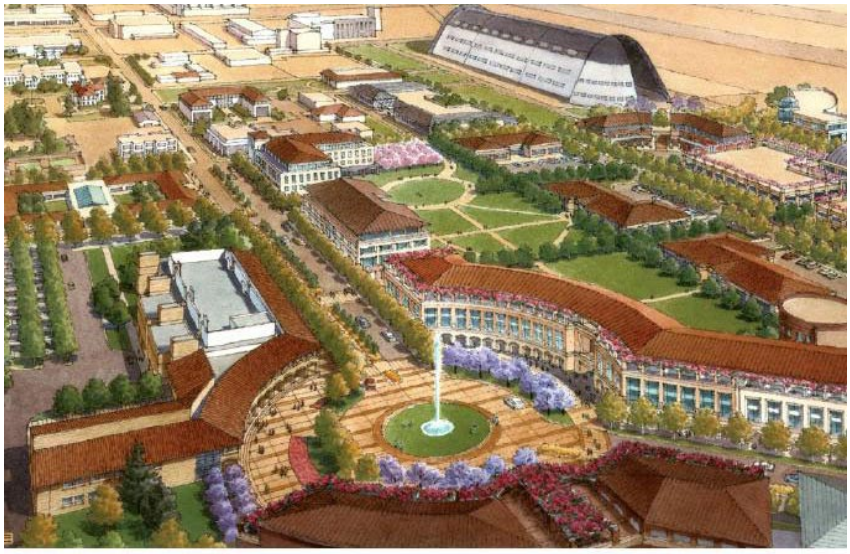
NASA Ames Development Plan

Final Programmatic

Environmental Impact Statement



Appendix C: Infrastructure Appendix

Nasa Ames Research Center

July 2002

Design, Community & Environment

NASA AMES DEVELOPMENT PLAN

FINAL PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT

APPENDIX C

NASA AMES RESEARCH CENTER

JULY 2002

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Summary of Existing and Proposed Water Demand for Development Areas Covered by EIS

Existing flows were determined based on meter readings at NASA ARC. Proposed demands for the various alternates are based on the calculations shown on the spreadsheets on the following pages.

	Standard Water Demands		Reduced Water Demands		Demand Reduction	
Development Alternate	Annual Water Demand (gallons)	Peak Hour Water Demand (gpm)	Annual Water Demand (gallons)	Peak Hour Water Demand (gpm)	Annual Water Demand (gallons)	Peak Hour Water Demand (gpm)
Exist - indoor only	131,300,000	1,000				
Existing - total	237,800,000	2,570				
1 - indoor only (a)	140,200,000	1,070	128,300,000	980	11,800,000	90
1 - total (c)	241,900,000	2,560	230,100,000	2,470		
2 - indoor only	296,800,000	2,260	206,700,000	1,570	90,100,000	690
2 - total (d)	337,400,000	2,910	247,300,000	2,220		
3 - indoor only	254,100,000	1,930	179,100,000	1,360	75,000,000	570
3 - total (d)	296,300,000	2,610	221,400,000	2,040		
4 - indoor only	343,100,000	2,610	236,000,000	1,790	107,100,000	810
4 - total (d)	383,700,000	3,260	276,600,000	2,450		
5 - indoor only (b)	270,500,000	2,060	194,500,000	1,480	76,000,000	580
5 - total (d)	312,700,000	2,740	236,800,000	2,160		

Notes: (a) Baseline
(b) Preferred Alternative
(c) Total value for Alternate 1 includes Irrigation for Moffett Field Golf Course, Ames Campus, and portions of NRP and Eastside/Airfield that will continue to be irrigated with potable water.
(d) Total values for Alternates 2-5 include Irrigation for Ames Campus and portions of Eastside/Airfield that will continue to be irrigated with potable water.

NASA AMES DEVELOPMENT PLAN - EIS
APPENDIX C: INFRASTRUCTURE - SECTION 1
WATER ANALYSIS
TABLE 1.0
AVERAGE AND PEAK DOMESTIC WATER DEMAND - EXISTING

Average Day Domestic Water Demand for Determining Required Emergency Storage
Annual Water Demand and Peak Hour Domestic Water Demand for Determining Regional Impacts

TABLE 1.0		**Existing Water Demands**				
Development Area \ Description	Area	Unit Water Demand	Average Day Water Demand (gpd)	Annual Water Demand (gallons)	Average Day Water Demand (gpm)	Peak Hour Water Demand (gpm) (1)
NASA RESEARCH PARK						
Existing Buildings	1,577,269 sf	0.128 gpd/sf	201,302	73,525,516	140	559
Subtotal - NRP	1,577,269 sf		201,302	73,525,516	140	559
EASTSIDE/AIRFIELD						
Existing Buildings	79,023 sf	0.128 gpd/sf	10,085	3,683,713	7	28
Hangars 2 & 3	780,613 sf	0.020 gpd/sf	15,612	5,702,378	11	43
Subtotal - EastSide/Airfield	859,636 sf		25,698	9,386,091	18	71
AMES CAMPUS						
Existing Buildings	2,889,658 sf	0.046 gpd/sf	132,536	48,408,762	92	368
Subtotal - Ames Campus	2,889,658 sf		132,536	48,408,762	92	368
	Total Indoor Demand - EIS		359,536	**131,320,369**	250	**999**
Orion Park Military Housing	435 units	225.00 gpd/unit	97,875	35,748,844	68	272
Berry Court Military Housing	110 units	225.00 gpd/unit	24,750	9,039,938	17	69
California Air National Guard	42 acre	912 gpd/acre	38,295	13,987,218	27	106
	Total Indoor Demand - Non EIS		160,920	**58,776,000**	112	**447**
	Total Indoor Demand - NASA ARC		520,455	**190,096,369**	361	**1446**
IRRIGATION **Not From Reclaimed**		Average Unit Demand gpd/acre			Peak Unit Demand gpm/acre	
NASA Research Park	199 acre	463 gpd/acre	92,137	33,653,039	2.72	541
Eastside/Airfield	10 acre	463 gpd/acre	4,630	1,691,108	2.72	27
Ames Campus	240 acre	463 gpd/acre	111,120	40,586,580	2.72	653
Moffett Field Golf Course	100 acre	836 gpd/acre	83,600	30,534,900	3.50	350
	Total Irrigation Demand - EIS		291,487	**106,465,627**		**1571**
Orion Park Military Housing	79 acre	463 gpd/acre	36,577	13,359,749	2.72	215
Berry Court Military Housing	37 acre	463 gpd/acre	17,131	6,257,098	2.72	101
California Air National Guard	42 acre	463 gpd/acre	19,446	7,102,652	2.72	114
	Total Irrigation Demand - Non EIS		73,154	**26,719,499**		**430**
	Total Irrigation Demand-NASA ARC		364,641	**133,185,125**		**2,001**
	Total Water Demand - EIS		651,023	**237,785,996**		**2,570**
	Total Water Demand - NASA ARC		885,096	**323,281,494**		**3,447**

Notes: (1) Peak hour demand is four times the average day demand.

NASA AMES DEVELOPMENT PLAN - EIS
APPENDIX C: INFRASTRUCTURE - SECTION 1
WATER ANALYSIS - TABLE 1.1
AVERAGE AND PEAK DOMESTIC WATER DEMAND - ALTERNATE 1
Average Day Domestic Water Demand for Determining Required Emergency Storage
Annual Water Demand and Peak Hour Domestic Water Demand for Determining Regional Impacts

TABLE 1.1		**Standard Water Demands**					**Reduced Water Demands**					**Demand Reduction**	
Development Area \ Description	Area	Unit Water Demand	Average Day Water Demand (gpd)	Annual Water Demand (gallons)	Average Day Water Demand (gpm)	Peak Hour Water Demand (gpm) (1)	Unit Water Demand	Average Day Water Demand (gpd)	Annual Water Demand (gallons)	Average Day Water Demand (gpm)	Peak Hour Water Demand (gpm) (1)	Annual Water Demand Reduction (gallons)	Peak Hour Demand Reduction (gpm)
LAB													
Office/High Density R&D	690,000 sf	0.10 gpd/sf	69,000	25,202,250	48	192	0.06 gpd/sf	41,400	15,121,350	29	115	10,080,900	77
Auditorium	30,000 sf	0.06 gpd/sf	1,800	657,450	1	5	0.04 gpd/sf	1,200	438,300	1	3	219,150	2
Subtotal - Lab	720,000 sf		70,800	25,859,700	49	197		42,600	15,559,650	30	118	10,300,050	78
NASA RESEARCH PARK													
Existing Buildings	1,129,962 sf	0.128 gpd/sf	144,214	52,673,982	100	401	0.128 gpd/sf	144,214	52,673,982	100	401	0	0
Invisible Studios	105,000 sf	0.10 gpd/sf	10,500	3,835,125	7	29	0.06 gpd/sf	6,300	2,301,075	4	18	1,534,050	12
Subtotal - NRP	1,234,962 sf		154,714	56,509,107	107	430		150,514	54,975,057	105	418	1,534,050	12
Subtotal - Lab and NRP	1,954,962 sf		225,514	82,368,807	157	626		193,114	70,534,707	134	536	11,834,100	90
EASTSIDE/AIRFIELD													
Existing Buildings	79,023 sf	0.128 gpd/sf	10,085	3,683,713	7	28	0.128 gpd/sf	10,085	3,683,713	7	28	0	0
Hangars 2 & 3	780,613 sf	0.02 gpd/sf	15,612	5,702,378	11	43	0.02 gpd/sf	15,612	5,702,378	11	43	0	0
Subtotal - EastSide/Airfield	859,636 sf		25,698	9,386,091	18	71		25,698	9,386,091	18	71	0	0
AMES CAMPUS													
Existing Buildings	2,889,658 sf	0.046 gpd/sf	132,536	48,408,762	92	368	0.046 gpd/sf	132,536	48,408,762	92	368	0	0
Subtotal - Ames Campus	2,889,658 sf		132,536	48,408,762	92	368		132,536	48,408,762	92	**368**	0	0
	Total Indoor Demand - EIS		383,747	**140,163,660**	266	**1066**		351,347	**128,329,560**	244	**976**	**11,834,100**	**90**
Orion Park Military Housing	435 units	225.00 gpd/unit	97,875	35,748,844	68	272	225.00 gpd/unit	97,875	35,748,844	68	272	0	0
Berry Court Military Housing	110 units	225.00 gpd/unit	24,750	9,039,938	17	69	225.00 gpd/unit	24,750	9,039,938	17	69	0	0
California Air National Guard	42 acre	912 gpd/acre	38,295	13,987,218	27	106	912 gpd/acre	38,295	13,987,218	27	106	0	0
	Total Indoor Demand - Non EIS		160,920	**58,776,000**	112	**447**		160,920	**58,776,000**	112	**447**	0	0
	Total Indoor Demand - NASA ARC		544,667	**198,939,660**	378	**1513**		512,267	**187,105,560**	356	**1423**	**11,834,100**	**90**
IRRIGATION Not From Reclaimed		Average Unit Demand gpd/acre			Peak Unit Demand gpm/acre		Average Unit Demand gpd/acre			Peak Unit Demand gpm/acre			
NASA Research Park	171 acre	463 gpd/acre	79,173	28,917,938	2.72	465	463 gpd/acre	79,173	28,917,938	2.72	465		
Eastside/Airfield	10 acre	463 gpd/acre	4,630	1,691,108	2.72	27	463 gpd/acre	4,630	1,691,108	2.72	27		
Ames Campus	240 acre	463 gpd/acre	111,120	40,586,580	2.72	653	463 gpd/acre	111,120	40,586,580	2.72	653		
Moffett Field Golf Course	100 acre	836 gpd/acre	83,600	30,534,900	3.50	350	836 gpd/acre	83,600	30,534,900	3.50	350		
	Total Irrigation Demand - EIS		278,523	**101,730,526**		**1495**		278,523	**101,730,526**		**1495**		
Orion Park Military Housing	79 acre	463 gpd/acre	36,577	13,359,749	2.72	215	463 gpd/acre	36,577	13,359,749	2.72	215		
Berry Court Military Housing	37 acre	463 gpd/acre	17,131	6,257,098	2.72	101	463 gpd/acre	17,131	6,257,098	2.72	101		
California Air National Guard	42 acre	463 gpd/acre	19,446	7,102,652	2.72	114	463 gpd/acre	19,446	7,102,652	2.72	114		
	Total Irrigation Demand - Non EIS		73,154	**26,719,499**		**430**		73,154	**26,719,499**		**430**		
	Total Irrigation Demand-NASA ARC		351,677	**128,450,024**		**1925**		351,677	**128,450,024**		**1925**		
	Total Water Demand - EIS		662,270	**241,894,186**		**2561**		629,870	**230,060,086**		**2471**		
	Total Water Demand - NASA ARC		896,344	**327,389,684**		**3438**		863,944	**315,555,584**		**3348**		

Notes:
(1) Peak hour demand is four times the average day demand.

NASA AMES DEVELOPMENT PLAN - EIS
APPENDIX C: INFRASTRUCTURE - SECTION 1
WATER ANALYSIS - TABLE 1.2
AVERAGE AND PEAK DOMESTIC WATER DEMAND - ALTERNATE 2
Average Day Domestic Water Demand for Determining Required Emergency Storage
Annual Water Demand and Peak Hour Domestic Water Demand for Determining Regional Impacts

