APPENDIX L3:
EBPSP SEWER AND WATER INFRASTRUCTURE

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MICHAEL BAKER INTERNATIONAL

EUCALYPTUS BUSINESS PARK SEWER STUDY

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List of Abbreviations

ac	Acre
ADWF	Average Dry Weather Flow
City	City of Ontario
d/D	Depth to Diameter Ratio
FAR	Floor Area Ratio
ft	feet
ft/s	Feet per Second
gpd	Gallons Per Day
gpm	Gallons per Minute
in	inches
mgd	Million Gallons per Day
MKN	Michael K. Nunley and Associates
OMUC	Ontario Municipal Utilities Company
PA	Planning Areas
PDWF	Peak Dry Weather Flow
PWWF	Peak Wet Weather Flow
PVC	Polyvinyl Chloride
SMP	Sewer Master Plan
tsf	Thousand Square Feet

Previous Studies and Reports

The following studies, reports, and other materials were reviewed during the preparation of this Report:

1. City of Ontario Sewer Master Plan
2. City of Ontario Water Master Plan
3. Eucalyptus Business Park Specific Plan

1.0 INTRODUCTION

1.1 Purpose

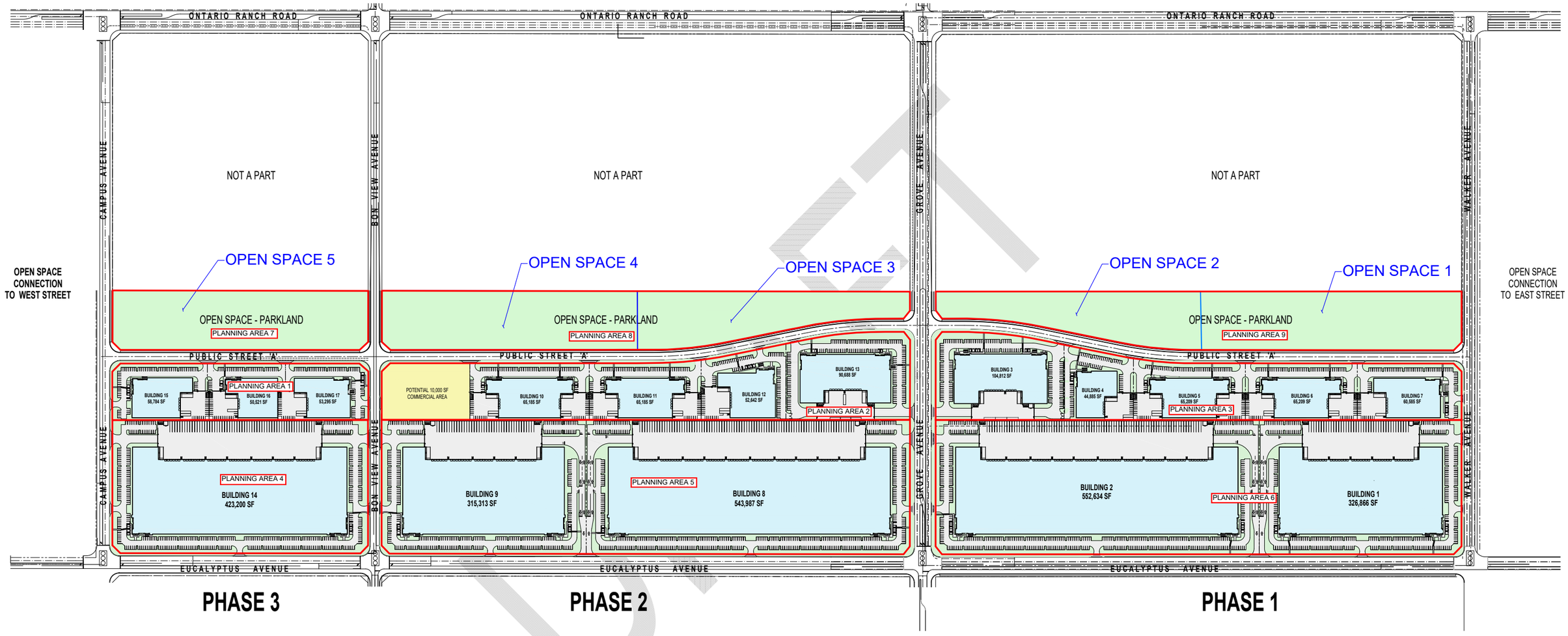
The purpose of this study is to evaluate whether the proposed sewer pipelines can adequately serve the 174-acre Eucalyptus Business Park (Project) and its connection to the Ontario Municipal Utilities Company (OMUC) sewer system. The findings presented in this report are based on the Eucalyptus Business Park Specific Plan, the City of Ontario Sewer Master Plan Update, and the sewer analysis completed by MKN.

