



WATERFRONT PIAP PROJECT PROPOSAL  
 URBAN RESERVE INTERIM MANAGEMENT IMPROVEMENTS  
 Phytoremediation plan at the southern end of the Urban Reserve

Waterfront PIAP Project Proposal  
Urban Reserve Interim Management Improvements  
Phytoremediation Maintenance  
Kyle Clark, Environmental Consultant

The species chosen for phytoremediation of the former Astroline site will primarily remediate contaminants (chiefly volatile organic compounds, and to a lesser degree polycyclic aromatic hydrocarbons) through phytovolatalization and rhizodegradation. The species in our design include hybrid poplar, willow, and a variety of flowering perennial species. Phytovolatilization refers to the uptake and transpiration of contaminants, primarily organic compounds, by plants. The contaminant, present in the water taken up by the plant, passes through the plant or is modified by the plant, and is released to the atmosphere (evaporates or vaporizes). Rhizodegradation, also known as phyto-stimulation, is the degradation of contaminants in the rhizosphere (area of soil surrounding the roots of the plants) by means of microbial activity which is enhanced by the presence of plant roots. The flowering species chosen have been found to degrade soil contaminants by way of root exudates, among other mechanisms; this below-soil degradation is also aided by bacteria present in the compost used in our design.

Since our method of phytoremediation does not involve the accumulation of contaminants, plant material is not thought to be toxic. However, considering that there are other potential contaminants that could be accumulated in plants, any large plant specimens that are felled should be chipped and incinerated or composted after harvesting. This is primarily a concern with hybrid poplars and willows as opposed to herbaceous perennials, which are not likely to accumulate contaminants.

Hybrid poplars will be responsible for the majority of the phytoremediation, and they typically live from 30 to 50 years. It will not be necessary to harvest the trees before their maturity, and thus maintenance should be minimal. Given that this is an interim planting, if a decision is made to use areas planted with trees for a different use in the future, trees can be harvested, chipped, and removed fairly quickly and at a fairly low cost. Removing stumps (e.g. with a stump grinder) would be the most expensive aspect of tree removal, and should cost approximately \$3 per inch of diameter. Assuming 250 trees, 10 inches in diameter (anticipated diameter after 8-10 years of growth), the cost to remove all stumps would be approximately \$7,500.

Aside from tree removal, maintenance at the former Astroline site should be minimal. Soil moisture content and weed suppression will be primarily controlled through the use of drought-tolerant plants, landscape fabric, compost, and mulch. Flowering plants are perennial and will flower each year without any aid; the flowering period could be extended by "dead heading" some species, although this is not necessary.

Urban Reserve Phytoremediation Preliminary Budget - October 15, 2013

Item	Units	Cost per unit	Quantity	Sutotal
Compost	Cubic Yard	\$55.00	160	\$8,800.00
Topsoil	Cubic Yard	\$15.00	75	\$1,125.00
Landscape fabric	Square foot	\$0.12	30000	\$3,600.00
Landscape anchor staples	Staple	\$0.06	7500	\$450.00
Mulch	Cubic Yard	\$45.00	50	\$2,250.00
Phyto trees	Tree	\$20.00	275	\$5,500.00
<i>Box trees</i>	Tree	\$150.00	30	\$4,500.00
<i>Portable planters</i>	Planter	\$150.00	20	\$3,000.00
Plant Plugs	Plug	\$2.25	3000	\$6,750.00
Wildflower and sunflower seed	Pound	\$25.00	20	\$500.00
Poly tarp for grass solarization	Square foot	\$0.16	3000	\$480.00
Installation labor	Hours	\$50.00	220	\$11,000.00
Grading for bioswale	Hours	\$100.00	10	\$1,000.00
Plant maintenance and irrigation	Hours	\$50.00	100	\$5,000.00
Plant removal and disposal	Hours	\$25.00	30	\$750.00
Planting diagram/spec finalization	Hours	\$100.00	25	\$2,500.00
Soil sampling and analysis	Hours	\$150.00	15	\$2,250.00
<b>Total</b>				<b>\$59,455.00</b>

Approximate area treated (sq. ft.):

30,000

Approximate cost per square foot:

\$1.98 (including aesthetic components)