TABLE 1.2		**Standard Water Demands**					**Reduced Water Demands**					**Demand Reduction**	
Development Area \ Description	Area	Unit Water Demand	Average Day Water Demand (gpd)	Annual Water Demand (gallons)	Average Day Water Demand (gpm)	Peak Hour Water Demand (gpm)	Unit Water Demand	Average Day Water Demand (gpd)	Annual Water Demand (gallons)	Average Day Water Demand (gpm)	Peak Hour Water Demand (gpm)	Annual Water Demand Reduction (gallons)	Peak Hour Demand Reduction (gpm)
LAB													
Office/High Density R&D	690,000 sf	0.10 gpd/sf	69,000	25,202,250	48	192	0.06 gpd/sf	41,400	15,121,350	29	115	10,080,900	77
Auditorium	30,000 sf	0.06 gpd/sf	1,800	657,450	1	5	0.04 gpd/sf	1,200	438,300	1	3	219,150	2
Subtotal - Lab	720,000 sf		70,800	25,859,700	49	197		42,600	15,559,650	30	118	10,300,050	78
NASA RESEARCH PARK													
Existing Buildings	112,990 sf	0.128 gpd/sf	14,421	5,267,109	10	40	0.128 gpd/sf	14,421	5,267,109	10	40	0	0
Office / R&D / University	1,447,010 sf	0.10 gpd/sf	144,701	52,852,040	100	402	0.06 gpd/sf	86,821	31,711,224	60	241	21,140,816	161
Museum / Conference Center	660,000 sf	0.05 gpd/sf	33,000	12,053,250	23	92	0.03 gpd/sf	19,800	7,231,950	14	55	4,821,300	37
Part Time Housing (1 unit/800 sf)	150,000 sf	200.00 gpd/unit	37,500	13,696,875	26	104	137.00 gpd/unit	25,688	9,382,359	18	71	4,314,516	33
Family Housing (1 unit/1,200 sf)	360,000 sf	250.00 gpd/unit	75,000	27,393,750	52	208	172.00 gpd/unit	51,600	18,846,900	36	143	8,546,850	65
Retail	50,000 sf	0.06 gpd/sf	3,000	1,095,750	2	8	0.04 gpd/sf	2,000	730,500	1	6	365,250	3
Subtotal - NRP	2,780,000 sf		307,622	112,358,774	214	855		200,329	73,170,043	139	556	39,188,732	298
Subtotal - Lab and NRP	3,500,000 sf		378,422	138,218,474	263	1051		242,929	88,729,693	169	675	49,488,782	376
BAY VIEW													
Office / R&D / University	1,000,000 sf	0.10 gpd/sf	100,000	36,525,000	69	278	0.06 gpd/sf	60,000	21,915,000	42	167	14,610,000	111
Family Housing (1 unit/1,200 sf)	300,000 sf	250.00 gpd/unit	62,500	22,828,125	43	174	172.00 gpd/unit	43,000	15,705,750	30	119	7,122,375	54
Subtotal - Bay View	1,300,000 sf		162,500	59,353,125	113	451		103,000	37,620,750	72	286	21,732,375	165
EASTSIDE/AIRFIELD													
Existing Buildings	79,023 sf	0.128 gpd/sf	10,085	3,683,713	7	28	0.128 gpd/sf	10,085	3,683,713	7	28	0	0
Office / R&D / Industrial	1,250,613 sf	0.10 gpd/sf	125,061	45,678,640	87	347	0.06 gpd/sf	75,037	27,407,184	52	208	18,271,456	139
Conference Center	80,000 sf	0.05 gpd/sf	4,000	1,461,000	3	11	0.03 gpd/sf	2,400	876,600	2	7	584,400	4
Subtotal - EastSide/Airfield	1,409,636 sf		139,147	50,823,353	97	387		87,522	31,967,497	61	243	18,855,856	143
AMES CAMPUS													
Existing Buildings	2,889,658 sf	0.046 gpd/sf	132,536	48,408,762	92	368	0.046 gpd/sf	132,536	48,408,762	92	368	0	0
Subtotal - Ames Campus	2,889,658 sf		132,536	48,408,762	92	368		132,536	48,408,762	92	368	0	0
Total Indoor Demand - EIS			812,604	**296,803,714**	564	**2257**		565,987	**206,726,702**	393	**1572**	**90,077,013**	**685**
Orion Park Military Housing	435 units	225.00 gpd/unit	97,875	35,748,844	68	272	225.00 gpd/unit	97,875	35,748,844	68	272	0	0
Berry Court Military Housing	110 units	225.00 gpd/unit	24,750	9,039,938	17	69	225.00 gpd/unit	24,750	9,039,938	17	69	0	0
California Air National Guard	42 acre	912 gpd/acre	38,295	13,987,218	27	106	912 gpd/acre	38,295	13,987,218	27	106	0	0
Total Indoor Demand - Non EIS			160,920	**58,776,000**	112	**447**		160,920	**58,776,000**	112	**447**	0	0
Total Indoor Demand - NASA ARC			973,524	**355,579,714**	676	**2704**		726,907	**265,502,701**	505	**2019**	**90,077,013**	**685**
IRRIGATION Not From Reclaimed		Average Unit Demand gpd/acre			Peak Unit Demand gpm/acre		Average Unit Demand gpd/acre			Peak Unit Demand gpm/acre			
Ames Campus	240 acre	463 gpd/acre	111,120	40,586,580	2.72	653	463 gpd/acre	111,120	40,586,580	2.72	653		
Total Irrigation Demand - EIS			111,120	**40,586,580**		**653**		111,120	**40,586,580**		**653**		
Orion Park Military Housing	79 acre	463 gpd/acre	36,577	13,359,749	2.72	215	463 gpd/acre	36,577	13,359,749	2.72	215		
Berry Court Military Housing	37 acre	463 gpd/acre	17,131	6,257,098	2.72	101	463 gpd/acre	17,131	6,257,098	2.72	101		
California Air National Guard	42 acre	463 gpd/acre	19,446	7,102,652	2.72	114	463 gpd/acre	19,446	7,102,652	2.72	114		
Total Irrigation Demand - Non EIS			73,154	**26,719,499**		**430**		73,154	**26,719,499**		**430**		
Total Irrigation Demand-NASA ARC			184,274	**67,306,079**		**1083**		184,274	**67,306,079**		**1083**		
Total Water Demand - EIS			923,724	**337,390,294**		**2910**		677,107	**247,313,282**		**2225**		
Total Water Demand - NASA ARC			1,157,798	**422,885,792**		**3787**		911,181	**332,808,780**		**3102**		

Notes:
(1) Peak hour demand is four times the average day demand.

NASA AMES DEVELOPMENT PLAN - EIS
APPENDIX C: INFRASTRUCTURE - SECTION 1
WATER ANALYSIS - TABLE 1.3
AVERAGE AND PEAK DOMESTIC WATER DEMAND - ALTERNATE 3
Average Day Domestic Water Demand for Determining Required Emergency Storage
Annual Water Demand and Peak Hour Domestic Water Demand for Determining Regional Impacts

TABLE 1.3		**Standard Water Demands**					**Reduced Water Demands**					**Demand Reduction**	
Development Area \ Description	Area	Unit Water Demand	Average Day Water Demand (gpd)	Annual Water Demand (gallons)	Average Day Water Demand (gpm)	Peak Hour Water Demand (gpm)	Unit Water Demand	Average Day Water Demand (gpd)	Annual Water Demand (gallons)	Average Day Water Demand (gpm)	Peak Hour Water Demand (gpm)	Annual Water Demand Reduction (gallons)	Peak Hour Demand Reduction (gpm)
LAB													
Office/High Density R&D	690,000 sf	0.10 gpd/sf	69,000	25,202,250	48	192	0.06 gpd/sf	41,400	15,121,350	29	115	10,080,900	77
Auditorium	30,000 sf	0.06 gpd/sf	1,800	657,450	1	5	0.04 gpd/sf	1,200	438,300	1	3	219,150	2
Subtotal - Lab	720,000 sf		70,800	25,859,700	49	197		42,600	15,559,650	30	118	10,300,050	78
NASA RESEARCH PARK													
Existing Buildings	112,990 sf	0.128 gpd/sf	14,421	5,267,109	10	40	0.128 gpd/sf	14,421	5,267,109	10	40	0	0
Office / R&D / University	2,372,010 sf	0.10 gpd/sf	237,201	86,637,665	165	659	0.06 gpd/sf	142,321	51,982,599	99	395	34,655,066	264
Museum / Conference Center	710,000 sf	0.05 gpd/sf	35,500	12,966,375	25	99	0.03 gpd/sf	21,300	7,779,825	15	59	5,186,550	39
Part Time Housing (1 unit/800 sf)	150,000 sf	200.00 gpd/unit	37,500	13,696,875	26	104	137.00 gpd/unit	25,688	9,382,359	18	71	4,314,516	33
Family Housing (1 unit/1,200 sf)	360,000 sf	250.00 gpd/unit	75,000	27,393,750	52	208	172.00 gpd/unit	51,600	18,846,900	36	143	8,546,850	65
Retail	75,000 sf	0.06 gpd/sf	4,500	1,643,625	3	13	0.04 gpd/sf	3,000	1,095,750	2	8	547,875	4
Subtotal - NRP	3,780,000 sf		404,122	147,605,399	281	1123		258,329	94,354,543	179	718	53,250,857	405
Subtotal - Lab and NRP	4,500,000 sf		474,922	173,465,099	330	1319		300,929	109,914,193	209	836	63,550,907	483
EASTSIDE/AIRFIELD													
Existing Buildings	79,023 sf	0.128 gpd/sf	10,085	3,683,713	7	28	0.128 gpd/sf	10,085	3,683,713	7	28	0	0
Office / R&D / Industrial	780,613 sf	0.10 gpd/sf	78,061	28,511,890	54	217	0.06 gpd/sf	46,837	17,107,134	33	130	11,404,756	87
Subtotal - EastSide/Airfield	859,636 sf		88,147	32,195,603	61	245		56,922	20,790,847	40	158	11,404,756	87
AMES CAMPUS													
Existing Buildings	2,889,658 sf	0.046 gpd/sf	132,536	48,408,762	92	368	0.046 gpd/sf	132,536	48,408,762	92	368	0	0
Subtotal - Ames Campus	2,889,658 sf		132,536	48,408,762	92	368		132,536	48,408,762	92	368	0	0
Total Indoor Demand - EIS			695,604	**254,069,464**	483	**1932**		490,387	**179,113,802**	341	**1362**	**74,955,663**	**570**
Orion Park Military Housing	435 units	225.00 gpd/unit	97,875	35,748,844	68	272	225.00 gpd/unit	97,875	35,748,844	68	272	0	0
Berry Court Military Housing	110 units	225.00 gpd/unit	24,750	9,039,938	17	69	225.00 gpd/unit	24,750	9,039,938	17	69	0	0
California Air National Guard	42 acre	912 gpd/acre	38,295	13,987,218	27	106	912 gpd/acre	38,295	13,987,218	27	106	0	0
Total Indoor Demand - Non EIS			160,920	**58,776,000**	112	**447**		160,920	**58,776,000**	112	**447**	0	0
Total Indoor Demand - NASA ARC			856,524	**312,845,464**	595	**2379**		651,307	**237,889,801**	452	**1809**	**74,955,663**	**570**

IRRIGATION **Not From Reclaimed**		Average Unit Demand gpd/acre			Peak Unit Demand gpm/acre		Average Unit Demand gpd/acre			Peak Unit Demand gpm/acre	
Eastside/Airfield	10 acre	463 gpd/acre	4,630	1,691,108	2.72	27	463 gpd/acre	4,630	1,691,108	2.72	27
Ames Campus	240 acre	463 gpd/acre	111,120	40,586,580	2.72	653	463 gpd/acre	111,120	40,586,580	2.72	653
Total Irrigation Demand - EIS			115,750	**42,277,688**		**680**		115,750	**42,277,688**		**680**
Orion Park Military Housing	79 acre	463 gpd/acre	36,577	13,359,749	2.72	215	463 gpd/acre	36,577	13,359,749	2.72	215
Berry Court Military Housing	37 acre	463 gpd/acre	17,131	6,257,098	2.72	101	463 gpd/acre	17,131	6,257,098	2.72	101
California Air National Guard	42 acre	463 gpd/acre	19,446	7,102,652	2.72	114	463 gpd/acre	19,446	7,102,652	2.72	114
Total Irrigation Demand - Non EIS			73,154	**26,719,499**		**430**		73,154	**26,719,499**		**430**
Total Irrigation Demand-NASA ARC			188,904	**68,997,186**		**1110**		188,904	**68,997,186**		**1110**
Total Water Demand - EIS			811,354	**296,347,152**		**2612**		606,137	**221,391,489**		**2042**
Total Water Demand - NASA ARC			1,045,428	**381,842,650**		**3489**		840,211	**306,886,987**		**2919**

Notes:
(1) Peak hour demand is four times the average day demand.

NASA AMES DEVELOPMENT PLAN - EIS
APPENDIX C: INFRASTRUCTURE - SECTION 1
WATER ANALYSIS - TABLE 1.4
AVERAGE AND PEAK DOMESTIC WATER DEMAND - ALTERNATE 4
Average Day Domestic Water Demand for Determining Required Emergency Storage
Annual Water Demand and Peak Hour Domestic Water Demand for Determining Regional Impacts

TABLE 1.4		**Standard Water Demands**					**Reduced Water Demands**					**Demand Reduction**	
Development Area \ Description	Area	Unit Water Demand	Average Day Water Demand (gpd)	Annual Water Demand (gallons)	Average Day Water Demand (gpm)	Peak Hour Water Demand (gpm)	Unit Water Demand	Average Day Water Demand (gpd)	Annual Water Demand (gallons)	Average Day Water Demand (gpm)	Peak Hour Water Demand (gpm)	Annual Water Demand Reduction (gallons)	Peak Hour Demand Reduction (gpm)
LAB													
Office/High Density R&D	690,000 sf	0.10 gpd/sf	69,000	25,202,250	48	192	0.06 gpd/sf	41,400	15,121,350	29	115	10,080,900	77
Auditorium	30,000 sf	0.06 gpd/sf	1,800	657,450	1	5	0.04 gpd/sf	1,200	438,300	1	3	219,150	2
Subtotal - Lab	720,000 sf		70,800	25,859,700	49	197		42,600	15,559,650	30	118	10,300,050	78
NASA RESEARCH PARK													
Existing Buildings	112,990 sf	0.128 gpd/sf	14,421	5,267,109	10	40	0.128 gpd/sf	14,421	5,267,109	10	40	0	0
Office / R&D / University	1,107,010 sf	0.10 gpd/sf	110,701	40,433,540	77	308	0.06 gpd/sf	66,421	24,260,124	46	185	16,173,416	123
Museum / Conference Center	645,000 sf	0.05 gpd/sf	32,250	11,779,313	22	90	0.03 gpd/sf	19,350	7,067,588	13	54	4,711,725	36
Part Time Housing (1 unit/800 sf)	115,000 sf	200.00 gpd/unit	28,750	10,500,938	20	80	137.00 gpd/unit	19,694	7,193,142	14	55	3,307,795	25
Family Housing (1 unit/1,200 sf)	265,000 sf	250.00 gpd/unit	55,208	20,164,844	38	153	172.00 gpd/unit	37,983	13,873,413	26	106	6,291,431	48
Retail	35,000 sf	0.06 gpd/sf	2,100	767,025	1	6	0.04 gpd/sf	1,400	511,350	1	4	255,675	2
Subtotal - NRP	2,280,000 sf		243,430	88,912,768	169	676		159,268	58,172,726	111	442	30,740,043	234
Subtotal - Lab and NRP	3,000,000 sf		314,230	114,772,468	218	873		201,868	73,732,376	140	561	41,040,093	312
BAY VIEW													
Office / R&D / University	2,040,000 sf	0.10 gpd/sf	204,000	74,511,000	142	567	0.06 gpd/sf	122,400	44,706,600	85	340	29,804,400	227
Family Housing (1 unit/1,200 sf)	660,000 sf	250.00 gpd/unit	137,500	50,221,875	95	382	172.00 gpd/unit	94,600	34,552,650	66	263	15,669,225	119
Subtotal - Bay View	2,700,000 sf		341,500	124,732,875	237	949		217,000	79,259,250	151	603	45,473,625	346
EASTSIDE/AIRFIELD													
Existing Buildings	79,023 sf	0.128 gpd/sf	10,085	3,683,713	7	28	0.128 gpd/sf	10,085	3,683,713	7	28	0	0
Office / R&D / Industrial	1,370,613 sf	0.10 gpd/sf	137,061	50,061,640	95	381	0.06 gpd/sf	82,237	30,036,984	57	228	20,024,656	152
Conference Center	80,000 sf	0.05 gpd/sf	4,000	1,461,000	3	11	0.03 gpd/sf	2,400	876,600	2	7	584,400	4
Subtotal - EastSide/Airfield	1,529,636 sf		151,147	55,206,353	105	420		94,722	34,597,297	66	263	20,609,056	157
AMES CAMPUS													
Existing Buildings	2,889,658 sf	0.046 gpd/sf	132,536	48,408,762	92	368	0.046 gpd/sf	132,536	48,408,762	92	368	0	0
Subtotal - Ames Campus	2,889,658 sf		132,536	48,408,762	92	368		132,536	48,408,762	92	368	0	0
Total Indoor Demand - EIS			939,413	**343,120,458**	652	**2609**		646,126	**235,997,684**	449	**1795**	**107,122,774**	**815**
Orion Park Military Housing	435 units	225.00 gpd/unit	97,875	35,748,844	68	272	225.00 gpd/unit	97,875	35,748,844	68	272	0	0
Berry Court Military Housing	110 units	225.00 gpd/unit	24,750	9,039,938	17	69	225.00 gpd/unit	24,750	9,039,938	17	69	0	0
California Air National Guard	42 acre	912 gpd/acre	38,295	13,987,218	27	106	912 gpd/acre	38,295	13,987,218	27	106	0	0
Total Indoor Demand - Non EIS			160,920	**58,776,000**	112	**447**		160,920	**58,776,000**	112	**447**	0	0
Total Indoor Demand - NASA ARC			1,100,333	**401,896,458**	764	**3056**		807,046	**294,773,684**	560	**2242**	**107,122,774**	**815**

IRRIGATION **Not From Reclaimed**		Average Unit Demand gpd/acre			Peak Unit Demand gpm/acre		Average Unit Demand gpd/acre			Peak Unit Demand gpm/acre	
Ames Campus	240 acre	463 gpd/acre	111,120	40,586,580	2.72	653	463 gpd/acre	111,120	40,586,580	2.72	653
Total Irrigation Demand - EIS			111,120	**40,586,580**		**653**		111,120	**40,586,580**		**653**
Orion Park Military Housing	79 acre	463 gpd/acre	36,577	13,359,749	2.72	215	463 gpd/acre	36,577	13,359,749	2.72	215
Berry Court Military Housing	37 acre	463 gpd/acre	17,131	6,257,098	2.72	101	463 gpd/acre	17,131	6,257,098	2.72	101
California Air National Guard	42 acre	463 gpd/acre	19,446	7,102,652	2.72	114	463 gpd/acre	19,446	7,102,652	2.72	114
Total Irrigation Demand - Non EIS			73,154	**26,719,499**		**430**		73,154	**26,719,499**		**430**
Total Irrigation Demand-NASA ARC			184,274	**67,306,079**		**1083**		184,274	**67,306,079**		**1083**
Total Water Demand - EIS			1,050,533	**383,707,038**		**3262**		757,246	**276,584,264**		**2448**
Total Water Demand - NASA ARC			1,284,607	**469,202,536**		**4139**		991,320	**362,079,763**		**3324**

Notes:
(1) Peak hour demand is four times the average day demand.