1.2 Background

The Eucalyptus Business Park project area is in the City of Ontario, in San Bernardino County, California. The City is divided into two distinct areas known as the Old Model Colony and the New Model Colony. The proposed Project is within the New Model Colony and is bounded by Eucalyptus Avenue to the south, Walker Avenue to the east, and Campus Avenue to the west. The proposed development encompasses approximately 174 acres, including approximately 37 acres of designated open space. The Project site is classified under Medium-Density Residential and Open Space per the Sewer Master Plan, however, is proposed for a mix of Business Park, Commercial and Open Space land use and is planned to be constructed in three phases. The development phasing and site layout is presented in Figure 1-1, while Table 1-1 summarizes the planning area and buildout areas.

Table 1-1: Summary of Eucalyptus Business Park				
Planning Area (PA)	**Acres**	**Building**	**Square Footage(sf)**	**Area (acres)**
1	7.70	15	58,784	-
		16	50,521	-
		17	53,295	-
2	18.33	Commercial	10,000	-
		10	65,185	-
		11	65,185	-
		12	52,642	-
		13	90,688	-
3	18.21	3	104,812	-
		4	44,885	-
		5	65,209	-
		6	65,209	-
		7	60,585	-
4	18.19	14	423,200	-
5	37.76	8	543,987	-
		9	315,313	-
6	37.71	1	326,866	-
		2	552,634	-
7	8.05	Open Space 5	-	8.05
8	14.10	Open Space 3	-	5.82
		Open Space 4	-	8.28
9	14.00	Open Space 1	-	8.22
		Open Space 2	-	5.78
Total	**174.05**	**-**	**2,949,000**	**36.15**

