APPENDIX E

Air Quality

APPENDIX E: AIR QUALITY

This appendix contains information, data and other materials used, collected and/or developed in support of the air quality impact assessment for the SAN Master Plan projects.

Aircraft Activity Levels

Aircraft activity levels (aircraft arrival and departure operations) and aircraft/engine assignments were determined based on SIMMOD analysis and EDMS assignments. The aircraft fleet/operational level data used in the air quality analysis are consistent with those used to assess noise impacts with the proposed alternatives. **Tables E-1, E-2, and E-3** contain the listing of annual aircraft operations (by aircraft and engine) for the Existing Conditions (2005), future No Action Alternative, West Terminal Alternative (Preferred Alternative), and the East Terminal Alternative for 2015 and 2020 used in the air quality assessment.

Table E-1 Annual Aircraft Operations for Existing (2005) and No Action Alternative Conditions

Aircraft	Engine	Type	2005	2015	2020
560 CITATION V	JT15D-5 (A & B)	GA	365	-	-
A300-600F	CF6-80C2A5	Cargo	1460	365	730
A319	CFM56-5A4	AC	-	730	365
A319	CFM56-5B6/P	AC	2190	1460	2555
A319	V2522-A5	AC	1460	1825	2190
A320-200	CFM56-5A1	AC	2190	1825	3650
A320-200	CFM56-5B4/2	AC	1095	1095	1095
A320-200	V2527-A5	AC	4380	13140	13140
A321	CFM56-5B3/P	AC	1095	-	730
A340-300	CFM56-5B1/2P	AC	-	365	730
B727-200F	JT8D-15	Cargo	1460	730	730
B737-300	CFM56-3B1	AC	1788	13140	6570
B737-300	CFM56-3C1	AC	1095	1825	365
B737-400	CFM56-3C1	AC	2555	1460	1460
B737-500	CFM56-3B1	AC	365	4745	4745
B737-500	CFM56-3C1	AC	365	-	-
B737-700	CFM56-7B22	AC	1533	23725	33580
B737-700	CFM56-7B24	AC	365	1095	730
B737-800	CFM56-7B26	AC	3650	6570	8395
B737-900	CFM56-7B26	AC	730	730	365
B757-200	PW2037	AC	3650	2920	4015
B757-200	RB211-535E4	AC	1460	365	365
B757-200	RB211-535E4B	AC	2190	1825	1460
B757-200F	RB211-535E4	Cargo	365	365	-
B767-200	CF6-80A	Cargo	365	730	730
B767-200	CF6-80A2	AC	-	-	-
B767-300	CF6-80A2	AC	1825	730	730
B767-300ER	CF6-80C2B6	AC	-	365	730
B767-300ER	PW4060	AC	365	730	730
B767-300F	CF6-80C2B7F	Cargo	-	365	730
B767-400ER	CF6-80C2B7F	AC	-	-	365
B777-200	PW4077	AC	-	1460	1460
B777-200	TRENT 892	AC	-	365	730
BAE 125-700	TFE731-3	GA	365	2190	2190
BEECH KING AIR 200	PT6A-41	GA	730	2190	2190
BEECHJET 400	JT15D-5 (A & B)	GA	365	-	-
CANADAIR REG-100	CF34-3A1	COMM	1095	-	-
CANADAIR REG-100	CF34-3B	COMM	2190	7300	7665
CANADAIR REG-700	CF34-8C1	COMM	-	4380	4015
CANADAIR REG-900	CF34-8C5	COMM	2555	-	-
CITATION I	JT15D-1A & 1B	GA	365	-	-
CITATION	PW308C	GA	365	-	-
CITATION VII	TFE731-3	GA	365	-	-
CL600	CF34-3B	GA	-	1460	1460
COMANCHE	TIO-540-J2B2	GA	365	-	-
DC10-10F	CF6-50C2	Cargo	-	730	730
EMB-120	PW118	COMM	6570	-	-
EMBRAER ERJ	AE3007A1/3	COMM	3285	8030	8030
EMBRAER ERJ 170	CF34-8E5A1	COMM	-	5475	5840
FALCON 20	CF700-2D	MILITAR	-	365	365
GULFSTREAM IV	TAY MK611-8	GA	730	3285	3285
GULFSTREAM V	BR700-710A1-10	GA	365	-	-
IAI WESTWIND	TFE731-3	GA	365	-	-
JETSTAR	TFE731-3	GA	365	-	-
LEARJET 35/36	TFE731-2-2B	GA	730	-	-
MD-11-11	PW4460	AC	-	365	365
MD-11-11F	CF6-80C2D1F	Cargo	-		365
MD-80-83	JT8D-219	AC	7665	8395	8030
MD-90-30	V2525-D5	AC	-	1460	1460

Source: HNTB; KB Environmental Sciences, Inc. 2007.

Table E-2 Annual Aircraft Operations for West Terminal Alternative (Preferred Alternative)

Aircraft	Engine	Type	2015	2020
NAVAJO	TIO-540-J2B2	GA	-	-
SF-340-B PLUS	CT7-5	COMM	-	-
A300-600F	CF6-80C2A5	Cargo	365	730
A319	CFM56-5A4	AC	730	365
A319	CFM56-5B6/P	AC	1460	2555
A319	V2522-A5	AC	1825	2190
A320-200	CFM56-5A1	AC	1825	3650
A320-200	CFM56-5B4/2	AC	1095	1095
A320-200	V2527-A5	AC	1314	13140
A321	CFM56-5B3/P	AC	-	730
A340-300	CFM56-5B1/2P	AC	365	730
B727-200F	JT8D-15	Cargo	730	730
B737-300	CFM56-3B1	AC	1314	6570
B737-300	CFM56-3C1	AC	1825	365
B737-400	CFM56-3C1	AC	1460	1460
B737-500	CFM56-3B1	AC	4745	4745
B737-700	CFM56-7B22	AC	2372	33580
B737-700	CFM56-7B24	AC	1095	730
B737-800	CFM56-7B26	AC	6570	8395
B737-900	CFM56-7B26	AC	730	365
B757-200	PW2037	AC	2920	4015
B757-200	RB211-535E4	AC	365	365
B757-200	RB211-535E4B	AC	1825	1460
B757-200F	RB211-535E4	Cargo	365	-
B767-200	CF6-80A	Cargo	730	730
B767-200	CF6-80A2	AC	-	-
B767-300	CF6-80A2	AC	730	730
B767-300ER	CF6-80C2B6	AC	365	730
B767-300ER	PW4060	AC	730	730
B767-300F	CF6-80C2B7F	Cargo	365	730
B767-400ER	CF6-80C2B7F	AC	-	365
B777-200	PW4077	AC	1460	1460
B777-200	TRENT 892	AC	365	730
BAE 125-700	TFE731-3	GA	2190	2190
BEECH KING AIR 200	PT6A-41	GA	2190	2190
CANADAIR REG-100	CF34-3A1	COMM	-	-
CANADAIR REG-100	CF34-3B	COMM	7300	7665
CANADAIR REG-700	CF34-8C1	COMM	4380	4015
CL600	CF34-3B	GA	1460	1460
DC10-10F	CF6-50C2	Cargo	730	730
EMBRAER ERJ	AE3007A1/3	COMM	8030	8030
EMBRAER ERJ 170	CF34-8E5A1	COMM	5475	5840
FALCON 20	CF700-2D	MILITARY	365	365
GULFSTREAM IV	TAY MK611-8	GA	3285	3285
MD-11-11	PW4460	AC	365	365
MD-11-11F	CF6-80C2D1F	Cargo	-	365
MD-80-83	JT8D-219	AC	8395	8030
MD-90-30	V2525-D5	AC	1460	1460

Source: HNTB; KB Environmental Sciences, Inc. 2007.

