, 0.2 meters South of centreline of lane, Northing: 5518926, Easting: 636130	215	191	100	Feb 13/23	56.6*	-	Kyle Zebiere
10	Westbound Warde Avenue, centreline of lane, Northing: 5518885, Easting: 636056	190	-	150	-	-	-	-
11	Westbound Warde Avenue, centreline of lane, Northing: 5518811, Easting: 635925	160	-	150	-	-	-	-
12	Eastbound Warde Avenue, turning lane to 672 Sonning Bay, Northing: 5518768, Easting: 635803	-	-	-	-	-	-	-
13	Eastbound Warde Avenue, centreline of lane, Northing: 5518836, Easting: 635978	206	146	100	Feb 13/23	67.6*	-	Kyle Zebiere
14	Eastbound Warde Avenue, 0.4 meters South of centreline of lane, Northing: 5519128, Easting: 636491	232	-	150	-	-	-	-

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*Denotes corrected strength for Length/Diameter ratio less than 2.0 to 1.0. Type of fracture indicated when cylinder fails to meet 85% of design strength or if different than Type 1.

Deviations from test procedure: None

Email: WSP Canada Inc. Contact Group

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Supplementary information may be provided upon request.
Restrictions and additional fees may apply.





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RENEWALS (23-C-05)
File No.: 23-035-01
Ref. No.: 23-35-1-1
Date Cored: See comments
Page: 3 of 3

Core No.	Location on Structure	Length		Average Diameter (mm)	Date Tested (m/d/y)	Compressive Strength (MPa)	Type of Fracture	Tested By ENG-TECH
		Cored (mm)	Tested (mm)					
15	Eastbound Warde Avenue, 1.2 meters South of centreline of lane, Northing: 5519159, Easting: 636555	170	-	150	-	-	-	-
16	Eastbound Warde Avenue, centreline of lane, Northing: 5519176, Easting: 636579	218	-	150	-	-	-	-
17	Eastbound Warde Avenue, centreline of lane, Northing: 5519205, Easting: 636635	208	-	150	-	-	-	-
18	Eastbound Warde Avenue, centreline of lane, Northing: 5519318, Easting: 636835	185	-	150	-	-	-	-
19	Eastbound Warde Avenue, centreline of lane, Northing: 5519361, Easting: 636912	190	-	150	-	-	-	-
20	Eastbound Warde Avenue, centreline of lane, Northing: 5519381, Easting: 636948	190	174	100	Feb 13/23	58.7*	-	Kyle Zebiere

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*Denotes corrected strength for Length/Diameter ratio less than 2.0 to 1.0. Type of fracture indicated when cylinder fails to meet 85% of design strength or if different than Type 1.

Comments: Core No.'s 1 to 4 were recovered February 1, 2023. Core No.'s 5 to 9 were recovered February 2, 2023. Core No.'s 10 to 14 were recovered February 3, 2023. Core No.'s 15 to 20 were recovered February 9, 2023. Core No. 1 contained 10M reinforcing steel 105mm below top of core. Core No. 2 contained 10M reinforcing steel 145mm below top of core. Core No. 3 contained 10M reinforcing steel 120mm below top of core. Core No. 4 contained 10M reinforcing steel 130mm below top of core. Core No. 7 contained 10M reinforcing steel 115mm below top of core. The steel was trimmed off prior to testing Core No. 7. Core No. 8 contained 10M reinforcing steel 100mm below top of core. Core No. 10 contained 10M reinforcing steel 115mm and 125mm below top of core. Core No. 12 was comprised entirely of asphalt. Core No. 13 contained 10M reinforcing steel 155mm below top of core. The steel was removed prior to testing Core No. 13. Core No. 17 contained 10M reinforcing steel 135mm below top of core. Core No. 18 contained 10M reinforcing steel 110mm below top of core.

Deviations from test procedure: None

Email: WSP Canada Inc. Contact Group

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File No.: 23-035-01

Ref. No.: 23-35-1-2

Attention: Richard Hawkins, C.E.T.

Project: City of Winnipeg RFP No. 526-2022.3, 2023 WARDE/PANDORA AVENUE PAVEMENT RENEWALS (23-C-05)

Date Cored: See comments Cored By: ENG-TECH (Kyle Zebiere) Page: 1 of 2
 Date Received: Feb 8/23 Received By: ENG-TECH (Kyle Zebiere) Structure: Road pavement
 Age of Concrete: - Concrete Design Strength: 32 Mpa Test Method: CSA A23.2-14C, 9C
 Core Conditioning: As per CSA A23.2-14C Clause 7.3.1 (moist) Direction of Load: Parallel
 Strength Specification: Minimum 85% of design strength on an average of 3 cores - no single less than 75% as per CSA A23.1 Clause 4.4.2.2.2.2

Core No.	Location on Structure	Length		Average Diameter (mm)	Date Tested (m/d/y)	Compressive Strength (MPa)	Type of Fracture	Tested By ENG-TECH
		Cored (mm)	Tested (mm)					
1	Eastbound Pandora Avenue East, 0.1 meter South of centreline of lane, Northing: 5528725, Easting: 644745	210	-	150	-	-	-	-
2	Eastbound Pandora Avenue East, 1.5 meters South of centreline of lane, Northing: 5528732, Easting: 644967	185	-	150	-	-	-	-
3	Eastbound Pandora Avenue East, centreline of lane, Northing: 5528737, Easting: 645093	185	-	150	-	-	-	-
4	Eastbound Pandora Avenue East, 0.3 meters North of centreline of lane, Northing: 5528741, Easting: 645301	195	-	150	-	-	-	-
5	Eastbound Pandora Avenue East, 0.2 meters South of centreline of lane, Northing: 5528741, Easting: 645383	195	149	100	Feb 13/23	44.3*	-	Kyle Zebiere
6	Eastbound Pandora Avenue East, 0.3 meters South of centreline of lane, Northing: 5528744, Easting: 645590	190	-	150	-	-	-	-

Reporting of these results constitutes a testing service only. Engineering interpretation or evaluation of the test results is provided only on written request.
 *Denotes corrected strength for Length/Diameter ratio less than 2.0 to 1.0. Type of fracture indicated when cylinder fails to meet 85% of design strength or if different than Type 1.

Deviations from test procedure: None

Email: WSP Canada Inc. Contact Group

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Page: 2 of 2

Core No.	Location on Structure	Length		Average Diameter (mm)	Date Tested (m/d/y)	Compressive Strength (MPa)	Type of Fracture	Tested By ENG-TECH
		Cored (mm)	Tested (mm)					
7	Eastbound Pandora Avenue East, turning lane to Ravenhurst Street, centreline of lane, Northing: 5528752, Easting: 645867	200	-	150	-	-	-	-
8	Eastbound Pandora Avenue East, median, 3.5 meters North of centreline of lane, Northing: 5528751, Easting: 645778	199	-	150	-	-	-	-
9	Westbound Pandora Avenue East, 1.2 meters North of centreline of lane, Northing: 5528748, Easting: 645479	198	127	100	Feb 13/23	42.9*	-	Kyle Zebiere
10	Westbound Pandora Avenue East, centreline of lane, Northing: 5528744, Easting: 645266	200	-	150	-	-	-	-
11	Westbound Pandora Avenue East, 1.2 meters North of centreline of lane, Northing: 5528736, Easting: 644840	199	-	150	-	-	-	-
12	Westbound Pandora Avenue East, 0.2 meters South of centreline of lane, Northing: 5528723, Easting: 644560	192	170	100	Feb 13/23	39.0*	-	Kyle Zebiere

Reporting of these results constitutes a testing service only. Engineering interpretation or evaluation of the test results is provided only on written request.

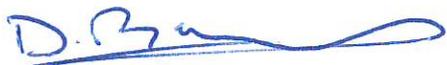
*Denotes corrected strength for Length/Diameter ratio less than 2.0 to 1.0. Type of fracture indicated when cylinder fails to meet 85% of design strength or if different than Type 1.

