

Appendix F
US23 MDOT Aggregate Test Road Sec. B Core Site



SB US23, section B, station 349+13, mid-slab, (MTU ID 23-06).



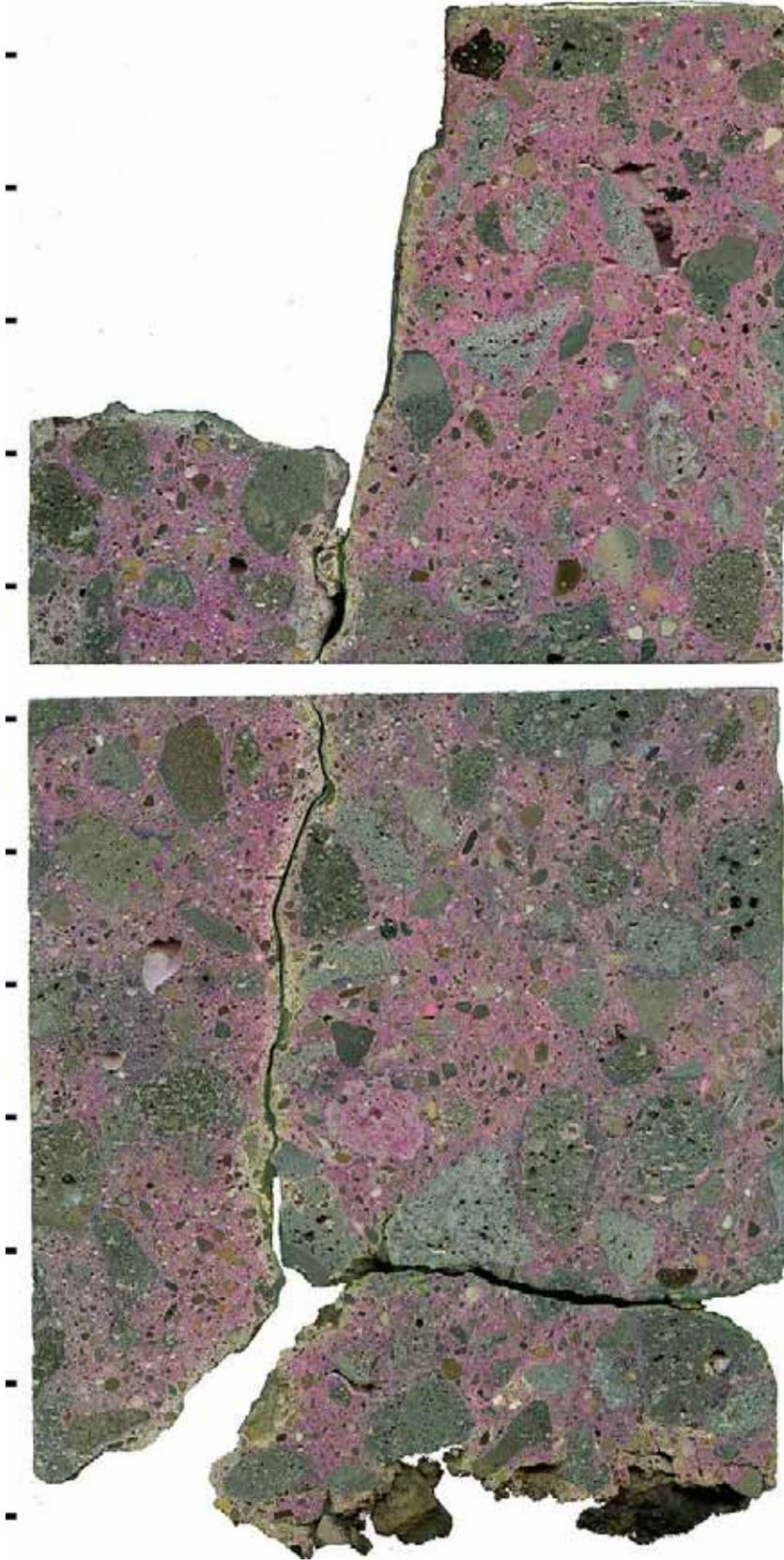
SB US23, section B, station 349+71.9, mid-slab, (MTU ID 23-07).

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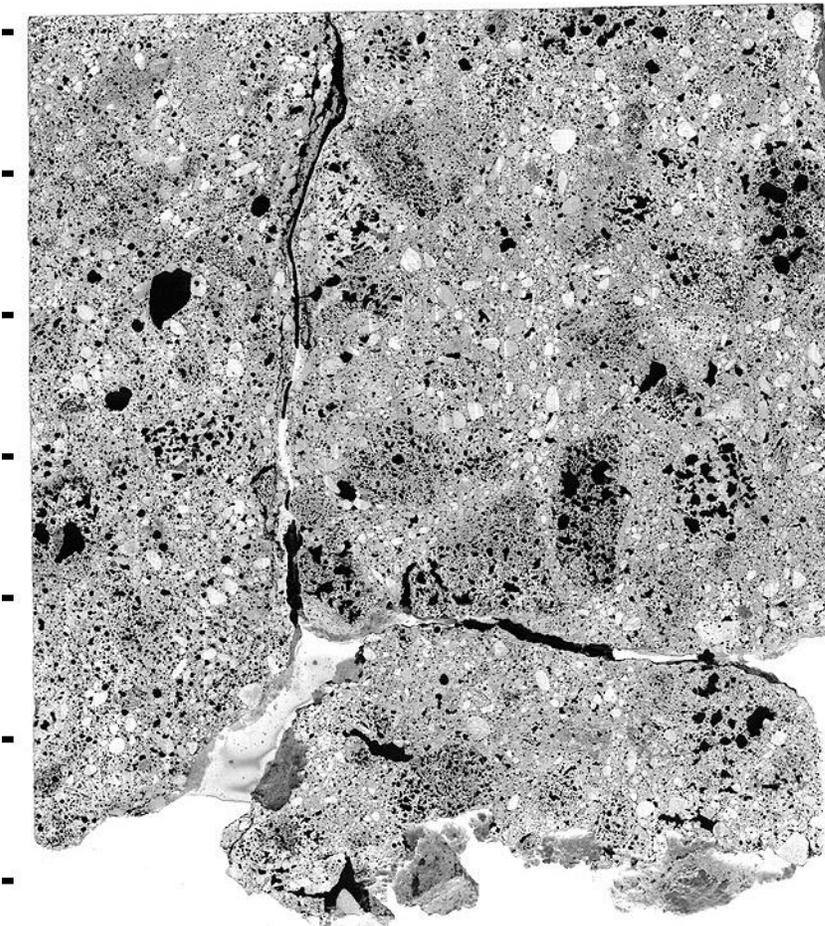
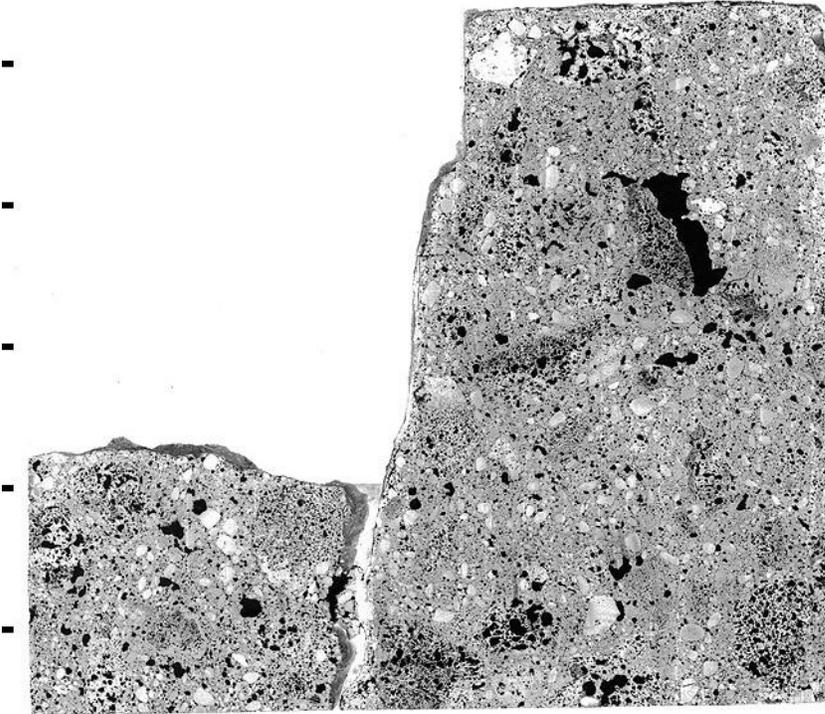
Slabs representing full cross section through pavement, as polished, SB US23, Section B, constructed 1992, station 349+71.9, at longitudinal joint, MTU ID US23-07, tic marks every inch.

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Slabs representing full cross section through pavement, after phenolphthalein stain, SB US23, Section B, constructed 1992, station 349+71.9, at longitudinal joint, MTU ID US23-07, tic marks every inch.

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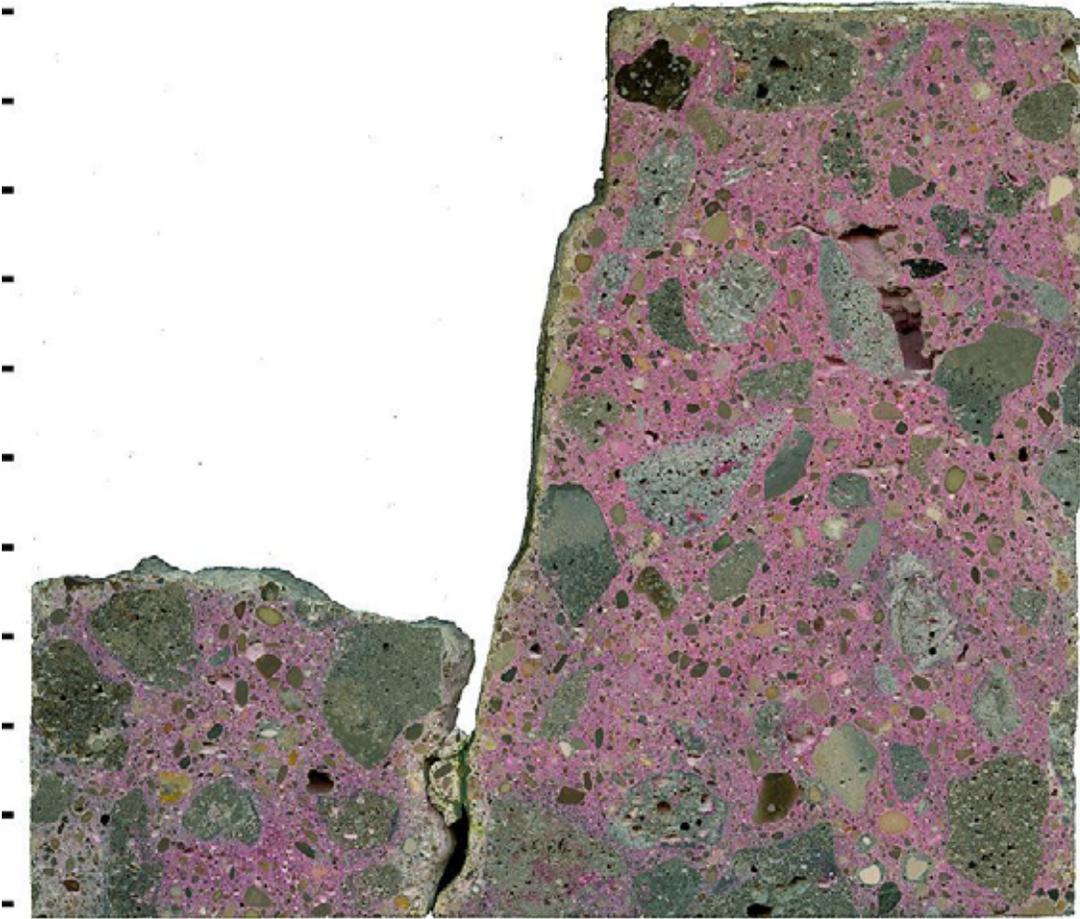
Slabs representing full cross section through pavement, after treatment to enhance air voids and cracks, SB US23, Section B, constructed 1992, station 349+71.9, at longitudinal joint, MTU ID US23-07, tic marks every inch.