Figure 1-1: Eucalyptus Business Park Project Area



2.0 EXISTING AND PROPOSED FACILITIES

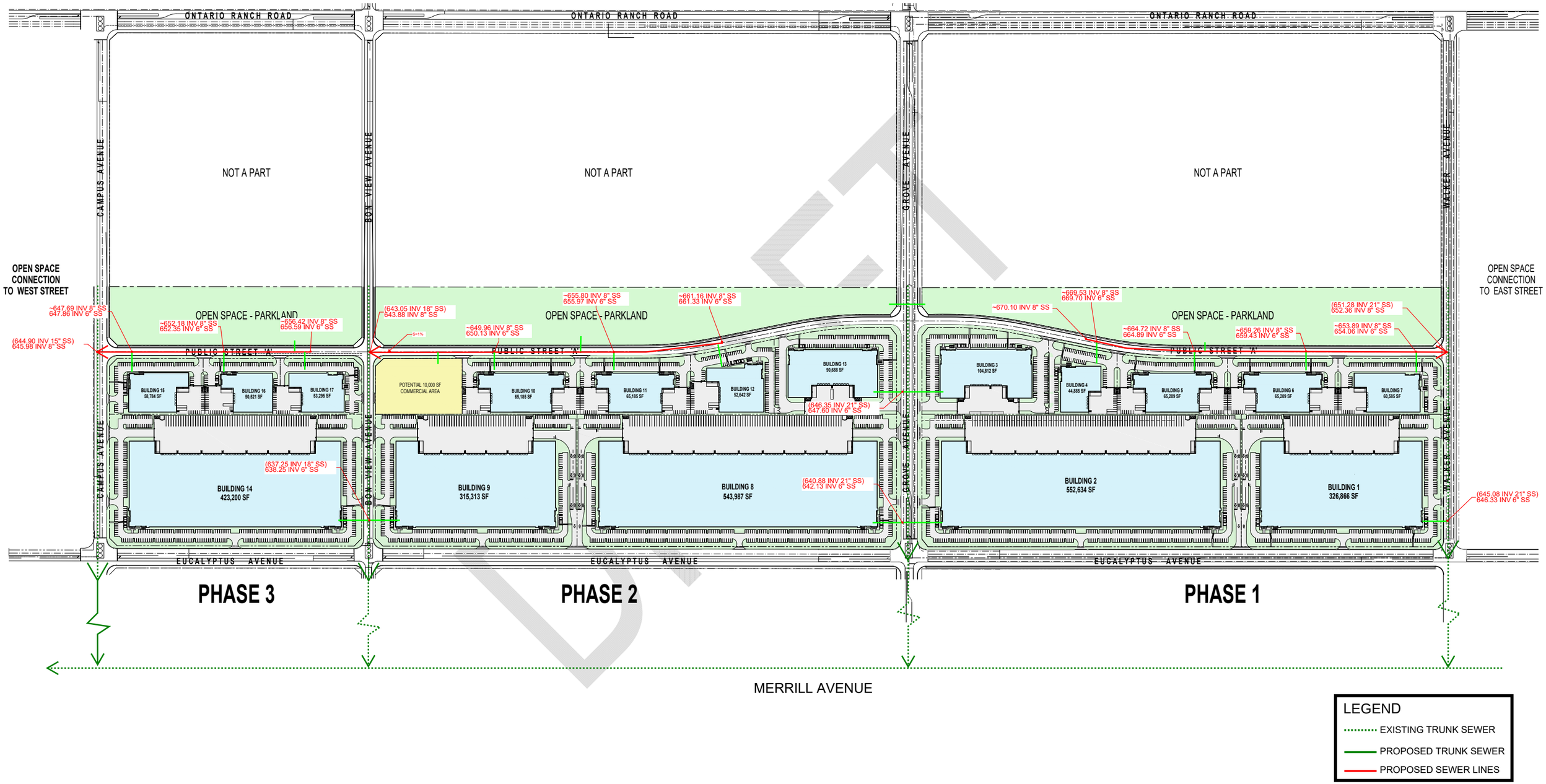
2.1 Existing Facilities

Per the City's 2012 Sewer Master Plan (SMP), the Project is located within the New Model Colony planning area. The SMP identifies sewer trunk lines along Campus Avenue, Bon View Avenue, Grove Avenue, and Walker Avenue, north of Eucalyptus Avenue, as master-planned facilities that have been sized as part of the SMP. For the purposes of this study, these trunk lines are referred to as existing facilities. The trunk lines along Campus Avenue and Bon View Avenue have diameters of 15 inches and 18 inches, respectively, while the trunk lines along Grove Avenue and Walker Avenue have diameters of 21 inches. Wastewater generated by the proposed development will discharge into these trunk lines and be conveyed downstream via the Kimball Interceptor to the Regional Wastewater Treatment Plant.

2.2 Proposed Facilities

The proposed sewer system includes 8-inch pipes along Public Street "A." These 8-inch lines will convey wastewater from the proposed developments to the trunk sewer lines. For this study, only the proposed 8-inch lines along Public Street "A" are analyzed. Per OMUC's direction, OMUC will evaluate the capacity of the existing sewer trunk lines relative to the Project's proposed sewer discharge flows. Wastewater generated within each development will discharge into the corresponding proposed sewer lines, which will then convey flows to the trunk lines along Campus Avenue, Bon View Avenue, Grove Avenue, or Walker Avenue, as shown in Figure 2-1. In addition to these proposed facilities, the sewer trunk line in Campus Avenue, south of Eucalyptus is a proposed sewer trunk extension.

Figure 2-1: Eucalyptus Business Park with Proposed and Existing Facilities



3.0 SEWER ANALYSIS

3.1 Methodology

3.1.1 Sewer Generation Calculation Methodology

A detailed sewer system analysis was conducted for the Project area to estimate wastewater flows and evaluate hydraulic performance under Average Dry Weather Flow (ADWF), Peak Dry Weather Flow (PDWF), and Peak Wet Weather Flow (PWWF) conditions. The analysis focused on calculating wastewater flows, flow depth-to-diameter (d/D) ratios, and flow velocities. This study specifically evaluates the new sewer pipelines proposed for the Project that deviate from the adopted Sewer Master Plan. Sewer pipelines shown in the Sewer Master Plan including the trunk lines in Campus Avenue, Bon View Avenue, Grove Avenue, and Walker Avenue, will be evaluated separately by OMUC.

Proposed wastewater flows were estimated using the Draft City of Ontario 2025 Water Demand and Sewer Flow Factors, included in Appendix A (provided by OMUC). The flow factors are summarized in Table 3-1.

