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One of the factors important in determining the reassessment interval is the corrosion rate. Both external and internal corrosion rates are affected by a number of conditions. The objective of this project is to use mechanistic modeling to generate simplified guidelines for estimating external and internal corrosion rates. A need for such a model-based estimation is especially important for corrosion under shielded, disbanded coatings.

Significant progress has been made in modeling the corrosion rate under shielded, disbanded coatings for both static and low-flow conditions (low flow assumed for external corrosion is reasonable under most circumstances where pin-hole leaks in coatings can lead to slow flow of groundwater through the disbanded area). It is shown that with the diffusion of oxygen through the coating holiday, flow conditions can significantly increase the corrosion rate near the mouth of the disbondment. These calculations will be validated by laboratory experiments. The model calculations also explored the effect of carbon dioxide permeation through the coating on external corrosion rate. Based on these calculations, simplified estimation guidelines will be developed.

Internal corrosion in a liquids pipeline was monitored using a multielectrode array sensor. The sensor corrosion was quite sensitive to changing input conditions, such as air ingress. Corrosion rates ranging from 0.1 mm/y (4 mpy) to 1 mm/y (40 mpy) were measured. It should be noted that the high corrosion rates were transient phenomena that occurred when the system was open to install the probes, not long-term corrosion rates.