Table E-3 Annual Aircraft Operations for East Terminal Alternative

Aircraft	Engine	Type	2015	2020
A300-600F	CF6-80C2A5	Cargo	365	730
A319	CFM56-5A4	AC	730	365
A319	CFM56-5B6/P	AC	1460	2555
A319	V2522-A5	AC	1825	2190
A320-200	CFM56-5A1	AC	1825	3650
A320-200	CFM56-5B4/2	AC	1095	1095
A320-200	V2527-A5	AC	1314	13140
A321	CFM56-5B3/P	AC	-	730
A340-300	CFM56-5B1/2P	AC	365	730
B727-200F	JT8D-15	Cargo	730	730
B737-300	CFM56-3B1	AC	1314	6570
B737-300	CFM56-3C1	AC	1825	365
B737-400	CFM56-3C1	AC	1460	1460
B737-500	CFM56-3B1	AC	4745	4745
B737-700	CFM56-7B22	AC	2372	33580
B737-700	CFM56-7B24	AC	1095	730
B737-800	CFM56-7B26	AC	6570	8395
B737-900	CFM56-7B26	AC	730	365
B757-200	PW2037	AC	2920	4015
B757-200	RB211-535E4	AC	365	365
B757-200	RB211-535E4B	AC	1825	1460
B757-200F	RB211-535E4	Cargo	365	-
B767-200	CF6-80A	Cargo	730	730
B767-200	CF6-80A2	AC	-	-
B767-300	CF6-80A2	AC	730	730
B767-300ER	CF6-80C2B6	AC	365	730
B767-300ER	PW4060	AC	730	730
B767-300F	CF6-80C2B7F	Cargo	365	730
B767-400ER	CF6-80C2B7F	AC	-	365
B777-200	PW4077	AC	1460	1460
B777-200	TRENT 892	AC	365	730
BAE 125-700	TFE731-3	GA	2190	2190
BEECH KING AIR 200	PT6A-41	GA	2190	2190
CANADAIR REG-100	CF34-3A1	COMM	-	-
CANADAIR REG-100	CF34-3B	COMM	7300	7665
CANADAIR REG-700	CF34-8C1	COMM	4380	4015
CL600	CF34-3B	GA	1460	1460
DC10-10F	CF6-50C2	Cargo	730	730
EMBRAER ERJ	AE3007A1/3	COMM	8030	8030
EMBRAER ERJ 170	CF34-8E5A1	COMM	5475	5840
FALCON 20	CF700-2D	MILITARY	365	365
GULFSTREAM IV	TAY MK611-8	GA	3285	3285
MD-11-11	PW4460	AC	365	365
MD-11-11F	CF6-80C2D1F	Cargo	-	365
MD-80-83	JT8D-219	AC	8395	8030
MD-90-30	V2525-D5	AC	1460	1460

Source: HNTB; KB Environmental Sciences, Inc. 2007.

Aircraft Particulate Emission Factors

Particulate matter emission factors for some (but not all) aircraft are contained in the EDMS. To provide estimates of this pollutant for those aircraft (in EDMS with particulate matter emission factors), mode-specific particulate matter emission factors are estimated within EDMS for aircraft turbine (jet) engines based on methodologies contained in the FAA's methodology known as the *First Order Approximation*.[1]

EDMS does not provide particulate matter emission factors for some aircraft, such as some turboprop and piston aircraft. For these aircraft, particulate matter emission factors were estimated from the turboprop engine particulate matter emission index provided in the Fifth Edition of AP-42, Volume 1.[2] **Table E-4** presents the particulate matter emission indices for which aircraft EDMS does not provide. Of note, the two aircraft listed occur only in the Existing 2005 condition. Secondly, the number of operations associated with these aircraft is quite small (less than 1,000 per year).

Table E-4 Aircraft Particulate Matter Emission Factors (mg/sec)

Aircraft	Engine	Aircraft Approach	Aircraft Climb-out	Aircraft Idle	Aircraft Takeoff
Comanche	TIO-540-J2B2	75.7	75.8	100.9	41.7
Navajo	TIO-540-J2B2	75.7	75.8	100.9	41.7

Source: Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources. U.S. Environmental Protection Agency, Office of Mobile Sources, Ann Arbor, MI. 1992.

Aircraft Time in Mode

LTO times-in-mode (TIM) for approach, landing, take-off and climb-out were obtained from EDMS using aircraft manufacturer performance data. Airport-specific, ground-based TIM for taxi-in, taxi-out and ground delay times were derived from the SIMMOD analysis. The taxi time/delay used in the emissions inventory is shown in **Tables E-5, E-6, and E-7** for the project alternatives. The taxi time used in the dispersion modeling is determined internally by EDMS using the taxiway assignments, distance traveled, and a typical aircraft ground speed of 17 mph. The ground delay used in the dispersion modeling is determined internally by EDMS using sequential modeling. Taxi times were assigned to aircraft type such as air carrier, cargo, commuter/air taxi, general aviation, and military. Generally, the taxi time for the project alternatives are expected to be greater than the no build alternative.

1 Derivation of a First Order Approximation of Particulate Matter from Aircraft, Roger Wayson, Gregg Fleming, and Julie Draper, July 2004, Proceedings for the Annual Air and Waste Management Conference and FAA Memorandum, Use of the First Order Approximation to Estimate Aircraft Engine Particulate Matter Emissions in NEPA Documents and Clean Air Act General Conformity Analyses, May 24, 2005.

2 U.S. EPA, 1999. "Compilation of Air Pollution Emission Factors. Volume 1: Stationary Point and Area Sources" AP-42, 5th Edition and Supplements, U.S. EPA, Office of Air Quality Planning and Standards, Environmental Sciences Research Laboratory, Research Triangle Park, NC.

Table E-5 Aircraft Taxi/Delay Times (minutes) for the Existing Conditions (2005) and No Action Alternative

Year	Aircraft Type	Arrival	Departure	Total
2005	AC	3.37	14.59	17.96
2005	CARGO	7.60	8.34	15.93
2005	COMM	4.63	12.06	16.70
2005	GA	10.07	5.26	15.33
2005	MILITARY	-	-	-
2005	All	4.21	13.24	17.45
2015	AC	3.58	16.92	20.50
2015	CARGO	7.32	9.44	16.76
2015	COMM	4.87	15.03	19.90
2015	GA	9.86	5.76	15.61
2015	MILITARY	7.19	3.46	10.65
2015	All	4.37	15.55	19.92
2020	AC	4.44	17.32	21.75
2020	CARGO	6.67	9.06	15.73
2020	COMM	6.22	15.28	21.50
2020	GA	9.99	5.44	15.43
2020	MILITARY	8.24	8.99	17.23
2020	All	5.20	15.91	21.11

Source: HNTB; KB Environmental Sciences, Inc. 2007.

Table E-6 Aircraft Taxi/Delay Times (minutes) for the West Terminal Alternative (Preferred Alternative)

Year	Aircraft Type	Arrival	Departure	Total
2015	AC	3.47	17.12	20.59
2015	CARGO	7.60	13.75	21.35
2015	COMM	4.09	14.66	18.74
2015	GA	9.46	13.99	23.44
2015	MILITARY	8.64	5.61	14.24
2015	All	4.12	16.31	20.43
2020	AC	3.34	17.05	20.39
2020	CARGO	6.32	13.62	19.94
2020	COMM	3.81	14.72	18.53
2020	GA	7.81	13.93	21.74
2020	MILITARY	6.22	9.28	15.50
2020	All	3.81	16.30	20.12

Source: HNTB; KB Environmental Sciences, Inc. 2007.

Table E-7 Aircraft Taxi/Delay Times (minutes) for the East Terminal Alternative

Year	Aircraft Type	Arrival	Departure	Total
2015	AC	4.10	16.38	20.48
2015	CARGO	7.41	14.29	21.70
2015	COMM	2.91	16.49	19.39
2015	GA	10.22	12.28	22.50
2015	MILITARY	7.72	6.77	14.50
2015	All	4.39	16.03	20.43
2020	AC	3.84	18.05	21.89
2020	CARGO	6.67	14.09	20.76
2020	COMM	2.73	16.65	19.38
2020	GA	9.11	16.86	25.97
2020	MILITARY	7.92	12.66	20.58
2020	All	4.07	17.59	21.66

Source: HNTB; KB Environmental Sciences, Inc. 2007.

