1139-35-51 **John Gemmer**, **Gary Moon** and **Sarah Raynor*** (raynorsg@wfu.edu). *Behavior of Solutions to an Elliptic Free Boundary Problem near a Neumann Fixed Boundary.*

We explore regularity properties of solutions to a two-phase elliptic free boundary problem near a Neumann fixed boundary in two dimensions. Consider a function u, defined variationally, which is harmonic where it is not zero and satisfies a gradient jump condition weakly along the free boundary $\partial\{u > 0\}$. Our main result is that u is Lipschitz continuous up to the Neumann fixed boundary. Additionally, we prove various basic properties of such a minimizer near a portion of the fixed boundary on which $\partial_\nu u = 0$ weakly. We also provide numerics that indicate the way in which the free and fixed boundaries interact and justify the convergence of those numerics. (Received January 23, 2018)