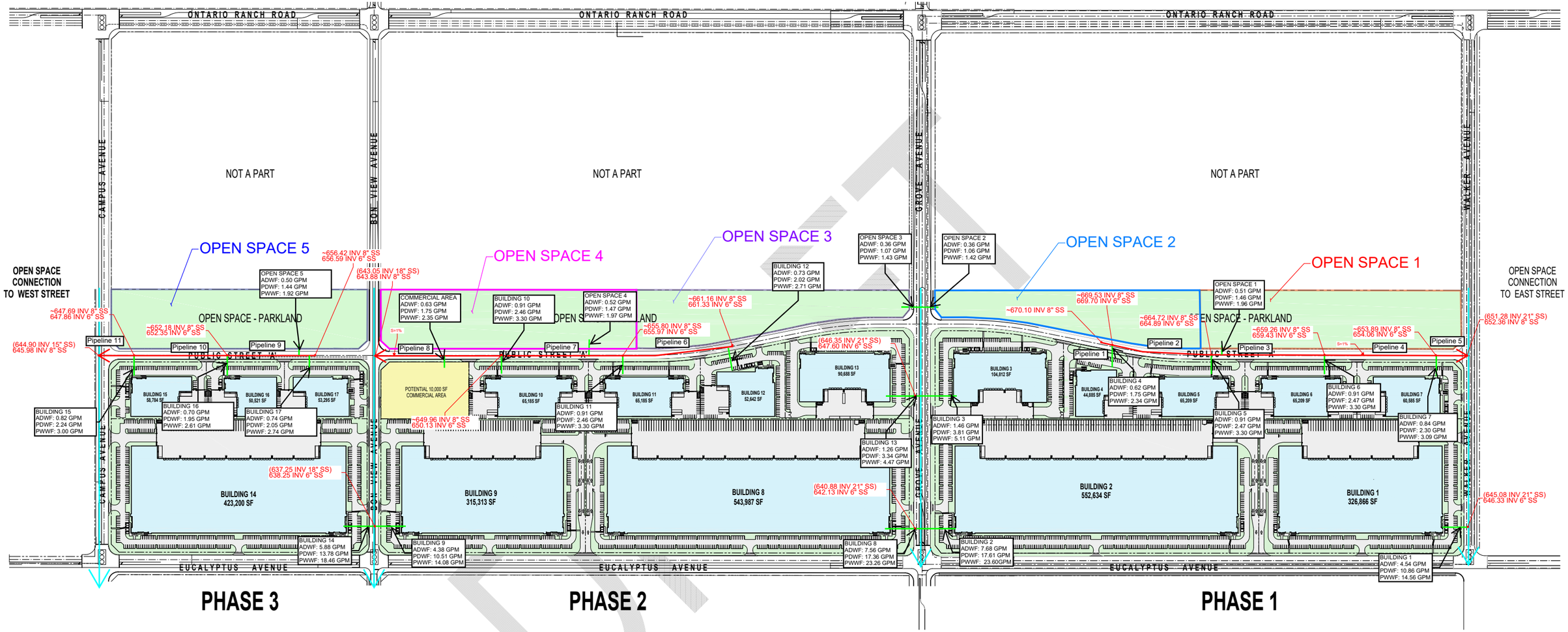
Table 3-1: Non-Residential Sewer Flow Factor Summary

General Landuse Category	FAR	Sewer Flow Factor			
		Value	Units	Value	Units
Commercial	0.30	1,150	gpd/ac	90	gpd/tsf
Business Park	0.50	1,150	gpd/ac	20	gpd/tsf
Office	0.75	1,150	gpd/ac	35	gpd/tsf
Hospitality	N/A	2,400	gpd/ac	100	gpd/room
Industrial	0.55	300	gpd/ac	13	gpd/tsf
Public Facility	0.30	475	gpd/ac	15	gpd/tsf
Open Space	N/A	90	gpd/ac	-	-
School	N/A	500	gpd/ac	10	gpd/student

For land uses where proposed building floor area is available, wastewater flows were computed using the gpd/tsf flow factors and the corresponding building areas (tsf). For land uses defined by area rather than building floor area (e.g., Open Space), wastewater flows were computed using the gpd/acre flow factors and the applicable acreage. This mixed basis is consistent with how the Sewer Master Plan flow factors are presented (i.e., some land uses are expressed per tsf and others per acre), and it provides the most representative estimate of wastewater generation for the proposed development.

The identification of each pipe segment is shown in Figure 3-1, based on the locations of manholes. Wastewater from each building and open space area is conveyed to the sewer pipelines through sewer laterals.

Figure 3-1: Eucalyptus Business Park Pipe Segments



Using the sewer flow factor criteria in Table 3-1, the calculation equations in Table 3-2, and the building square footages and open space area acreages listed in Table 1-1, the Average Dry Weather Flow (ADWF), Peak Dry Weather Flow (PDWF), and Peak Wet Weather Flow (PWWF) were determined. The sewer discharges from the development, shown in Table 3-3, include their corresponding pipeline segments. Table 3-4 summarizes the sewer generation for each development based on the established phasing plan.

Table 3-2: Equations to compute ADWF, PDWF, and PWWF Sewer Generation

Scenario	Equation
Average Dry Weather Flow (mgd)	$ADWF(gpd) = Sewer\ Flow\ Factor\ per\ landuse\ gpd/acres * area\ (acres)$ $ADWF(gpd) = Sewer\ Flow\ Factor\ per\ landuse\ gpd/tsf * area\ (tsf)$ $ADWF(mgd) = \frac{ADWF\ gpd}{1{,}000{,}000\ gpd/mgd}$
Peak Dry Weather Flow (mgd)	$PDWF(mgd) = 1.6 * ADWF^{0.92}$
Peak Wet Weather Flow	$PWWF = 1.34 * PDWF$