Remain Over Night Aircraft

SDIA has aircraft operations which Remain Over Night (RON), as described within the following. Tug "Out of Gate" operations are arrival flights that are towed from their final destination gate to a RON location, while tug "Into Gate" operations are departure flights that are towed from a RON location to the departure gate for boarding. **Table E-8** presents the RON aircraft operations per alternative and analysis year. Data was developed based on the SIMMOD analysis. As the activities entail the use of aircraft tugs, the associated emissions were determined. **Table E-9** presents the annual emissions as a result of these RON operations and the operation of the aircraft tugs. Generally, the emissions associated with RON decrease as a result of project alternatives as gates are available and RON operations are not required.

Table E-8 Annual Aircraft Operations and Taxi Time (minutes) for Remain Over Night

Condition	Year	Out of Gate	Taxi Time	Into Gate	Taxi Time
Existing	2005	6205	12.35	5110	46.91
No Action Alternative	2015	6935	16.01	8030	40.02
No Action Alternative	2020	6935	14.53	6059	30.68
West Terminal Alternative (Preferred Alternative)	2015	7300	6.69	8030	44.91
West Terminal Alternative (Preferred Alternative)	2020	5110	8.31	2555	30.00
East Terminal Alternative	2015	6570	15.92	4015	44.81
East Terminal Alternative	2020	5840	15.31	3979	29.90

Source: HNTB; KB Environmental Sciences, Inc. 2007.

Table E-9 Emissions Inventory (tpy) due to Remain Over Night Operations

Condition	Year	CO	HC	NO_x	SO_x	PM_{10}	$PM_{2.5}$
Existing	2005	0.99	0.19	0.19	0.20	2.47	0.30
No Action Alternative	2015	0.53	0.13	0.13	0.14	1.61	<0.01
No Action Alternative	2020	0.22	0.08	0.08	0.09	0.62	<0.01
West Terminal Alternative (Preferred Alternative)	2015	0.23	0.06	0.06	0.06	0.71	<0.01
West Terminal Alternative (Preferred Alternative)	2020	0.09	0.04	0.03	0.04	0.26	<0.01
East Terminal Alternative	2015	0.50	0.13	0.12	0.13	1.51	<0.01
East Terminal Alternative	2020	0.20	0.07	0.07	0.08	0.55	<0.01

Source: HNTB; KB Environmental Sciences, Inc. 2007.

Ground Support Equipment

Ground support equipment (GSE) is a term used to describe the vehicles that service aircraft after arrival and before departure at an airport. Auxiliary power units (APU) are on-board engines that provide power to an aircraft while at the gate. Emissions from the GSE and APU were calculated using EDMS. The number, types of GSE and APU, fuel type, and operational times that are used to service each category of aircraft were based on airport specific information and supplemented with default data from EDMS. Emissions from these sources are based on the number and type of equipment used to service each aircraft along with the amount of time the equipment is in use per aircraft landing-takeoff cycle. The type of GSE includes aircraft tugs, baggage tugs, fuel trucks, food trucks, cargo trailers, water trucks, lavatory trucks, cabin service, belt loaders, and cargo loaders. **Tables E-10, E-11, and E-12** present the observed TIM for air carrier and commuter aircraft, default TIM for GA and cargo, and airline specific TIM. APU data (i.e., model and emission rates) was obtained from EDMS, and TIM was derived from FAA guidance and knowledge of the number of gates which contain 400 Hz power and pre-conditioned air.

Table E-10 Observed Ground Service Equipment (GSE) Times-in-Mode (minutes)

GSE Type	Air Carriers – Narrow Body	Air Carriers – Wide Body	Commuters
Belt Loader	43.7	82.0	16.3
Baggage Tractor	28.7	30.0	26.3
Fuel Truck	18.5	24.0	8.0
Catering Truck	10.0	33.0	-
Aircraft Tractor	6.3	7.0	-
Lavatory Truck	4.0	4.0	-
Service Truck	1.8	31.0	0.7
Auxiliary Power Unit[a]	3.4	3.4	-

Source: San Diego County Regional Airport Authority; KB Environmental Sciences, Inc. 2005.
[a] It was assumed that only air carriers assigned to Terminal 1, commuters and GA aircraft use their APUs.

Table E-11 Ground Service Equipment (GSE) Times-in-Mode (minutes)

GSE	General Aviation	Cargo
Belt Loader	-	35/48
Baggage Tractor	-	75/120
Fuel Truck	10/12/20	12/20/45
Catering Truck	-	-
Aircraft Tractor	5	8
Lavatory Truck	-	-
Service Truck	-	15
Ground Power Unit	40	-
Auxiliary Power Unit[b]	-	-

Source: FAA EDMS Version 5.0.2, 2007.

Table E-12 Airline-specific Ground Service Equipment (GSE) Times-in-Mode (minutes)

GSE	Southwest	United	US Airways/ America West
Baggage Tractor	28.7	23.8	17.8
Aircraft Tractor	4.0	6.3	6.3

Source: San Diego County Regional Airport Authority; KB Environmental Sciences, Inc. 2005.

Aircraft Runway Utilization

Runway use data are used by EDMS to perform the dispersion modeling. Departure/Arrival runway use percentages, or the percent of the time that the various runways are used for departures/arrivals, were obtained based on the SIMMOD analysis. These percentages were used to distribute the LTO to each runway end point by aircraft size. **Table E-13** contains the runway utilization percentages used for the air quality assessment.

Table E-13 Runway Utilization (%)

Year	Aircraft Size	Operation Type	Existing/No Build		T2 West		T1 East	
			Runway 9	Runway 27	Runway 9	Runway 27	Runway 9	Runway 27
2005	Heavy	Arrival	0.13	3.71	--	--	--	--
	Large		2.61	75.79	--	--	--	--
	Small		0.59	17.18	--	--	--	--
	Heavy	Departure	0.07	3.76	--	--	--	--
	Large		1.32	77.08	--	--	--	--
	Small		0.32	17.45	--	--	--	--
2015	Heavy	Arrival	0.17	4.86	0.17	4.86	0.17	4.86
	Large		3.04	88.30	3.04	88.30	3.04	88.30
	Small		0.12	3.51	0.12	3.51	0.12	3.51
	Heavy	Departure	0.10	4.92	0.08	4.95	0.09	4.94
	Large		1.48	89.86	1.53	89.81	1.49	89.85
	Small		0.06	3.57	0.06	3.57	0.06	3.57
2020	Heavy	Arrival	0.22	6.29	0.22	6.29	0.22	6.29
	Large		3.00	87.11	3.00	87.11	3.00	87.11
	Small		0.11	3.27	0.11	3.27	0.11	3.27
	Heavy	Departure	0.12	6.39	0.12	6.39	0.11	6.40
	Large		1.52	88.58	1.52	88.58	1.54	88.57
	Small		0.06	3.33	0.05	3.34	0.06	3.32

Source: HNTB; KB Environmental Sciences, Inc. 2007.

Aircraft Operational Temporal Profiles

Temporal factors are used to describe the relationship of activity levels in one period of time to another period of time (i.e., the relationship of the activity during 15-minute to the activity during a 24-hour period). Temporal factors represent a faction to the peak period. Thus, annual operations can be represented as a weekly, daily, and quarter hour activity. The use of temporal factors gives the model the ability to more accurately reflect real world conditions.

Aircraft temporal profiles that reflect the variation in operations by month, day and quarter hour were derived from FAA Operational and Performance Data for 2005 for SDIA. Because their activity levels are closely linked to the aircraft, GSE and APU temporal profiles are based on the same data. **Tables E-14, E-15, E-16, and E-17** presents the aircraft operational temporal profiles (quarter hourly-arrivals and departures, daily, and monthly, respectively).