Comments: Core No.'s 1 to 6 were recovered February 6, 2023. Core No.'s 7 to 12 were recovered February 8, 2023. Core No. 1 contained 30M reinforcing steel 90mm below top of core. Core No. 2 contained 10M reinforcing steel 140mm below top of core. Core No. 8 contained 10M reinforcing steel 115mm and 125mm below top of core. Core No. 9 contained 10M reinforcing steel 125mm below top of core. The steel was removed from Core No. 9 prior to testing.

Deviations from test procedure: None

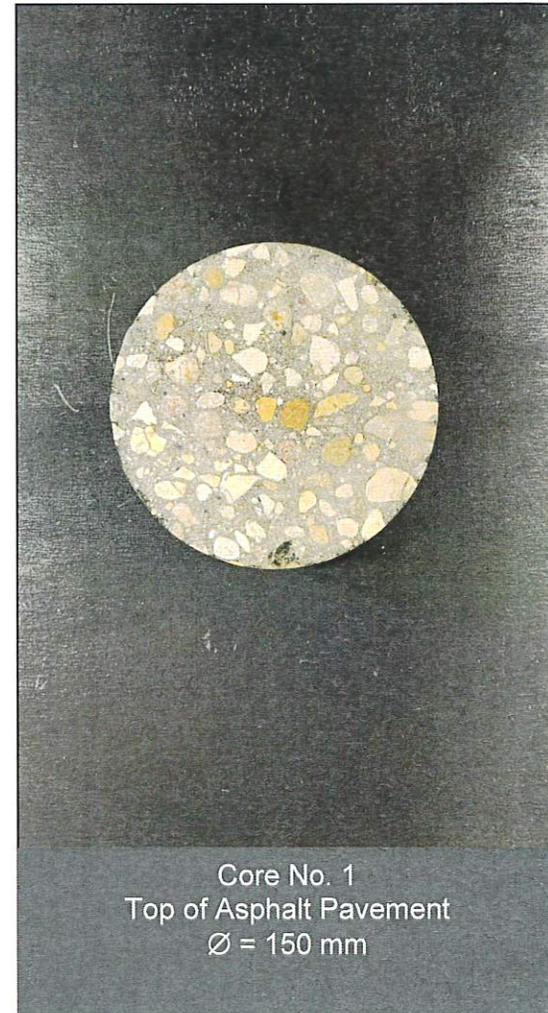
Email: WSP Canada Inc. Contact Group

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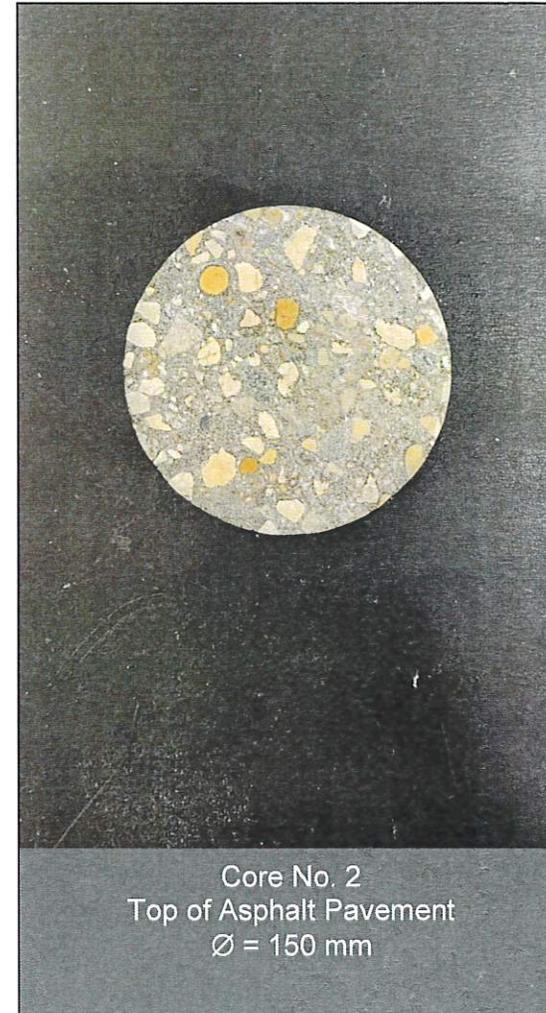
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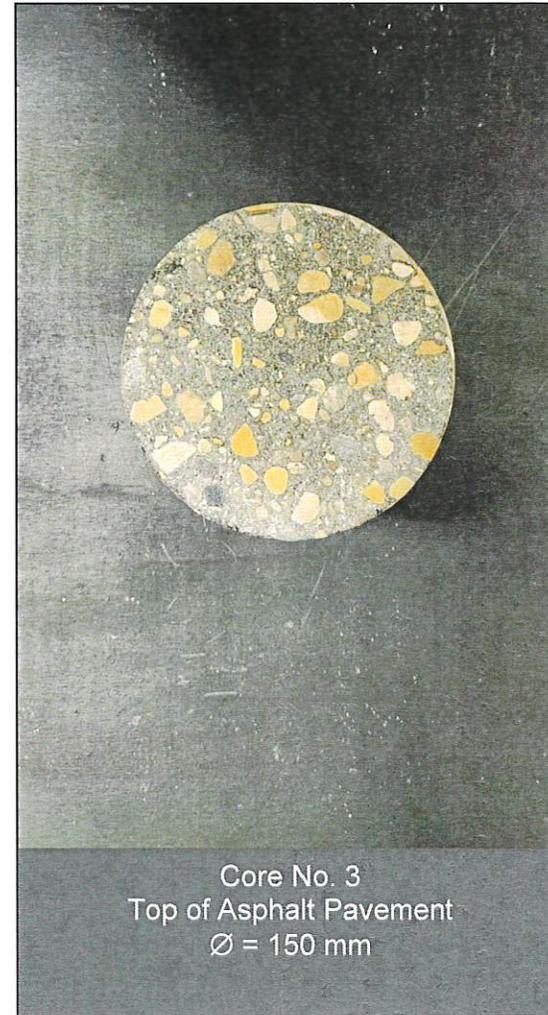
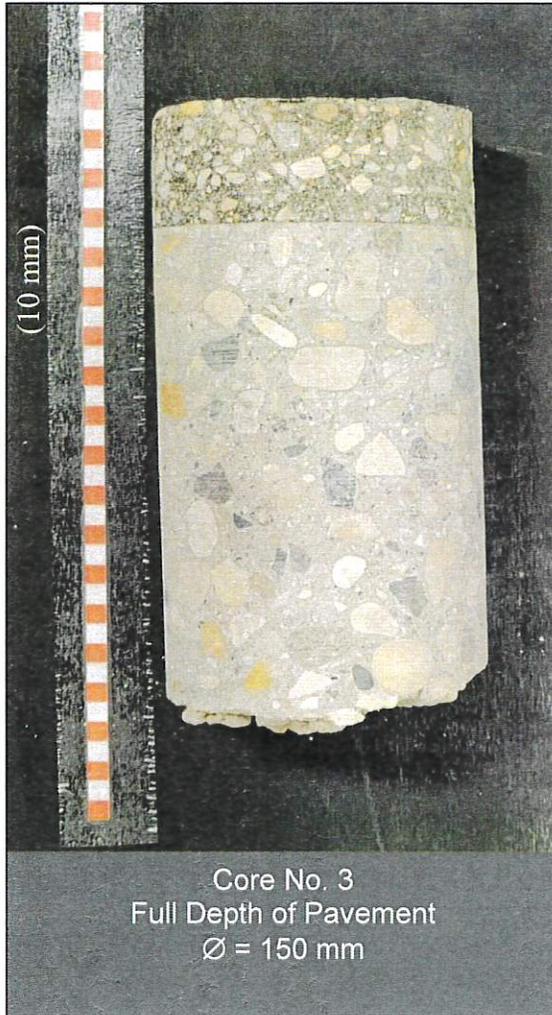
Photograph 1: Specimen from Warde Avenue, Westbound Lane