Table 3-3: Development to Pipeline Flow Summary	
Development	**Pipeline Segment Collecting Wastewater**
Phase 1	
Building 1	21-in Trunk Sewer on Walker Avenue
Building 2	21-in Trunk Sewer on Grove Avenue
Building 3	21-in Trunk Sewer on Grove Avenue
Building 4	Pipeline 2
Building 5	Pipeline 3
Building 6	Pipeline 4
Building 7	Pipeline 5
Open Space 1	Pipeline 3
Open Space 2	21-in Trunk Sewer on Grove Avenue
Phase 2	
Building 8	21-in Trunk Sewer on Grove Avenue
Building 9	18-in Trunk Sewer on Bon View Avenue
Building 10	Pipeline 8
Building 11	Pipeline 7
Building 12	Pipeline 6
Building 13	21-in Trunk Sewer on Grove Avenue
Commercial	Pipeline 8
Open Space 3	21-in Trunk Sewer on Grove Avenue
Open Space 4	Pipeline 7
Phase 3	
Building 14	18-in Trunk Sewer Bon View Avenue
Building 15	Pipeline 11
Building 16	Pipeline 10
Building 17	Pipeline 9
Open Space 5	Pipeline 9

Table 3-4: Sewer Generation Per Development

Planning Area (PA)	Development	Area (sqf)	Area (tsf)	Area (acres)	Average Dry Weather Flow Unit Flow Factor (gpd/tsf)	Average Dry Weather Flow Unit Flow Factor (gpd/acre)	Land Use	Average Dry Weather Flow (mgd)	Average Dry Weather Flow (gpd)	Average Dry Weather Flow (gpm)	Peak Dry Weather Flow (mgd)	Peak Dry Weather Flow (gpd)	Peak Dry Weather Flow (gpm)	Peak Wet Weather Flow (mgd)	Peak Wet Weather Flow (gpd)	Peak Wet Weather Flow (gpm)
Phase 1																
6	Building 1	326,866	326.87	-	20	-	Business Park	0.007	6,537	4.54	0.016	15,642	10.86	0.021	20,960	14.56
6	Building 2	552,634	552.63	-	20	-	Business Park	0.011	11,053	7.68	0.025	25,358	17.61	0.034	33,979	23.60
3	Building 3	104,812	104.81	-	20	-	Business Park	0.002	2,096	1.46	0.005	5,493	3.81	0.007	7,361	5.11
3	Building 4	44,885	44.89	-	20	-	Business Park	0.001	897.70	0.62	0.003	2,518	1.75	0.003	3,374	2.34
3	Building 5	65,209	65.21	-	20	-	Business Park	0.001	1,304	0.91	0.004	3,550	2.47	0.005	4,757	3.30
3	Building 6	65,209	65.21	-	20	-	Business Park	0.001	1,304	0.91	0.004	3,550	2.47	0.005	4,757	3.30
3	Building 7	60,585	60.59	-	20	-	Business Park	0.001	1,212	0.84	0.003	3,318	2.30	0.004	4,446	3.09
9	Open Space 1	-	-	8.22	-	90	Open Space	0.001	739.80	0.51	0.002	2,107	1.46	0.003	2,824	1.96
9	Open Space 2	-	-	5.78	-	90	Open Space	0.001	520.20	0.36	0.002	1,524	1.06	0.002	2,042	1.42
							Phase 1 Total	**0.026**	**25,664**	**17.82**	**0.063**	**63,060**	**43.79**	**0.085**	**84,500**	**58.68**
Phase 2																
5	Building 8	543,987	543.99	-	20	-	Business Park	0.011	10,880	7.56	0.025	24,992	17.36	0.033	33,490	23.26
5	Building 9	315,313	315.31	-	20	-	Business Park	0.006	6,306	4.38	0.015	15,132	10.51	0.020	20,278	14.08
2	Building 10	65,185	65.19	-	20	-	Business Park	0.001	1,304	0.91	0.004	3,549	2.46	0.005	4,755	3.30
2	Building 11	65,185	65.19	-	20	-	Business Park	0.001	1,304	0.91	0.004	3,549	2.46	0.005	4,755	3.30
2	Building 12	52,642	52.64	-	20	-	Business Park	0.001	1,053	0.73	0.003	2,915	2.02	0.004	3,907	2.71
2	Building 13	90,688	90.69	-	20	-	Business Park	0.002	1,814	1.26	0.005	4,809	3.34	0.006	6,443	4.47
2	Commercial Area	10,000	10.00	-	90	-	Commercial	0.001	900.00	0.63	0.003	2,524	1.75	0.003	3,382	2.35
8	Open Space 3	-	-	5.82	-	90	Open Space	0.001	523.80	0.36	0.002	1,534	1.07	0.002	2,055	1.43
8	Open Space 4	-	-	8.28	-	90	Open Space	0.001	745.20	0.52	0.002	2,121	1.47	0.003	2,843	1.97
							Phase 2 Total	**0.025**	**24,829**	**17.24**	**0.061**	**61,125**	**42.45**	**0.082**	**81,908**	**56.88**
Phase 3																
4	Building 14	423,200	423.20	-	20	-	Business Park	0.008	8,464	5.88	0.020	19,838	13.78	0.027	26,582	18.46
1	Building 15	58,784	58.78	-	20	-	Business Park	0.001	1,176	0.82	0.003	3,227	2.24	0.004	4,324	3.00
1	Building 16	50,521	50.52	-	20	-	Business Park	0.001	1,010	0.70	0.003	2,807	1.95	0.004	3,762	2.61
1	Building 17	53,295	53.30	-	20	-	Business Park	0.001	1,066	0.74	0.003	2,949	2.05	0.004	3,951	2.74
7	Open Space 5	-	-	8.05	-	90	Open Space	0.001	724.50	0.50	0.002	2,067	1.44	0.003	2,770	1.92
							Phase 3 Total	**0.012**	**12,441**	**8.64**	**0.031**	**30,887**	**21.45**	**0.041**	**41,389**	**28.74**
							Total	**0.063**	**62,934**	**43.70**	**0.155**	**155,072**	**107.69**	**0.208**	**207,797**	**144.30**