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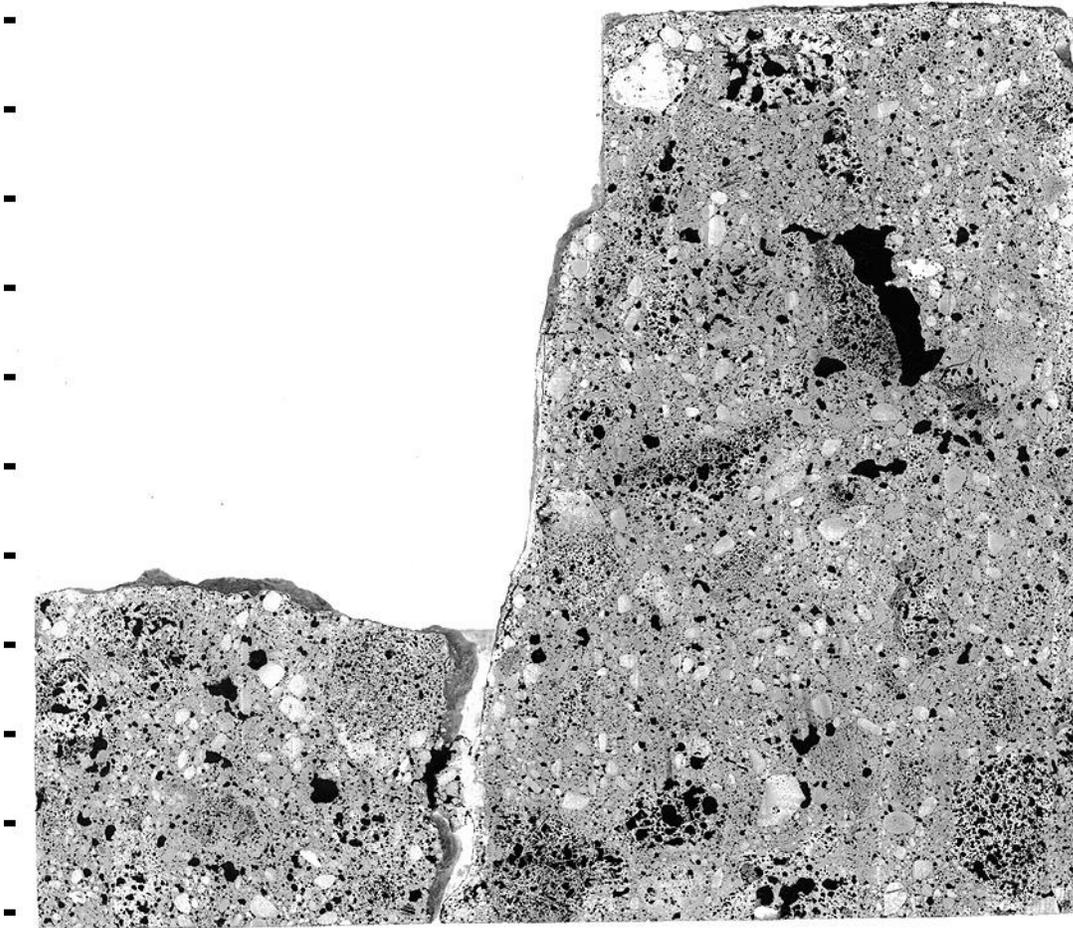
Slab representing cross section through top half of pavement, as polished, SB US23, Section B, constructed 1992, station 349+71.9, at longitudinal joint, MTU ID US23-07, tic marks every half inch.