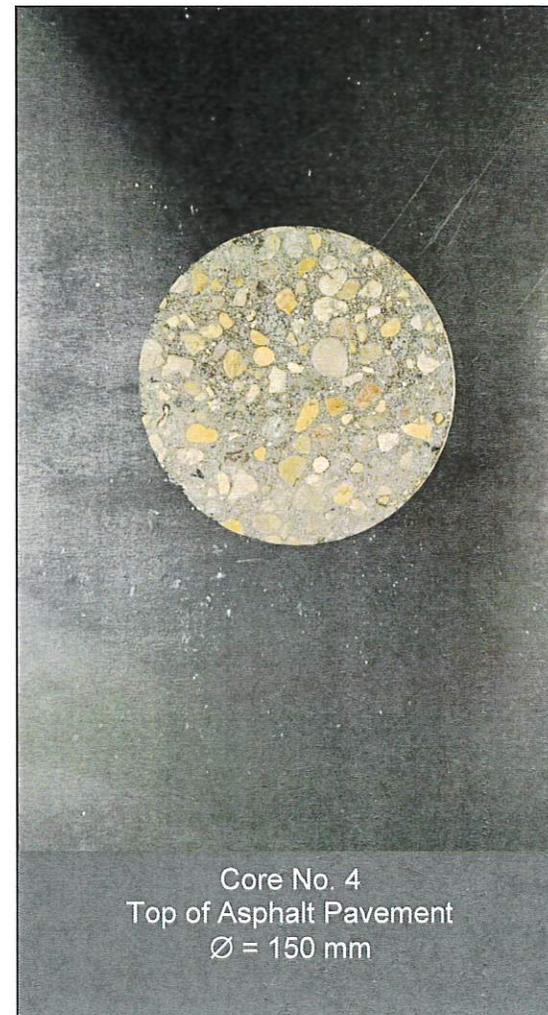
Photograph 2: Specimen from Warde Avenue, Westbound Lane



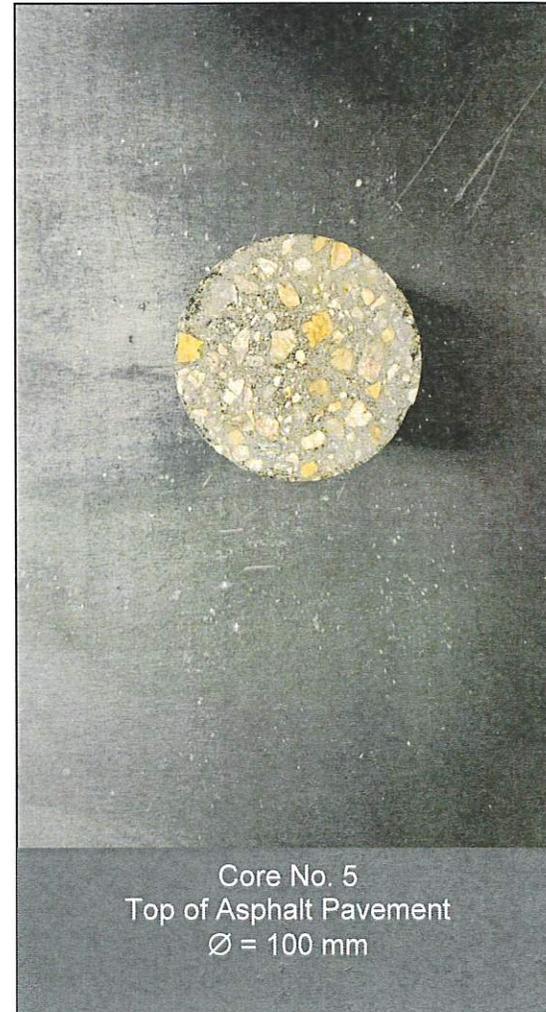
Photograph 3: Specimen from Warde Avenue, Westbound Lane



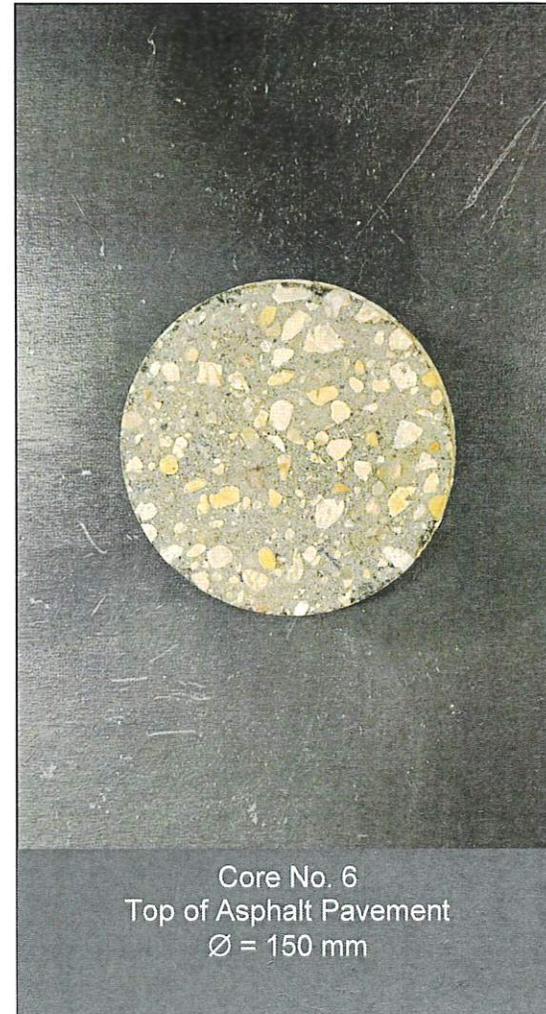
Photograph 4: Specimen from Warde Avenue, Westbound Lane



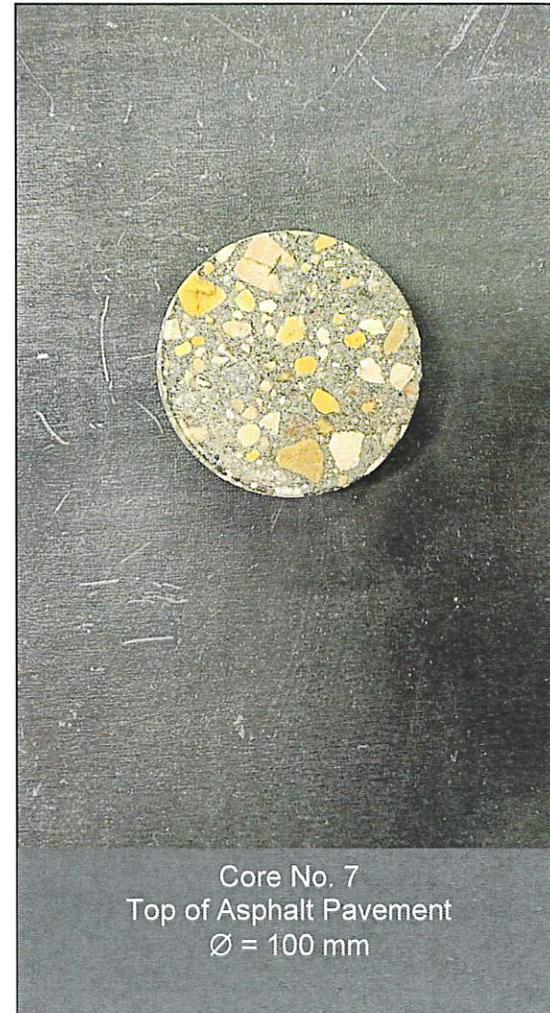
Photograph 5: Specimen from Warde Avenue, Westbound Lane