Notes:
1. Business Park flows are calculated using gpd/tsf and building floor area (tsf). Open Space flows are calculated using gpd/acre and acreage.

3.1.2 Sewer Capacity Calculation Methodology

Sewer hydraulic capacity was evaluated using Manning's equation for gravity-driven flow under partially full pipe conditions. Although Manning's equation is commonly applied to open-channel flow, it is also appropriate for partially full circular pipes because the flow is governed by the same hydraulic principles, with a free water surface and no pressurization. Below is the Manning's equation.

For each pipe segment, hydraulic performance was evaluated under Average Dry Weather Flow (ADWF), Peak Dry Weather Flow (PDWF), and Peak Wet Weather Flow (PWWF) conditions. Manning's equation (shown in Table 3-5) was used to compute flow velocity and hydraulic capacity as a function of pipe slope, diameter, and roughness coefficient. Because the pipes operate partially full, the effective flow area and hydraulic radius vary with flow depth and were determined using standard geometric relationships for circular conduits.

Table 3-5: Manning's Equation used for Hydraulic Analysis

Equation	Variables
$Q = \frac{1.486}{n} \cdot A \cdot R^{2/3} \cdot S^{1/2}$	$Q = flow\ rate\ in\ cubic\ feet\ per\ second$ $R = hydraulic\ radius\ in\ feet = A/P$ $A = cross-sectional\ area\ of\ the\ pipe\ in\ sqaure\ feet$ $P = wetted\ perimeter\ in\ feet$ $S = Slope\ of\ pipe\ in\ feet\ of\ rise\ per\ foot\ of\ length$ $n = Manning's friction\ factor$ [1]

Notes:
1. Sewer system capacity is established using a Manning's friction factor of 0.011 for PVC pipe.

3.2 OMUC Criteria

The criteria for the sewer system analysis were obtained from the Sewer Master Plan Update 2012 and is summarized in Table 3-6 below.

Table 3-6: Sewer Collection System Criteria

Flow Type	Minimum Pipe Size (in)	Minimum Velocity (ft/s)	Maximum Velocity (ft/s)	Pipe Depth to Diameter Ratio for New Construction	
				<12 in diameter	>15 in diameter
ADWF	8	2.0	10	-	-
PDWF	8	3.0	10	0.50	0.64
PWWF [1]	8	-	10	0.82	0.82

Notes:
1. SMP did not mention a minimum velocity but is compared to 3.0 ft/s

3.3 Hydraulic Results

The pipe characteristics of each segment and hydraulic results are shown Table 3-7 with full calculations provided in Appendix B.

Table 3-7: Hydraulic Results														
Pipe Number	Pipe Diameter (in)	Upper Invert (ft)	Lower Invert (ft)	Length (ft)	Slope (ft/ft)	Average Dry Weather Flow (gpm)	Average Dry Weather Flow (d/D)	Average Dry Weather Flow Velocity (ft/s)	Peak Dry Weather Flow (gpm)	Peak Dry Weather Flow d/D	Peak Dry Weather Flow Velocity (ft/s)	Peak Wet Weather Flow (gpm)	Peak Wet Weather Flow d/D	Peak Wet Weather Flow Velocity (ft/s)
Phase 1														
1	8	670.10	669.53	56.76	0.0100	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.01	0.00
2	8	669.53	664.72	480.20	0.0100	0.62	0.02	0.66	1.75	0.04	0.92	2.34	0.04	0.99
3	8	664.72	659.26	545.57	0.0100	2.04	0.04	0.96	5.68	0.07	1.29	7.61	0.08	1.41
4	8	659.26	653.89	536.55	0.0100	2.95	0.05	1.06	8.14	0.08	1.44	10.91	0.09	1.58
5	8	653.89	652.36	152.50	0.0100	3.79	0.05	1.15	10.45	0.09	1.56	14.00	0.10	1.70
Phase 2														
6	8	661.16	655.80	531.84	0.0101	0.73	0.03	0.69	2.02	0.04	0.96	2.71	0.05	1.04
7	8	655.80	649.96	583.66	0.0100	2.15	0.04	0.97	5.96	0.07	1.31	7.99	0.08	1.43
8	8	649.96	643.88	608.42	0.0100	3.68	0.05	1.14	10.18	0.09	1.55	13.64	0.10	1.69
Phase 3														
9	8	656.42	652.18	424.95	0.0100	1.24	0.03	0.82	3.48	0.05	1.12	4.67	0.06	1.22
10	8	652.18	647.69	448.09	0.0100	1.95	0.04	0.95	5.43	0.06	1.28	7.28	0.09	1.39
11	8	647.69	645.98	170.67	0.0100	2.76	0.05	1.04	7.67	0.08	1.42	10.28	0.10	1.55