NASA AMES DEVELOPMENT PLAN - EIS
APPENDIX C: INFRASTRUCTURE - SECTION 1
WATER ANALYSIS - TABLE 1.5
AVERAGE AND PEAK DOMESTIC WATER DEMAND - ALTERNATE 5
Average Day Domestic Water Demand for Determining Required Emergency Storage
Annual Water Demand and Peak Hour Domestic Water Demand for Determining Regional Impacts

TABLE 1.5		**Standard Water Demands**					**Reduced Water Demands**					**Demand Reduction**	
Development Area \ Description	Area	Unit Water Demand	Average Day Water Demand (gpd)	Annual Water Demand (gallons)	Average Day Water Demand (gpm)	Peak Hour Water Demand (gpm)	Unit Water Demand	Average Day Water Demand (gpd)	Annual Water Demand (gallons)	Average Day Water Demand (gpm)	Peak Hour Water Demand (gpm)	Annual Water Demand Reduction (gallons)	Peak Hour Demand Reduction (gpm)
LAB													
Office/High Density R&D	690,000 sf	0.10 gpd/sf	69,000	25,202,250	48	192	0.06 gpd/sf	41,400	15,121,350	29	115	10,080,900	77
Auditorium	30,000 sf	0.06 gpd/sf	1,800	657,450	1	5	0.04 gpd/sf	1,200	438,300	1	3	219,150	2
Subtotal - Lab	720,000 sf		70,800	25,859,700	49	197		42,600	15,559,650	30	118	10,300,050	78
NASA RESEARCH PARK													
Existing Buildings	54,355 sf	0.128 gpd/sf	6,937	2,533,797	5	19	0.128 gpd/sf	6,937	2,533,797	5	19	0	0
Office / R&D / University	1,521,645 sf	0.10 gpd/sf	152,165	55,578,084	106	423	0.06 gpd/sf	91,299	33,346,850	63	254	22,231,233	169
Museum / Conference Center	895,000 sf	0.05 gpd/sf	44,750	16,344,938	31	124	0.03 gpd/sf	26,850	9,806,963	19	75	6,537,975	50
Part Time Housing (1 unit/800 sf)	232,000 sf	200.00 gpd/unit	58,000	21,184,500	40	161	137.00 gpd/unit	39,730	14,511,383	28	110	6,673,118	51
Retail	77,000 sf	0.06 gpd/sf	4,620	1,687,455	3	13	0.04 gpd/sf	3,080	1,124,970	2	9	562,485	4
Subtotal - NRP	2,780,000 sf		266,472	97,328,773	185	740		167,896	61,323,962	117	466	36,004,811	274
Subtotal - Lab and NRP	3,500,000 sf		337,272	123,188,473	234	937		210,496	76,883,612	146	585	46,304,861	352
BAY VIEW													
Child Care	25,000 sf	0.07 gpd/sf	1,750	639,188	1	5	0.04 gpd/sf	1,000	365,250	1	3	273,938	2
Retail	75,000 sf	0.06 gpd/sf	4,500	1,643,625	3	13	0.04 gpd/sf	3,000	1,095,750	2	8	547,875	4
Family Housing (1 unit/1,200 sf)	900,000 sf	250.00 gpd/unit	187,500	68,484,375	130	521	172.00 gpd/unit	129,000	47,117,250	90	358	21,367,125	163
Subtotal - Bay View	1,000,000 sf		193,750	70,767,188	135	538		133,000	48,578,250	92	369	22,188,938	169
EASTSIDE/AIRFIELD													
Existing Buildings	79,023 sf	0.128 gpd/sf	10,085	3,683,713	7	28	0.128 gpd/sf	10,085	3,683,713	7	28	0	0
Hangars 2 & 3	780,613 sf	0.02 gpd/sf	15,612	5,702,378	11	43	0.02 gpd/sf	15,612	5,702,378	11	43	0	0
Low Density R&D / Industrial	12,000 sf	0.10 gpd/sf	1,200	438,300	1	3	0.06 gpd/sf	720	262,980	1	2	175,320	1
Subtotal - EastSide/Airfield	871,636 sf		26,898	9,824,391	19	75		26,418	9,649,071	18	73	175,320	1
AMES CAMPUS													
Existing Buildings	2,889,658 sf	0.046 gpd/sf	132,536	48,408,762	92	368	0.046 gpd/sf	132,536	48,408,762	92	368	0	0
Office/High Density R&D	500,000 sf	0.10 gpd/sf	50,000	18,262,500	35	139	0.06 gpd/sf	30,000	10,957,500	21	83	7,305,000	56
Subtotal - Ames Campus	3,389,658 sf		182,536	66,671,262	127	507		162,536	59,366,262	113	451	7,305,000	56
Total Indoor Demand - EIS			740,455	**270,451,314**	514	**2057**		532,450	**194,477,195**	370	**1479**	**75,974,118**	**578**
Orion Park Military Housing	435 units	225.00 gpd/unit	97,875	35,748,844	68	272	225.00 gpd/unit	97,875	35,748,844	68	272	0	0
Berry Court Military Housing	110 units	225.00 gpd/unit	24,750	9,039,938	17	69	225.00 gpd/unit	24,750	9,039,938	17	69	0	0
California Air National Guard	42 acre	912 gpd/acre	38,295	13,987,218	27	106	912 gpd/acre	38,295	13,987,218	27	106	0	0
Total Indoor Demand - Non EIS			160,920	**58,776,000**	112	**447**		160,920	**58,776,000**	112	**447**	0	0
Total Indoor Demand - NASA ARC			901,375	**329,227,313**	626	**2504**		693,369	**253,253,195**	482	**1926**	**75,974,118**	**578**

IRRIGATION **Not From Reclaimed**		Average Unit Demand gpd/acre			Peak Unit Demand gpm/acre		Average Unit Demand gpd/acre			Peak Unit Demand gpm/acre	
Eastside/Airfield	10 acre	463 gpd/acre	4,630	1,691,108	2.72	27	463 gpd/acre	4,630	1,691,108	2.72	27
Ames Campus	240 acre	463 gpd/acre	111,120	40,586,580	2.72	653	463 gpd/acre	111,120	40,586,580	2.72	653
Total Irrigation Demand - EIS			115,750	**42,277,688**		**680**		115,750	**42,277,688**		**680**
Orion Park Military Housing	79 acre	463 gpd/acre	36,577	13,359,749	2.72	215	463 gpd/acre	36,577	13,359,749	2.72	215
Berry Court Military Housing	37 acre	463 gpd/acre	17,131	6,257,098	2.72	101	463 gpd/acre	17,131	6,257,098	2.72	101
California Air National Guard	42 acre	463 gpd/acre	19,446	7,102,652	2.72	114	463 gpd/acre	19,446	7,102,652	2.72	114
Total Irrigation Demand - Non EIS			73,154	**26,719,499**		**430**		73,154	**26,719,499**		**430**
Total Irrigation Demand-NASA ARC			188,904	**68,997,186**		**1110**		188,904	**68,997,186**		**1110**
Total Water Demand - EIS			856,205	**312,729,001**		**2737**		648,200	**236,754,883**		**2159**
Total Water Demand - NASA ARC			1,090,279	**398,224,499**		**3614**		882,273	**322,250,381**		**3036**

Notes:
(1) Peak hour demand is four times the average day demand.

NASA AMES DEVELOPMENT PLAN - EIS
APPENDIX C: INFRASTRUCTURE - SECTION 1
WATER ANALYSIS
TABLE 1.6
AVERAGE WATER DEMAND - PENDING PROJECTS

Annual Water Demand for Determining Regional Impacts

TABLE 1.6 A - SUNNYVALE Development Area \ Description	*Area	Unit Demand	Average Day Water Demand (gpd)	Annual Water Demand (gallons)
Office/High Density R&D	6,172,060 sf	0.10 gpd/sf	617,206	225,434,492
Moffett Park	28,600,000 sf	0.10 gpd/sf	2,860,000	1,044,615,000
Retail	562,397 sf	0.10 gpd/sf	56,240	20,541,550
Hotel/Apartment (820 units @ 1,000 sf/unit)	820,000 sf	165.00 gpd/unit	135,300	49,418,325
Condo/Townhomes/Homes (316 units @ 1,200 sf/unit)	379,200 sf	180.00 gpd/unit	56,880	20,775,420
Child Care	15,000 sf	0.05 gpd/sf	750	273,938
Total Pending Projects in Sunnyvale	36,548,657 sf		3,726,376	1,361,058,724

TABLE 1.6 B - MOUNTAIN VIEW Development Area \ Description	**Area	Unit Demand	Average Day Water Demand (gpd)	Annual Water Demand (gallons)
Office/High Density R&D	2,201,000 sf	0.10 gpd/sf	220,100	80,391,525
Retail	8,820 sf	0.10 gpd/sf	882	322,151
Condo/Multi-family (275 units @ 1,200 sf/unit)	330,000 sf	180.00 gpd/unit	49,500	18,079,875
Total Pending Projects in Mountain View	2,539,820 sf		270,482	98,793,551

Total Demand from Pending Projects			**3,996,858**	**1,459,852,275**

* Square footages based on September 2001 development update from Sunnyvale Planning Department.
**Square footages based on memorandum from Linda Forsberg, Deputy City Manager, dated September 17, 2000.

APPENDIX C2

RECLAIMED WATER DEMAND

NASA AMES DEVELOPMENT PLAN - EIS
APPENDIX C: INFRASTRUCTURE - SECTION 2
RECLAIMED WATER / IRRIGATION ANALYSIS
SUMMARY SHEET
ANNUAL AND PEAK IRRIGATION DEMAND

Peak Irrigation Demand
(gpm)

Development Area \ Description	EXISTING *	ALTERNATE 1	ALTERNATE 2	ALTERNATE 3	ALTERNATE 4	ALTERNATE 5
NASA RESEARCH PARK	540	80	540	540	540	540
AMES CAMPUS	650	0	0	0	0	0
EASTSIDE/AIRFIELD	30	0	240	0	240	0
BAY VIEW	0	0	260	0	260	260
GOLF COURSE	350	0	350	350	350	350
Subtotal for EIS	1,570	80	1,390	890	1,390	1,150
Berry Court Military Housing	100	100	100	100	100	100
Orion Park Military Housing	210	210	210	210	210	210
California Air National Guard	110	110	110	110	110	110
Subtotal - outside EIS	420	420	420	420	420	420
Total for NASA ARC	1,990	500	1,810	1,310	1,810	1,570

***** NOTE: EXISTING IRRIGATION DEMAND IS *NOT* FROM RECLAIMED WATER

Annual Irrigation Demand
(gal)

Development Area \ Description	EXISTING *	ALTERNATE 1	ALTERNATE 2	ALTERNATE 3	ALTERNATE 4	ALTERNATE 5
NASA RESEARCH PARK	33,600,000	4,700,000	33,600,000	33,600,000	33,600,000	33,600,000
AMES CAMPUS	40,600,000	0	0	0	0	0
EASTSIDE/AIRFIELD	1,700,000	0	15,000,000	0	15,000,000	0
BAY VIEW	0	0	16,100,000	0	16,100,000	16,100,000
GOLF COURSE	30,500,000	0	30,500,000	30,500,000	30,500,000	30,500,000
Subtotal for EIS	106,400,000	4,700,000	95,200,000	64,100,000	95,200,000	80,200,000
Berry Court Military Housing	6,300,000	6,300,000	6,300,000	6,300,000	6,300,000	6,300,000
Orion Park Military Housing	13,400,000	13,400,000	13,400,000	13,400,000	13,400,000	13,400,000
California Air National Guard	7,100,000	7,100,000	7,100,000	7,100,000	7,100,000	7,100,000
Subtotal - outside EIS	26,800,000	26,800,000	26,800,000	26,800,000	26,800,000	26,800,000
Total for NASA ARC	133,200,000	31,500,000	122,000,000	90,900,000	122,000,000	107,000,000

***** NOTE: EXISTING IRRIGATION DEMAND IS *NOT* FROM RECLAIMED WATER

NASA AMES DEVELOPMENT PLAN - EIS
APPENDIX C: INFRASTRUCTURE - SECTION 2
RECLAIMED WATER / IRRIGATION ANALYSIS
TABLE 2.0
EXISTING - *NOT FROM RECLAIMED WATER*
AVERAGE AND PEAK IRRIGATION FLOWS

TABLE 2.0 Development Area \ Description	Gross Land Area	Gross Average Unit Irrigation Demand	Average Irrigation Demand (gpd)	Annual Irrigation Demand (gal)	Gross Peak Unit Irrigation Demand	Peak Irrigation Demand (gpm)
LAB	28 acres	463 gpd/acre	12,964	4,731,860	2.7 gpm/acre	76
NASA RESEARCH PARK	171 acres	463 gpd/acre	79,173	28,898,145	2.7 gpm/acre	465
NRP Total	199 acres	463 gpd/acre	92,137	33,630,005	2.7 gpm/acre	541
AMES CAMPUS	240 acres	463 gpd/acre	111,120	40,558,800	2.7 gpm/acre	653
EASTSIDE/AIRFIELD *	10 acres	463 gpd/acre	4,630	1,689,950	2.7 gpm/acre	27
BAY VIEW	0 acres	463 gpd/acre	0	0	2.7 gpm/acre	0
GOLF COURSE	100 acres	836 gpd/acre	83,600	30,514,000	3.5 gpm/acre	350
Subtotal for EIS	549		291,487	106,392,755		**1571**
Berry Court Military Housing	37 acres	463 gpd/acre	17,131	6,252,815	2.7 gpm/acre	101
Orion Park Military Housing	79 acres	463 gpd/acre	36,577	13,350,605	2.7 gpm/acre	215
California Air National Guard	42 acres	463 gpd/acre	19,446	7,097,790	2.7 gpm/acre	114
Subtotal - outside EIS	158		73,154	26,701,210		**430**
Total for NASA ARC	707		364,641	133,093,965		**2001**

* Total area for Eastside/Airfield is 89 acres. Roughly 10 acres is developed under existing conditions.