Table E-14 Quarter Hourly Operational Profiles for Aircraft - Arrival

Time	Air Carrier	Cargo	Air Taxi/Commuter	General Aviation	Military	All Aircraft
0:15	0.2349	0.0000	0.1338	0.0000	0.0555	0.2105
0:30	0.1937	0.0000	0.1545	0.0000	0.0256	0.1771
0:45	0.1698	0.0000	0.2562	0.0000	0.0106	0.1563
1:00	0.1959	0.0082	0.1624	0.0000	0.0180	0.1751
1:15	0.0946	0.0000	0.0295	0.0000	0.0073	0.0811
1:30	0.1968	0.0000	0.0606	0.0000	0.0067	0.1675
1:45	0.1521	0.0000	0.1676	0.0000	0.0000	0.1380
2:00	0.1737	0.0000	0.2020	0.0000	0.0000	0.1544
2:15	0.1568	0.0000	0.4376	0.0000	0.0000	0.1544
2:30	0.1568	0.0000	0.2918	0.0000	0.0000	0.1458
2:45	0.1380	0.0000	0.7002	**1.0000**	0.0000	0.1647
3:00	0.1045	0.0000	0.5835	0.0000	0.0000	0.1372
3:15	0.1881	0.0000	0.0000	0.0000	0.0000	0.1544
3:30	0.1344	0.0000	0.3751	0.0000	0.0000	0.1323
3:45	0.0627	0.0000	0.4376	0.0000	0.0000	0.1029
4:00	0.0941	0.3991	0.0000	0.0000	0.0000	0.1544
4:15	0.0314	0.3991	0.1459	0.8333	0.0000	0.1372
4:30	0.0000	0.8123	0.0000	0.0000	0.0000	0.1571
4:45	0.0000	1.0000	0.0302	0.1724	0.0000	0.2005
5:00	0.0021	0.9506	0.0295	0.0000	0.0000	0.1926
5:15	0.0047	0.9367	0.0651	0.0000	0.0000	0.1901
5:30	0.0030	0.9012	0.0212	0.0000	0.0000	0.1781
5:45	0.0131	0.8353	0.0814	0.0000	0.0000	0.1783
6:00	0.0029	0.7691	0.0547	0.0000	0.0000	0.1552

Source: FAA Operational and Performance Data for 2005.

Table E-14 (cont.) Quarter Hourly Operational Profiles for Aircraft - Arrival

Time	Air Carrier	Cargo	Air Taxi/Commuter	General Aviation	Military	All Aircraft
6:15	0.0062	0.4565	0.1163	0.0554	0.0000	0.1008
6:30	0.0052	0.1596	0.0360	0.0411	0.0310	0.0431
6:45	0.0093	0.0962	0.1007	0.0000	0.6563	0.1485
7:00	0.0082	0.0722	0.1583	0.0000	0.2363	0.0732
7:15	0.0691	0.0328	0.2158	0.0411	0.9284	0.2407
7:30	0.5660	0.0219	0.2590	0.0000	0.4797	0.5690
7:45	0.1985	0.0197	0.3094	0.0822	0.1098	0.2052
8:00	0.3216	0.0087	0.4173	0.0000	0.2291	0.3312
8:15	0.4191	0.0044	0.4748	0.0000	0.4869	0.4602
8:30	0.6124	0.0131	0.6547	0.1233	0.3556	0.6100
8:45	0.6485	0.0109	0.6906	0.0411	0.4081	0.6485
9:00	0.7036	0.0087	0.8129	0.1233	0.4200	0.7047
9:15	0.6866	0.0066	0.6978	0.0822	0.4654	0.6920
9:30	0.5742	0.0044	0.8201	0.0000	0.7852	0.6599
9:45	0.5361	0.0022	0.8345	0.0411	0.5442	0.5876
10:00	0.8021	0.0022	0.7626	0.0411	0.2601	0.7517
10:15	0.8381	0.0022	0.8345	0.0000	0.2673	0.7868
10:30	0.6335	0.0044	0.7842	0.0411	**1.0000**	0.7470
10:45	0.7495	0.0066	0.8849	0.1233	0.7351	0.8029
11:00	0.8242	0.0044	0.8129	0.1644	0.5489	0.8257
11:15	**1.0000**	0.0000	0.8417	0.2055	0.7064	**1.0000**
11:30	0.7830	0.0044	0.9424	0.1233	0.2864	0.7551
11:45	0.6814	0.0109	0.9209	0.0822	0.4988	0.7081
12:00	0.9521	0.0087	0.9209	0.1233	0.4033	0.9116
12:15	0.9170	0.0219	0.8129	0.0822	0.3604	0.8739
12:30	0.5392	0.0284	**1.0000**	0.0822	0.1169	0.5292
12:45	0.5412	0.0284	0.8201	0.0822	0.1313	0.5245
13:00	0.8057	0.0634	0.8201	0.1233	0.5060	0.8173
1315	0.8387	0.0569	0.8777	0.1644	0.2697	0.8020
13:30	0.6567	0.0481	0.7050	0.0822	0.6325	0.7056
13:45	0.4428	0.0197	0.7482	0.1233	0.5274	0.5097
14:00	0.6397	0.0197	0.7410	0.2466	0.4821	0.6624
14:15	0.7191	0.0066	0.9568	0.0411	0.4845	0.7360
14:30	0.5778	0.0241	0.8417	0.1644	0.5537	0.6311
14:45	0.5124	0.0153	0.7626	0.0822	0.3747	0.5398
15:00	0.7113	0.0087	0.8489	0.0411	0.5179	0.7305
15:15	0.4959	0.0087	0.8705	0.1233	0.4105	0.5360
15:30	0.4536	0.0087	0.9353	0.1233	0.3508	0.4962
15:45	0.6469	0.0241	0.8561	0.0411	0.1289	0.6113
16:00	0.6804	0.0415	0.9784	0.0822	0.5060	0.7162
16:15	0.4706	0.0831	0.9784	0.0411	0.6706	0.5838
16:30	0.5479	0.1334	0.9784	0.1233	0.4105	0.6096
16:45	0.4691	0.1159	0.9568	0.0822	0.4487	0.5478
17:00	0.5938	0.1115	0.8489	0.0822	0.4916	0.6497
17:15	0.3876	0.2974	0.9353	0.0822	0.1766	0.4662
17:30	0.7577	0.3936	0.7770	0.2055	0.2267	0.7885

Table E-14 (cont.) Quarter Hourly Operational Profiles for Aircraft - Arrival

Time	Air Carrier	Cargo	Air Taxi/Commuter	General Aviation	Military	All Aircraft
17:45	0.9036	0.2865	0.9137	0.0000	0.4988	0.9425
18:00	0.9314	0.1421	0.8705	0.0411	0.3771	0.9150
18:15	0.8021	0.0590	0.7914	0.1233	0.3270	0.7788
18:30	0.7268	0.1990	0.9784	0.1233	0.5251	0.7889
18:45	0.6237	0.2799	0.7482	0.0822	0.1074	0.6328
19:00	0.6861	0.2252	0.7122	0.0000	0.1575	0.6798
1915	0.7680	0.0066	0.6763	0.0411	0.4368	0.7504
19:30	0.7825	0.0066	0.5755	0.0411	0.4654	0.7631
19:45	0.8304	0.0109	0.5755	0.1233	0.2005	0.7568
20:00	0.7526	0.0131	0.4388	0.0822	0.2172	0.6882
20:15	0.7005	0.0066	0.4388	0.0411	0.5203	0.6967
20:30	0.6892	0.0044	0.3381	0.0411	0.4177	0.6612
20:45	0.7799	0.0022	0.3309	0.0000	0.1098	0.6815
21:00	0.7948	0.0087	0.3237	0.1233	0.2959	0.7276
21:15	0.6423	0.0044	0.3957	0.2055	0.2124	0.5952
21:30	0.5861	0.0044	0.3165	0.0000	0.3556	0.5651
21:45	0.7851	0.0022	0.2446	0.1233	0.0597	0.6722
22:00	0.6552	0.0000	0.2302	0.2466	0.0286	0.5609
22:15	0.6680	0.0000	0.1439	0.3288	0.0215	0.5656
22:30	0.6443	0.0022	0.1439	0.0411	0.0955	0.5563
22:45	0.8021	0.0044	0.1439	0.1644	0.2029	0.7060
23:00	0.6691	0.0022	0.1727	0.0822	0.4749	0.6455
23:15	0.5155	0.0000	0.0935	0.0822	0.3222	0.4877
23:30	0.3799	0.0000	0.0504	0.0000	0.1050	0.3338
23:45	0.2850	0.0000	0.0772	0.0000	0.3331	0.2984
24:00	0.1942	0.0000	0.0565	0.1075	0.1686	0.1942

Source: FAA Operational and Performance Data for 2005.

