Draft Information Sheet
Attachment No. 1

Summary of Strength Parameters for Bulk Materials				
Materials	**Shear Strength Parameters**		**Unit Weight**	**Comments**
	Peak	**Residual**		
MSW Fill	$\varphi = 30^o$ c = 200 psf	Not used	γ = 80 pcf	Based on Kavazanjian (1995), Singh & Murphy (1990)
Williams Formation / Massive Bedrock	Hoek & Brown Shear strength failure criteria m = 1.231 / s = 0.00293		γ = 147 pcf	Based on lab testing of rock core samples
Protective Cover Layer	$\varphi = 32^o$ / c = 200 psf (temporary stability analysis) Not used in global analysis - not critical strength parameter		γ = 120 pcf	Based on grain size distributions from GeoLogic 2006 report. Used for temporary liner stability analysis.
Low Permeability layer ($k < 10^{-7}$ cm/sec)	Not used in analysis - not critical strength parameter		γ = 120 pcf	Strength depends on selected material and must be verified prior to construction to exceed critical shear strength.
Summary of Strength Parameters for Slope Liner Interface Components				
Protective Cover Layer & 16-oz Geotextile	Not used in analysis - not critical strength parameter		γ = 120 pcf	Peak & large displacement shear strength estimated to both be $\varphi = 29^o$, c = 125 psf (Koerner, 2005).
16-oz Geotextil & smooth 60-mil HDPE	φ = 11o c = 0 psf (used for temporary stability analysis)	$\varphi = 8^o$ c = 0 psf		Peak & large displacement shear strength estimated from in-house database & Koerner (2005). This is the anticipated critical interface for all slope stability analyses.
Textured 60-mil HDPE & Low Permeability Layer ($k = 10^{-7}$ cm/sec)	Not used in analysis - not critical strength parameter			Peak & large displacement shear strength estimated to be $\varphi = 18^o$, c = 0 psf; and $\varphi = 16^o$, c = 0 psf, respectively (Koerner 2005).
Summary of Strength Parameters for Base Liner Interface Components				
Protective Cover & 6-oz Geotextile	Not used in the analyses - not considered critical strength parameters		γ = 120 pcf	Peak & large displacement shear strength estimated to be $\varphi = 33^o$, c = 0 psf (Koerner 2005).
6-oz Geotextile & 3/4-inch gravel drainage layer				Peak & large displacement shear strength estimated to be at least $\varphi = 33^o$, c = 0 psf (Koerner 2005).
3/4-inch gravel drainage layer & 16-oz Geotextile				Peak & large displacement shear strength estimated to be $\varphi = 33^o$, c = 0 psf (Koerner 2005).
16-oz Geotextil & textured 60-mil HDPE				Peak & large displacement shear strength estimated to be $\varphi = 25^o$, c = 0 psf; and $\varphi = 17^o$, c = 0 psf, respectively (Koerner 2005).
Textured 60-mil HDPE & Low Permeability Layer (k = 10-7 cm/sec)	$\varphi = 18^o$ c = 0 psf	Not used in analyses		Peak shear strength estimated from Koerner (2005). Anticipated to be the critical interface.

Information derived from "Las Pulgas Landfill Phase II Composite Liner System Design Report", Marine Corps Base Camp Pendleton, San Diego, California; November 2009

c = cohesion
φ = friction angle
k = permeability
m & s = dimensionless
psf = pounds per square foot
pcf = pounds per cubic foot