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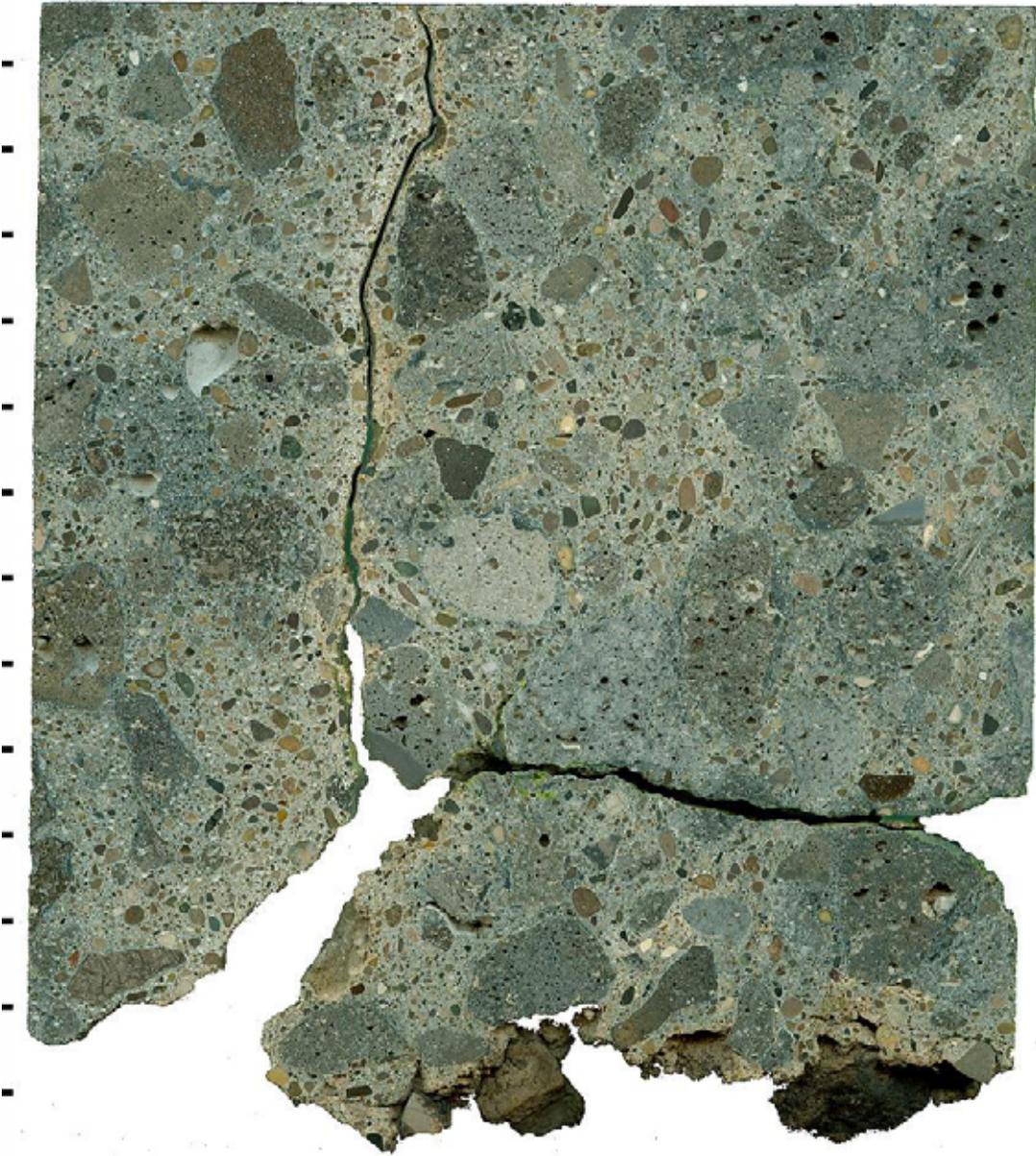
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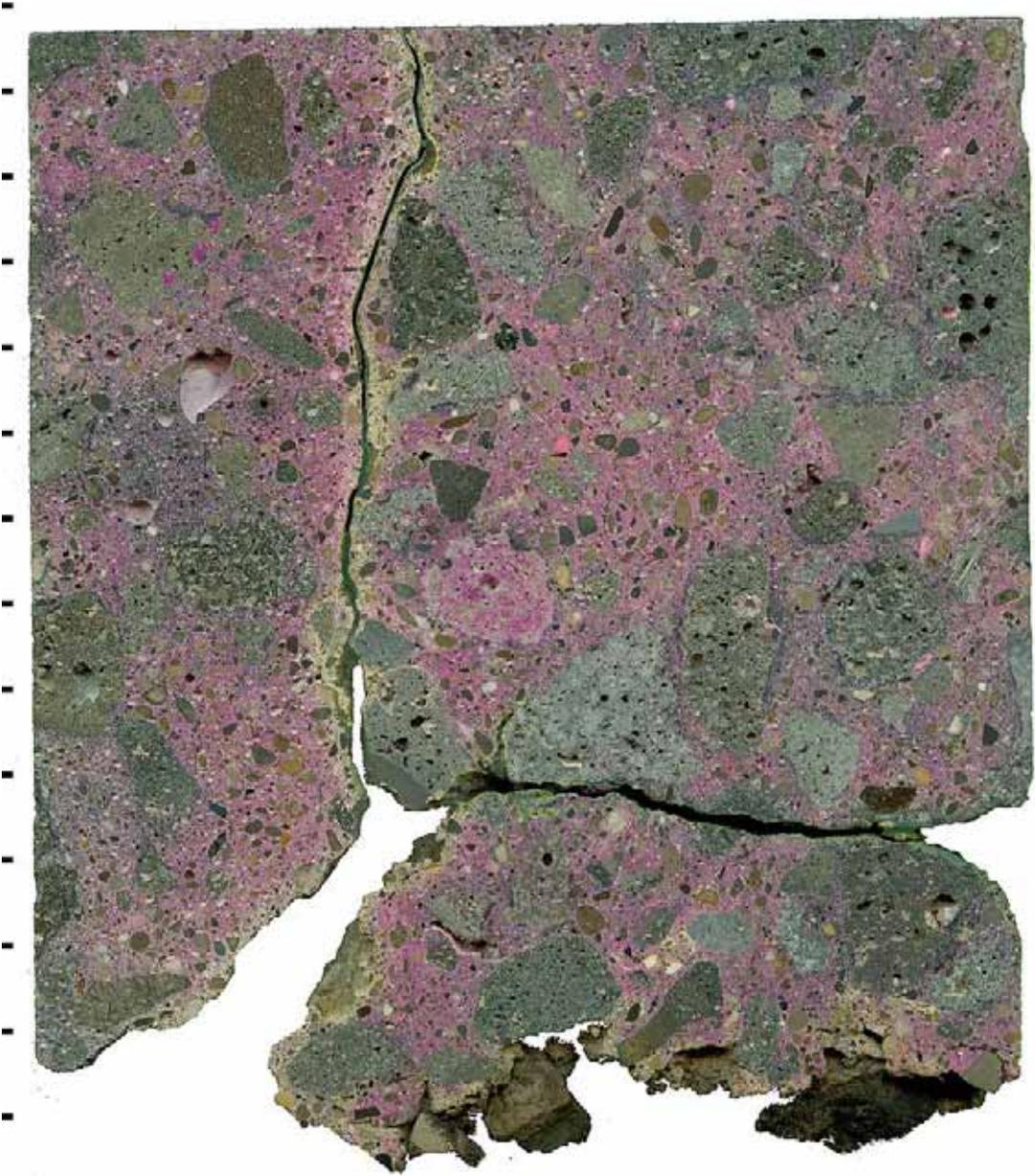
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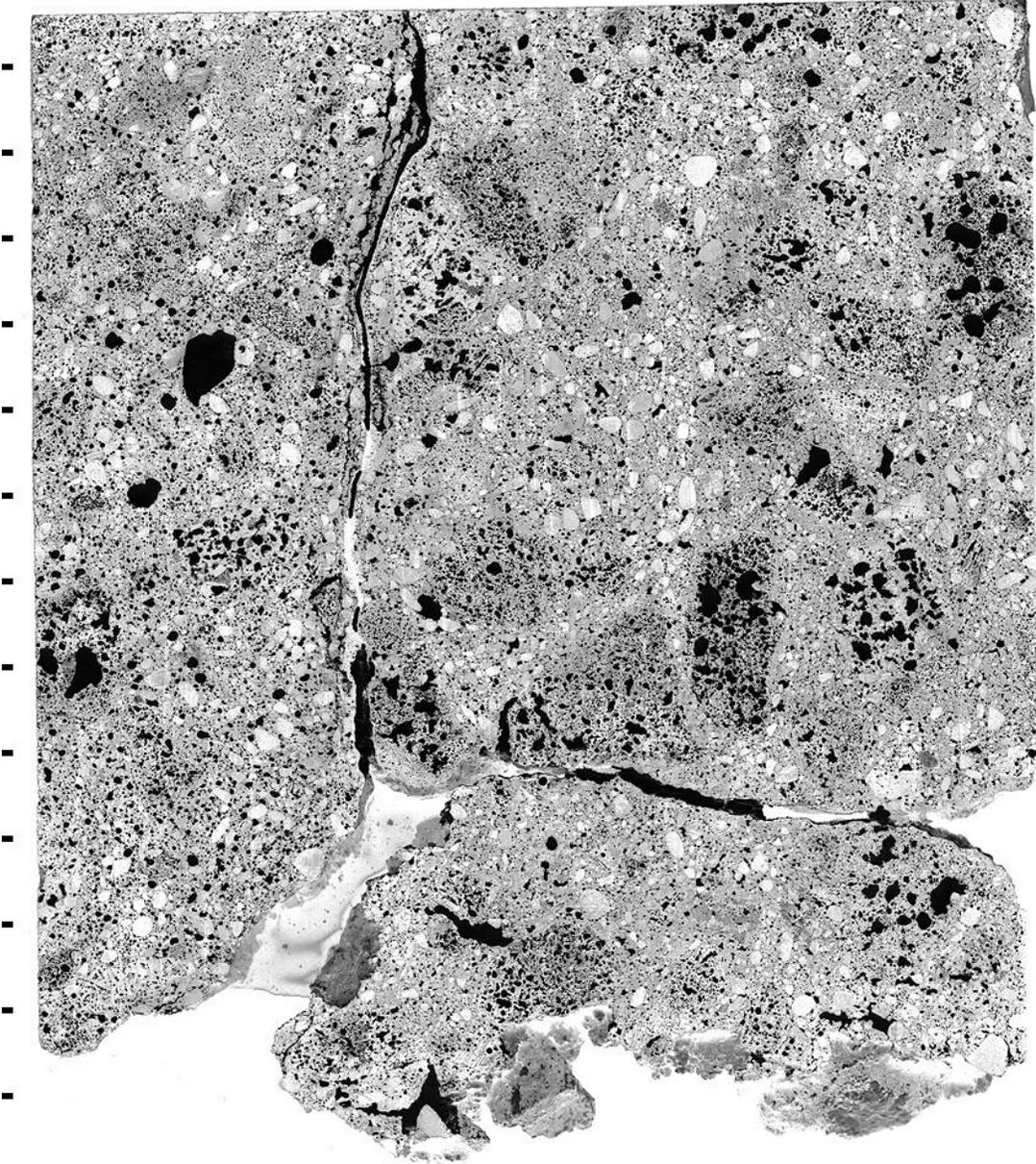
Slab representing cross section through bottom half of pavement, as polished, SB US23, Section B, constructed 1992, station 349+71.9, at longitudinal joint, MTU ID US23-07, tic marks every half inch.

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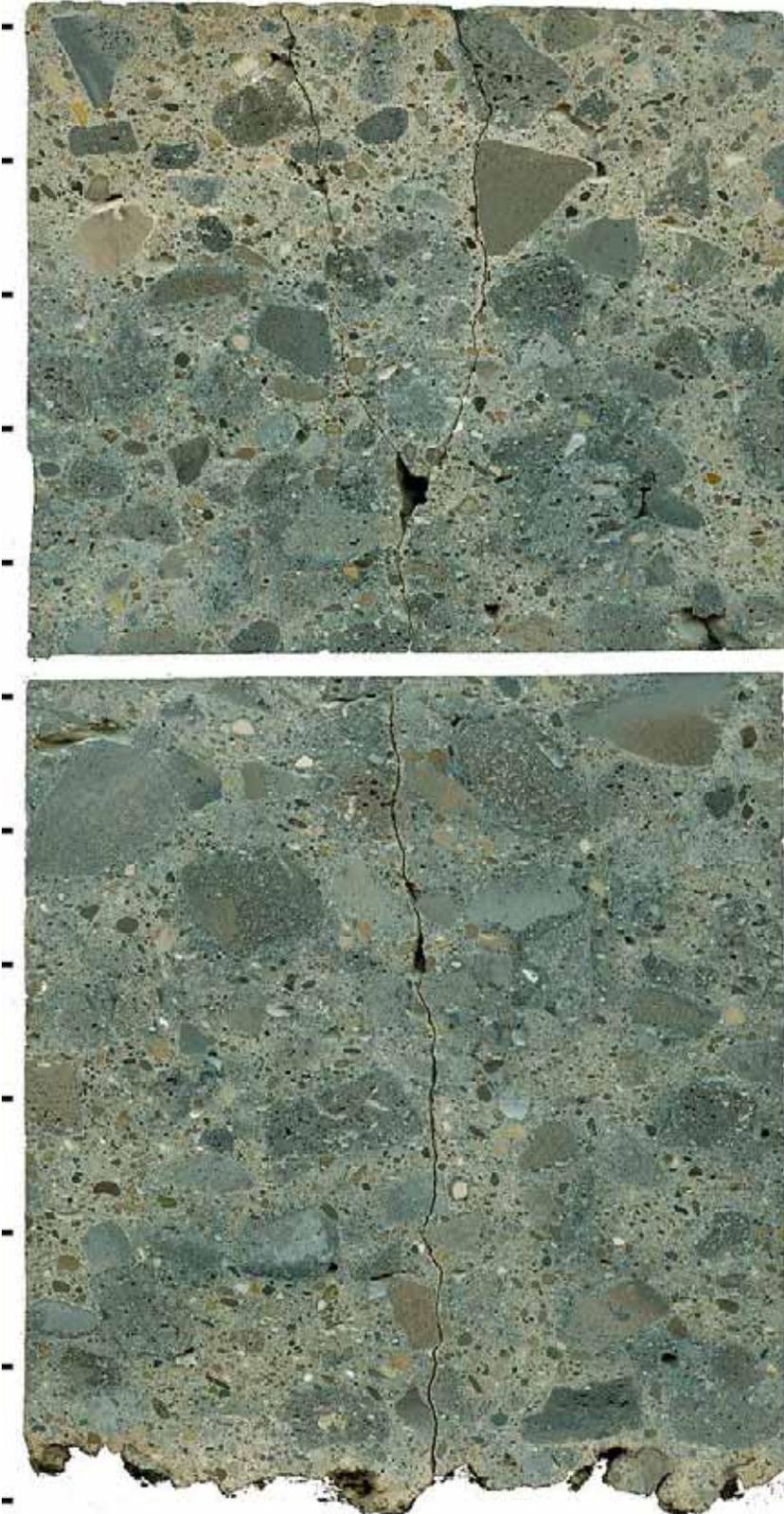
Slab representing cross section through top half of pavement, after sodium cobaltinitrite stain, SB US23, Section B, constructed 1992, station 349+71.9, at longitudinal joint, MTU ID US23-07, tic marks every half inch.