3.3.1 ADWF Conditions

Under Average Dry Weather Flow (ADWF) conditions, the calculated flow depths (d/D) for all pipe segments range from approximately 0.01 to 0.05. Corresponding velocities vary between 0.66 and 1.15 ft/s, with a minimum pipe slope of 1%.

3.3.2 PDWF Conditions

During Peak Dry Weather Flow (PDWF) conditions, flow depths increase to approximately 0.04–0.09 d/D, remaining well below the maximum allowable 0.50 d/D for new construction. Corresponding velocities range from 0.92 to 1.56 ft/s, with a minimum pipe slope of 1%.

3.3.3 PWWF Conditions

Under Peak Wet Weather Flow (PWWF) conditions, calculated d/D values range from approximately 0.04 to 0.10, well below the OMUC's maximum allowable 0.82 d/D for new construction. Corresponding velocities range from 0.99 to 1.70 ft/s, with a minimum pipe slope of 1%.

4.0 CONCLUSION

Based on the hydraulic analysis, the proposed 8-inch sewer pipelines along Public Street “A” are adequately sized to convey projected wastewater flows under all analyzed flow scenarios. Under ADWF, PDWF, and PWWF conditions, the calculated depth-to-diameter (d/D) ratios remain well below OMUC’s maximum allowable limits. Since the proposed 8-inch sewer lines have pipeline velocities less than 2 ft/s, a 1% minimum slope is proposed.

Appendix A

Draft City of Ontario 2024 Water Demand and Sewer Flow Factors

DRAFT 2025 Sewer Master Plan
Peaking Formulas and Demand Factors

The following information is the best available information provided by AKM at this time. This information is subject to change upon finalization of the Water and Sewer Master Plans. The Draft 2025 Master Plans' Design Criteria are currently in progress and Project's studies may need to be re-evaluated at a later time.

Sewer: PDWF (mgd) = 1.6 x ADWF (mgd)^0.92

PWWF = 1.34 x PDWF

Table 6-3
Residential Sewer Flow Factor Summary

Landuse		Density Range (du/ac)	OMC Preferred Density (du/ac) [1]	OR Preferred Density (du/ac) [1]	Estimated Population Density from LU-03 (people/du) [2]	Areas without Recycled Water [3]		Areas with Recycled Water [4]	
						Value	Units	Value	Units
Rural Residential	RR	0-2	2.0	2.0	3.66	255	gpd/du	-	
Low Density Residential	LDR	2.1-5	5.9	4.5	3.66	180	gpd/du	175	gpd/du
Low Medium Density Residential	LMDR	5.1-11	8.5	8.5	3.66	170	gpd/du	170	gpd/du
Medium Density Residential	MDR	11.1-25	18.0	22.0	3.24	160	gpd/du	160	gpd/du
High Density Residential	HDR	25.1-45	25.0	35.0	2.57	140	gpd/du	140	gpd/du

[1] *Preferred densities are from City's 2050 TOP, Table LU-03 (Appendix A)*

[2] *Planned population densities are from City's 2050 TOP, Table LU-03 (Appendix A)*

[3] *Areas without Recycled Water Available - Primarily in Original Model Colony*

[4] *Areas with Recycled Water Available - Primarily in Ontario Ranch and new development areas*

Table 6-4
Non-Residential Sewer Flow Factor Summary

General Landuse Category	FAR [1]	Sewer Flow Factor			
		Value	Units	Value	Units
Commercial	0.30	1,150	gpd/ac	90	gpd/tsf
Business Park	0.50	1,150	gpd/ac	20	gpd/tsf
Office	0.75	1,150	gpd/ac	35	gpd/tsf
Hospitality	-	2,400	gpd/ac	100	gpd/room
Industrial	0.55	300	gpd/ac	13	gpd/tsf
Public Facility	0.30	475	gpd/ac	15	gpd/tsf
Open Space [5]	-	90	gpd/ac	-	-
School	-	500	gpd/ac	10	gpd/student