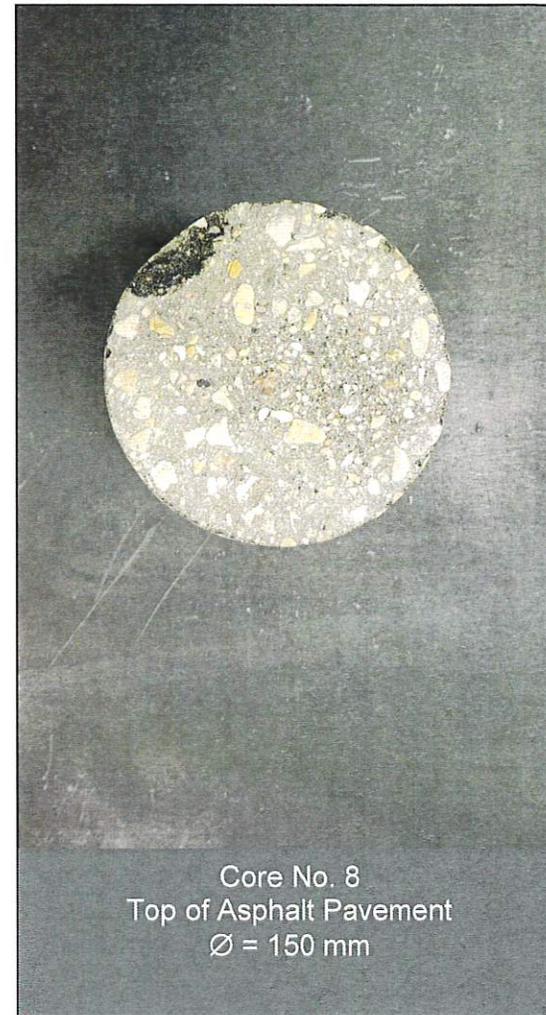
Photograph 6: Specimen from Warde Avenue, Westbound Lane



Photograph 7: Specimen from Warde Avenue, Westbound Lane



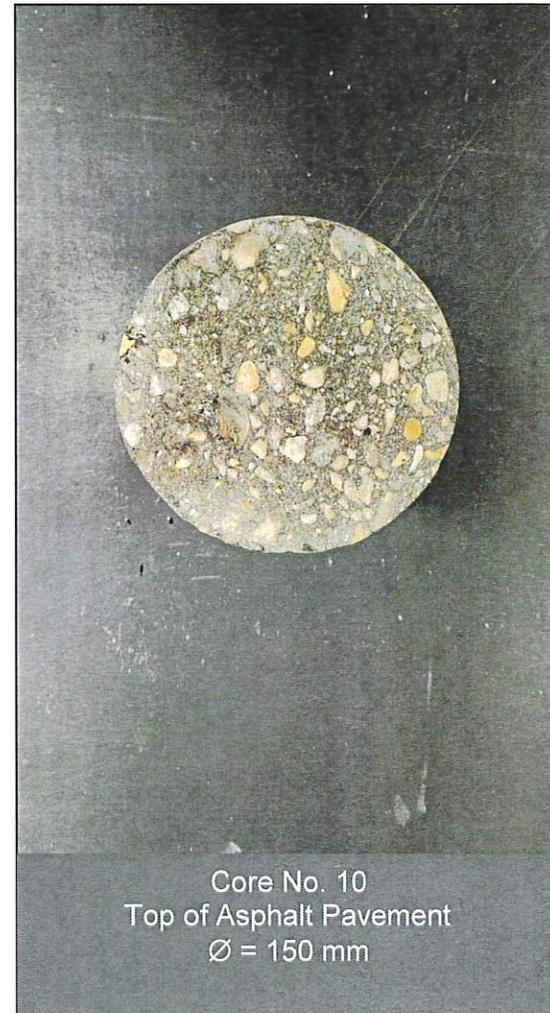
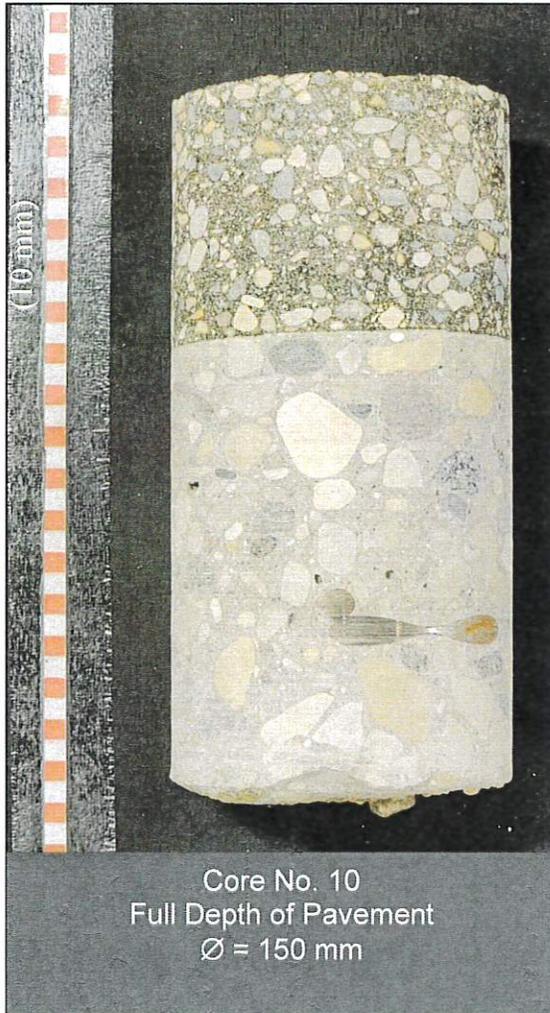
Photograph 8: Specimen from Warde Avenue, Westbound Lane



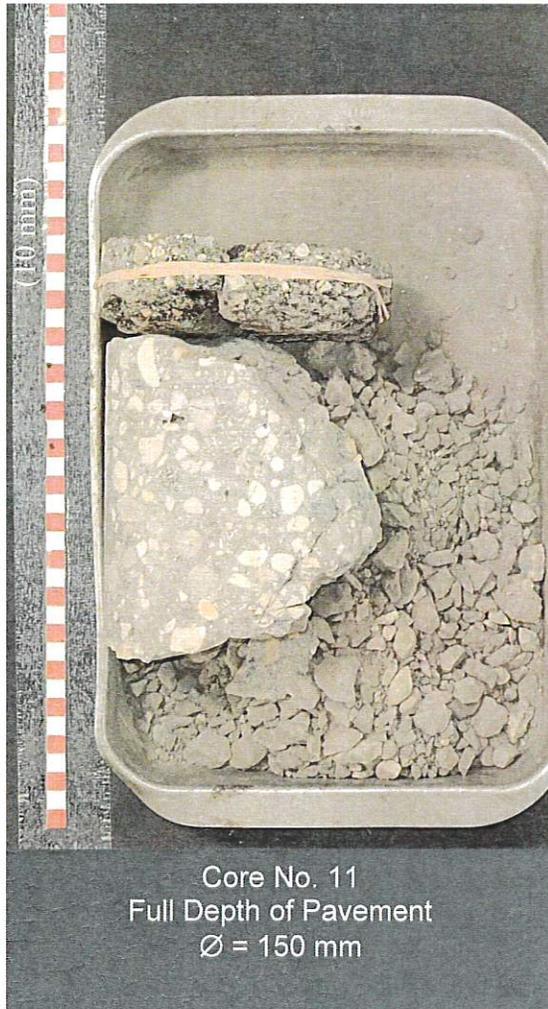
Photograph 9: Specimen from Warde Avenue, Westbound Lane