NASA AMES DEVELOPMENT PLAN - EIS
APPENDIX C: INFRASTRUCTURE - SECTION 2
RECLAIMED WATER / IRRIGATION ANALYSIS
TABLE 2.1
BASELINE - ALTERNATE 1
AVERAGE AND PEAK IRRIGATION FLOWS

TABLE 2.1 Development Area \ Description	Gross Land Area	Gross Average Unit Irrigation Demand	Average Irrigation Demand (gpd)	Annual Irrigation Demand (gal)	Gross Peak Unit Irrigation Demand	Peak Irrigation Demand (gpm)
LAB	28 acres	463 gpd/acre	12,964	4,731,860	2.7 gpm/acre	76
NASA RESEARCH PARK #	0 acres	463 gpd/acre	0	0	2.7 gpm/acre	0
NRP Total	28 acres	463 gpd/acre	12,964	4,731,860	2.7 gpm/acre	76
AMES CAMPUS #	0 acres	463 gpd/acre	0	0	2.7 gpm/acre	0
EASTSIDE/AIRFIELD *	0 acres	463 gpd/acre	0	0	2.7 gpm/acre	0
BAY VIEW	0 acres	463 gpd/acre	0	0	2.7 gpm/acre	0
GOLF COURSE	0 acres	836 gpd/acre	0	0	3.5 gpm/acre	0
Subtotal for EIS	28		12,964	4,731,860		**76**
Berry Court Military Housing	37 acres	463 gpd/acre	17,131	6,252,815	2.7 gpm/acre	101
Orion Park Military Housing	79 acres	463 gpd/acre	36,577	13,350,605	2.7 gpm/acre	215
California Air National Guard	42 acres	463 gpd/acre	19,446	7,097,790	2.7 gpm/acre	114
Subtotal - outside EIS	158		73,154	26,701,210		**430**
Total for NASA ARC	186		86,118	31,433,070		**506**

Existing NRP and AMES CAMPUS will not be retrofitted to use reclaimed water for irrigation.
***** Eastside/Airfield will not be retrofitted to use reclaimed water for irrigation.

NASA AMES DEVELOPMENT PLAN - EIS
APPENDIX C: INFRASTRUCTURE - SECTION 2
RECLAIMED WATER / IRRIGATION ANALYSIS
TABLE 2.2
PROPOSED - ALTERNATE 2
AVERAGE AND PEAK IRRIGATION FLOWS

TABLE 2.2 Development Area \ Description	Gross Land Area	Gross Average Unit Irrigation Demand	Average Irrigation Demand (gpd)	Annual Irrigation Demand (gal)	Gross Peak Unit Irrigation Demand	Peak Irrigation Demand (gpm)
LAB	28 acres	463 gpd/acre	12,964	4,731,860	2.7 gpm/acre	76
NASA RESEARCH PARK	171 acres	463 gpd/acre	79,173	28,898,145	2.7 gpm/acre	465
NRP Total	199 acres	463 gpd/acre	92,137	33,630,005	2.7 gpm/acre	541
AMES CAMPUS #	0 acres	463 gpd/acre	0	0	2.7 gpm/acre	0
EASTSIDE/AIRFIELD	89 acres	463 gpd/acre	41,207	15,040,555	2.7 gpm/acre	242
BAY VIEW	95 acres	463 gpd/acre	43,985	16,054,525	2.7 gpm/acre	258
GOLF COURSE	100 acres	836 gpd/acre	83,600	30,514,000	3.5 gpm/acre	350
Subtotal for EIS	483		260,929	95,239,085		**1392**
Berry Court Military Housing	37 acres	463 gpd/acre	17,131	6,252,815	2.7 gpm/acre	101
Orion Park Military Housing	79 acres	463 gpd/acre	36,577	13,350,605	2.7 gpm/acre	215
California Air National Guard	42 acres	463 gpd/acre	19,446	7,097,790	2.7 gpm/acre	114
Subtotal - outside EIS	158		73,154	26,701,210		**430**
Total for NASA ARC	641		334,083	121,940,295		**1822**

AMES CAMPUS will not be retrofitted to use reclaimed water for irrigation.

NASA AMES DEVELOPMENT PLAN - EIS
APPENDIX C: INFRASTRUCTURE - SECTION 2
RECLAIMED WATER / IRRIGATION ANALYSIS
TABLE 2.3
PROPOSED - ALTERNATE 3
AVERAGE AND PEAK IRRIGATION FLOWS

TABLE 2.3 Development Area \ Description	Gross Land Area	Gross Average Unit Irrigation Demand	Average Irrigation Demand (gpd)	Annual Irrigation Demand (gal)	Gross Peak Unit Irrigation Demand	Peak Irrigation Demand (gpm)
LAB	28 acres	463 gpd/acre	12,964	4,731,860	2.7 gpm/acre	76
NASA RESEARCH PARK	171 acres	463 gpd/acre	79,173	28,898,145	2.7 gpm/acre	465
NRP Total	199 acres	463 gpd/acre	92,137	33,630,005	2.7 gpm/acre	541
AMES CAMPUS #	0 acres	463 gpd/acre	0	0	2.7 gpm/acre	0
EASTSIDE/AIRFIELD	0 acres	463 gpd/acre	0	0	2.7 gpm/acre	0
BAY VIEW	0 acres	463 gpd/acre	0	0	2.7 gpm/acre	0
GOLF COURSE	100 acres	836 gpd/acre	83,600	30,514,000	3.5 gpm/acre	350
Subtotal for EIS	299		175,737	64,144,005		**891**
Berry Court Military Housing	37 acres	463 gpd/acre	17,131	6,252,815	2.7 gpm/acre	101
Orion Park Military Housing	79 acres	463 gpd/acre	36,577	13,350,605	2.7 gpm/acre	215
California Air National Guard	42 acres	463 gpd/acre	19,446	7,097,790	2.7 gpm/acre	114
Subtotal - outside EIS	158		73,154	26,701,210		**430**
Total for NASA ARC	457		248,891	90,845,215		**1321**

AMES CAMPUS will not be retrofitted to use reclaimed water for irrigation.
***** Eastside/Airfield will not be retrofitted to use reclaimed water for irrigation.

NASA AMES DEVELOPMENT PLAN - EIS
APPENDIX C: INFRASTRUCTURE - SECTION 2
RECLAIMED WATER / IRRIGATION ANALYSIS
TABLE 2.4
PROPOSED - ALTERNATE 4
AVERAGE AND PEAK IRRIGATION FLOWS

TABLE 2.4 Development Area \ Description	Gross Land Area	Gross Average Unit Irrigation Demand	Average Irrigation Demand (gpd)	Annual Irrigation Demand (gal)	Gross Peak Unit Irrigation Demand	Peak Irrigation Demand (gpm)
LAB	28 acres	463 gpd/acre	12,964	4,731,860	2.7 gpm/acre	76
NASA RESEARCH PARK	171 acres	463 gpd/acre	79,173	28,898,145	2.7 gpm/acre	465
NRP Total	199 acres	463 gpd/acre	92,137	33,630,005	2.7 gpm/acre	541
AMES CAMPUS #	0 acres	463 gpd/acre	0	0	2.7 gpm/acre	0
EASTSIDE/AIRFIELD	89 acres	463 gpd/acre	41,207	15,040,555	2.7 gpm/acre	242
BAY VIEW	95 acres	463 gpd/acre	43,985	16,054,525	2.7 gpm/acre	258
GOLF COURSE	100 acres	836 gpd/acre	83,600	30,514,000	3.5 gpm/acre	350
Subtotal for EIS	483		260,929	95,239,085		**1392**
Berry Court Military Housing	37 acres	463 gpd/acre	17,131	6,252,815	2.7 gpm/acre	101
Orion Park Military Housing	79 acres	463 gpd/acre	36,577	13,350,605	2.7 gpm/acre	215
California Air National Guard	42 acres	463 gpd/acre	19,446	7,097,790	2.7 gpm/acre	114
Subtotal - outside EIS	158		73,154	26,701,210		**430**
Total for NASA ARC	641		334,083	121,940,295		**1822**

AMES CAMPUS will not be retrofitted to use reclaimed water for irrigation.

NASA AMES DEVELOPMENT PLAN - EIS
APPENDIX C: INFRASTRUCTURE - SECTION 2
RECLAIMED WATER / IRRIGATION ANALYSIS
TABLE 2.5
PROPOSED - ALTERNATE 5
AVERAGE AND PEAK IRRIGATION FLOWS

TABLE 2.5 Development Area \ Description	Gross Land Area	Gross Average Unit Irrigation Demand	Average Irrigation Demand (gpd)	Annual Irrigation Demand (gal)	Gross Peak Unit Irrigation Demand	Peak Irrigation Demand (gpm)
LAB	28 acres	463 gpd/acre	12,964	4,731,860	2.7 gpm/acre	76
NASA RESEARCH PARK	171 acres	463 gpd/acre	79,173	28,898,145	2.7 gpm/acre	465
NRP Total	199 acres	463 gpd/acre	92,137	33,630,005	2.7 gpm/acre	541
AMES CAMPUS #	0 acres	463 gpd/acre	0	0	2.7 gpm/acre	0
EASTSIDE/AIRFIELD	0 acres	463 gpd/acre	0	0	2.7 gpm/acre	0
BAY VIEW	95 acres	463 gpd/acre	43,985	16,054,525	2.7 gpm/acre	258
GOLF COURSE	100 acres	836 gpd/acre	83,600	30,514,000	3.5 gpm/acre	350
Subtotal for EIS	394		219,722	80,198,530		**1150**
Berry Court Military Housing	37 acres	463 gpd/acre	17,131	6,252,815	2.7 gpm/acre	101
Orion Park Military Housing	79 acres	463 gpd/acre	36,577	13,350,605	2.7 gpm/acre	215
California Air National Guard	42 acres	463 gpd/acre	19,446	7,097,790	2.7 gpm/acre	114
Subtotal - outside EIS	158		73,154	26,701,210		**430**
Total for NASA ARC	552		292,876	106,899,740		**1579**

AMES CAMPUS will not be retrofitted to use reclaimed water for irrigation.
***** Total area for Eastside/Airfield is 89 acres. Roughly 15 acres is developed under Alternative 5.

SANITARY SEWER DEMAND - EASTERN/SUNNYVALE

NASA AMES DEVELOPMENT PLAN - EIS
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SANITARY SEWER ANALYSIS
SUMMARY
SANITARY SEWER DEMAND - EASTERN / SUNNYVALE SYSTEM

Area Flowing to Sunnyvale

Almost 1400 acres of NASA ARC currently discharge sanitary sewer to the system operated by the City of Sunnyvale. The contributing areas are listed below.

Project Areas Flowing to Sunnyvale	Area
NASA Research Park - including Shenandoah Plaza	213 acres
Southern & Eastern Portion of Ames Campus	64 acres
Berry Court Military Housing	37 acres
California Air National Guard	110 acres
Eastside/Airfield	952 acres
Total to Sunnyvale System	1376 acres

Note: The areas listed in the table to the left represent actual land areas, including sparsely developed areas that contribute negligible sewage flow. Areas listed in spreadsheets on the following pages represent the developed areas of the project site and are for calculation

Summary of Existing and Proposed Sanitary Sewer flows

Existing flows were determined based on meter readings at the pump station located at the northeast corner of the project site, which pumps into a force main that discharges into a City of Sunnyvale sewer main. Proposed flows for the various alternates are based on the calculations shown on the spreadsheets on the following pages.

Development Alternate	Conveyance System Peak Wet Weather Sewer Flow (gpm) (1)	Treatment Plant Peak Wet Weather Sewer Flow (MGD) (2)
Existing	1318 gpm	0.86 MGD
1- Baseline	1319 gpm	0.87 MGD
2	1576 gpm	1.07 MGD
3	1640 gpm	1.08 MGD
4	1498 gpm	1.02 MGD
5 - Preferred	1336 gpm	0.88 MGD

NOTES: (1) This value will be used for determining the impacts of the proposed development on conveyance system capacity.
(2) This value will be used for determining the impacts of the proposed development on treatment plant capacity.

NASA AMES DEVELOPMENT PLAN - EIS
APPENDIX C: INFRASTRUCTURE - SECTION 3
SANITARY SEWER ANALYSIS
TABLE 3.0
EXISTING FLOW TO SUNNYVALE METERING STATION
AVERAGE AND PEAK SANITARY SEWER FLOWS

Table 3.0 A - Peak Wet Weather Flow for Determining Required Capacity of Pipes Conveying Sewage to Treatment Plant
Based on Meter Records for the Sunnyvale Pump Station; Sewer Generation is based on August and September sewer flows.

NASA Research Park - including Shenandoah Plaza
Flow to Meter: 326,327 gallons/day
Total acreage: 357.9 acres
Sewer Generation per Acre: 911.8 gallons/acre/day

TABLE 3.0 A Project Area	Area	Unit Sewer Flow	Average Dry Weather Sewer Flow (gpd)	Average Dry Weather Sewer Flow (gpm)	Peak Dry Weather Sewer Flow (gpm) (1)	Land Area (acre)	Peak Inflow and Infiltration (gpm) (2)	Peak Wet Weather Sewer Flow (gpm)
Lab Area	27.9 acres	912 gpd/acre	25,439	18	44	28	59	103
NRP South of Shenandoah excluding Lab	101.7 acres	912 gpd/acre	92,728	64	161	102	214	375
Subtotal, Ex NRP South of Shenandoah	129.6 acres	912 gpd/acre	118,167	82	205	130	272	477
Shenandoah Plaza Excluding Hangar 1	68.4 acres	912 gpd/acre	62,366	43	108	68	144	252
Southern & Eastern Portion of Ames	64.3 acres	912 gpd/acre	58,628	41	102	64	135	237
Berry Court Military Housing	36.8 acres	912 gpd/acre	33,554	23	58	37	77	136
California Air National Guard	41.5 acres	912 gpd/acre	37,839	26	66	42	87	153
East Airfield Excluding Hangars 2 & 3	17.3 acres	912 gpd/acre	15,774	11	27	17	36	64
Total to Sunnyvale Meter	357.9 acres	912 gpd/acre	326,327	227	**567**	358	752	**1318**

Notes: (1) Peak Dry Weather = 2.5 x Average Dry Weather
(2) Peak I/I = 3,000 gpd/acre for existing systems. Peak I/I = 750 gpd/acre for new systems.

Table 3.0 B - Peak Wet Weather Flow for Determining Required Capacity of Pipes Conveying Sewage to Treatment Plant
Based on Estimated Building Areas

TABLE 3.0 B Project Area	Area	Unit Sewer Flow	Average Dry Weather Sewer Flow (gpd)	Average Dry Weather Sewer Flow (gpm)	Peak Dry Weather Sewer Flow (gpm) (1)	Land Area (acre)	Peak Inflow and Infiltration (gpm) (2)	Peak Wet Weather Sewer Flow (gpm)
Lab Area	222,252 sf	0.128 gpd/sf	28,448	20	49	28	59	108
NRP South of Shenandoah excluding Lab	810,143 sf	0.128 gpd/sf	103,698	72	180	102	214	394
Subtotal, Ex NRP South of Shenandoah	1,032,394 sf	0.128 gpd/sf	132,146	92	229	130	272	502
Shenandoah Plaza Excluding Hangar 1	544,875 sf	0.128 gpd/sf	69,744	48	121	68	144	265
Southern & Eastern Portion of Ames	801,000 sf	0.046 gpd/sf	36,738	26	64	64	135	199
Berry Court Military Housing	110 units	225.00 gpd/unit	24,750	17	43	37	77	120
California Air National Guard	42 acres	912 gpd/acre	37,839	26	66	42	87	153
East Airfield Excluding Hangars 2 & 3	79,023 sf	0.128 gpd/sf	10,115	7	18	17	36	54
Hangars 2 & 3	780,613 sf	0.020 gpd/sf	15,612	11	27	17	36	63
Total to Sunnyvale Meter			326,945	227	**568**	375	788	**1356**

Notes: (1) Peak Dry Weather = 2.5 x Average Dry Weather
(2) Peak I/I = 3,000 gpd/acre for existing systems. Peak I/I = 750 gpd/acre for new systems.