Table E-15 Quarter Hourly Operational Profiles for Aircraft - Departure

Time	Air Carrier	Cargo	Air Taxi/Commuter	General Aviation	Military	All Aircraft
0:15	0.0074	0.0000	0.0000	0.0000	0.0000	0.0059
0:30	0.0069	0.0000	0.0000	0.0000	0.0000	0.0075
0:45	0.0071	0.0000	0.0285	0.0000	0.0000	0.0080
1:00	0.0024	0.0000	0.0000	0.3421	0.0000	0.0029
1:15	0.0016	0.0000	0.0000	0.1864	0.0000	0.0024
1:30	0.0054	0.0000	0.0000	0.0000	0.0000	0.0043
1:45	0.0149	0.0000	0.0000	0.7060	0.0000	0.0159
2:00	0.0150	0.0000	0.0000	0.0000	0.0208	0.0143
2:15	0.0130	0.0000	0.0000	0.0000	0.0000	0.0104
2:30	0.0130	0.0000	0.0000	0.0000	0.0000	0.0104
2:45	0.0078	0.0000	0.0000	0.0000	0.0000	0.0062
3:00	0.0000	0.0000	0.2600	0.0000	0.0000	0.0207
3:15	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3:30	0.0167	0.0000	0.0000	0.0000	0.0000	0.0133
3:45	0.0000	0.0000	0.3900	0.0000	0.0000	0.0311
4:00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4:15	0.0130	0.0000	0.0000	0.0000	0.0000	0.0104
4:30	0.0010	0.0000	0.0000	0.0000	0.0000	0.0008
4:45	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5:00	0.0013	0.0000	0.0000	0.0000	0.0000	0.0031
5:15	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5:30	0.0009	0.0065	0.0000	0.0000	0.0000	0.0015
5:45	0.0009	0.0000	0.0363	0.0000	0.0000	0.0022
6:00	0.0006	0.0000	0.0244	0.0000	0.0000	0.0015
6:15	0.0000	0.0000	0.0086	0.0000	0.0000	0.0014
6:30	0.0010	0.0000	0.0000	0.0000	0.0022	0.0015
6:45	0.9862	0.6867	0.4744	0.0000	**1.0000**	**1.0000**
7:00	**1.0000**	0.4044	0.4231	0.1818	0.4766	0.9162
7:15	0.6923	0.3467	0.5962	0.0000	0.3519	0.6563
7:30	0.5405	0.2578	0.3846	0.2727	0.4209	0.5263
7:45	0.4352	0.1311	0.4103	0.2727	0.4009	0.4265
8:00	0.5415	0.0733	0.5000	0.3636	0.5011	0.5197
8:15	0.6929	0.0111	0.5385	0.4545	0.5078	0.6374
8:30	0.5536	0.0244	0.6282	0.4545	0.1670	0.4908
8:45	0.5110	0.0133	0.5769	0.5455	0.5367	0.4957
9:00	0.4288	0.0111	0.7115	0.3636	0.2851	0.4068
9:15	0.5690	0.0044	0.8333	**1.0000**	0.3586	0.5324
9:30	0.5965	0.0089	0.7051	0.3636	0.3318	0.5460
9:45	0.4976	0.0089	0.7436	0.4545	0.4878	0.4875
10:00	0.4893	0.0022	0.7308	0.2727	0.4276	0.4719
10:15	0.5543	0.0022	0.8974	0.8182	0.8441	0.5794
10:30	0.4339	0.0044	0.9038	0.2727	0.3163	0.4224
10:45	0.3865	0.0022	0.8974	0.2727	0.2183	0.3723
11:00	0.3942	0.0000	0.8333	0.4545	0.2739	0.3820
11:15	0.4236	0.0000	0.8397	0.2727	0.5234	0.4341
11:30	0.4451	0.0200	0.9359	0.5455	0.4499	0.4510
11:45	0.4829	0.0556	0.9231	0.0909	0.9443	0.5380
12:00	0.4262	0.0244	0.7564	0.3636	0.7216	0.4574

Table E-15 (cont.) Quarter Hourly Operational Profiles for Aircraft - Departure

Time	Air Carrier	Cargo	Air Taxi/Commuter	General Aviation	Military	All Aircraft
12:15	0.5988	0.0044	**1.0000**	0.2727	0.6058	0.5901
12:30	0.5299	0.0111	0.9231	0.4545	0.5167	0.5240
12:45	0.5581	0.0022	0.8462	0.5455	0.3898	0.5263
13:00	0.4784	0.0067	0.7179	0.1818	0.1537	0.4308
1315	0.5405	0.0044	0.7821	0.1818	0.1002	0.4755
13:30	0.4512	0.0000	0.9295	0.1818	0.4410	0.4505
13:45	0.4448	0.0022	0.7949	0.3636	0.2361	0.4170
14:00	0.5347	0.0000	0.7372	0.4545	0.0780	0.4688
14:15	0.4797	0.0022	0.8462	0.4545	0.5078	0.4793
14:30	0.3846	0.0000	0.9295	0.5455	0.5902	0.4150
14:45	0.4531	0.0000	0.9679	0.5455	0.3497	0.4448
15:00	0.3756	0.0000	0.8141	0.2727	0.3853	0.3779
15:15	0.3894	0.0044	0.9551	0.0909	0.8285	0.4466
15:30	0.3289	0.0000	0.9936	0.0909	0.1737	0.3243
15:45	0.3686	0.0022	0.8333	0.4545	0.5702	0.3961
16:00	0.4012	0.0022	0.9679	0.1818	0.4232	0.4106
16:15	0.4806	0.0022	0.8462	0.5455	0.3296	0.4581
16:30	0.3029	0.0000	0.7628	0.0909	0.2027	0.2978
16:45	0.3878	0.0022	0.7756	0.2727	0.6771	0.4208
17:00	0.3497	0.0022	0.7628	0.1818	0.3964	0.3585
17:15	0.3907	0.0044	0.9167	0.1818	0.5969	0.4188
17:30	0.2975	0.0022	0.8910	0.1818	0.5345	0.3368
17:45	0.3298	0.0044	0.6474	0.0909	0.5679	0.3575
18:00	0.2152	0.0267	0.6410	0.2727	0.1871	0.2250
18:15	0.4691	0.0489	0.5385	0.0909	0.2962	0.4372
18:30	0.3692	0.0311	0.5192	0.1818	0.3786	0.3654
18:45	0.4169	0.2356	0.5064	0.0909	0.4165	0.4293
19:00	0.3919	0.3178	0.3846	0.2727	0.6793	0.4459
1915	0.3298	0.6511	0.4615	0.0000	0.3140	0.3943
19:30	0.2895	0.5267	0.4423	0.0000	0.2517	0.3389
19:45	0.3516	**1.0000**	0.3526	0.0000	0.2762	0.4436
20:00	0.2763	0.3578	0.2821	0.0000	0.3497	0.3149
20:15	0.2241	0.1089	0.3077	0.0909	0.3430	0.2439
20:30	0.2190	0.1044	0.3590	0.2727	0.1849	0.2242
20:45	0.3622	0.4044	0.2885	0.1818	0.4454	0.4002
21:00	0.1809	0.0800	0.2821	0.2727	0.3964	0.2127
21:15	0.2286	0.0289	0.2115	0.0909	0.2806	0.2273
21:30	0.2450	0.0133	0.2885	0.0000	0.3719	0.2523
21:45	0.3164	0.0111	0.2628	0.0909	0.3118	0.3018
22:00	0.2155	0.0067	0.3141	0.4545	0.3430	0.2275
22:15	0.1883	0.0044	0.2885	0.1818	0.0913	0.1739
22:30	0.1649	0.0067	0.2244	0.4545	0.0223	0.1468
22:45	0.1358	0.0067	0.1538	0.4545	0.0156	0.1198
23:00	0.1611	0.0089	0.1154	0.4545	0.0134	0.1387
23:15	0.1905	0.0022	0.1538	0.3636	0.0111	0.1611
23:30	0.0704	0.0044	0.1090	0.3636	0.0089	0.0641
23:45	0.0093	0.0024	0.0000	0.0976	0.0000	0.0080
24:00	0.0042	0.0000	0.0084	0.0000	0.0000	0.0037

Source: FAA Operational and Performance Data for 2005.