Photograph 10: Specimen from Warde Avenue, Westbound Lane



Photograph 11: Specimen from Warde Avenue, Westbound Lane



Core No. 11
Full Depth of Pavement
Ø = 150 mm

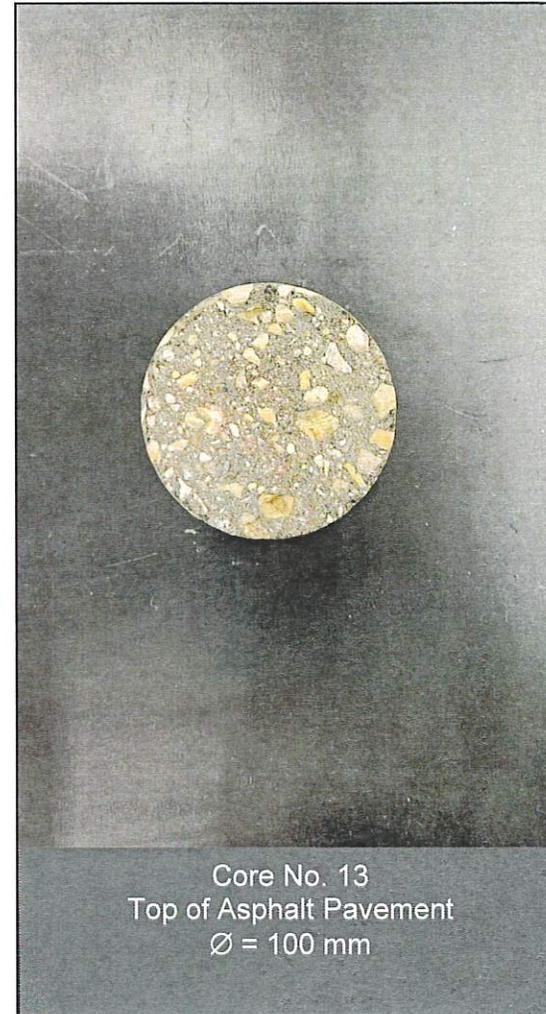


Core No. 11
Top of Asphalt Pavement
Ø = 150 mm

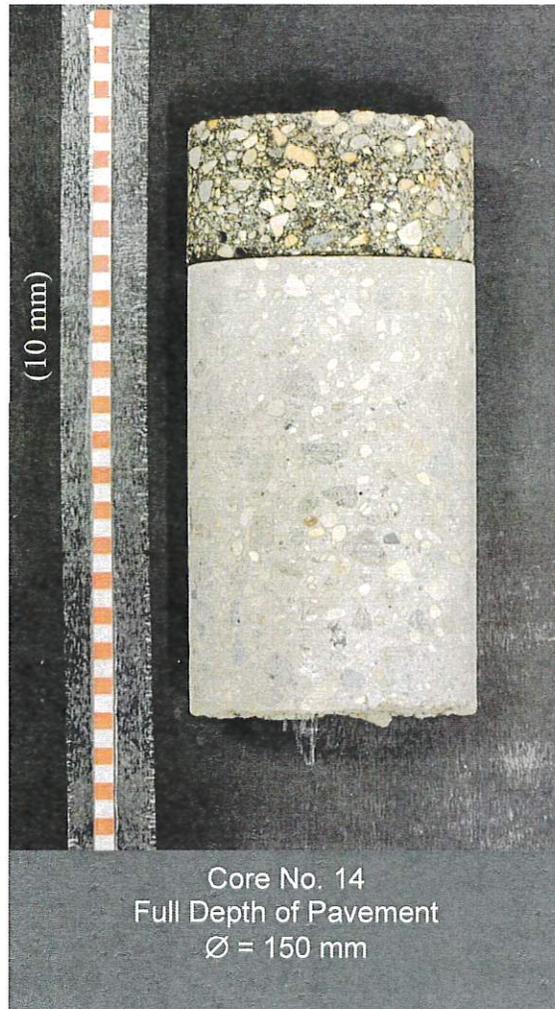
Photograph 12: Specimen from Warde Avenue, Eastbound Lane



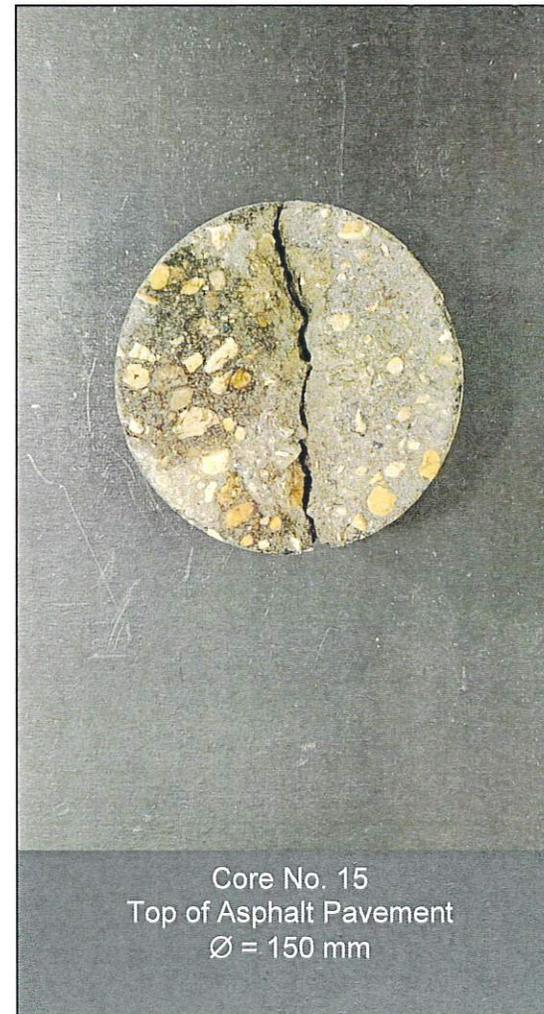
Photograph 13: Specimen from Warde Avenue, Eastbound Lane



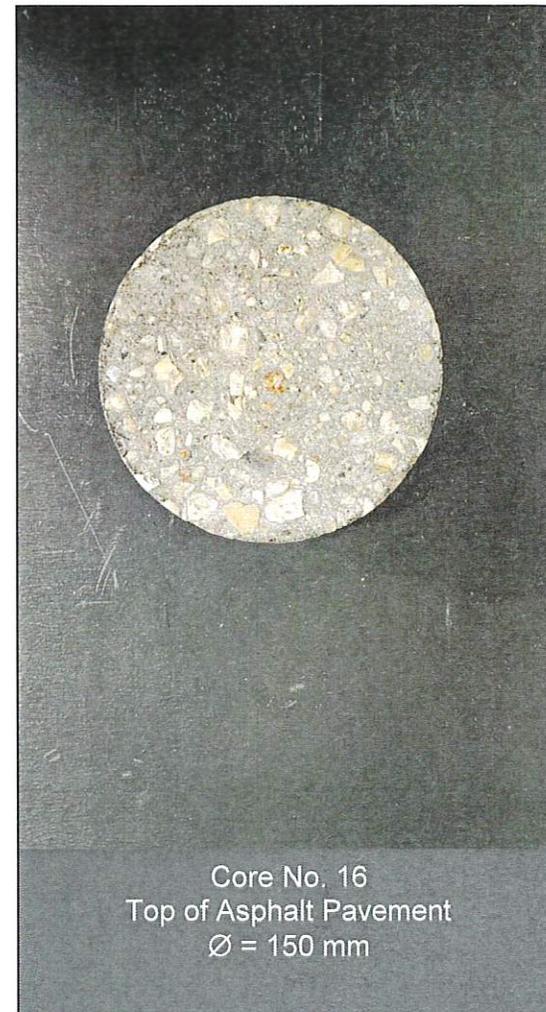
Photograph 14: Specimen from Warde Avenue, Eastbound Lane



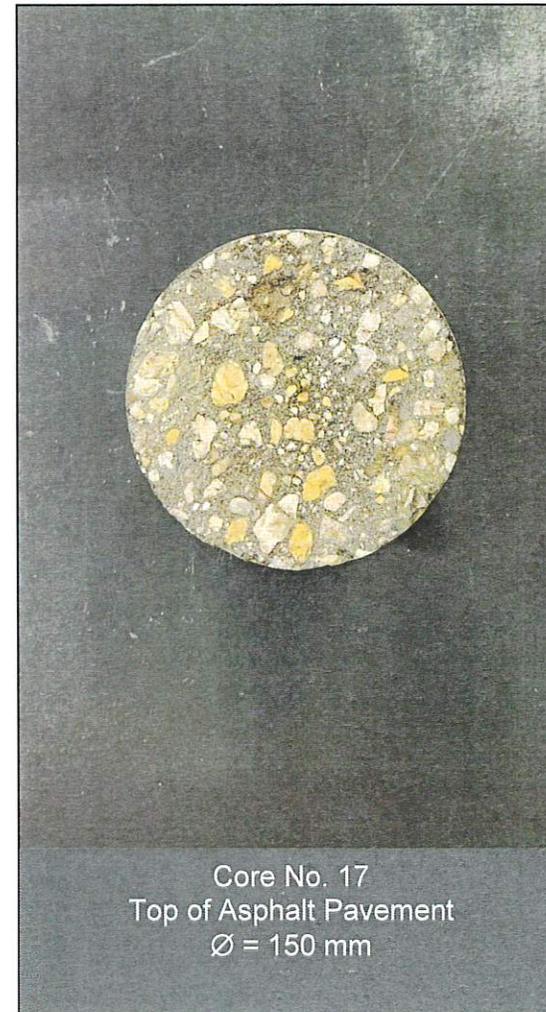
Photograph 15: Specimen from Warde Avenue, Eastbound Lane