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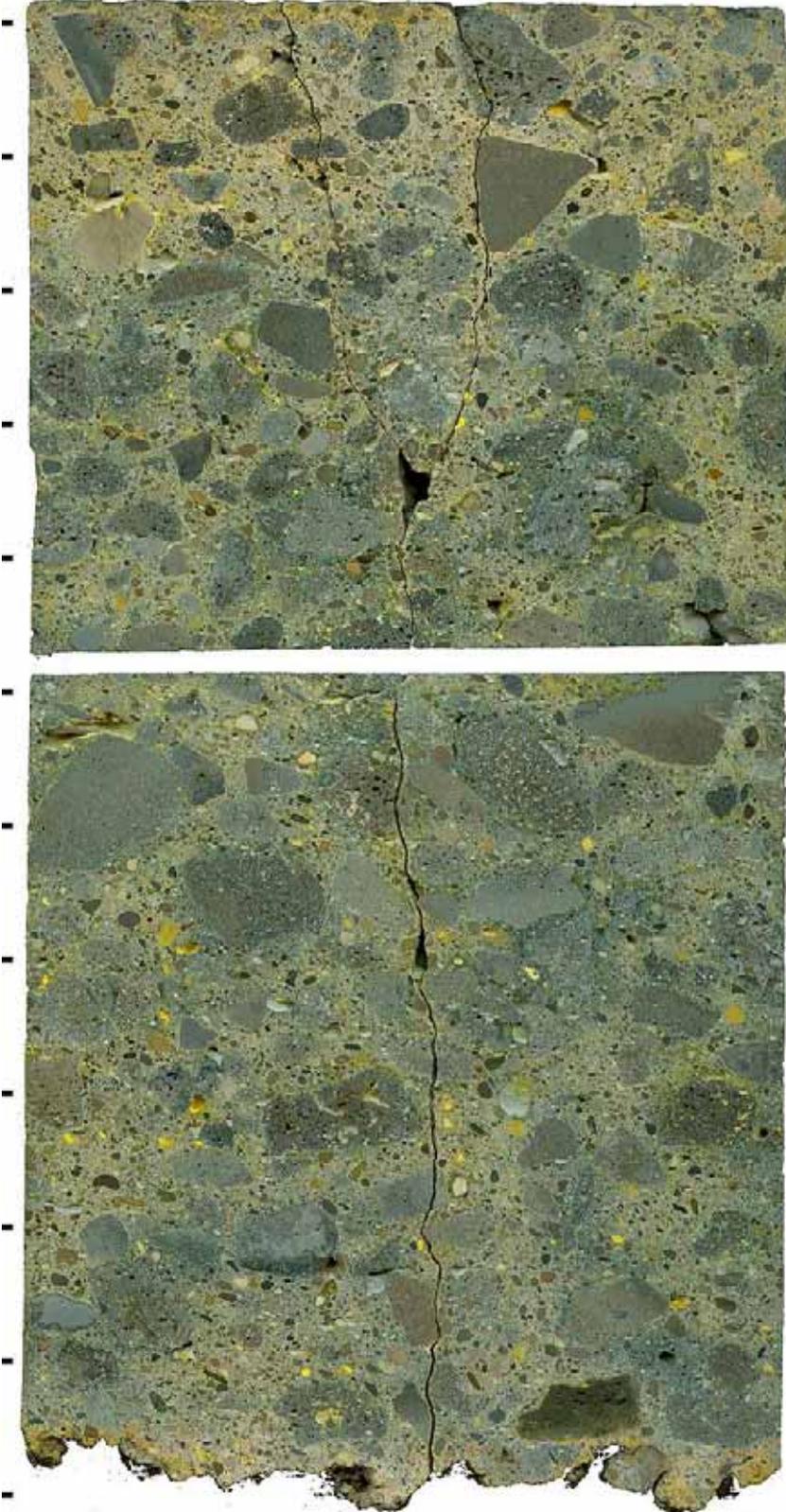
Slab representing cross section through top half of pavement, after treatment to enhance air voids and cracks, SB US23, Section B, constructed 1992, station 349+71.9, at longitudinal joint, MTU ID US23-07, tic marks every half inch.

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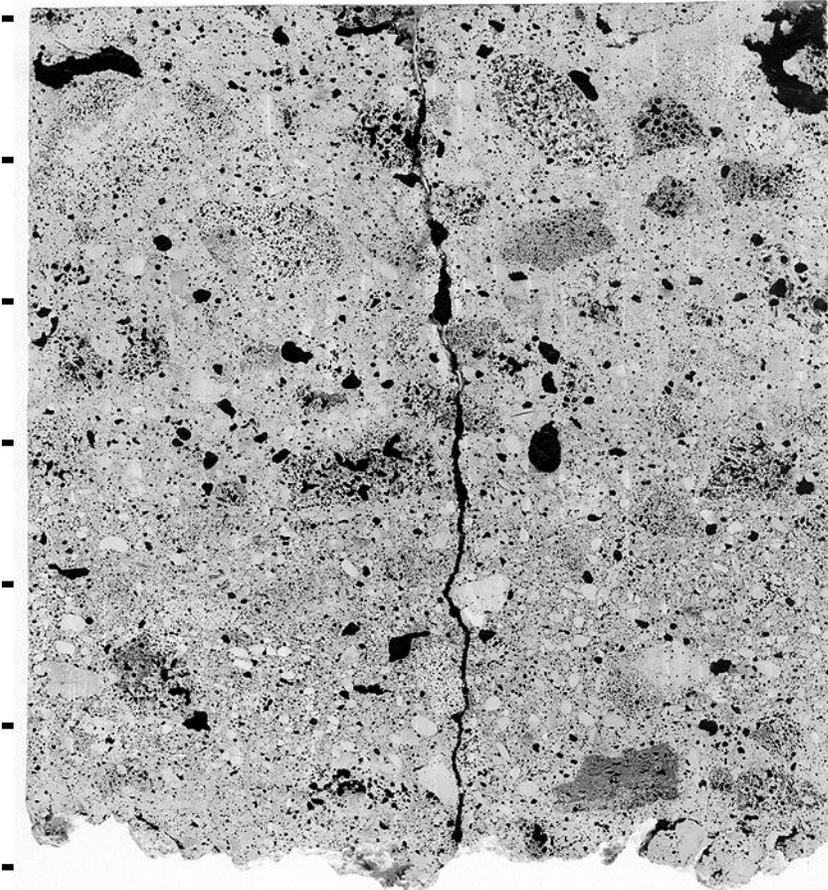
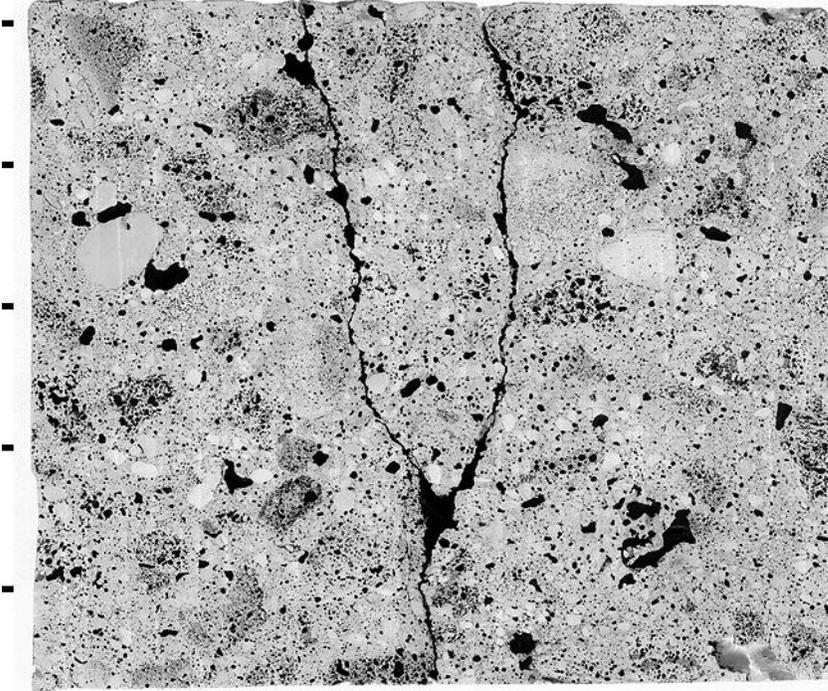
Slabs representing full cross section through pavement, as polished, SB US23, Section B, constructed 1992, station 349+13, away from transverse joint, MTU ID US23-06, tic marks every inch.

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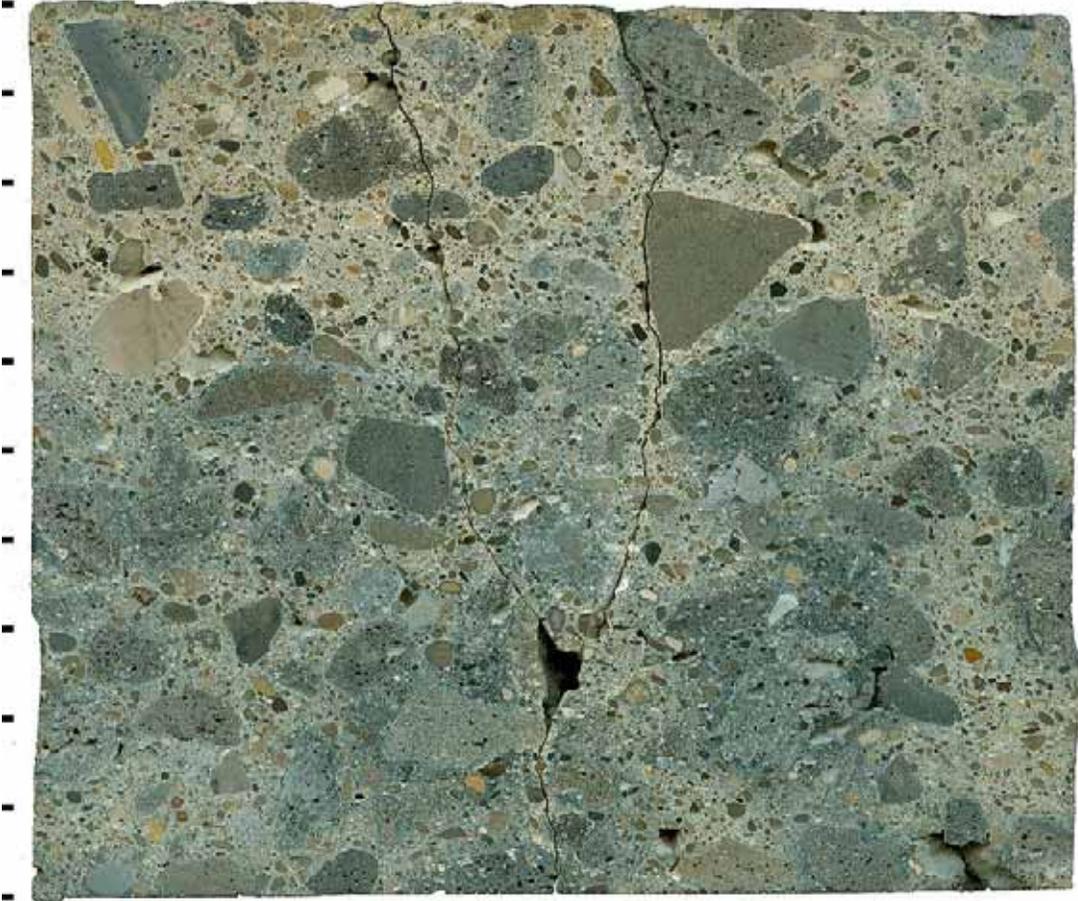
Slabs representing full cross section through pavement, after sodium cobaltinitrite stain, SB US23, Section B, constructed 1992, station 349+13, away from transverse joint, MTU ID US23-06, tic marks every inch.