[1] *Floor Area Ratios (FAR) are from City's 2050 TOP, Table LU-03 (Appendix A)*

Appendix B

Hydraulic Calculation

Pipe Description	Pipe Diameter (IN.)	Upper Invert (FT)	Lower Invert (FT)	Length (LF)	Slope (FT/FT)	Pipe Material n-coeff.	Full Pipe Flow (GPM)	Pipe Capacity (75%) (GPM)	ADWF (GPM)	ADWF (CFS)	PDWF (GPM)	PDWF (CFS)	PWWF (GPM)	PWWF (CFS)	% Capacity	D^(8/3)	ADWF ARh^(2/3)	ADWF (ARh^(2/3))/ (D^(8/3))	ADWF d/D	Theta (radians)	ADWF Velocity (FT/S)	PDWF ARh^(2/3)	PDWF (ARh^(2/3))/ (D^(8/3))	PDWF d/D	Theta (radians)	PDWF Velocity (FT/S)	PWWF ARh^(2/3)	PWWF (ARh^(2/3))/ (D^(8/3))	PWWF d/D	Theta (radians)	PWWF Velocity (FT/S)
Phase 1																															
1	8	670.10	669.53	56.76	0.0100	0.0110	644	578	0.00	0.00	0.00	0.00	0.00	0.00	0%	0.339	0.000	0.000	0.01	0.00	0.00	0.0000	0.000	0.01	0.00	0.00	0.0000	0.000	0.01	0.00	0.00
2	8	669.53	664.72	480.20	0.0100	0.0110	643	577	0.62	0.00	1.75	0.00	2.34	0.01	0%	0.339	0.000	0.000	0.02	0.61	0.66	0.0003	0.001	0.04	0.79	0.92	0.0004	0.001	0.04	0.84	0.99
3	8	664.72	659.26	545.57	0.0100	0.0110	643	577	2.04	0.00	5.68	0.01	7.61	0.02	1%	0.339	0.000	0.001	0.04	0.82	0.96	0.0009	0.003	0.07	1.04	1.29	0.0013	0.004	0.08	1.12	1.41
4	8	659.26	653.89	536.55	0.0100	0.0110	643	577	2.95	0.01	8.14	0.02	10.91	0.02	1%	0.339	0.000	0.001	0.05	0.89	1.06	0.0013	0.004	0.08	1.14	1.44	0.0018	0.005	0.09	1.22	1.58
5	8	653.89	652.36	152.50	0.0100	0.0110	644	577	3.79	0.01	10.45	0.02	14.00	0.03	2%	0.339	0.001	0.002	0.05	0.94	1.15	0.0017	0.005	0.09	1.21	1.56	0.0023	0.007	0.10	1.30	1.70
Phase 2																															
6	8	661.16	655.80	531.84	0.0101	0.0110	645	579	0.73	0.00	2.02	0.00	2.71	0.01	0%	0.339	0.000	0.000	0.03	0.63	0.69	0.0003	0.001	0.04	0.82	0.96	0.0004	0.001	0.05	0.87	1.04
7	8	655.80	649.96	583.66	0.0100	0.0110	643	577	2.15	0.00	5.96	0.01	7.99	0.02	1%	0.339	0.000	0.001	0.04	0.83	0.97	0.0010	0.003	0.07	1.05	1.31	0.0013	0.004	0.08	1.13	1.43
8	8	649.96	643.88	608.42	0.0100	0.0110	642	576	3.68	0.01	10.18	0.02	13.64	0.03	2%	0.339	0.001	0.002	0.05	0.94	1.14	0.0017	0.005	0.09	1.20	1.55	0.0022	0.007	0.10	1.29	1.69
Phase 3																															
9	8	656.42	652.18	424.95	0.0100	0.0110	642	576	1.24	0.00	3.48	0.01	4.67	0.01	1%	0.339	0.000	0.001	0.03	0.72	0.82	0.0006	0.002	0.05	0.93	1.12	0.0008	0.002	0.06	1.00	1.22
10	8	652.18	647.69	448.09	0.0100	0.0110	643	577	1.95	0.00	5.43	0.01	7.28	0.02	1%	0.339	0.000	0.001	0.04	0.81	0.95	0.0009	0.003	0.06	1.03	1.28	0.0012	0.004	0.07	1.10	1.39
11	8	647.69	645.98	170.67	0.0100	0.0110	643	577	2.76	0.01	7.67	0.02	10.28	0.02	1%	0.339	0.000	0.001	0.05	0.88	1.04	0.0013	0.004	0.08	1.12	1.42	0.0017	0.005	0.09	1.20	1.55

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