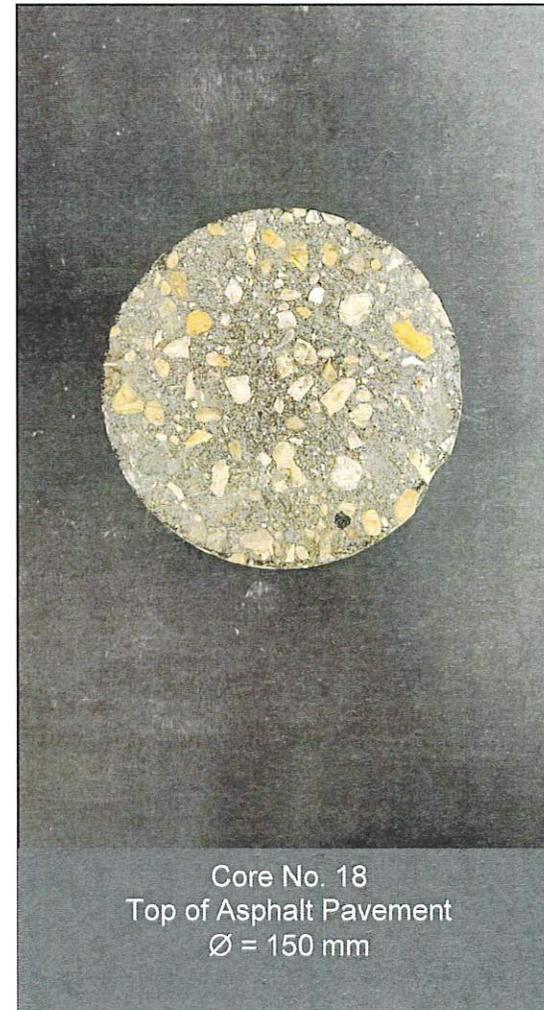
Photograph 16: Specimen from Warde Avenue, Eastbound Lane



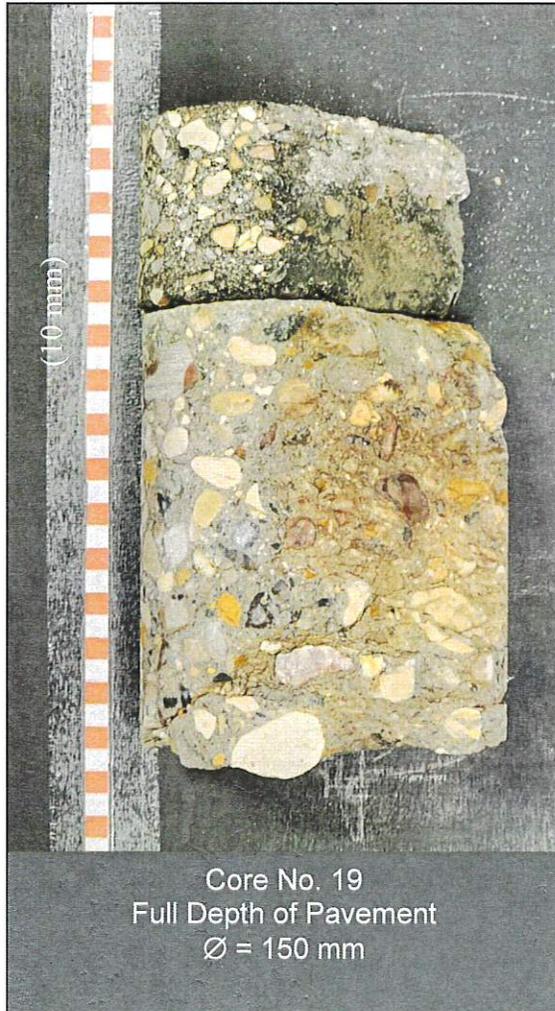
Photograph 17: Specimen from Warde Avenue, Eastbound Lane



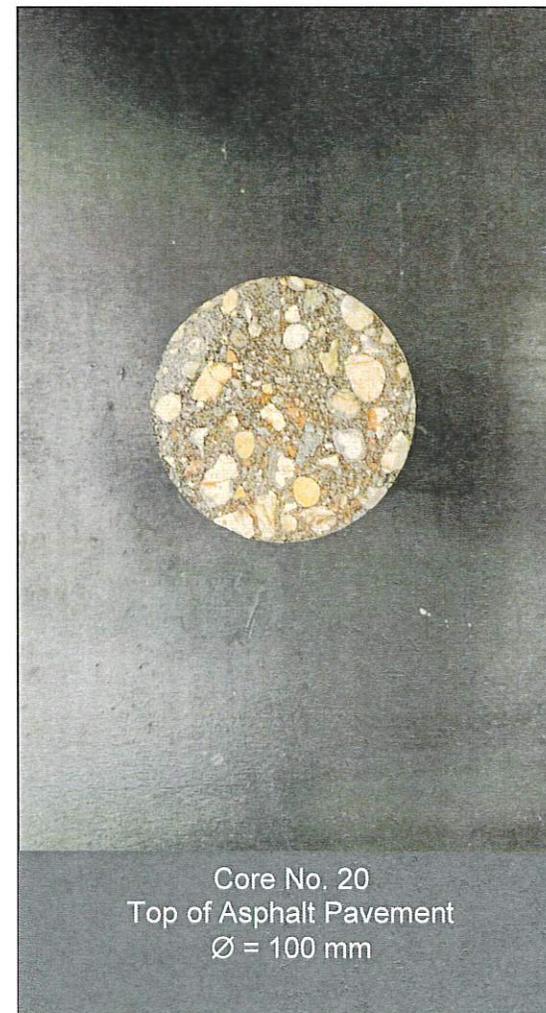
Photograph 18: Specimen from Warde Avenue, Eastbound Lane



Photograph 19: Specimen from Warde Avenue, Eastbound Lane



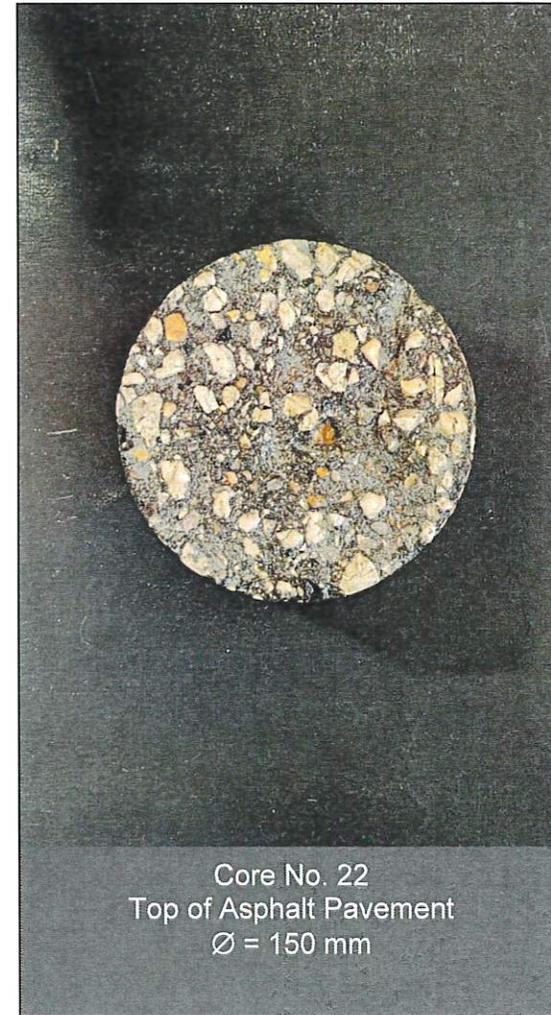
Photograph 20: Specimen from Warde Avenue, Eastbound Lane