Table 3.0 C - Peak Wet Weather Flow for Determining Sewage Flowing to Treatment Plant
From Meter Readings and Calculations

TABLE 3.0 C	Average Dry Weather Sewer Flow (gpd) (1)	Land Area (acre)	Average Inflow and Infiltration (gpd/acre) (2)	Total Inflow and Infiltration (gpd)	Peak Wet Weather Sewer Flow (MGD)
Total Flow from Existing Development	326,327	358	1,500	536,850	0.86
Total to Sunnyvale Meter	326,327	358		536,850	**0.86**

Notes: (1) From Table 3.0 A
(2) Daily I/I = 1,500 gpd/acre for existing systems. Daily I/I = 750 gpd/acre for new systems.

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APPENDIX C: INFRASTRUCTURE - SECTION 3
SANITARY SEWER ANALYSIS
TABLE 3.1
BASELINE FLOW TO SUNNYVALE METERING STATION - ALTERNATE 1
AVERAGE AND PEAK SANITARY SEWER FLOWS

Table 3.1 A - Peak Wet Weather Flow for Determining Required Capacity of Pipes Conveying Sewage to Treatment Plant
Based on Meter Records for the Sunnyvale Pump Station; Sewer Generation is based on August, September and October sewer flows.

TABLE 3.1 A Development Area \ Description	Area	Unit Sewer Flow	Average Dry Weather Sewer Flow (gpd)	Average Dry Weather Sewer Flow (gpm)	Peak Dry Weather Sewer Flow (gpm) (1)	Land Area (acre)	Peak Inflow and Infiltration (gpm) (2)	Peak Wet Weather Sewer Flow (gpm)
LAB								
Office/High Density R&D	690,000 sf	0.10 gpd/sf	69,000	48	120			
Auditorium	30,000 sf	0.05 gpd/sf	1,500	1	3			
Subtotal, Lab	720,000 sf		70,500	49	122	28	15	137
NASA RESEARCH PARK								
Existing Buildings	1,129,962 sf	0.13 gpd/sf	144,635	100	251			
Invisible Studios	105,000 sf	0.10 gpd/sf	10,500	7	18			
Subtotal, NRP	1,234,962 sf		155,135	108	269	171	359	628
Subtotal, Lab and NRP	1,954,962 sf		225,635	157	392	199	374	**765**
Southern & Eastern Portion of Ames	801,000 sf	0.05 gpd/sf	36,738	26	64	64	135	199
Berry Court Military Housing	110 units	225.00 gpd/unit	24,750	17	43	37	77	120
Subtotal to New SS Pump Station			287,124	199	498	300	586	**1084**
EASTSIDE/AIRFIELD								
East Airfield Excluding Hangars 2 & 3	79,023 sf	0.13 gpd/sf	10,115	7	18			
Hangars 2 & 3	780,613 sf	0.02 gpd/sf	15,612	11	27			
Subtotal, EastSide/Airfield	780,613 sf		25,727	18	45	17	36	81
Air National Guard	42 acres	912 gpd/acre	38,295	27	66	42	87	154
Total to Existing SS Pump Station			351,146	244	**610**	359	709	**1319**

Notes: (1) Peak Dry Weather = 2.5 x Average Dry Weather
(2) Peak I/I = 3,000 gpd/acre for existing systems. Peak I/I = 750 gpd/acre for new systems.

Table 3.1 B - Peak Wet Weather Flow for Determining Sewage Flowing to Treatment Plant
From Meter Readings and Calculations

TABLE 3.1 B	Average Dry Weather Sewer Flow (gpd) (1)	Land Area (acre)	Average Inflow and Infiltration (gpd/acre) (2)	Total Inflow and Infiltration (gpd)	Peak Wet Weather Sewer Flow (MGD)
Total Flow from Existing Development	280,646	331	1500	496,350	0.78
Total Flow from Proposed Development	70,500	28	750	21,000	0.09
Total to Sunnyvale Meter	351,146	359		517,350	**0.87**

Notes: (1) From Table 3.1 A
(2) Daily I/I = 1,500 gpd/acre for existing systems. Daily I/I = 750 gpd/acre for new systems.

The recommended mitigation for NASA Research Park is the installation of new sanitary sewer piping throughout the entire development area, including Shenandoah Plaza. This will reduce the inflow and infiltration into the system. However, for this study, we are assuming that inflow and infiltration will not be reduced in Shenandoah Plaza, in order to allow for the possibility that it could be the last area to develop. For the remainder of NASA Research Park, we have assumed that inflow and infiltration will only be reduced in the portion of the site that will be developed.

NASA AMES DEVELOPMENT PLAN - EIS
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SANITARY SEWER ANALYSIS
TABLE 3.2
PROPOSED FLOW TO SUNNYVALE METERING STATION - ALTERNATE 2
AVERAGE AND PEAK SANITARY SEWER FLOWS

Table 3.2 A - Peak Wet Weather Flow for Determining Required Capacity of Pipes Conveying Sewage to Treatment Plant
Based on Meter Records for the Sunnyvale Pump Station; Sewer Generation is based on August, September and October sewer flows.

TABLE 3.2 A Development Area \ Description	Area	Unit Sewer Flow	Average Dry Weather Sewer Flow (gpd)	Average Dry Weather Sewer Flow (gpm)	Peak Dry Weather Sewer Flow (gpm) (1)	Land Area (acre)	Peak Inflow and Infiltration (gpm) (2)	Peak Wet Weather Sewer Flow (gpm)
LAB								
Office/High Density R&D	690,000 sf	0.10 gpd/sf	69,000	48	120			
Auditorium	30,000 sf	0.05 gpd/sf	1,500	1	3			
Subtotal, Lab	720,000 sf		70,500	49	122	28	15	137
NASA RESEARCH PARK								
Existing Buildings	112,990 sf	0.13 gpd/sf	14,463	10	25			
Invisible Studios	105,000 sf	0.10 gpd/sf	10,500	7	18			
Office/High Density R&D								
Historic Infill	100,000 sf	0.10 gpd/sf	10,000	7	17			
Space Camp	140,000 sf	0.10 gpd/sf	14,000	10	24			
Gateway Parcels	262,010 sf	0.10 gpd/sf	26,201	18	45			
University Office	352,800 sf	0.10 gpd/sf	35,280	25	61			
University Classroom	487,200 sf	0.10 gpd/sf	48,720	34	85			
Museum (Computer)	70,000 sf	0.05 gpd/sf	3,500	2	6			
Museum (CASC)	390,000 sf	0.05 gpd/sf	19,500	14	34			
Conference Center	200,000 sf	0.05 gpd/sf	10,000	7	17			
Part Time Housing (1 unit/800 sf)	150,000 sf	150.00 gpd/unit	28,125	20	49			
Family Housing (1 unit/1,200 sf)	360,000 sf	180.00 gpd/unit	54,000	38	94			
Retail (University)	50,000 sf	0.10 gpd/sf	5,000	3	9			
Area with Existing System						69	145	
Area with New System						102	53	
Subtotal, NRP	2,780,000 sf		279,289	194	485	171	198	683
Subtotal, Lab and NRP	3,500,000 sf		349,789	243	607	199	213	**820**
Southern & Eastern Portion of Ames	801,000 sf	0.05 gpd/sf	36,738	26	64	64	135	199
Berry Court Military Housing	110 units	225.00 gpd/unit	24,750	17	43	37	77	120
Subtotal to New SS Pump Station			411,277	286	714	300	425	**1139**
EASTSIDE/AIRFIELD								
Existing Buildings	79,023 sf	0.13 gpd/sf	10,115	7	18	17	36	
Low Density R&D/Industrial	890,613 sf	0.08 gpd/sf	71,249	49	124			
Office/High Density R&D	360,000 sf	0.10 gpd/sf	36,000	25	63			
Conference Center	80,000 sf	0.05 gpd/sf	4,000	3	7			
Area with New System						72	37	
Subtotal, EastSide/Airfield	1,409,636 sf		121,364	84	211	89	73	284
California Air National Guard	42 acres	912 gpd/acre	38,295	27	66	42	87	154
Total to EX SS Pump Station			570,936	396	**991**	431	585	**1576**

Notes: (1) Peak Dry Weather = 2.5 x Average Dry Weather
(2) Peak I/I = 3,000 gpd/acre for existing systems. Peak I/I = 750 gpd/acre for new systems.

Table 3.2 B - Peak Wet Weather Flow for Determining Sewage Flowing to Treatment Plant
From Meter Readings and Calculations

TABLE 3.2 B	Average Dry Weather Sewer Flow (gpd) (1)	Land Area (acre)	Average Inflow and Infiltration (gpd/acre) (2)	Total Inflow and Infiltration (gpd)	Peak Wet Weather Sewer Flow (MGD)
Total Flow from Existing Development	124,361	229	1500	342,900	0.47
Total Flow from Proposed Development	446,575	202	750	151,500	0.60
Total to Sunnyvale Meter	570,936	431		494,400	**1.07**

Notes: (1) From Table 3.2 A
(2) Daily I/I = 1,500 gpd/acre for existing systems. Daily I/I = 750 gpd/acre for new systems.

The recommended mitigation for NASA Research Park is the installation of new sanitary sewer piping throughout the entire development area, including Shenandoah Plaza. This will reduce the inflow and infiltration into the system. However, for this study, we are assuming that inflow and infiltration will not be reduced in Shenandoah Plaza, in order to allow for the possibility that it could be the last area to develop. For the remainder of NASA Research Park, we have assumed that inflow and infiltration will only be reduced in the portion of the site that will be developed.

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SANITARY SEWER ANALYSIS
TABLE 3.3
PROPOSED FLOW TO SUNNYVALE METERING STATION - ALTERNATE 3
AVERAGE AND PEAK SANITARY SEWER FLOWS

Table 3.3 A - Peak Wet Weather Flow for Determining Required Capacity of Pipes Conveying Sewage to Treatment Plant
Based on Meter Records for the Sunnyvale Pump Station; Sewer Generation is based on August, September and October sewer flows.

TABLE 3.3 A Development Area \ Description	Area	Unit Sewer Flow	Average Dry Weather Sewer Flow (gpd)	Average Dry Weather Sewer Flow (gpm)	Peak Dry Weather Sewer Flow (gpm) (1)	Land Area (acre)	Peak Inflow and Infiltration (gpm) (2)	Peak Wet Weather Sewer Flow (gpm)
LAB								
Office/High Density R&D	690,000 sf	0.10 gpd/sf	69,000	48	120			
Auditorium	30,000 sf	0.05 gpd/sf	1,500	1	3			
Subtotal, Lab	720,000 sf		70,500	49	122	28	15	137
NASA RESEARCH PARK								
Existing Buildings	112,990 sf	0.13 gpd/sf	14,463	10	25			
Invisible Studios	105,000 sf	0.10 gpd/sf	10,500	7	18			
Office/High Density R&D								
Historic Infill	115,000 sf	0.10 gpd/sf	11,500	8	20			
Space Camp	200,000 sf	0.10 gpd/sf	20,000	14	35			
Gateway Parcels	362,010 sf	0.10 gpd/sf	36,201	25	63			
Parcel 9	750,000 sf	0.10 gpd/sf	75,000	52	130			
University Office	352,800 sf	0.10 gpd/sf	35,280	25	61			
University Classroom	487,200 sf	0.10 gpd/sf	48,720	34	85			
Museum (Computer)	70,000 sf	0.05 gpd/sf	3,500	2	6			
Museum (CASC)	390,000 sf	0.05 gpd/sf	19,500	14	34			
Conference Center	250,000 sf	0.05 gpd/sf	12,500	9	22			
Part Time Housing (1 unit/800 sf)	150,000 sf	150.00 gpd/unit	28,125	20	49			
Family Housing (1 unit/1,200 sf)	360,000 sf	180.00 gpd/unit	54,000	38	94			
Retail (University)	75,000 sf	0.10 gpd/sf	7,500	5	13			
Area with Existing System						69	145	
Area with New System						102	53	
Subtotal, NRP	3,780,000 sf		376,789	262	654	171	198	852
Subtotal, Lab and NRP	4,500,000 sf		447,289	311	777	199	213	**989**
Southern & Eastern Portion of Ames	801,000 sf	0.05 gpd/sf	36,738	26	64	64	135	199
Berry Court Military Housing	110 units	225.00 gpd/unit	24,750	17	43	37	77	120
Subtotal to New SS Pump Station			508,777	353	883	300	425	**1308**
EASTSIDE/AIRFIELD								
Existing Buildings	79,023 sf	0.13 gpd/sf	10,115	7	18	17	36	
Low Density R&D/Industrial	780,613 sf	0.08 gpd/sf	62,449	43	108			
Area with New System						32	17	
Subtotal, EastSide/Airfield	859,636 sf		72,564	50	126	49	52	178
California Air National Guard	42 acres	912 gpd/acre	38,295	27	66	42	87	154
Total to EX SS Pump Station			619,636	430	**1076**	391	564	**1640**

Notes: (1) Peak Dry Weather = 2.5 x Average Dry Weather
(2) Peak I/I = 3,000 gpd/acre for existing systems. Peak I/I = 750 gpd/acre for new systems.

Table 3.3 B - Peak Wet Weather Flow for Determining Sewage Flowing to Treatment Plant
From Meter Readings and Calculations

TABLE 3.3 B	Average Dry Weather Sewer Flow (gpd) (1)	Land Area (acre)	Average Inflow and Infiltration (gpd/acre) (2)	Total Inflow and Infiltration (gpd)	Peak Wet Weather Sewer Flow (MGD)
Total Flow from Existing Development	124,361	229	1500	342,900	0.47
Total Flow from Proposed Development	495,275	162	750	121,500	0.62
Total to Sunnyvale Meter	619,636	391		464,400	**1.08**

Notes: (1) From Table 3.3. A
(2) Daily I/I = 1,500 gpd/acre for existing systems. Daily I/I = 750 gpd/acre for new systems.

The recommended mitigation for NASA Research Park is the installation of new sanitary sewer piping throughout the entire development area, including Shenandoah Plaza. This will reduce the inflow and infiltration into the system. However, for this study, we are assuming that inflow and infiltration will not be reduced in Shenandoah Plaza, in order to allow for the possibility that it could be the last area to develop. For the remainder of NASA Research Park, we have assumed that inflow and infiltration will only be reduced in the portion of the site that will be developed.

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TABLE 3.4
PROPOSED FLOW TO SUNNYVALE METERING STATION - ALTERNATE 4
AVERAGE AND PEAK SANITARY SEWER FLOWS

Table 3.4 A - Peak Wet Weather Flow for Determining Required Capacity of Pipes Conveying Sewage to Treatment Plant
Based on Meter Records for the Sunnyvale Pump Station; Sewer Generation is based on August, September and October sewer flows.