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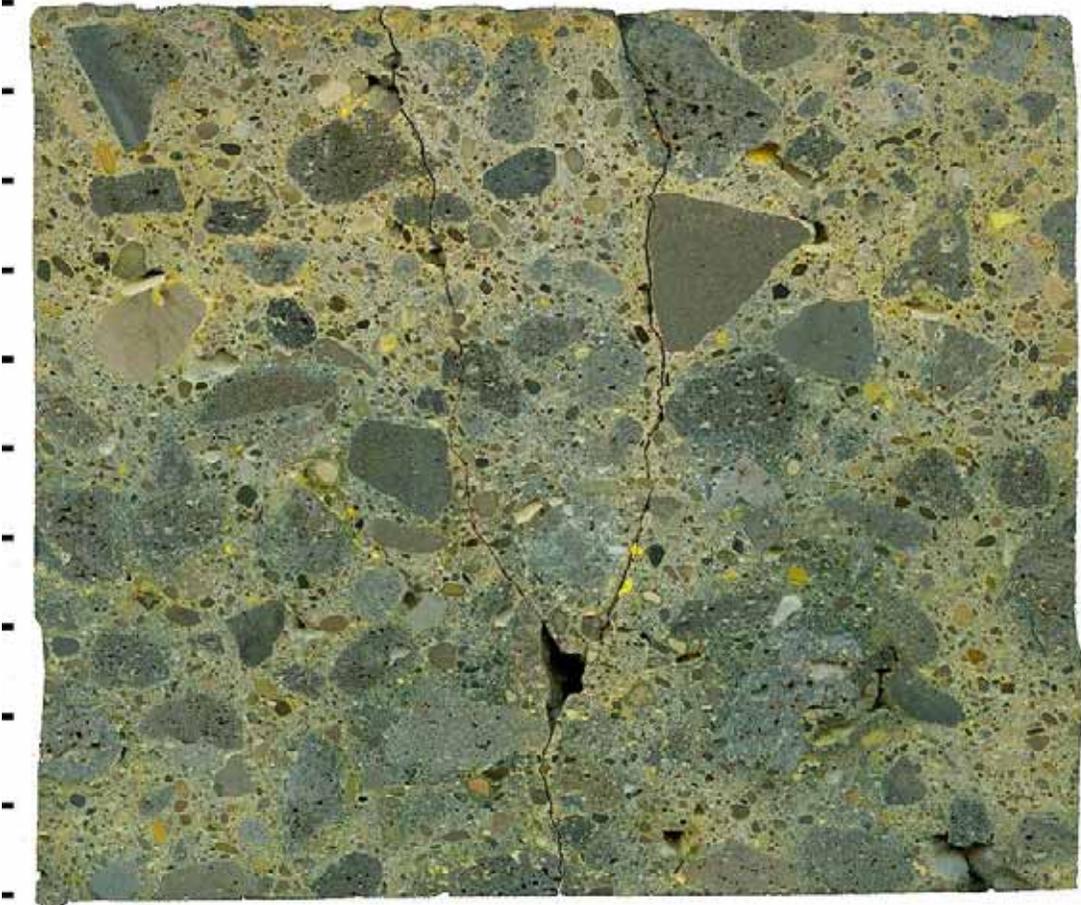
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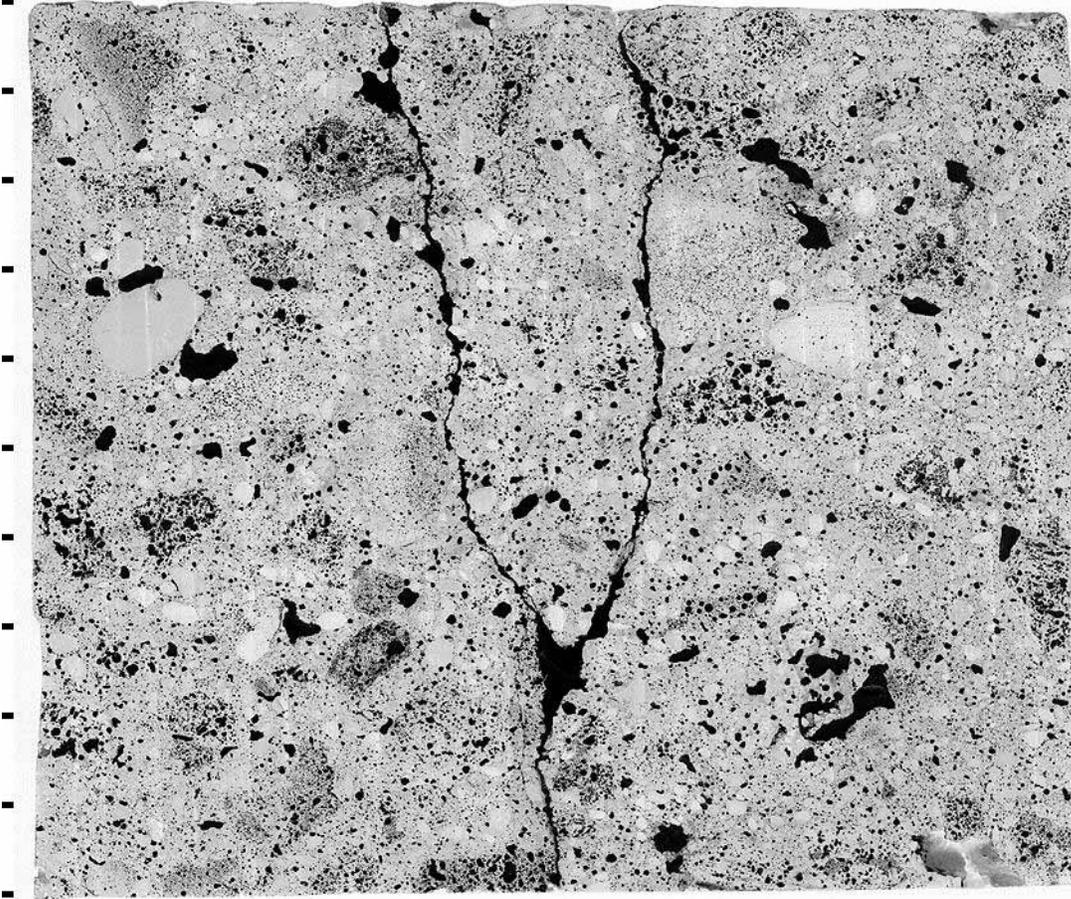
Slab representing cross section through top half of pavement, as polished, SB US23, Section B, constructed 1992, station 349+13, away from transverse joint, MTU ID US23-06, tic marks every half inch.

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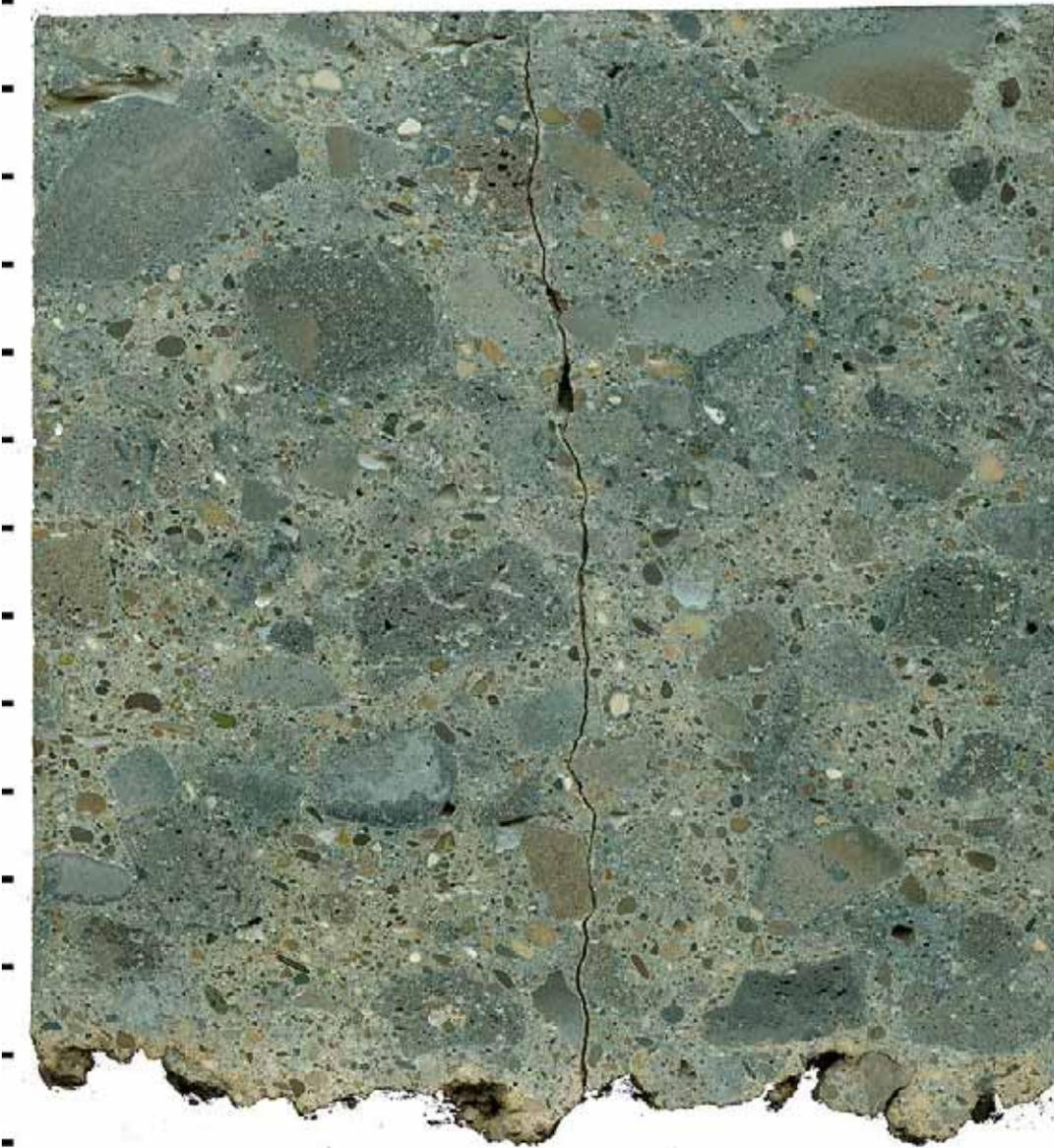
Slab representing cross section through top half of pavement, after sodium cobaltinitrite stain, SB US23, Section B, constructed 1992, station 349+13, away from transverse joint, MTU ID US23-06, tic marks every half inch.