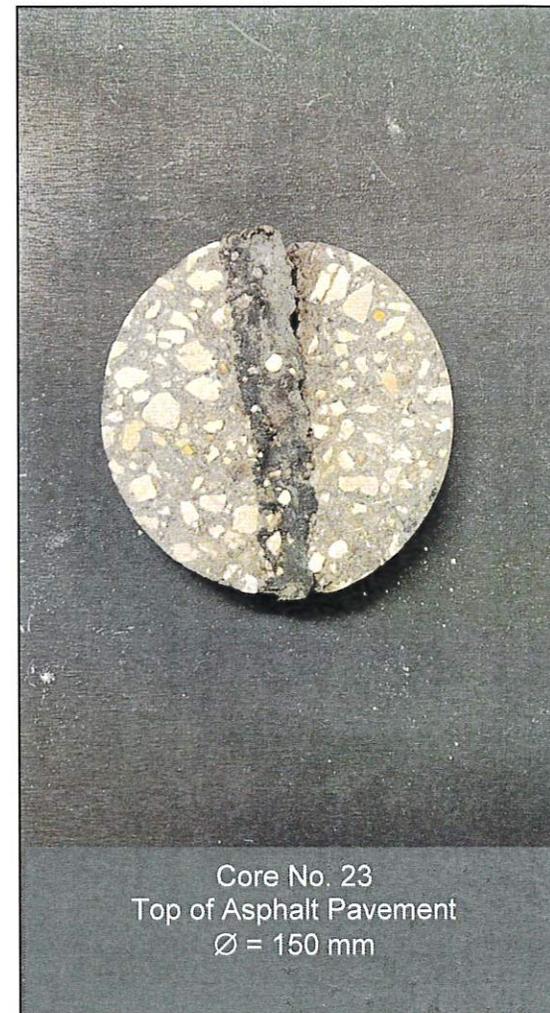
Photograph 21: Specimen from Pandora Avenue East, Eastbound Lane



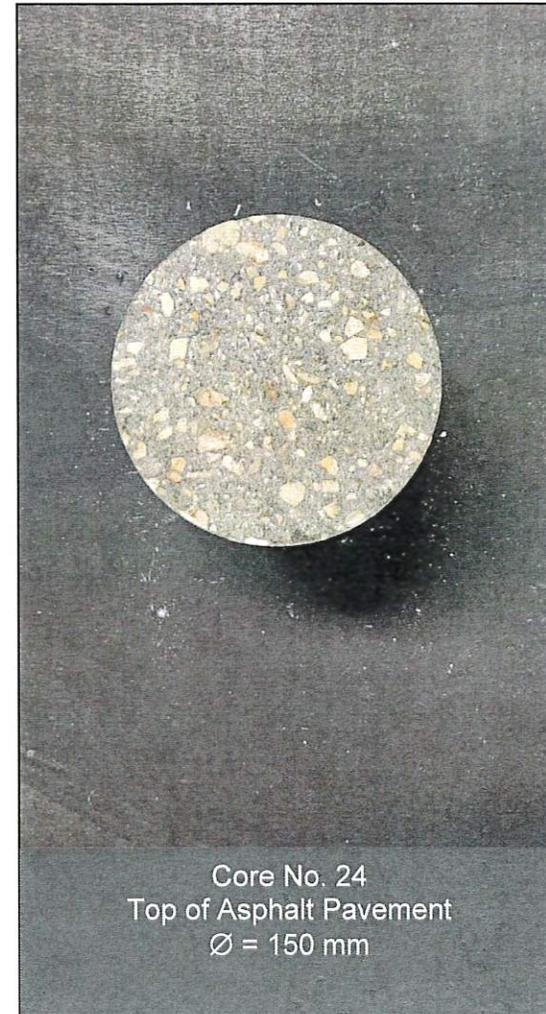
Photograph 22: Specimen from Pandora Avenue East, Eastbound Lane



Photograph 23: Specimen from Pandora Avenue East, Eastbound Lane



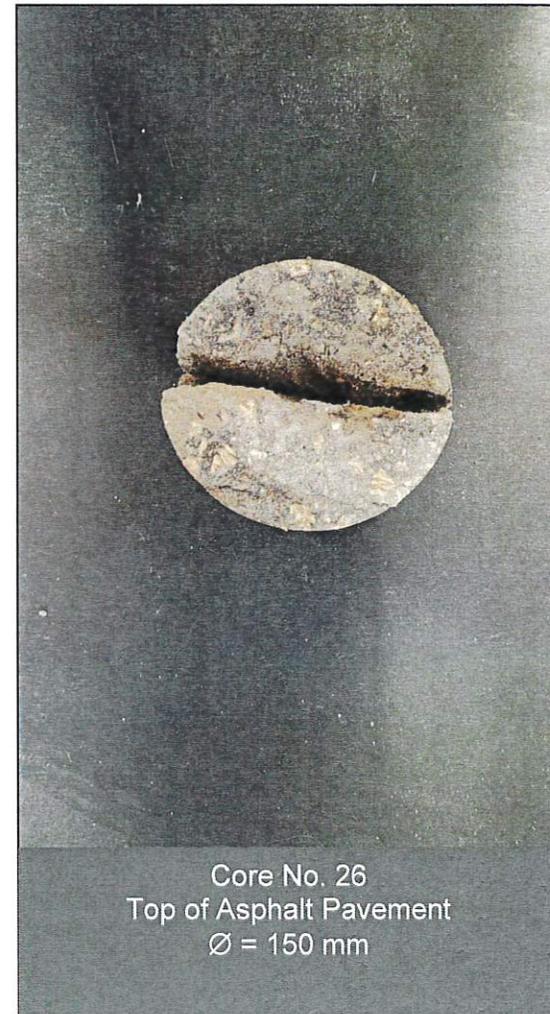
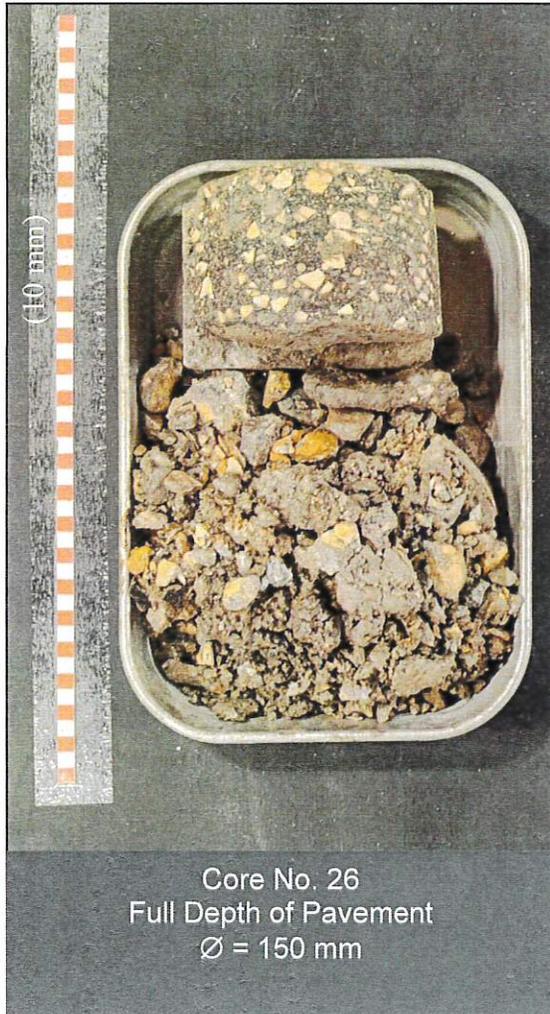
Photograph 24: Specimen from Pandora Avenue East, Eastbound Lane