TABLE 3.4 A Development Area \ Description	Area	Unit Sewer Flow	Average Dry Weather Sewer Flow (gpd)	Average Dry Weather Sewer Flow (gpm)	Peak Dry Weather Sewer Flow (gpm) (1)	Land Area (acre)	Peak Inflow and Infiltration (gpm) (2)	Peak Wet Weather Sewer Flow (gpm)
LAB								
Office/High Density R&D	690,000 sf	0.10 gpd/sf	69,000	48	120			
Auditorium	30,000 sf	0.05 gpd/sf	1,500	1	3			
Subtotal, Lab	720,000 sf		70,500	49	122	28	15	137
NASA RESEARCH PARK								
Existing Buildings	112,990 sf	0.13 gpd/sf	14,463	10	25			
Invisible Studios	105,000 sf	0.10 gpd/sf	10,500	7	18			
Office/High Density R&D								
Historic Infill	50,000 sf	0.10 gpd/sf	5,000	3	9			
Space Camp	55,000 sf	0.10 gpd/sf	5,500	4	10			
Gateway Parcels	97,010 sf	0.10 gpd/sf	9,701	7	17			
University Office	336,000 sf	0.10 gpd/sf	33,600	23	58			
University Classroom	464,000 sf	0.10 gpd/sf	46,400	32	81			
Museum (Computer)	70,000 sf	0.05 gpd/sf	3,500	2	6			
Museum (CASC)	390,000 sf	0.05 gpd/sf	19,500	14	34			
Conference Center	185,000 sf	0.05 gpd/sf	9,250	6	16			
Part Time Housing (1 unit/800 sf)	115,000 sf	150.00 gpd/unit	21,563	15	37			
Family Housing (1 unit/1,200 sf)	265,000 sf	180.00 gpd/unit	39,750	28	69			
Retail (University)	35,000 sf	0.10 gpd/sf	3,500	2	6			
Area with Existing System						69	145	
Area with New System						102	53	
Subtotal, NRP	2,280,000 sf		222,226	154	386	171	198	584
Subtotal, Lab and NRP	3,000,000 sf		292,726	203	508	199	213	**721**
Southern & Eastern Portion of Ames	801,000 sf	0.05 gpd/sf	36,738	26	64	64	135	199
Berry Court Military Housing	110 units	225.00 gpd/unit	24,750	17	43	37	77	120
Subtotal to New SS Pump Station			354,215	246	615	300	425	**1040**
EASTSIDE/AIRFIELD								
Existing Buildings	79,023 sf	0.13 gpd/sf	10,115	7	18	17	36	
Low Density R&D/Industrial	890,613 sf	0.08 gpd/sf	71,249	49	124			
Conference Center	80,000	0.05 gpd/sf	4,000	3	7			
Office/High Density R&D	480,000	0.10 gpd/sf	48,000	33	83			
Area with New System						72	37	
Subtotal, EastSide/Airfield	1,529,636 sf		133,364	93	232	89	73	305
California Air National Guard	42 acres	912 gpd/acre	38,295	27	66	42	87	154
Total to EX SS Pump Station			525,873	365	**913**	431	585	**1498**

Notes: (1) Peak Dry Weather = 2.5 x Average Dry Weather
(2) Peak I/I = 3,000 gpd/acre for existing systems. Peak I/I = 750 gpd/acre for new systems.

Table 3.4 B - Peak Wet Weather Flow for Determining Sewage Flowing to Treatment Plant
From Meter Readings and Calculations

TABLE 3.4 B	Average Dry Weather Sewer Flow (gpd) (1)	Land Area (acre)	Average Inflow and Infiltration (gpd/acre) (2)	Total Inflow and Infiltration (gpd)	Peak Wet Weather Sewer Flow (MGD)
Total Flow from Existing Development	124,361	229	1500	342,900	0.47
Total Flow from Proposed Development	401,513	202	750	151,500	0.55
Total to Sunnyvale Meter	525,873	431		494,400	**1.02**

Notes: (1) From Table 3.4 A
(2) Daily I/I = 1,500 gpd/acre for existing systems. Daily I/I = 750 gpd/acre for new systems.

The recommended mitigation for NASA Research Park is the installation of new sanitary sewer piping throughout the entire development area, including Shenandoah Plaza. This will reduce the inflow and infiltration into the system. However, for this study, we are assuming that inflow and infiltration will not be reduced in Shenandoah Plaza, in order to allow for the possibility that it could be the last area to develop. For the remainder of NASA Research Park, we have assumed that inflow and infiltration will only be reduced in the portion of the site that will be developed.

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TABLE 3.5
PROPOSED FLOW TO SUNNYVALE METERING STATION - ALTERNATE 5
AVERAGE AND PEAK SANITARY SEWER FLOWS

Table 3.5 A - Peak Wet Weather Flow for Determining Required Capacity of Pipes Conveying Sewage to Treatment Plant
Based on Meter Records for the Sunnyvale Pump Station; Sewer Generation is based on August, September and October sewer flows.

TABLE 3.5 A Development Area \ Description	Area	Unit Sewer Flow	Average Dry Weather Sewer Flow (gpd)	Average Dry Weather Sewer Flow (gpm)	Peak Dry Weather Sewer Flow (gpm) (1)	Land Area (acre)	Peak Inflow and Infiltration (gpm) (2)	Peak Wet Weather Sewer Flow (gpm)
LAB								
Office/High Density R&D	690,000 sf	0.10 gpd/sf	69,000	48	120			
Auditorium	30,000 sf	0.05 gpd/sf	1,500	1	3			
Subtotal, Lab	720,000 sf		70,500	49	122	28	15	137
NASA RESEARCH PARK								
Existing Buildings	54,355 sf	0.13 gpd/sf	6,957	5	12			
Invisible Studios	105,000 sf	0.10 gpd/sf	10,500	7	18			
Office/High Density R&D								
Historic Infill	155,000 sf	0.10 gpd/sf	15,500	11	27			
Space Camp	70,000 sf	0.10 gpd/sf	7,000	5	12			
Other	223,645 sf	0.10 gpd/sf	22,365	16	39			
University Office	406,560 sf	0.10 gpd/sf	40,656	28	71			
University Classroom	561,440 sf	0.10 gpd/sf	56,144	39	97			
Museum (Computer)	120,000 sf	0.05 gpd/sf	6,000	4	10			
Museum (CASC)	500,000 sf	0.05 gpd/sf	25,000	17	43			
Conference Center	250,000 sf	0.05 gpd/sf	12,500	9	22			
Part Time Housing (1 unit/800 sf)	232,000 sf	150.00 gpd/unit	43,500	30	76			
Retail (University)	50,000 sf	0.10 gpd/sf	5,000	3	9			
Retail (Gateway & Historic Infill)	27,000 sf	0.10 gpd/sf	2,700	2	5			
Recreation (Conference Center)	25,000 sf	0.05 gpd/sf	1,250	1	2			
Area with Existing System						69	145	
Area with New System						102	53	
Subtotal, NRP	2,780,000 sf		255,072	177	443	171	198	641
Subtotal, Lab and NRP	3,500,000 sf		325,572	226	565	199	213	**778**
Southern & Eastern Portion of Ames	801,000 sf	0.05 gpd/sf	36,738	26	64	64	135	199
Berry Court Military Housing	110 units	225.00 gpd/unit	24,750	17	43	37	77	120
Subtotal to New SS Pump Station			387,060	269	672	300	425	**1097**
EASTSIDE/AIRFIELD								
Existing Buildings Excluding Hangars 2 & 3	79,023 sf	0.13 gpd/sf	10,115	7	18	17	36	
Hangars 2 & 3	780,613 sf	0.02 gpd/sf	15,612	11	27			
Control Tower	12,000 sf	0.08 gpd/sf	960	1	2			
Area with New System						5	3	
Subtotal, EastSide/Airfield	871,636 sf		26,687	19	46	22	39	85
California Air National Guard	42 acres	912 gpd/acre	38,295	27	66	42	87	154
Total to EX SS Pump Station			452,042	314	**785**	364	551	**1336**

Notes: (1) Peak Dry Weather = 2.5 x Average Dry Weather
(2) Peak I/I = 3,000 gpd/acre for existing systems. Peak I/I = 750 gpd/acre for new systems.

Table 3.5 B - Peak Wet Weather Flow for Determining Sewage Flowing to Treatment Plant
From Meter Readings and Calculations

TABLE 3.5 B	Average Dry Weather Sewer Flow (gpd) (1)	Land Area (acre)	Average Inflow and Infiltration (gpd/acre) (2)	Total Inflow and Infiltration (gpd)	Peak Wet Weather Sewer Flow (MGD)
Total Flow from Existing Development	116,856	229	1500	343,350	0.46
Total Flow from Proposed Development	319,575	135	750	101,250	0.42
Total to Sunnyvale Meter	436,430	364		444,600	**0.88**

Notes: (1) From Table 3.5 A
(2) Daily I/I = 1,500 gpd/acre for existing systems. Daily I/I = 750 gpd/acre for new systems.

The recommended mitigation for NASA Research Park is the installation of new sanitary sewer piping throughout the entire development area, including Shenandoah Plaza. This will reduce the inflow and infiltration into the system. However, for this study, we are assuming that inflow and infiltration will not be reduced in Shenandoah Plaza, in order to allow for the possibility that it could be the last area to develop. For the remainder of NASA Research Park, we have assumed that inflow and infiltration will only be reduced in the portion of the site that will be developed.

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TABLE 3.6
FLOW TO SUNNYVALE FROM PENDING PROJECTS
AVERAGE AND PEAK SANITARY SEWER FLOWS

Table 3.6 A - Peak Wet Weather Flow for Determining Required Capacity of Pipes Conveying Sewage to Treatment Plant (Adjacent Projects)
From Calculations

TABLE 3.6 A Development Area \ Description	**Area	Unit Demand	Average Dry Weather Sewer Flow (gpd)	Average Dry Weather Sewer Flow (gpm)	Peak Dry Weather Sewer Flow (gpm) (1)	*Equivalent Land Area (acre)	Peak Inflow and Infiltration (gpm) (2)	Peak Wet Weather Sewer Flow (gpm)
Office/High Density R&D	4,016,778 sf	0.10 gpd/sf	401,678	279	697	446.3	310	1007
Hotel/Apartment (30 units @ 1,000 sf/unit)	30,000 sf	165.00 gpd/unit	4,950	3	9	3.3	2	11
Total Pending Projects in Sunnyvale	4,046,778 sf		406,628	282	706	450	312	1018

Notes: (1) Peak Dry Weather = 2.5 x Average Dry Weather
(2) Peak I/I = 1,000 gpd/acre for new systems (conservative value relative to 750 gpd/acre).

Table 3.6 B - Peak Wet Weather Flow for Determining Required Capacity of Pipes Conveying Sewage to Treatment Plant (All City Projects)
From Calculations

TABLE 3.6 B Development Area \ Description	**Area	Unit Demand	Average Dry Weather Sewer Flow (gpd)	Average Dry Weather Sewer Flow (gpm)	Peak Dry Weather Sewer Flow (gpm) (1)	*Equivalent Land Area (acre)	Peak Inflow and Infiltration (gpm) (2)	Peak Wet Weather Sewer Flow (gpm)
Office/High Density R&D	6,172,060 sf	0.10 gpd/sf	617,206	429	1072	685.8	476	1547
Moffett Park	28,600,000 sf	0.10 gpd/sf	2,860,000	1986	4965	3177.8	2205	7171
Retail	562,397 sf	0.10 gpd/sf	56,240	39	98	62.5	43	141
Hotel/Apartment (820 units @ 1,000 sf/unit)	820,000 sf	165.00 gpd/unit	135,300	94	235	91.1	63	298
Condo/Townhomes/Homes (316 units @ 1,200 sf/unit)	379,200 sf	180.00 gpd/unit	56,880	40	99	42.1	29	128
Child Care	15,000 sf	0.05 gpd/sf	750	1	1	1.7	1	2
Total Pending Projects in Sunnyvale	36,548,657 sf		3,726,376	2588	6469	4061	2818	9288

Notes: (1) Peak Dry Weather = 2.5 x Average Dry Weather
(2) Peak I/I = 1,000 gpd/acre for new systems (conservative value relative to 750 gpd/acre).

Table 3.6 C - Peak Wet Weather Flow for Determining Sewage Flowing to Treatment Plant
From Calculations

TABLE 3.6 C	Average Dry Weather Sewer Flow (gpd) (1)	*Equivalent Land Area (acre)	Average Inflow and Infiltration (gpd/acre) (2)	Total Inflow and Infiltration (gpd)	Peak Wet Weather Sewer Flow (MGD)
Total Flow from Pending Projects	**3,726,376**	**4061**	**1000**	**4,060,962**	**7.79**

Notes: (1) From Table 3.6 B
(2) Daily I/I = 1,000 gpd/acre for new systems (conservative value relative to 750 gpd/acre).

*Equivalent land area based on 9,000 sf/acre

**Square footages based on September 2001 development update from Sunnyvale Planning Department.

APPENDIX C 4

SANITARY SEWER DEMAND - WESTERN/MOUNTAIN VIEW

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SANITARY SEWER ANALYSIS
SUMMARY
SANITARY SEWER DEMAND - WESTERN / MOUNTAIN VIEW SYSTEM

Area Flowing to Mountain View

Approximately 350 acres of NASA Ames Research Center currently discharge sanitary sewer to the system operated by the City of Mountain View. The contributing areas are listed below.

Project Areas Flowing to Mountain View	Area
Bay View	95 acres
Northern & Western Portion of Ames Campus	176 acres
Orion Park Military Housing	79 acres
Total to Mountain View System	350 acres

Summary of Existing and Proposed Sanitary Sewer flows

Existing flows were determined based on meter readings at the metering station located at the northwest corner of the project site, which discharges into a City of Mountain View sewer main. Proposed flows for the various alternates are based on calculations shown on the spreadsheets on the following pages.

Development Alternate	Conveyance System Peak Wet Weather Sewer Flow (gpm) (1)	Treatment Plant Peak Wet Weather Sewer Flow (MGD) (2)
1- Baseline (Existing)	872 gpm	0.58 MGD
2	1173 gpm	0.79 MGD
3	872 gpm	0.58 MGD
4	1447 gpm	0.95 MGD
5 - Preferred	1178 gpm	0.85 MGD

NOTES: (1) This value will be used for determining the impacts of the proposed development on conveyance system capacity.

(2) This value will be used for determining the impacts of the proposed development on treatment plant capacity.

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SANITARY SEWER ANALYSIS
TABLE 4.1
EXISTING FLOW TO MOUNTAIN VIEW FROM NASA ARC - ALTERNATE 1
AVERAGE AND PEAK SANITARY SEWER FLOWS

Table 4.1 A - Peak Wet Weather Flow for Determining Required Capacity of Pipes Conveying Sewage to Treatment Plant
From Meter Readings and Calculations

TABLE 4.1 A Development Area \ Description	Area	Unit Demand	Average Dry Weather Sewer Flow (gpd)	Average Dry Weather Sewer Flow (gpm)	Peak Dry Weather Sewer Flow (gpm) (1)	Land Area (acre)	Peak Inflow and Infiltration (gpm) (2)	Peak Wet Weather Sewer Flow (gpm)
Ames Campus								
Existing Buildings	2,088,658 sf	0.046 gpd/sf	95,798	67	166	176	370	536
Ex Buildings flowing to Sunnyvale	801,000 sf							
Subtotal, Ames Campus	2,889,658 sf		95,798	67	166	176	370	536
Orion Park Military Housing	435 units	225.00 gpd/unit	97,875	68	170	79	166	336
Total Leaving NASA ARC			193,673	134	**336**	255	536	**872**

Notes: (1) Peak Dry Weather = 2.5 x Average Dry Weather
(2) Peak I/I = 3,000 gpd/acre for existing systems. Peak I/I = 750 gpd/acre for new systems.
(3) Flow to Mountain View, Corrected. 95,798 gpd to meter

Table 4.1 B - Peak Wet Weather Flow for Determining Required Capacity of Pipes Conveying Sewage to Treatment Plant
From 1991 City of Mountain View Sanitary Sewer Master Plan

TABLE 4.1 B **City's Model**	Station per City's Model	1990 Peak Dry Weather Flow (MGD)	1990 Peak Wet Weather Flow (MGD)	1990 Peak Wet Weather Flow (gpm)	2010 Peak Dry Weather Flow (MGD)	2010 Peak Wet Weather Flow (MGD)	2010 Peak Wet Weather Flow (gpm)
at Entrance to NASA ARC	650030	3.18	3.81	2646	3.72	4.05	2813
at Exit from NASA ARC	250200	3.29	4.08	2833	3.96	4.50	3125
Total Leaving NASA ARC		0.11	0.27	**188**	0.24	0.45	**313**

Comparison of BKF Calculations and Mountain View Master Plan

The City's model indicates a 1990 peak dry weather flow of 110,000 gpd (0.11 MGD). However, meter records for the Moffett Meter show that the average dry weather flow is approximately 100,000 gpd for the metered portion of Ames Research Center alone (Table 4.7). The Orion Park Military Housing adds another 100,000 gpd average dry weather flow (Table 4.1 A). Therefore the total average dry weather flow leaving NASA ARC is 200,000 gpd. This equates to a peak dry weather flow of about 400,000 gpd, which is almost 4 times the flow indicated by the City's model.