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Slab representing cross section through top half of pavement, after treatment to enhance air voids and cracks, SB US23, Section B, constructed 1992, station 349+13, away from transverse joint, MTU ID US23-06, tic marks every half inch.

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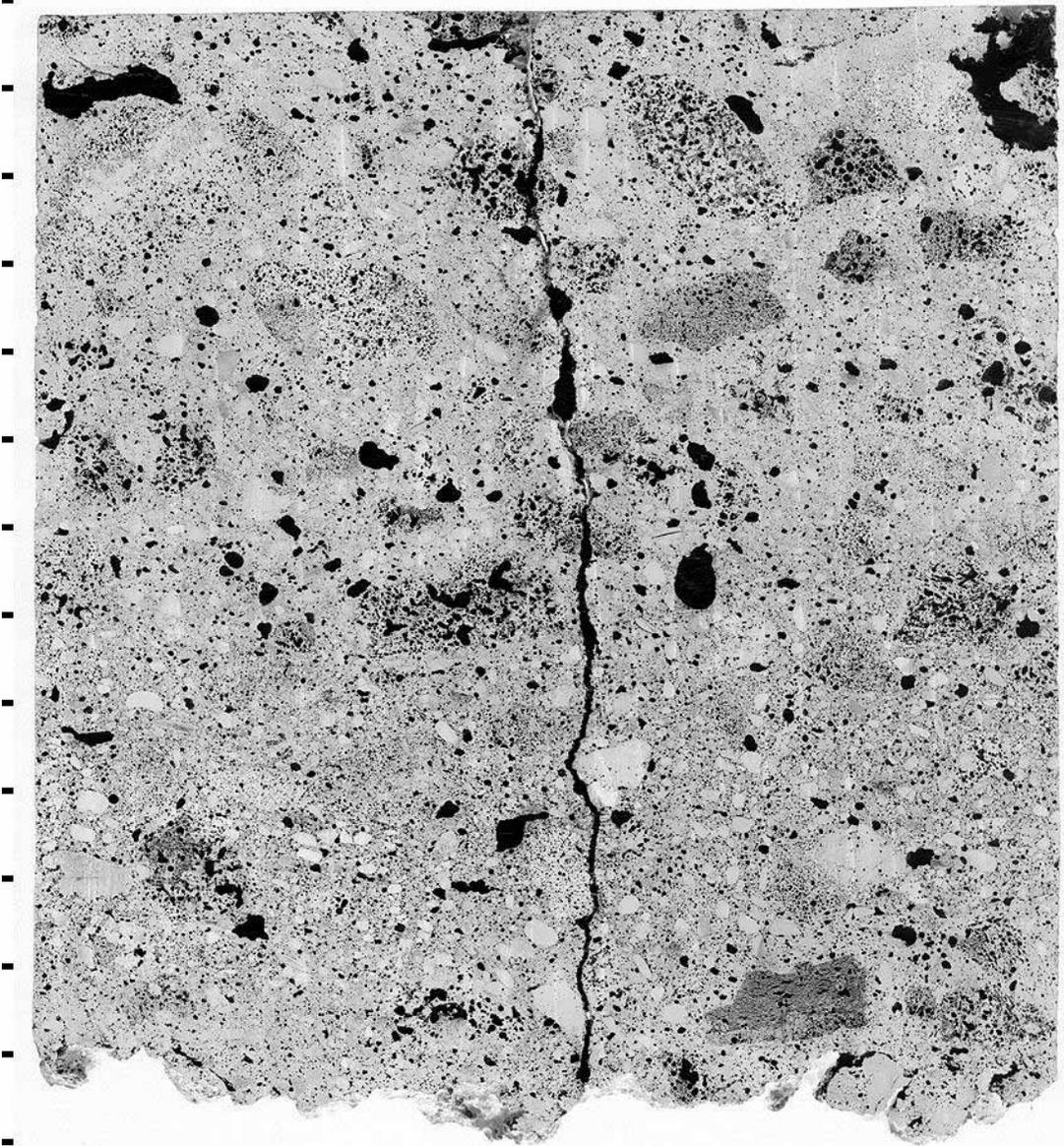
Slab representing cross section through bottom half of pavement, as polished, SB US23, Section B, constructed 1992, station 349+13, away from transverse joint, MTU ID US23-06, tic marks every half inch.

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Slab representing cross section through top half of pavement, after sodium cobaltinitrite stain, SB US23, Section B, constructed 1992, station 349+13, away from transverse joint, MTU ID US23-06, tic marks every half inch.

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Slab representing cross section through top half of pavement, after treatment to enhance air voids and cracks, SB US23, Section B, constructed 1992, station 349+13, away from transverse joint, MTU ID US23-06, tic marks every half inch.

Appendix F
US23 MDOT Aggregate Test Road Sec. B Core Site

SB US-23, Section B, constructed 1992, at longitudinal joint, MTU ID US23-07

| | | | |
|--|-------------|----------|----------|
| Data Analysed - 5/23/ 7 at 10:34 | | | |
| Operator Name - Matt | | | |
| Sample ID - us23-07 | | | |
| Raw Data | | | |
| | bottom half | top half | summary |
| Total Traverse Length (mm) | 1886.041 | 1886.041 | 3772.082 |
| Total Area Analyzed (cm ²) | 37.0 | 37.0 | 73.9 |
| Air Stops | 45 | 84 | 129 |
| Paste Stops | 232 | 207 | 439 |
| Aggregate Stops | 445 | 430 | 875 |
| Secondary Phase Stops | 0 | 1 | 1 |
| Total Stops | 722 | 722 | 1444 |
| # of Air Void Intercepts | 906 | 1039 | 1945 |
| # of Filled Void Intercepts | 0 | 2 | 2 |
| Results | | | |
| Air vol% | 6.2 | 11.6 | 8.9 |
| Paste vol% | 32.1 | 28.7 | 30.4 |
| Aggregate vol% | 61.6 | 59.6 | 60.6 |
| Secondary Phase vol% | 0.0 | 0.1 | 0.1 |
| Spacing Factor (mm) | 0.152 | 0.131 | 0.147 |
| Paste/Air ratio | 5.16 | 2.48 | 3.40 |
| Specific Surface (mm ² /mm ³) | 30.8 | 18.9 | 23.1 |
| Void Frequency (voids/m) | 480 | 551 | 516 |
| Average Chord Length (mm) | 0.130 | 0.211 | 0.173 |

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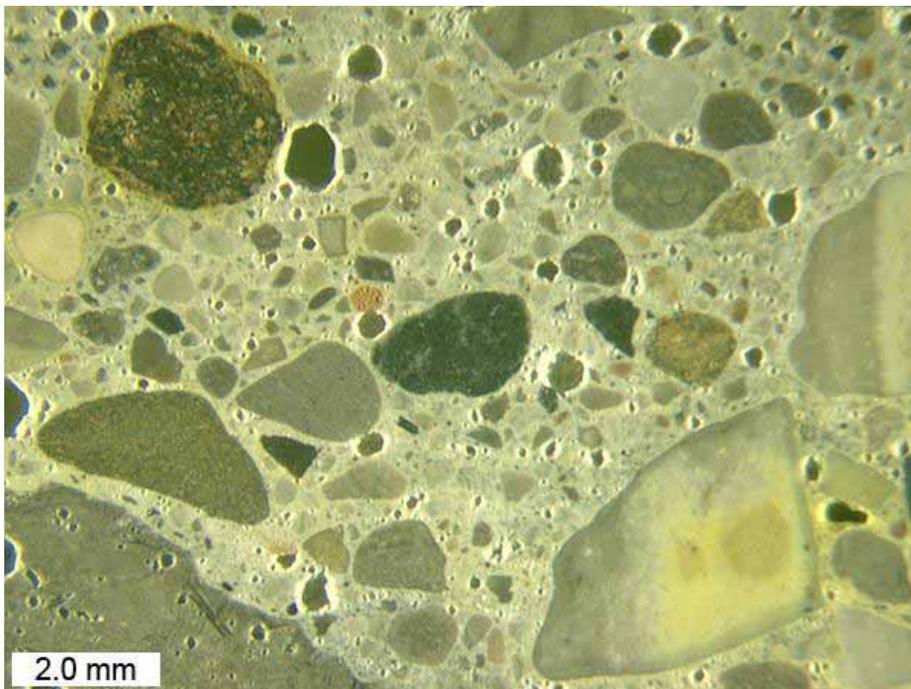
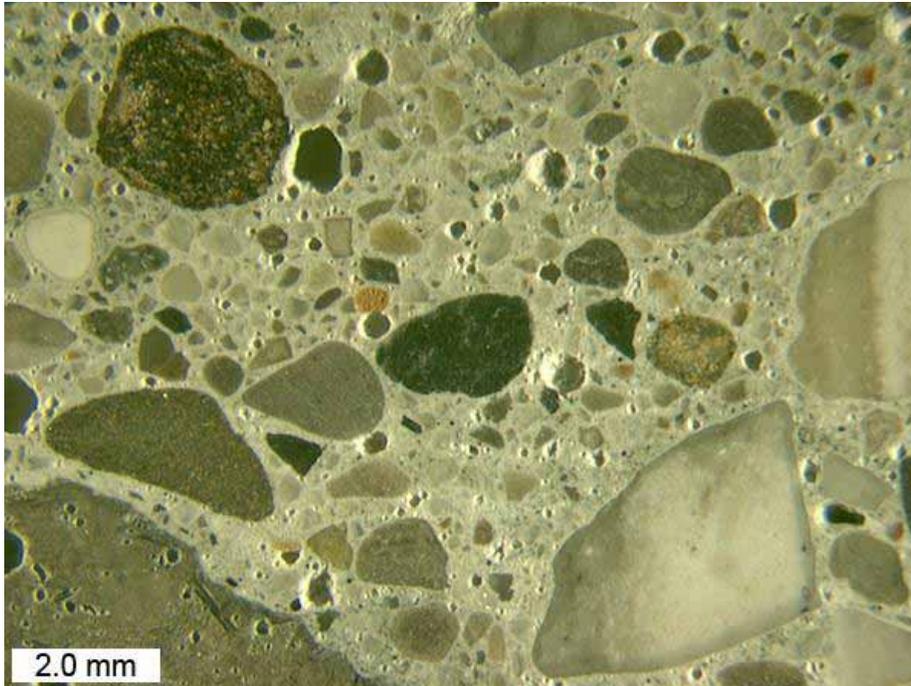
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrite stain, polished slab from SB US23, Section B, constructed 1992, at longitudinal joint, bottom half of core, MTU ID US23-07.