Table E-16 Daily Operational Profiles for Aircraft

Day	All Aircraft	Air Carriers	Air Taxi/Commuters	General Aviation	Military
Monday	0.9068	0.9553	0.9588	0.7710	**1.0000**
Tuesday	**1.0000**	0.9783	0.9718	0.9006	0.6140
Wednesday	0.9386	0.9805	0.9983	0.9253	0.4605
Thursday	0.9479	**1.0000**	0.9927	0.8828	0.7237
Friday	0.9746	0.9749	**1.0000**	**1.0000**	0.8377
Saturday	0.8034	0.8617	0.8348	0.6172	0.7660
Sunday	0.8649	0.9176	0.8834	0.8317	0.5789

Source: FAA Operational and Performance Data for 2005.

Table E-17 Monthly Operational Profiles for Aircraft

Month	All Aircraft	Air Carriers	Air Taxi/Commuters	General Aviation	Military
January	0.8841	0.9250	0.8673	0.7712	0.7891
February	0.8065	0.8345	0.7868	0.8120	0.6016
March	0.9124	0.9334	0.9080	0.9766	0.7188
April	0.8737	0.8932	0.9032	0.8282	0.5156
May	0.9208	0.9329	0.9716	0.8541	0.7500
June	0.9234	0.9487	0.9467	0.8120	0.7109
July	0.9789	0.9887	0.9772	0.9982	0.7344
August	**1.0000**	**1.0000**	**1.0000**	**1.0000**	0.7734
September	0.9158	0.9210	0.9607	0.8871	**1.0000**
October	0.9331	0.9445	0.9689	0.8565	0.8828
November	0.8899	0.9012	0.8963	0.8330	0.5313
December	0.9306	0.9586	0.9151	0.7784	0.8906

Source: FAA Operational and Performance Data for 2005.

Stationary Sources

For stationary sources, such as the Heating and Cooling Plant and emergency generators, the emissions were based on annual fuel use or hours of operation. **Table E-18** presents the natural gas usage for the boilers and **Table E-19** presents the hours of operation and size for the emergency generators.

Table E-18 Natural Gas Usage for Boilers (1,000 cubic meters)

Equipment	Permit Number	No Action	T2West Project	T1East Project
Kewanne Boiler 7.5 MMBTU/Hr	950458	4,873,424	6,709,787	6,780,416
Kewanne Boiler 7.5 MMBTU/Hr	950459	9,464,331	13,101,741	13,243,000
Kewanne Boiler 7.5 MMBTU/Hr	950460	9,958,736	13,772,720	13,913,979
Total		**24,296,491**	**33,584,248**	**33,937,395**

Source: Air Quality Compliance Guide, 2004; KB Environmental Sciences, Inc. 2008.

Table E-19 Diesel Emergency Generator Maximum Permitted Annual Hours of Operation

Permit Number	Hours of Operation	Size (hp)	Fuel Usage (gallons)
972648	100	650	966
940098	100	380	133
951081	100	211	312
973586	100	277	417
961289	100	519	755
978266	500	110	2,700
961809	500	755	495
961834	100	900	1,305
972682	100	760	966
978267	500	64	1,650
978268	500	64	1,650
978269	500	64	1,650
980490	200	78	680
Total			**13,679**

Source: Air Quality Compliance Guide, 2004; KB Environmental Sciences, Inc. 2008.

Fuel Storage

The operational characteristics (i.e., fuel types and throughput volumes, storage dimensions, etc.) of the individual fuel storage units at the airport were provided. Emissions were based on estimates and forecasts of airport activity or capacity levels. Fuel storage facility fuel types (i.e., jet fuel, avgas, and gasoline) and throughput data (see **Table E-20**) were obtained from records and adjusted for future years based on forecasted airport operations. Increase in fuel throughput was based on projected increase in LTO. There is no projected increase in general aviation operations.

Emissions from fuel storage and handling were based on the annual fuel use. The emissions factors for fuel storage and handling facilities were obtained from EDMS. The sources of VOC emissions from the storage and handling of fuel include breathing and working losses for storage tanks, and losses from the filling of tanker trucks.

Table E-20 Fuel Throughput (gallons per year)

Fuel Tank	2005	2015 No Action	2020 No Action	2015 Project	2020 Project
Jet A AST	156,983,154	195,818,708	210,040,179	195,818,708	210,040,179
90,000 Jet A UST	979,021	1,221,218	1,309,910	1,221,218	1,309,910
15,000 Gas UST	187,034	233,303	250,247	233,303	250,247
2,400 Avgas UST	29,587	36,907	39,587	36,907	39,587
2,400 Avgas UST	29,587	36,907	39,587	36,907	39,587

Source: Air Quality Compliance Guide, 2004; KB Environmental Sciences, Inc. 2008.

Motor Vehicles

The level of emissions from motor vehicles that would result from the daily operation of airport-related motor vehicles with or without the proposed Alternatives depends on several factors including the volume of vehicles, the vehicle fleet mix, the motor vehicle emission rates, travel distance, speed, the level of congestion/delay, the year of analysis, and meteorological factors.

The California Air Resources Board (CARB) EMFAC2007 program was used to determine THC, NMHC, VOC, SO_2, $PM_{10/2.5}$, NO_x, and CO emission factors for free-flowing and idling motor vehicles. EMFAC2007 input parameters were selected in accordance with guidance. Particulate matter emissions include tire and brake wear. Emission factors under summer and winter conditions (ambient temperature and relative humidity) were determined and the highest values per each pollutant were used. **Tables E-21, E-22, and E-23** present the motor vehicle emission factors for 2005, 2015, and 2020.

Traffic volumes, vehicle speeds, temporal operational profiles, and roadway lengths of airport-related motor vehicles (i.e., patrons, employees and cargo) operating on the internal roadway network, terminal building curbsides and the off-airport traffic, roadway operating conditions (i.e., levels-of-service) were derived from data contained in the Surface Transportation analysis and project layout plans. Motor vehicle volumes, idling duration, and travel distance for vehicles accessing the on-site parking facilities and data for rental car usage were provided. The motor vehicle fleet mix (i.e., cars, vans, trucks, buses, etc.) was taken from the Master Plan. **Tables E-24, E-25, and E-26** present the roadway operational temporal profiles (hourly). Roadway operational profiles for daily and monthly used those for aircraft.

Table E-21 EMFAC2007 Emission Factors (grams/mile or grams/hour) for 2005

	Parking Lots		On-Airport Roadways	Off-Airport Roadways			
Pollutant	**Idle**	**15 mph**	**25 mph**	**25 mph**	**35 mph**	**40 mph**	**45 mph**
THC	2.494	0.405	0.242	0.301	0.218	0.200	0.192
VOC	2.340	0.360	0.209	0.276	0.197	0.179	0.172
NMHC	2.208	0.337	0.194	0.250	0.178	0.163	0.156
CO	22.993	6.043	4.765	5.215	4.381	4.154	4.042
NOx	2.105	0.603	0.534	1.060	0.998	0.995	1.010
SO2	0.033	0.007	0.005	0.010	0.009	0.009	0.008
PM10	0.273	0.054	0.040	0.065	0.054	0.051	0.049
PM2.5	0.220	0.038	0.025	0.047	0.036	0.033	0.032

Source: EMFAC2007; KB Environmental Sciences, Inc. 2007.