Meter records for the Moffett Meter were also reviewed for peak wet weather flows. Unfortunately, during peak flows the Mountain View lift station that is located downstream of the Moffett Meter operates in a gravity bypass mode which allows flow to back up to the Moffett Meter. This necessitates close examination of the meter readings to identify the false peaks that result from the backup. The calculations in Table 4.1 A incorporate BKF's interpretation of the meter readings for wet weather flows and more closely reflect the true existing peak wet weather flow. This value will be used for determing the impacts of the proposed development on conveyance system capacity.

Table 4.1 C - Peak Wet Weather Flow for Determining Sewage Flowing to Treatment Plant
From Meter Readings and Calculations

TABLE 4.1 C	Average Dry Weather Sewer Flow (gpd) (1)	Land Area (acre)	Average Inflow and Infiltration (gpd/acre) (2)	Total Inflow and Infiltration (gpd)	Peak Wet Weather Sewer Flow (MGD)
Total Flow from Existing Development	193,673	255	1500	382,500	0.58
Total Leaving NASA ARC	193,673	255		382,500	**0.58**

Note: (1) Daily I/I = 1,500 gpd/acre for existing systems. Daily I/I = 750 gpd/acre for new systems.

The calculations in Table 4.1 C for the peak daily flow leaving the site are based on the reasoning outlined in the paragraphs above. This value reflects BKF's estimate of the true existing peak wet weather flow and will be used for determing the impacts of the proposed development on treatment plant capacity.

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TABLE 4.2
PROPOSED FLOW TO MOUNTAIN VIEW - ALTERNATE 2
AVERAGE AND PEAK SANITARY SEWER FLOWS

Table 4.2 A - Peak Wet Weather Flow for Determining Required Capacity of Pipes Conveying Sewage to Treatment Plant
From Meter Readings and Calculations

TABLE 4.2 A Development Area \ Description	Area	Unit Demand	Average Dry Weather Sewer Flow (gpd)	Average Dry Weather Sewer Flow (gpm)	Peak Dry Weather Sewer Flow (gpm) (1)	Land Area (acre)	Peak Inflow and Infiltration (gpm) (2)	Peak Wet Weather Sewer Flow (gpm)
Ames Campus								
Existing Buildings	2,088,658 sf	0.046 gpd/sf	95,798	67	166	176	370	536
Ex Buildings flowing to Sunnyvale	801,000 sf							
Subtotal, Ames Campus	2,889,658 sf		95,798	67	166	176	370	536
BAY VIEW								
Office/High Density R&D	500,000 sf	0.10 gpd/sf	50,000	35	87			
University Office	210,000 sf	0.10 gpd/sf	21,000	15	36			
University Classroom	290,000 sf	0.10 gpd/sf	29,000	20	50			
Family Housing (1 unit/1200 sf)	300,000 sf	180.00 gpd/unit	45,000	31	78			
Subtotal, Proposed Bay View	1,300,000 sf		145,000	101	252	95	49	301
Subtotal, ARC & Proposed Bay View	4,189,658 sf		240,798	167	**418**	271	419	**837**
Orion Park Military Housing	435 units	225.00 gpd/unit	97,875	68	170	79	166	336
Total Leaving NASA ARC			338,673	235	**588**	350	585	**1173**

Notes: (1) Peak Dry Weather = 2.5 x Average Dry Weather
(2) Peak I/I = 3,000 gpd/acre for existing systems. Peak I/I = 750 gpd/acre for new systems.

Table 4.2 B - Peak Wet Weather Flow for Determining Sewage Flowing to Treatment Plant
From Meter Readings and Calculations

TABLE 4.2 B	Average Dry Weather Sewer Flow (gpd) (1)	Land Area (acre) (1)	Average Inflow and Infiltration (gpd/acre) (2)	Total Inflow and Infiltration (gpd)	Peak Wet Weather Sewer Flow (MGD)
Total Flow from Existing Development	193,673	255	1500	382,500	0.58
Total Flow from Proposed Development	145,000	95	750	70,950	0.22
Total Leaving NASA ARC	338,673	350		453,450	**0.79**

Notes: (1) From Table 4.2 A
(2) Daily I/I = 1,500 gpd/acre for existing systems. Daily I/I = 750 gpd/acre for new systems.

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TABLE 4.3
PROPOSED FLOW TO MOUNTAIN VIEW - ALTERNATE 3
AVERAGE AND PEAK SANITARY SEWER FLOWS

Table 4.3 A - Peak Wet Weather Flow for Determining Required Capacity of Pipes Conveying Sewage to Treatment Plant
From Meter Readings and Calculations

TABLE 4.3 A Development Area \ Description	Area	Unit Demand	Average Dry Weather Sewer Flow (gpd)	Average Dry Weather Sewer Flow (gpm)	Peak Dry Weather Sewer Flow (gpm) (1)	Land Area (acre)	Peak Inflow and Infiltration (gpm) (2)	Peak Wet Weather Sewer Flow (gpm)
Ames Campus								
Existing Buildings	2,088,658 sf	0.046 gpd/sf	95,798	67	166	176	370	536
Ex Buildings flowing to Sunnyvale	801,000 sf							
Subtotal, Ames Campus	2,889,658 sf		95,798	67	166	176	370	536
Orion Park Military Housing	435 units	225.00 gpd/unit	97,875	68	170	79	166	336
Total Leaving NASA ARC			193,673	68	**170**	79	166	**872**

Notes: (1) Peak Dry Weather = 2.5 x Average Dry Weather
(2) Peak I/I = 3,000 gpd/acre for existing systems. Peak I/I = 750 gpd/acre for new systems.

Table 4.3 B - Peak Wet Weather Flow for Determining Sewage Flowing to Treatment Plant
From Meter Readings and Calculations

TABLE 4.3 B	Average Dry Weather Sewer Flow (gpd) (1)	Land Area (acre) (1)	Average Inflow and Infiltration (gpd/acre) (2)	Total Inflow and Infiltration (gpd)	Peak Wet Weather Sewer Flow (MGD)
Total Flow from Existing Development	193,673	255	1500	382,500	0.58
Total Leaving NASA ARC	193,673	255		382,500	**0.58**

Notes: (1) From Table 4.3 A
(2) Daily I/I = 1,500 gpd/acre for existing systems. Daily I/I = 750 gpd/acre for new systems.

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TABLE 4.4
PROPOSED FLOW TO MOUNTAIN VIEW - ALTERNATE 4
AVERAGE AND PEAK SANITARY SEWER FLOWS

Table 4.4 A - Peak Wet Weather Flow for Determining Required Capacity of Pipes Conveying Sewage to Treatment Plant
From Meter Readings and Calculations

TABLE 4.4 A Development Area \ Description	Area	Unit Demand	Average Dry Weather Sewer Flow (gpd)	Average Dry Weather Sewer Flow (gpm)	Peak Dry Weather Sewer Flow (gpm) (1)	Land Area (acre)	Peak Inflow and Infiltration (gpm) (2)	Peak Wet Weather Sewer Flow (gpm)
Ames Campus								
Existing Buildings	2,088,658 sf	0.046 gpd/sf	95,798	67	166	176	370	536
Ex Buildings flowing to Sunnyvale	801,000 sf							
Subtotal, Ames Campus	2,889,658 sf		95,798	67	166	176	370	536
BAY VIEW								
Office/High Density R&D	1,540,000 sf	0.10 gpd/sf	154,000	107	267			
University Office	126,000 sf	0.10 gpd/sf	12,600	9	22			
University Classroom	174,000 sf	0.10 gpd/sf	17,400	12	30			
Family Housing (1 unit/1200 sf)	660,000 sf	180.00 gpd/unit	99,000	69	172			
Low Density R&D/Industrial	200,000 sf	0.10 gpd/sf	20,000	14	35			
Subtotal, Proposed Bay View	2,700,000 sf		303,000	210	526	95	49	575
Subtotal, ARC & Proposed Bay View	5,589,658 sf		398,798	277	**692**	271	419	**1111**
Orion Park Military Housing	435 units	225.00 gpd/unit	97,875	68	170	79	166	336
Total Leaving NASA ARC			496,673	345	**862**	350	585	**1447**

Notes: (1) Peak Dry Weather = 2.5 x Average Dry Weather
(2) Peak I/I = 3,000 gpd/acre for existing systems. Peak I/I = 750 gpd/acre for new systems.

Table 4.4 B - Peak Wet Weather Flow for Determining Sewage Flowing to Treatment Plant
From Meter Readings and Calculations

TABLE 4.4 B	Average Dry Weather Sewer Flow (gpd) (1)	Land Area (acre) (1)	Average Inflow and Infiltration (gpd/acre) (2)	Total Inflow and Infiltration (gpd)	Peak Wet Weather Sewer Flow (MGD)
Total Flow from Existing Development	193,673	255	1500	382,500	0.58
Total Flow from Proposed Development	303,000	95	750	70,950	0.37
Total Leaving NASA ARC	496,673	350		453,450	**0.95**

Notes: (1) From Table 4.4 A
(2) Daily I/I = 1,500 gpd/acre for existing systems. Daily I/I = 750 gpd/acre for new systems.

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APPENDIX C: INFRASTRUCTURE - SECTION 4
SANITARY SEWER ANALYSIS
TABLE 4.5
PROPOSED FLOW TO MOUNTAIN VIEW - ALTERNATE 5
AVERAGE AND PEAK SANITARY SEWER FLOWS

Table 4.5 A - Peak Wet Weather Flow for Determining Required Capacity of Pipes Conveying Sewage to Treatment Plant
From Meter Readings and Calculations

TABLE 4.5 A Development Area \ Description	Area	Unit Demand	Average Dry Weather Sewer Flow (gpd)	Average Dry Weather Sewer Flow (gpm)	Peak Dry Weather Sewer Flow (gpm) (2)	Land Area (acre)	Peak Inflow and Infiltration (gpm) (3)	Peak Wet Weather Sewer Flow (gpm)
Ames Campus								
Existing Buildings	1,688,658 sf	(1)	100,000	69	174	176	370	543
Ex Buildings flowing to Sunnyvale	801,000 sf							
Office/High Density R&D	500,000 sf	0.10 gpd/sf	50,000	35	87			
Subtotal, Ames Campus	2,989,658 sf		150,000	69	174	176	370	543
BAY VIEW								
Family Housing (1 unit/1200 sf)	900,000 sf	180.00 gpd/sf	135,000	94	234			
Retail	75,000 sf	0.10 gpd/sf	7,500	5	13			
Child Care	25,000 sf	0.05 gpd/sf	1,250	1	2			
Subtotal, Proposed Bay View	1,000,000 sf		143,750	100	250	95	49	299
Subtotal, ARC & Proposed Bay View	3,989,658 sf		293,750	169	**423**	271	419	**842**
Orion Park Military Housing	435 units	225.00 gpd/unit	97,875	68	170	79	166	336
Total Leaving NASA ARC			391,625	237	**593**	350	585	**1178**

Notes: (1) Assume existing Ames Campus flow from Table 4.7 is unchanged and flows from new development are added.
(2) Peak Dry Weather = 2.5 x Average Dry Weather
(3) Peak I/I = 3,000 gpd/acre for existing systems. Peak I/I = 750 gpd/acre for new systems.

Table 4.5 B - Peak Wet Weather Flow for Determining Sewage Flowing to Treatment Plant
From Meter Readings and Calculations

TABLE 4.5 B	Average Dry Weather Sewer Flow (gpd) (1)	Land Area (acre) (1)	Average Inflow and Infiltration (gpd/acre) (2)	Total Inflow and Infiltration (gpd)	Peak Wet Weather Sewer Flow (MGD)
Total Flow from Existing Development	197,875	255	1500	382,500	0.58
Total Flow from Proposed Development	193,750	95	750	70,950	0.26
Total Leaving NASA ARC	391,625	350		453,450	**0.85**

Notes: (1) From Table 4.5 A
(2) Daily I/I = 1,500 gpd/acre for existing systems. Daily I/I = 750 gpd/acre for new systems.

SANITARY SEWER ANALYSIS
TABLE 4.6
FLOW TO MOUNTAIN VIEW FROM PENDING PROJECTS
AVERAGE AND PEAK SANITARY SEWER FLOWS

Table 4.6 A - Peak Wet Weather Flow for Determining Required Capacity of Pipes Conveying Sewage to Treatment Plant (Adjacent Projects)
From Calculations

TABLE 4.6 A			Average Dry Weather Sewer Flow	Average Dry Weather Sewer Flow	Peak Dry Weather Sewer Flow	*Equivalent Land Area	Peak Inflow and Infiltration	Peak Wet Weather Sewer Flow
Development Area \ Description	**Area	Unit Demand	(gpd)	(gpm)	(gpm) (1)	(acre)	(gpm) (2)	(gpm)
Office/High Density R&D	617,924 sf	0.10 gpd/sf	61,792	43	107	68.7	48	155
Total Pending Projects in Mountain View	617,924 sf		61,792	43	107	68.7	48	155

Notes: (1) Peak Dry Weather = 2.5 x Average Dry Weather
(2) Peak I/I = 1,000 gpd/acre for new systems (conservative value relative to 750 gpd/acre).

Table 4.6 B - Peak Wet Weather Flow for Determining Required Capacity of Pipes Conveying Sewage to Treatment Plant (All City Projects)
From Calculations

TABLE 4.6 B			Average Dry Weather Sewer Flow	Average Dry Weather Sewer Flow	Peak Dry Weather Sewer Flow	*Equivalent Land Area	Peak Inflow and Infiltration	Peak Wet Weather Sewer Flow
Development Area \ Description	**Area	Unit Demand	(gpd)	(gpm)	(gpm) (1)	(acre)	(gpm) (2)	(gpm)
Office/High Density R&D	2,201,000 sf	0.10 gpd/sf	220,100	153	382	244.6	170	552
Retail	8,820 sf	0.10 gpd/sf	882	1	2	1.0	1	2
Condo/Multi-family (275 units @ 1,200 sf/unit)	330,000 sf	180.00 gpd/unit	49,500	34	86	36.7	25	111
Total Pending Projects in Mountain View	2,539,820 sf		270,482	188	470	281.2	196	665

Notes: (1) Peak Dry Weather = 2.5 x Average Dry Weather
(2) Peak I/I = 1,000 gpd/acre for new systems (conservative value relative to 750 gpd/acre).

