Attachment D
Digester Design Calculations

HANOVER FOODS WWTP
ANAEROBIC DIGESTERS NO. 2 DESIGN CALCULATION

						Notes:
1 WWTP Design Process Flow						
Existing ADF	*	0.46 mgd				2014 Flow Data Calculated for 365 Days
Ex. MMF	*	0.62 mgd				2015 Flow Data Calculated for 365 Days
MMF/ADF	*	1.33				Calculated
Design ADF	*	0.46 mgd				Design to meet TN limits
MMF/ADF	*	1.33				From above
Design MMF	*	0.62 mgd				Design to meet TN limits
Influent BOD (average)	*	3,000 mg/L	*	11,573 lbs/day		Defined in Engineer's Report
Influent BOD (maximum)	*	4,000 mg/L	*	20,550 lbs/day		Defined in Engineer's Report
Influent COD (average)	*	5,000 mg/L	*	19,288 lbs/day		Defined in Engineer's Report
Influent COD (maximum)	*	6,000 mg/L	*	30,825 lbs/day		Defined in Engineer's Report
Influent TSS (average)	*	380 mg/L	*	1,466 lbs/day		Defined in Engineer's Report
Influent TSS (maximum)	*	460 mg/L	*	2,363 lbs/day		Defined in Engineer's Report
Influent NH4-N (average)	*	5 mg/L	*	19 lbs/day		Defined in Engineer's Report
Influent NH4-N (maximum)	*	10 mg/L	*	51 lbs/day		Defined in Engineer's Report
Influent TN (average)	*	70 mg/L	*	270 lbs/day		Defined in Engineer's Report
Influent TN (maximum)	*	100 mg/L	*	514 lbs/day		Defined in Engineer's Report
Influent TP (average)	*	10 mg/L	*	39 lbs/day		Defined in Engineer's Report
Influent TP (maximum)	*	15 mg/L	*	77 lbs/day		Defined in Engineer's Report
2 Anaerobic Digesters						
Digester No. 2 Ø	*	110 ft				
Digester No. 2 SWD	*	15.3 ft				
Digester No. 2 Volume	*	145,401 cf	*	1,087,598 gallons		
Effective Digester No. 2 Volume (90% of Total Volume)	*	130,861 cf	*	978,838 gallons		
Bottom Cone Volume	*	30,481	*	228,000 gallons		
Combined Effective Digestion Volume	*	130,861 cf	*	978,838 gallons		
Combined Bottom Cone Volume	*	30,481 cf	*	228,000 gallons		
Combined Total Digestion Volume	*	175,882 cf	*	1,315,598 gallons		
COD Loading (AAF)	*	0.15 lbs COD/cf/day	*	2.36 kg COD/m3/day	ok	AECOM WW Book (4th ed.): 1-8 kg COD/m3/day
COD Loading (MMAF)	*	0.24 lbs COD/cf/day	*	3.77 kg COD/m3/day	ok	AECOM WW Book (4th ed.): 1-8 kg COD/m3/day
3 Hydraulic Ration Time (HRT)						
HRT @ ADF	*	2.1 days	ok			AECOM WW Book (4th ed.): 0.5-5 days
HRT @ MMF	*	1.6 days	ok			AECOM WW Book (4th ed.): 0.5-5 days
4 Sludge Generation						
Volatile Sludge Yield, Y	*	0.08 lbs VS/lbs COD				AECOM WW Book (4th ed.): Table 10-10
COD Removal Rate	*	90.00%				Assumed
COD Removed (ADF)	*	17,359 lbs/day				
COD Removed (MMAF)	*	27,742 lbs/day				
VS Production (ADF)	*	1,389 lbs/day				
VS Production (MMAF)	*	2,219 lbs/day				
VS/TS	*	65.00%				Historical pilot study data
TS Production (ADF)	*	2,137 lbs/day				
TS Production (AMMAF)	*	3,414 lbs/day				
5 Solids Retention Time						
MLSS	*	6,000 mg/L				
SRT (ADF)	*	23 days				
SRT (MMAF)	*	14 days				
6 Methane Generation						
Methane Production Rate	*	0.4 m3/kg COD				AECOM WW Book (4th ed.): Table 10-10
	*	5.62 cf/lbs COD				
Methane Generation (ADF)	*	97,559 cf/day				
Methane Generation (MMAF)	*	155,911 cf/day				
7 Biogas Production						
Methane Purity in Biogas	*	65.00%				
Biogas Production (ADF)	*	150,090 cf/day				
	*	104 cfm				
Biogas Production (MMAF)	*	239,863 cf/day				
	*	167 cfm				
Biogas Thermal Energy	*	600 BTU/cf				
Biogas Thermal Energy Value (ADF)	*	90,054,297 BTU/day				
	*	90 MMBTU/day				
	*	3.8 MMBTU/hr				
Biogas Thermal Energy Value (MMAF)	*	143,917,873 BTU/day				
	*	144 MMBTU/day				
	*	6.0 MMBTU/hr				