Table E-22 EMFAC2007 Emission Factors (grams/mile or grams/hour) for 2015

	Parking Lots		On-Airport Roadways	Off-Airport Roadways			
Pollutant	**Idle**	**15 mph**	**25 mph**	**25 mph**	**35 mph**	**40 mph**	**45 mph**
THC	1.034	0.157	0.091	0.128	0.094	0.086	0.083
VOC	0.920	0.130	0.072	0.114	0.082	0.075	0.073
NMHC	0.859	0.120	0.066	0.101	0.074	0.067	0.065
CO	9.488	2.793	2.294	2.491	2.117	1.995	1.913
NOx	0.964	0.274	0.249	0.527	0.481	0.473	0.476
SO2	0.030	0.006	0.004	0.005	0.004	0.004	0.004
PM10	0.339	0.062	0.044	0.055	0.046	0.044	0.043
PM2.5	0.284	0.045	0.029	0.037	0.029	0.027	0.027

Source: EMFAC2007; KB Environmental Sciences, Inc. 2007.

Table E-23 EMFAC2007 Emission Factors (grams/mile or grams/hour) for 2020

	Parking Lots		On-Airport Roadways	Off-Airport Roadways			
Pollutant	**Idle**	**15 mph**	**25 mph**	**25 mph**	**35 mph**	**40 mph**	**45 mph**
THC	0.781	0.115	0.066	0.098	0.072	0.066	0.064
VOC	0.680	0.093	0.051	0.087	0.063	0.058	0.057
NMHC	0.631	0.085	0.047	0.077	0.056	0.051	0.050
CO	6.806	2.084	1.733	1.884	1.611	1.517	1.451
NOx	0.709	0.202	0.186	0.389	0.349	0.341	0.341
SO2	0.030	0.006	0.004	0.005	0.004	0.004	0.004
PM10	0.350	0.064	0.045	0.052	0.044	0.043	0.042
PM2.5	0.293	0.047	0.029	0.035	0.028	0.026	0.025

Source: EMFAC2007; KB Environmental Sciences, Inc. 2007.

Table E-24 Quarter Hour Operational Profiles for Motor Vehicles

Hour	Employee Parking	Off-Airport	Off-Airport	On-Airport	On-Airport	Rental Parking
0000-0100	0.000	0.010	0.066	0.091	0.090	0.000
0100-0200	0.000	0.000	0.045	0.047	0.050	0.000
0200-0300	0.000	0.000	0.024	0.009	0.014	0.000
0300-0400	0.000	0.000	0.066	0.008	0.024	0.000
0400-0500	0.000	0.000	0.268	0.072	0.175	0.000
0500-0600	0.293	**1.000**	0.673	0.434	0.734	0.352
0600-0700	0.348	0.412	0.628	0.444	0.749	0.364
0700-0800	0.295	0.606	0.664	0.459	0.731	0.420
0800-0900	0.305	0.470	0.695	0.503	0.689	0.465
0900-1000	0.237	0.459	0.700	0.541	0.716	0.701
1000-1100	0.242	0.655	0.824	0.773	0.952	0.796
1100-1200	0.370	0.582	0.944	0.879	**1.000**	0.965
1200-1300	**1.000**	0.750	0.995	0.852	0.997	**1.000**
1300-1400	0.754	0.700	**1.000**	0.818	0.892	0.832
1400-1500	0.436	0.591	0.920	0.837	0.887	0.726
1500-1600	0.314	0.580	0.810	0.663	0.732	0.601
1600-1700	0.320	0.403	0.719	0.627	0.647	0.530
1700-1800	0.340	0.336	0.866	0.770	0.731	0.452
1800-1900	0.000	0.328	0.804	0.807	0.656	0.450
1900-2000	0.000	0.595	0.881	0.957	0.784	0.422
2000-2100	0.000	0.677	0.841	**1.000**	0.800	0.455
2100-2200	0.000	0.655	0.854	0.947	0.753	0.314
2200-2300	0.000	0.009	0.602	0.713	0.579	0.000
2300-2400	0.000	0.009	0.430	0.390	0.313	0.000

Source: HNTB; KB Environmental Sciences, Inc. 2005.

Table E-25 Daily Operational Profiles for Motor Vehicles

Day	Employee Parking	Off-Airport Parking	Off-Airport Roads	On-Airport Parking	On-Airport Roads
Monday	0.78	0.73	**1.00**	**1.00**	**1.00**
Tuesday	0.81	0.75	0.84	0.95	0.80
Wednesday	0.96	0.63	0.89	0.91	0.85
Thursday	**1.00**	0.90	0.98	0.98	0.97
Friday	0.94	**1.00**	0.98	0.98	0.97
Saturday	0.69	0.44	0.72	0.86	0.73
Sunday	0.68	0.91	0.90	0.89	0.93

Source: HNTB; KB Environmental Sciences, Inc. 2005.

Table E-26 Monthly Operational Profiles for Motor Vehicles

Month	Profile
January	0.88
February	0.80
March	0.91
April	0.87
May	0.89
June	0.92
July	0.97
August	**1.00**
September	0.91
October	0.93
November	0.84
December	0.87

Source: FAA Operational and Performance Data for 2005.

Receptors

Based on land use information, sensitive receptors were located in areas within close proximity to SDIA and where the general public could have unrestricted access for one to several hours or longer. These include the school and residential areas of Liberty Station to the west and northwest; Spanish Landing Park and the recreation area along Navy Lagoon to the south and west; and the military installations (MCRC and USCC) to the north and southeast. Other model receptors were placed along the SDIA property boundary approximately 1,000 feet apart as a means of the identifying areas of highest pollutant concentrations at which the public has access.

A total of 33 receptors were included in the analysis. The elevation of each receptor within the modeling domain is determined from the Digital Elevation Model (DEM) data. Receptors are placed at a height of

1.8 meters (typical breathing height) above ground level. **Table E-27** provides a listing of the receptor locations.

Table E-27 Receptor Descriptions

ID	Description
A1	St. Charles Borromeo Parish
A2	Boat Ramp/Dock
A3	Rock Academy (K thru 12)
A4	Spanish Landing Park
A5	Marine Corp Recruit Depot (MCRD)
A6	U.S. Coast Guard Station
B1-B27	Airport Boundary Receptors

Source: KB Environmental Sciences, Inc. 2007

Worst Case Meteorological Data Analysis

Meteorological data (i.e., wind speed, wind direction, temperature, etc.) were used in support of both the emissions inventory and atmospheric dispersion analysis. These data, obtained from the National Climatic Data Center (NCDC), were collected at weather stations located at SDAI (surface data) and Miramar, CA (upper air data). Five years of the most recent data available (2002 through 2006) were obtained.

The purpose of this analysis was to determine which of the five years of meteorological data results in the highest predicted concentrations of air pollutants around San Diego Airport. For consistency, the Existing (2005) conditions at San Diego Airport were analyzed. Because nitrogen oxides (NO_x) are the most indicative of airport operations, it was selected as the assessment pollutant. Using EDMS, the 2005 airport operational data (including aircraft, ground support equipment, stationary sources and motor vehicles operating on the airport and off-site roadways) were combined with the NCDC meteorological data. Five separate EDMS analyses were made; one for each year from 2002 to 2006. Both short- (one hour) and long-term (annual) conditions were analyzed.

The results of the analysis are summarized in **Table E-28**. As shown, the year 2002 meteorological data caused the highest one hour and one of the highest annual NO_x concentrations and represents the worst-case condition. The 2002 one hour NO_x concentration is significantly higher (approximately 15 percent) than the next highest value (in 2005) and the 2002 annual NO_x concentration is within 2 percent of the highest annual concentration (in 2003). Therefore, the 2002 meteorological data represent worst-case conditions and will be used in support of the atmospheric dispersion analysis for the future year conditions at the airport under the No-build and Project Alternatives.