Photograph 25: Specimen from Pandora Avenue East, Eastbound Lane



Photograph 26: Specimen from Pandora Avenue East, Eastbound Lane



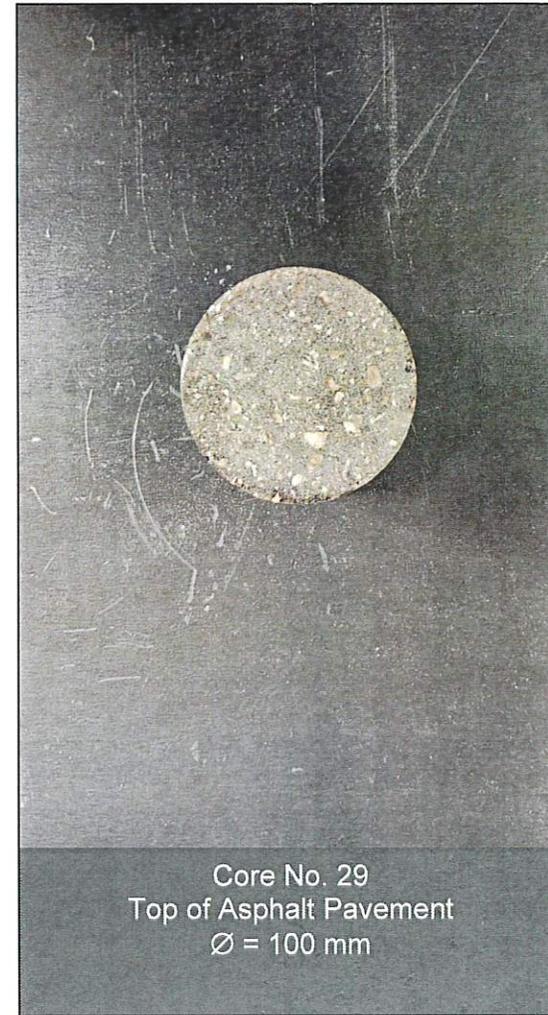
Photograph 27: Specimen from Pandora Avenue East, Eastbound Lane



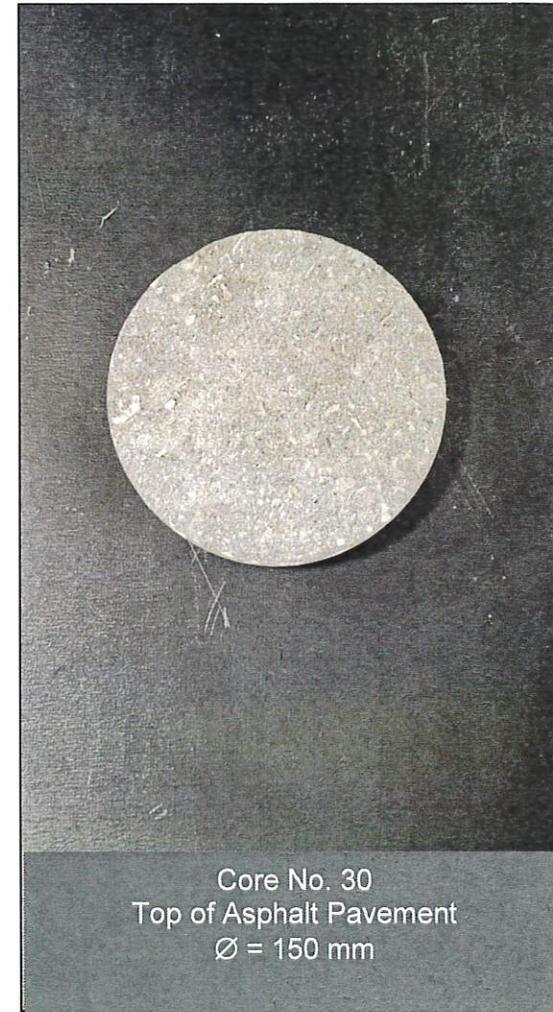
Photograph 28: Specimen from Pandora Avenue East, Eastbound Lane



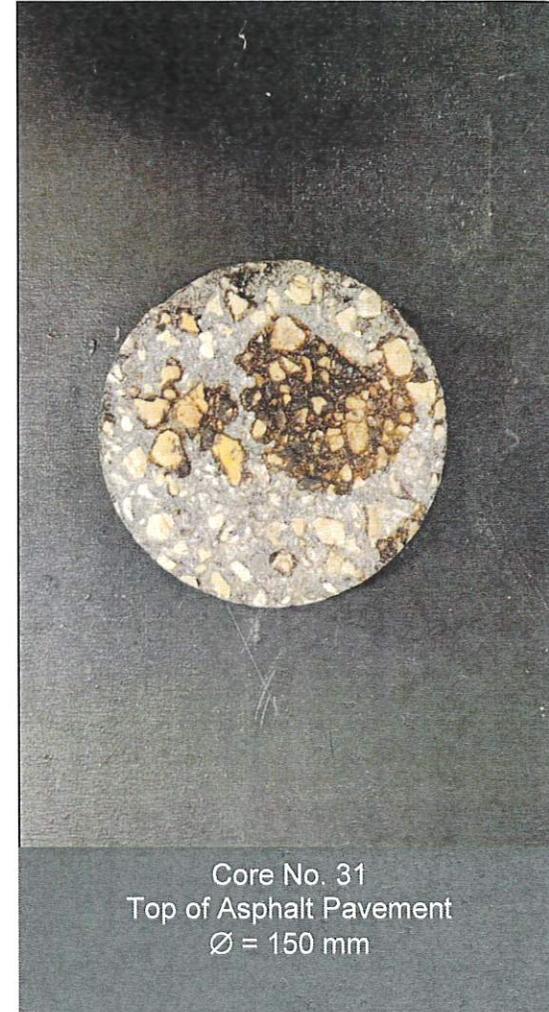
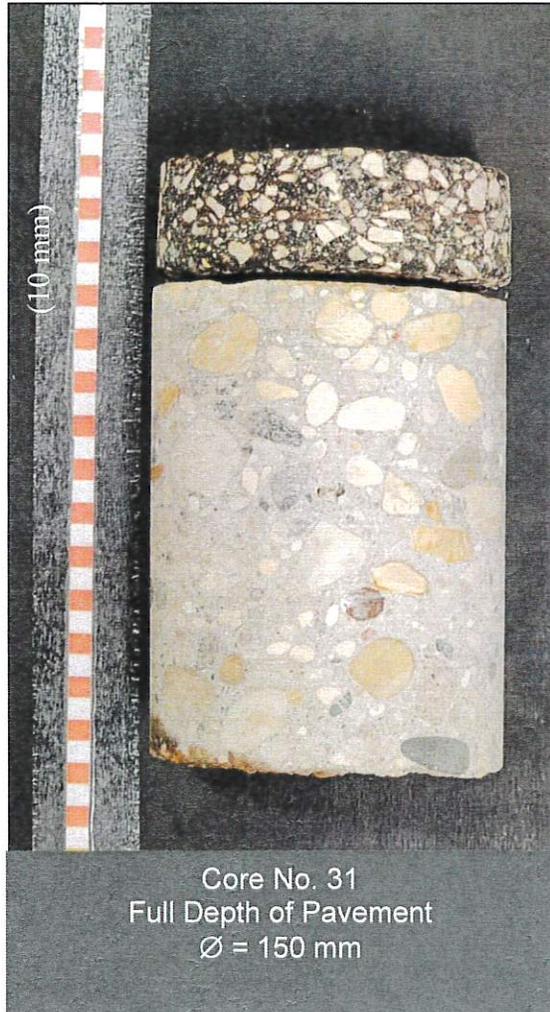
Photograph 29: Specimen from Pandora Avenue East, Westbound Lane



Photograph 30: Specimen from Pandora Avenue East, Westbound Lane



Photograph 31: Specimen from Pandora Avenue East, Westbound Lane



Photograph 32: Specimen from Pandora Avenue East, Westbound Lane