Table 4.6 C - Peak Wet Weather Flow for Determining Sewage Flowing to Treatment Plant
From Calculations

TABLE 4.6 C	Average Dry Weather Sewer Flow (gpd) (1)	*Equivalent Land Area (acre)	Average Inflow and Infiltration (gpd/acre) (2)	Total Inflow and Infiltration (gpd)	Peak Wet Weather Sewer Flow (MGD)
Total Flow from Pending Projects	**270,482**	**281**	**1000**	**281,222**	**0.55**

Notes: (1) From Table 4.6 B
(2) Daily I/I = 1,000 gpd/acre for new systems.

*Equivalent land area based on 9,000 sf/acre

**Square footages based on memorandum from Linda Forsberg, Deputy City Manager, dated September 17, 2000.

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SANITARY SEWER ANALYSIS

TABLE 4.7

EXISTING FLOW TO MOUNTAIN VIEW METERING STATION

Comparison of Monitoring Results to Mountain View 1991 Sanitary Sewer Master Plan and BKF Model	1998 Monitoring Results Average Day (MGD)	1999 Monitoring Results Average Day (MGD)	Report Table 4-2 Monitoring Results Average Day (MGD)	Report Table 4-5 Projected Wet Weather Peak Day (MGD)	BKF Model Projected Wet Weather Peak Day (MGD)
Basin 3			1.72	4.07	4.07
Basin 4			1.91	5.94	5.94
Basin 5			3.9	8.67	8.67
Moffett Meter	0.113	0.096	0.097	4.22	0.45
Subtotal			7.63	22.9	19.13
Palo Alto Treatment Plant Meter			7.43	19.54	19.54
Difference at Plant Meter			0.20	3.36	-0.41
			3%	17%	-2%

CONCLUSION: Existing Average Daily Flow to Moffett Meter = 0.1 MGD

Monitoring Results - Meter S101 at N-255

August, 1998	3,220,140	gallons
September, 1998	3,686,892	gallons
Total	6,907,032	gallons
Days	61	
	113230.0328	gallons/day
Average metered use, 1998	0.113	mgd
Moffet Meter 1990 (Table 4-2)	0.097	
Difference	0.016	
	17%	

May, 1999	2,533,476	
June, 1999	3,322,616	
Total	5,856,092	gallons
Days	61	
	96,002	gallons/day
Average metered use, 1999	0.096	mgd
Moffet Meter 1990 (Table 4-2)	0.097	
Difference	-0.001	
	-1%	

Note: Meter readings during wet months are suspect because the City shuts off a downstream pump station. When this occurs, there is a tailwater on the meter station that affects the meter results.

STORM DRAIN DISCHARGE

NASA AMES DEVELOPMENT PLAN - EIS
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STORM DRAIN ANALYSIS
TABLE 5.1
STORM DRAIN DISCHARGE

Drainage Area	Acres	C-Factor	I - 10yr (inch/hour)	Q - 10yr (cfs)	I - 25yr (inch/hour)	Q - 25yr (cfs)	I - 100yr (inch/hour)	Q - 100yr (cfs)
1	150	0.86	0.71	92	0.8	103	0.95	123
2	320	0.86	0.71	195	0.8	220	0.95	261
Hwy 101 R/W	35	0.90	0.71	22	0.8	25	0.95	30
3	100	0.86	0.71	61	0.8	69	0.95	82
4	50	0.86	0.71	31	0.8	34	0.95	41
5	30	0.86	0.71	18	0.8	21	0.95	25
6	930	0.65	0.71	429	0.8	484	0.95	574
Hwy 101 R/W	15	0.90	0.71	10	0.8	11	0.95	13

Note: This table contains only calculations for total discharge from each drainage area.

NATURAL GAS DEMAND

NASA AMES DEVELOPMENT PLAN - EIS
APPENDIX C: INFRASTRUCTURE - SECTION 6
GAS ANALYSIS
ANNUAL GAS DEMAND SUMMARY

Summary of Existing and Proposed Gas Demand

Existing and proposed demands for the various alternates are based on the calculations shown on the spreadsheets on the following pages.

Development Alternate	Annual Gas Demand (Kilo Therms)
Existing	4064
1- Baseline	4,330
2	7,130
3	6,508
4	7,854
5 - Preferred	6,939

NASA AMES DEVELOPMENT PLAN - EIS
APPENDIX C: INFRASTRUCTURE - SECTION 6
GAS ANALYSIS
TABLE 6.0
EXISTING NATURAL GAS DEMAND

TABLE 6.0 Development Area \ Description	Area	Unit Gas Demand (KThrms/sf)	Annual Gas Demand (KTherms)
NASA RESEARCH PARK			
Existing Buildings	1,187,269 sf	0.00065	772
Hangar 1 - Existing Use	390,000 sf	0.00030	117
Subtotal - NRP	1,577,269 sf		889
EAST SIDE/AIRFIELD			
Existing Buildings	79,023 sf	0.00065	51
Hangars 2 & 3 - Existing Use	780,613 sf	0.00030	234
Subtotal - Eastside/Airfield	859,636 sf		286
AMES CAMPUS			
Existing Buildings	2,889,658 sf	0.00100	2,890
Subtotal - AMES CAMPUS	2,889,658 sf		2,890
Total - NASA Ames Research Center			4,064

NASA AMES DEVELOPMENT PLAN - EIS
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GAS ANALYSIS
TABLE 6.1
NATURAL GAS DEMAND - ALTERNATE 1

TABLE 6.1 Development Area \ Description	Area	Unit Gas Demand (KThrms/sf)	Annual Gas Demand (KTherms)
LAB			
Office/High Density R&D	590,000 sf	0.00067	395
Computer Lab	100,000 sf	0.00067	67
Auditorium	30,000 sf	0.00080	24
Subtotal - Lab	720,000 sf		486
NASA RESEARCH PARK			
Existing Buildings	739,962 sf	0.00065	481
Hangar 1 - Existing Use	390,000 sf	0.00030	117
Invisible Studios	105,000 sf	0.00067	70
Subtotal - NRP	1,234,962 sf		668
Subtotal - Lab and NRP	1,954,962 sf		1,155
EAST SIDE/AIRFIELD			
Existing Buildings	79,023 sf	0.00065	51
Hangars 2 & 3 - Existing Use	780,613 sf	0.00030	234
Subtotal - Eastside/Airfield	859,636 sf		286
AMES CAMPUS			
Existing Buildings	2,889,658 sf	0.00100	2,890
Subtotal - AMES CAMPUS	2,889,658 sf		2,890
Total - NASA Ames Research Center			4,330

NASA AMES DEVELOPMENT PLAN - EIS
APPENDIX C: INFRASTRUCTURE - SECTION 6
GAS ANALYSIS
TABLE 6.2
NATURAL GAS DEMAND - ALTERNATE 2

TABLE 6.2 Development Area \ Description	Area	Unit Gas Demand (KThrms/sf)	Annual Gas Demand (KTherms)
LAB			
Office/High Density R&D	590,000 sf	0.00067	395
Computer Lab	100,000 sf	0.00067	67
Auditorium	30,000 sf	0.00080	24
Subtotal - Lab	720,000 sf		486
NASA RESEARCH PARK			
Existing Buildings	112,990 sf	0.00065	73
Invisible Studios	105,000 sf	0.00067	70
Office/High Density R&D			
Historic Infill	100,000 sf	0.00067	67
Space Camp	140,000 sf	0.00067	94
Gateway Parcels	262,010 sf	0.00067	176
University Office	352,800 sf	0.00070	247
University Classroom	487,200 sf	0.00070	341
Museum (Computer)	70,000 sf	0.00080	56
Museum (CASC)	390,000 sf	0.00080	312
Conference Center	200,000 sf	0.00080	160
Part Time Housing (1 unit/800 sf)	150,000 sf	0.00080	120
Family Housing (1 unit/1,200 sf)	360,000 sf	0.00086	310
Retail (University)	50,000 sf	0.00100	50
Subtotal - NRP	2,780,000 sf		2,076
Subtotal - Lab and NRP	3,500,000 sf		2,562
BAY VIEW			
Office/High Density R&D	500,000 sf	0.00067	335
University Office	210,000 sf	0.00067	141
University Classroom	290,000 sf	0.00067	194
Family Housing (1 unit/1,200 sf)	300,000 sf	0.00086	258
Subtotal - Bay View	300,000 sf		928
EAST SIDE/AIRFIELD			
Existing Buildings	79,023 sf	0.00065	51
Hangars 2 & 3	780,613 sf	0.00041	320
Office / R&D / Industrial	470,000 sf	0.00067	315
Conference Center	80,000 sf	0.00080	64
Subtotal - Eastside/Airfield	1,409,636 sf		750
AMES CAMPUS			
Existing Buildings	2,889,658 sf	0.00100	2,890
Subtotal - AMES CAMPUS	2,889,658 sf		2,890
Total - NASA Ames Research Center			7,130

NASA AMES DEVELOPMENT PLAN - EIS
APPENDIX C: INFRASTRUCTURE - SECTION 6
GAS ANALYSIS
TABLE 6.3
NATURAL GAS DEMAND - ALTERNATE 3

TABLE 6.3 Development Area \ Description	Area	Unit Gas Demand (KThrms/sf)	Annual Gas Demand (KTherms)
LAB			
Office/High Density R&D	590,000 sf	0.00067	395
Computer Lab	100,000 sf	0.00067	67
Auditorium	30,000 sf	0.00080	24
Subtotal - Lab	720,000 sf		486
NASA RESEARCH PARK			
Existing Buildings	112,990 sf	0.00065	73
Invisible Studios	105,000 sf	0.00067	70
Office/High Density R&D			
Historic Infill	115,000 sf	0.00067	77
Space Camp	200,000 sf	0.00067	134
Gateway Parcels	362,010 sf	0.00067	243
Parcel 9 / Others	750,000 sf	0.00067	503
University Office	352,800 sf	0.00070	247
University Classroom	487,200 sf	0.00070	341
Museum (Computer)	70,000 sf	0.00080	56
Museum (CASC)	390,000 sf	0.00080	312
Conference Center	250,000 sf	0.00080	200
Part Time Housing (1 unit/800 sf)	150,000 sf	0.00080	120
Family Housing (1 unit/1,200 sf)	360,000 sf	0.00086	310
Retail (University)	75,000 sf	0.00100	75
Subtotal - NRP	3,780,000 sf		2,760
Subtotal - Lab and NRP	4,500,000 sf		3,247
EAST SIDE/AIRFIELD			
Existing Buildings	79,023 sf	0.00065	51
Hangars 2 & 3	780,613 sf	0.00041	320
Subtotal - Eastside/Airfield	859,636 sf		371
AMES CAMPUS			
Existing Buildings	2,889,658 sf	0.00100	2,890
Subtotal - AMES CAMPUS	2,889,658 sf		2,890
Total - NASA Ames Research Center			6,508

NASA AMES DEVELOPMENT PLAN - EIS
APPENDIX C: INFRASTRUCTURE - SECTION 6
GAS ANALYSIS
TABLE 6.4
NATURAL GAS DEMAND - ALTERNATE 4

TABLE 6.4 Development Area \ Description	Area	Unit Gas Demand (KThrms/sf)	Annual Gas Demand (KTherms)
LAB			
Office/High Density R&D	590,000 sf	0.00067	395
Computer Lab	100,000 sf	0.00067	67
Auditorium	30,000 sf	0.00080	24
Subtotal - Lab	720,000 sf		486
NASA RESEARCH PARK			
Existing Buildings	112,990 sf	0.00073	82
Invisible Studios	105,000 sf	0.00067	70
Office/High Density R&D			
Historic Infill	50,000 sf	0.00067	34
Space Camp	55,000 sf	0.00067	37
Gateway Parcels	97,010 sf	0.00067	65
University Office	336,000 sf	0.00070	235
University Classroom	464,000 sf	0.00070	325
Museum (Computer)	70,000 sf	0.00080	56
Museum (CASC)	390,000 sf	0.00080	312
Conference Center	185,000 sf	0.00080	148
Part Time Housing (1 unit/800 sf)	115,000 sf	0.00080	92
Family Housing (1 unit/1,200 sf)	265,000 sf	0.00086	228
Retail (University)	35,000 sf	0.00100	35
Subtotal - NRP	2,280,000 sf		1,719
Subtotal - Lab and NRP	3,000,000 sf		2,205
BAY VIEW			
Office/High Density R&D	1,540,000 sf	0.00067	1,032
University Office	126,000 sf	0.00067	84
University Classroom	174,000 sf	0.00067	117
Low Density R&D / Industrial	200,000 sf	0.00064	128
Family Housing (1 unit/1,200 sf)	660,000 sf	0.00086	568
Subtotal - Bay View	2,700,000 sf		1,928
EAST SIDE/AIRFIELD			
Existing Buildings	79,023 sf	0.00065	51
Hangars 2 & 3	780,613 sf	0.00041	320
Office / R&D / Industrial	590,000 sf	0.00067	395
Conference Center	80,000 sf	0.00080	64
Subtotal - Eastside/Airfield	1,529,636 sf		831
AMES CAMPUS			
Existing Buildings	2,889,658 sf	0.001	2,890
Subtotal - AMES CAMPUS	2,889,658 sf		2,890
Total - NASA Ames Research Center			7,854

NASA AMES DEVELOPMENT PLAN - EIS
APPENDIX C: INFRASTRUCTURE - SECTION 6
GAS ANALYSIS
TABLE 6.5
NATURAL GAS DEMAND - ALTERNATE 5

TABLE 6.5 Development Area \ Description	Area	Unit Gas Demand (KThrms/sf)	Annual Gas Demand (KTherms)
LAB			
Office/High Density R&D	590,000 sf	0.00067	395
Computer Lab	100,000 sf	0.00067	67
Auditorium	30,000 sf	0.00080	24
Subtotal - Lab	720,000 sf		486
NASA RESEARCH PARK			
Existing Buildings	54,355 sf	0.00065	35
Invisible Studios	105,000 sf	0.00067	70
Office/High Density R&D			
Historic Infill	155,000 sf	0.00067	104
Space Camp	70,000 sf	0.00067	47
Parcel 9 / Others	223,645 sf	0.00067	150
University Office	406,560 sf	0.00070	285
University Classroom	561,440 sf	0.00070	393
Museum (Computer)	120,000 sf	0.00080	96
Museum (CASC)	500,000 sf	0.00080	400
Conference Center	250,000 sf	0.00080	200
Recreation (Conference Center)	25,000 sf	0.00080	20
Part Time Housing (1 unit/800 sf)	232,000 sf	0.00080	186
Retail (University)	50,000 sf	0.00100	50
Retail (Gateway & Historic Infill)	27,000 sf	0.00100	27
Subtotal - NRP	2,780,000 sf		2,062
Subtotal - Lab and NRP	3,500,000 sf		2,549
BAY VIEW			
Child Care	25,000 sf	0.00095	24
Retail	75,000 sf	0.00100	75
Family Housing (1 unit/1,200 sf)	900,000 sf	0.00086	774
Subtotal - Bay View	1,000,000 sf		873
EAST SIDE/AIRFIELD			
Existing Buildings	79,023 sf	0.00065	51
Hangars 2 & 3 - Existing Use	780,613 sf	0.00030	234
Low Density R&D / Industrial	12,000 sf	0.00064	8
Subtotal - Eastside/Airfield	871,636 sf		293
AMES CAMPUS			
Existing Buildings	2,889,658 sf	0.00100	2,890
Office/High Density R&D	500,000 sf	0.00067	335
Subtotal - AMES CAMPUS	3,389,658 sf		3,225
Total - NASA Ames Research Center			6,939