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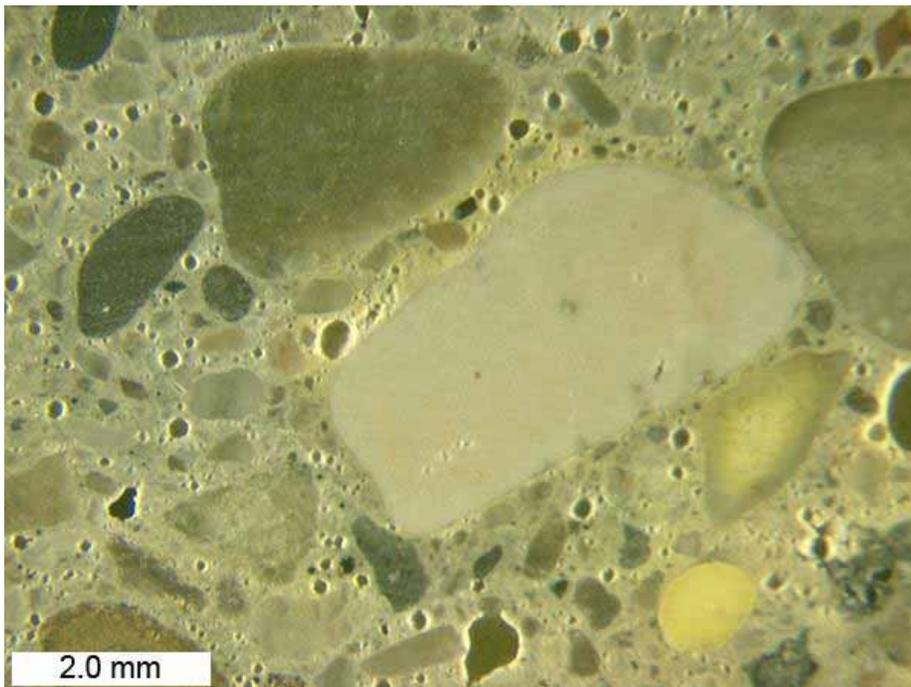
Alkali silica reaction in fine aggregate with associated cracking and reaction product filled air voids, before and after sodium cobaltinitrite stain, polished slab from SB US23, Section B, constructed 1992, at longitudinal joint, bottom half of core, MTU ID US23-07.

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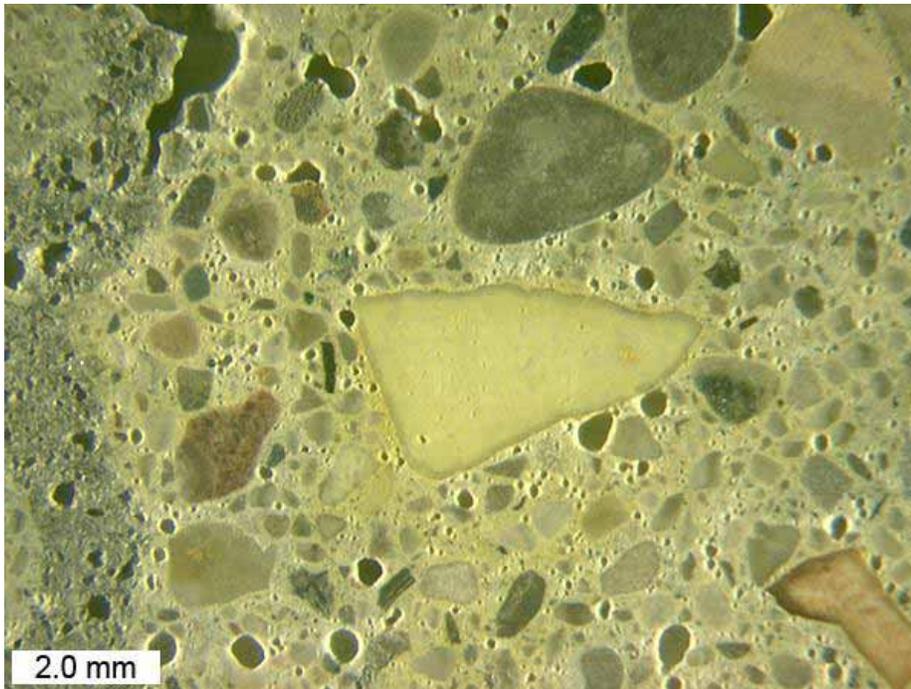
Alkali silica reaction in fine aggregate, without cracking, before and after sodium cobaltinitrite stain, polished slab from SB US23, Section B, constructed 1992, away from joint, top half of core, MTU ID US23-06.

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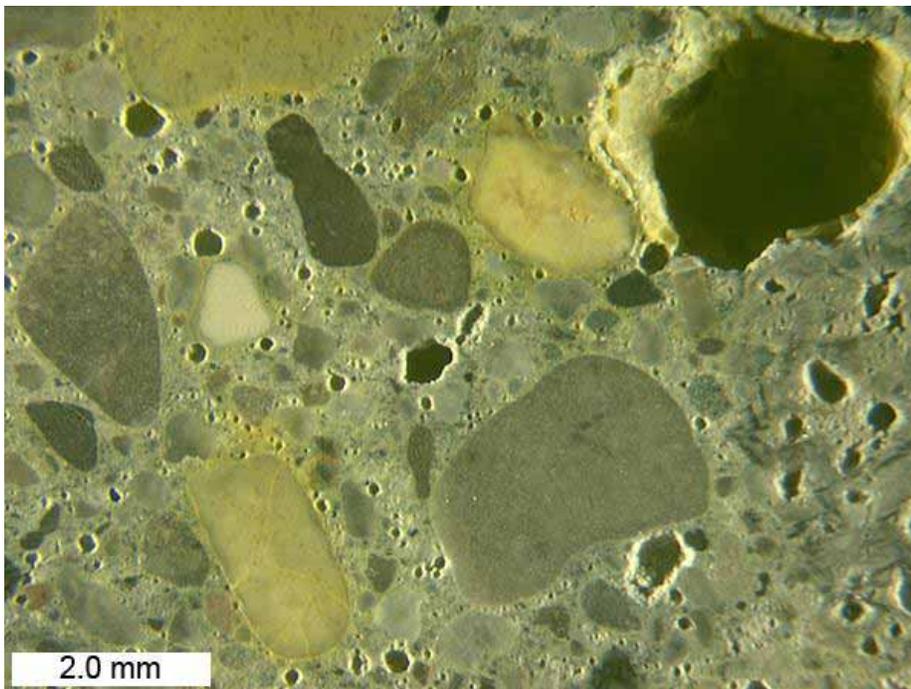
Fine aggregate particles with darkened rims in contact with the cement and alkali silica reaction product filled air void, before and after sodium cobaltinitrite stain, polished slab from SB US23, Section B, constructed 1992, away from joint, top half of core, MTU ID US23-06.

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Fine aggregate particles with darkened rims in contact with the cement paste, before and after sodium cobaltinitrite stain, polished slab from SB US23, Section B, constructed 1992, away from joint, top half of core, MTU ID US23-06.

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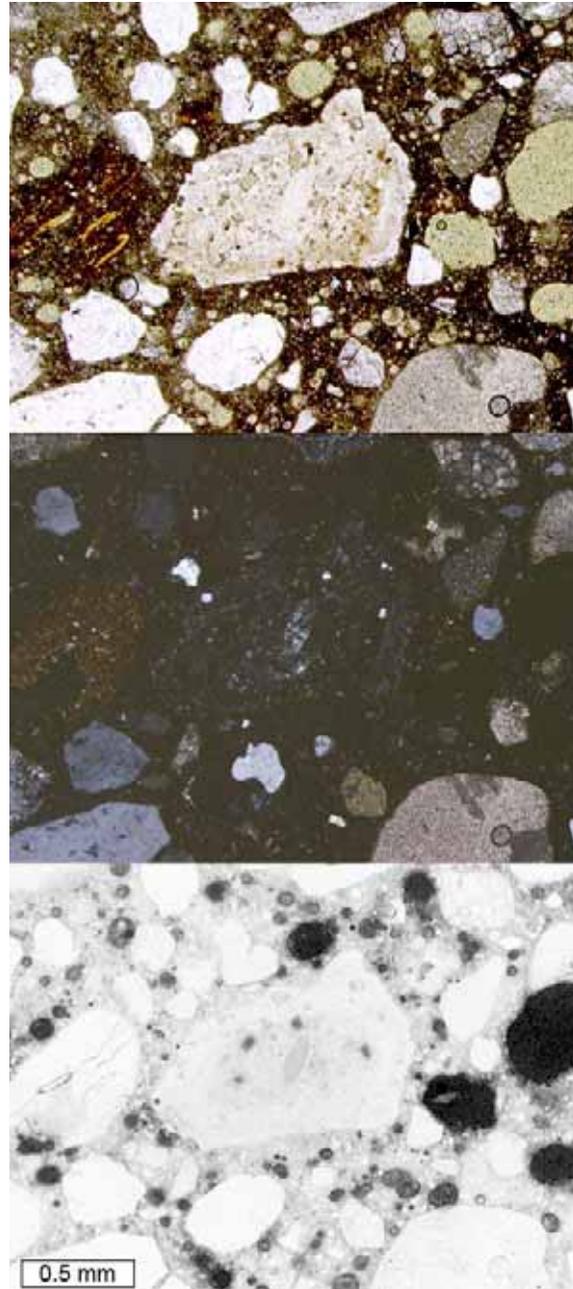
Examples of alkali silica reaction in fine aggregate, without cracking, after sodium cobaltinitrite stain, polished slab from SB US23, Section B, constructed 1992, away from joint, bottom half of core, MTU ID US23-06.

