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*EXCERPT FROM
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**RESUVASEAL EVALUATION
CFB COLD LAKE AND CFB WAINWRIGHT**

Prepared For
ECHOLON INDUSTRIES INC.

By

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ENVIRONMENTAL TESTING AND ANALYSES

Selected cores from CFB Cold Lake and CFB Wainwright were submitted for environmental analyses as follows. For each facility, representative cores were selected from a RejuvaSeal treated area at the centre of the runway (where pavement brooming/sweeping activity is most concentrated) and at the adjacent edge (relatively little brooming/sweeping), and from an untreated area of the runway/taxiway. After general examination in the JEGEL laboratory, the top 10 to 15 mm of the core was removed by sawcutting and then split into specimens of approximately equal mass (about 100 g each). The specimens were then submitted to Cambridge Materials Testing Limited where the following testing was carried out:

1. Samples of the cores were analyzed for general composition by pyrolysis at 550°C to determine the proportion of organic and inorganic constituents. The volatile organic constituents were analyzed by gas chromatograph, and the inorganic constituents analyzed by infrared spectrometer. The inorganic residue (ash) was also analyzed by plasma spectrometer for metal oxides (composition); and
2. Distilled water and acid leach testing were carried out, both on intact pieces of the cores and pieces that were 'crushed' in the laboratory. The current Ontario Ministry of the Environment Ontario Regulation 347 (Amended Regulation 558) leachate extraction procedure was adopted for the acid leach testing. This test procedure is similar to the US EPA Toxicity Characteristics Leachate Procedure (TCLP). In addition, distilled (pure de-ionized) water leach tests were also carried out on similar bulk and crushed samples. The results of the acid and distilled water leach tests were then compared with the CCME Environmental Water Quality Guidelines for the Protection of Freshwater Aquatic Life.

ENVIRONMENTAL ANALYSIS RESULTS

The environmental analysis results for CFB Cold Lake and CFB Wainwright core samples are presented in Table 2, Tables 3A through 3F, and in Appendix E.

The compositional analysis results for the inorganic residues for the cores, and previous results for sweeper samples supplied by DND, are summarized in Table 2 for comparison. The test results indicate that the sweepings samples contain substantially higher concentrations of iron, zinc, barium,

copper, vanadium and cobalt in comparison with the core samples from CFB Cold Lake and CFB Wainwright. The main constituents of the sweeper residues are silica and iron, with smaller quantities of calcium and zinc also present. The higher iron and zinc concentrations are most probably due to broom 'wear and tear', with the copper, vanadium and cobalt probably attributable to the nonferrous slag sand applied in conjunction with the RejuvaSeal application. The compositional analysis results for the inorganic residues for both treated and untreated surfaces at CFB Cold Lake and treated and untreated surfaces at CFB Wainwright are for all intents and purposes identical, with the major constituents being silica and smaller amounts of alumina and calcium.

The core analysis results also indicate:

- All of the RejuvaSeal-treated and untreated cores tested by gas chromatography for organic composition showed either trace or no detectable concentrations of aliphatic hydrocarbons, and no detectable concentrations of polyaromatic hydrocarbons (PAH);
- The infrared analysis of the non-volatile organic constituents confirmed that the non-volatile material consists of a mixture of partially oxidized hydrocarbon resin;
- The total oxide analyses of the inorganic constituents (whole rock analyses of major oxides and metals) confirmed that the compositions of the treated and untreated cores from both CFB Cold Lake and CFB Wainwright were virtually identical, reflecting mainly the aggregate components. There was no obvious difference in the mineral compositions of the treated and untreated pavements from either facility.

The results of the leachate analyses of both bulk and 'crushed' core samples indicated the following:

- Neither the distilled water or acid leachate testing indicated the presence of polyaromatic hydrocarbons, phenols or volatile organics in the RejuvaSeal or untreated cores;
- The leachate analyses confirmed several metals exceedances of the CCME criteria. However, in all cases, the same exceedances were generally observed for both treated and untreated cores at both facilities. In particular:
 - the concentration of aluminum was observed to be high in almost all of the cores, and particularly for the distilled water leachate testing of 'crushed' samples;

- the concentration of iron was observed to be high in almost all of the cores, and particularly for the distilled water testing of 'crushed' samples;
- the concentration of lead was observed to be high in some of the cores, with the 'crushed' samples generally exhibiting somewhat higher concentrations than the bulk sample results; and
- occasional exceedances in the concentration of zinc were noted at both CFB Cold Lake and CFB Wainwright for 'crushed' samples only, and in the concentration of copper at CFB Wainwright only.

As similar CCME exceedances were observed for both RejuvaSeal-treated and untreated cores, the high (in comparison to CCME criteria) test results are attributed to the mineral constituents or other operational activities (such as de-icing chemical application for instance), not the RejuvaSeal treatments.

CLOSING REMARKS

This report on the evaluation of the RejuvaSeal pavement sealer has been prepared by JEGEL and is intended for use by representatives of Echelon Industries Inc. and the Department of National Defence.

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