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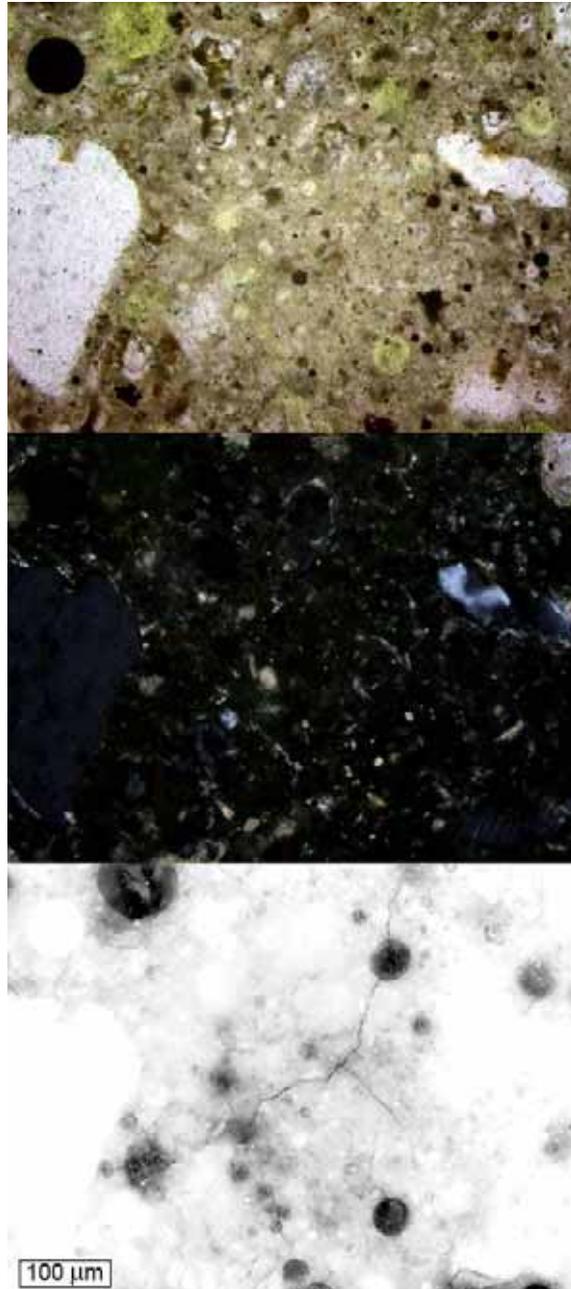
Examples of alkali silica reaction in fine aggregate, with cracking, after sodium cobaltinitrite stain, polished slab from SB US23, Section B, constructed 1992, away from joint, top half of core, MTU ID US23-06.

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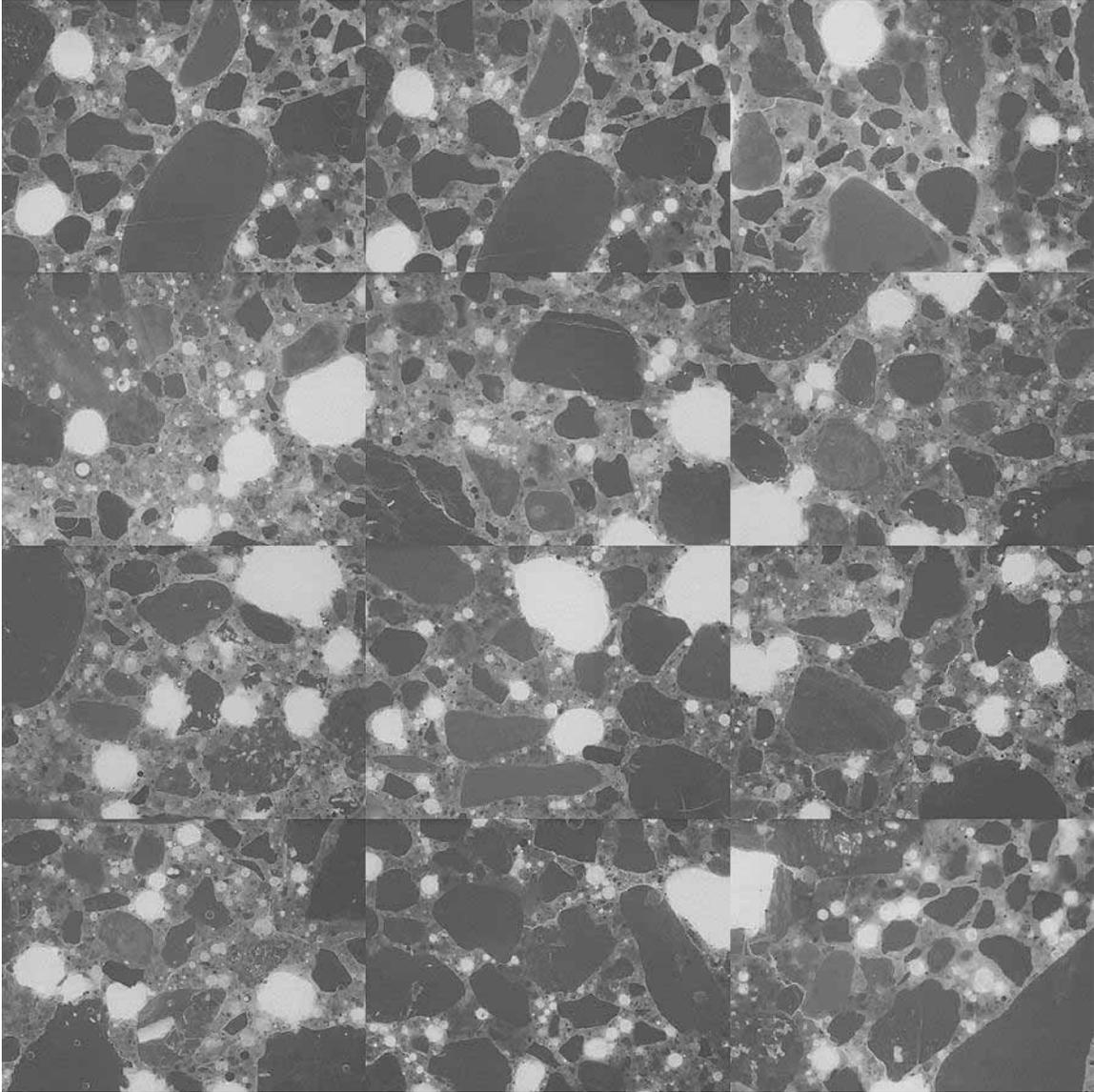
Example of chert particle, and brown siltstone particle, both without signs of deleterious alkali-silica reaction, from thin section prepared from core from US23, Section B away from joint, MTU ID US23-06. From top to bottom: transmitted light, crossed-polars, and epifluorescent mode images.

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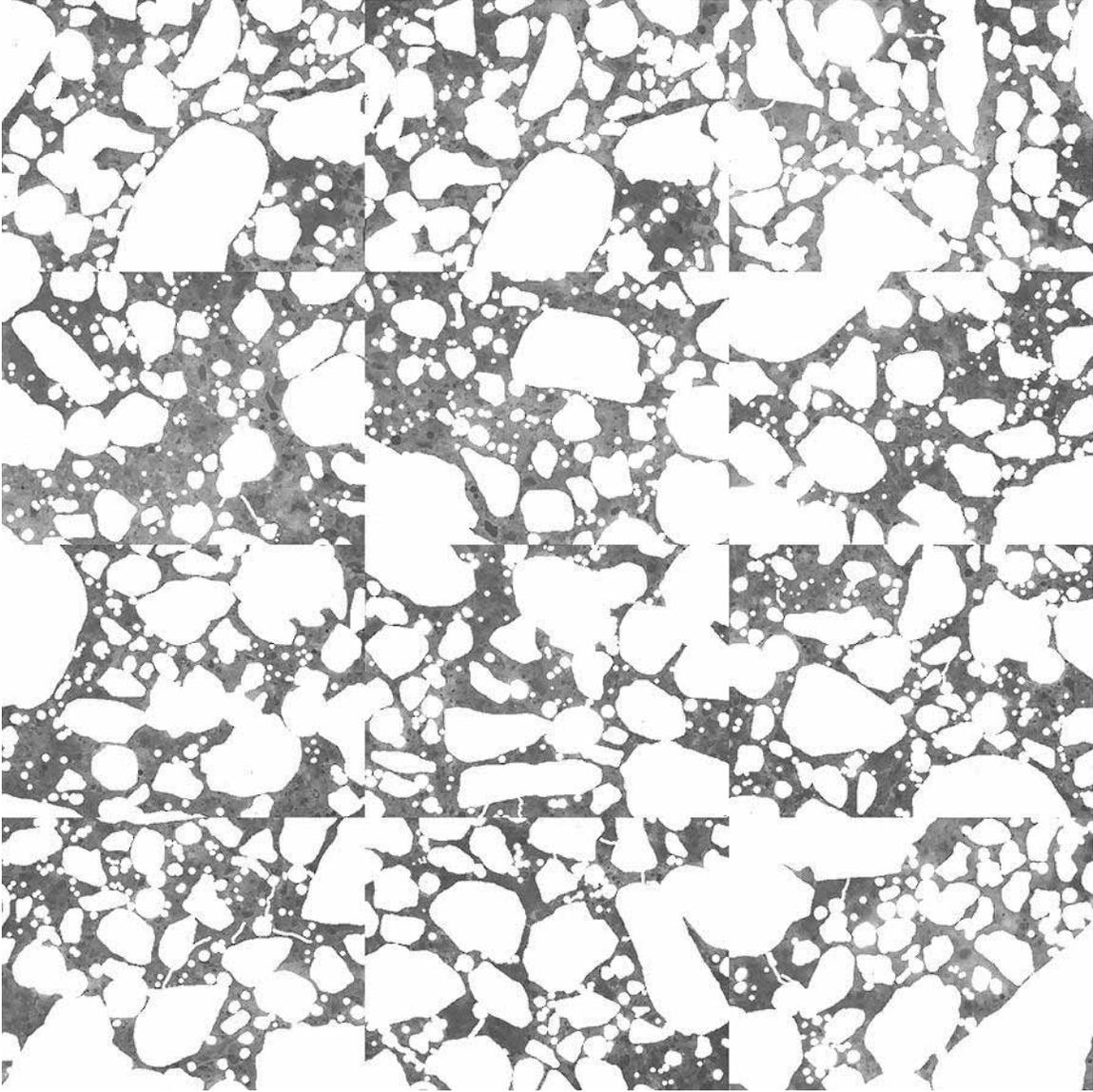
Fly ash in cement paste fraction in thin section prepared from core from US23, Section B at longitudinal joint, MTU ID US23-07. From top to bottom: transmitted light, crossed-polars, and epifluorescent mode images.

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Mosaic of 12 epifluorescent mode images collected from thin sections prepared from core from US23, Section B, away from transverse joint, MTU ID US23-06 (each individual frame measures 2.612 x 1.959 mm).

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Mosaic of 12 epifluorescent mode images collected from thin sections prepared from core US23, Section B, away from transverse joint, MTU ID US23-06, after masking out air voids and fine aggregate to isolate cement paste (each individual frame measures 2.612 x 1.959 mm).

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Average cement paste pixel intensities per frame, and equivalent w/c values (as compared to 28-day moist cured mortar samples) from thin section prepared from core from US23, Section B, away from transverse joint, MTU ID US23-06.

| cement paste pixel fluorescence measurements (average intensity per frame) | | | |
|--|------|------|------|
| 70 | 69 | 83 | 78 |
| 75 | 65 | 63 | 66 |
| 63 | 65 | 54 | 76 |
| equivalent w/c ($y = 0.0044x + 0.0329$) | | | |
| 0.33 | 0.34 | 0.34 | 0.39 |
| 0.37 | 0.36 | 0.32 | 0.31 |
| 0.32 | 0.31 | 0.31 | 0.27 |