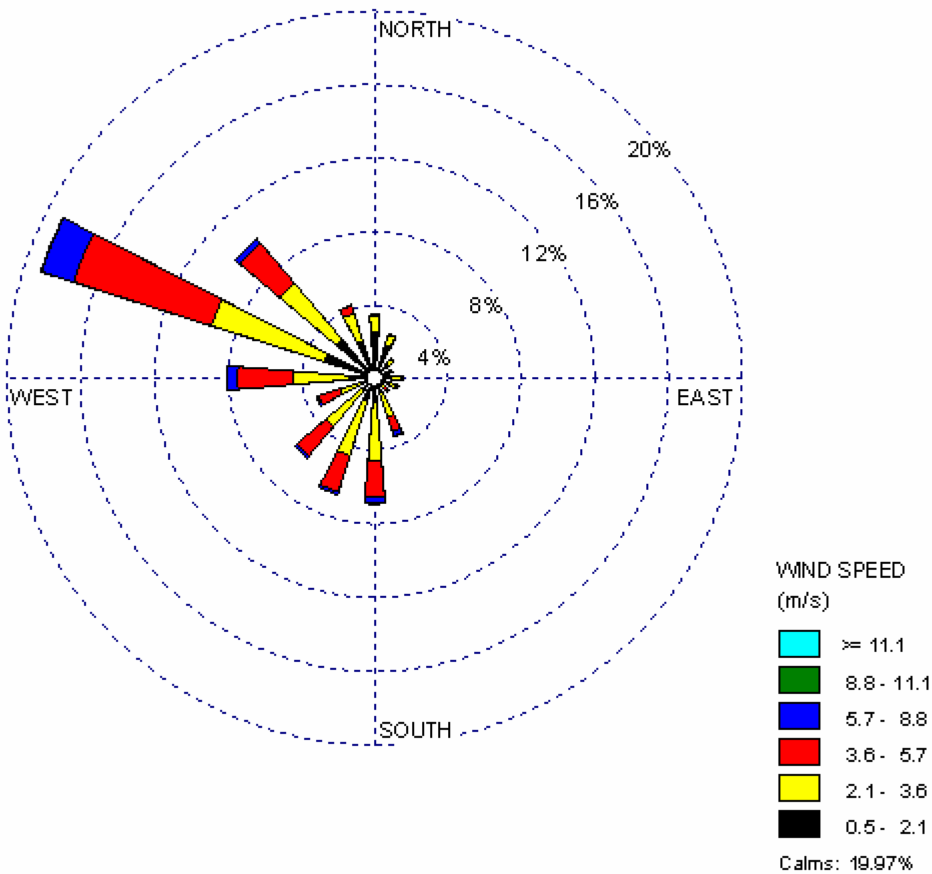
Table E-28 NO_x Concentrations ($\mu g/m^3$) Using Five Years of Meteorological Data

Averaging Period	Year				
	2002	2003	2004	2005	2006
1-Hour	2,170	1,622	1,497	1,719	1,668
Annual	61.9	62.5	58.3	62.8	61.9

Source: KB Environmental Sciences, Inc. 2008.

A wind rose for the five-year period used for the air quality assessment is provided as **Figure E-1** showing a strong dominance of winds from the west-northwest.

Figure E-1 San Diego Airport Wind Rose (2002 through 2006)



NO_x to NO_2 Conversion

Dispersion modeling typically predicts NO_x concentrations, while AAQS are associated with NO_2 concentrations. The combustion process typically forms several types of NO_x. For modeling purposes, the NO_x emissions are typically assumed to be 90 percent (by volume) nitric oxide (NO), and 10 percent NO_2. However, after the flue gas exits the stack, additional NO is created as the exhaust mixes with the surrounding air. The typical atmospheric reactions that create and destroy NO are:

NO + O3 -> NO_2 + O2 (*oxidation of NO by ambient ozone*)

NO + HC -> NO_2 + HC^- (*oxidation of NO by reactive HC*)

NO_2 + sunlight -> NO + O (*photo-dissociation of v*)

Oxidation by ozone is typically the main reaction for NO_2 formation, especially in rural areas. While the reaction rate is essentially instantaneous, the total amount of NO_2 conversion is limited by how quickly the plume entrains surrounding air. Therefore, the amount of NO_2 within the NO_x plume increases as the plume travels and disperses downwind of the stack. The *final* plume NO_x-to-NO_2 ratio will equal the existing ambient NO_x-to-NO_2 ratio. Therefore, once the ambient NO_x-to-NO_2 ratio is established, the predicted NO_2 impact can be determined by multiplying the modeled NO_x concentration by the ambient ratio. **Table E-29** presents the NO_x-to-NO_2 ratio used for this analysis.

Table E-29 NOx to NO2 Conversion Ratio

Pollutant	Averaging Time	Maximum Value	Year	Location
NO2	Annual	0.5405	2005	Beardsley Street

Source: EPA, 2007 http://www.epa.gov/air/data/geosel.html.

Background Concentrations

The dispersion modeling performed for the air quality analysis cannot represent all pollutant sources in proximity to the airport that contribute to total pollutant levels. Therefore, background concentrations were developed to reflect the emissions from nearby sources. When background concentrations are added to the airport dispersion modeling results, the results represent total pollutant concentrations at the receptor sites. Background concentrations are defined as the maximum values observed during the past three years at the downtown monitoring sites except of NO_2. **Table E-30** presents the background concentrations.

For NO_2, the background concentrations were developed based on several different methodologies. The first set of data for NO_2 represent the maximum values observed during the past three years at the downtown monitoring sites. The second set of data for NO_2 represent the concentration during those periods when the wind was blowing from the Airport to the downtown monitoring sites; and thus, strong influence from emissions sources within SDIA. This data would tend to overestimate the background concentration. The third set of data for NO_2 represent the concentration during those periods when the wind was blowing from the downtown monitoring sites to the Airport; and thus, strong influence from emissions sources within the downtown area. The forth set of data for NO_2 is from the Alpine monitoring site which is located to the west of the Airport in a rural environment of San Diego County and can be considered background concentrations without great influence from emissions sources within the Airport or the downtown area.

Table E-30 Background Concentrations

Pollutant	Averaging Time	NAAQS	Highest Measured Value	Year	Location
CO	1-hour	35 ppm (40 mg/m^3)	10.8 ppm	2006	Union Street
	8-hour	9 ppm (10 mg/m^3)	4.7 ppm	2005	12th Ave
NO_2	Annual	0.053 ppm (100 µg/m^3)	0.021 ppm	2006	Beardsley Street
			0.019 ppm	2005	WD from Airport to Downtown
			0.018 ppm	2005	WD towards Airport
			0.011 ppm	2004	Alpine
SO_2	3-hour	0.5 ppm (1,300 µg/m^3)	0.030 ppm	2006	Beardsley Street
	24-hour	0.14 ppm (365 µg/m^3)	0.009 ppm	2006	Beardsley Street
	Annual	0.03 ppm (80 µg/m^3)	0.004 ppm	2006	Beardsley Street
PM_{10}	24-hour	150 µg/m^3	76 µg/m^3	2005	12th Ave
$PM_{2.5}$	24-hour	35 µg/m^3	63 µg/m^3	2006	Beardsley Street
	Annual	15 µg/m^3	15.6 µg/m^3	2005	Beardsley Street
Ozone	8-hour	0.070 ppm (137 µg/m^3)	0.091 ppm	2006	Overland Ave.

Source: EPA, 2007 http://www.epa.gov/air/data/geosel.html.

Dispersion Modeling Results

Predicted concentrations resulting from the sources associated with each alternative were added to background concentrations that represent sources in the vicinity of the airport that were not included in the modeling effort. **Tables E-31 through E-37** contains the dispersion modeling result for all pollutants at each receptor for the Existing for 2005, No Action, and Project Alternatives for 2015 and 2020.

Table E-31 Existing 2005 Dispersion Modeling Results (µg/m^3)

	Maximum Predicted Concentration (µg/m^3)								
	CO		NO2	PM10	PM2.5		SO2		
Receptor ID	1-Hour	8-Hour	Annual	24-Hour	24-Hour	Annual	3-Hour	24-Hour	Annual
Sensitive Receptors									
A1	14,171	5,612	78	64	16	92	26	11	14,171
A2	15,028	5,666	77	64	16	98	27	11	15,028
A3	15,167	5,691	78	64	16	106	28	11	15,167
A4	15,307	6,410	80	65	16	112	29	11	15,307
A5	14,044	5,864	79	64	16	89	26	11	14,044
A6	15,812	6,530	82	66	17	109	32	13	15,812
Fenceline Receptors									
B1	16,221	6,017	81	67	17	126	37	16	16,221
B2	16,407	6,400	82	66	17	113	34	14	16,407
B3	18,522	6,723	83	67	17	114	33	14	18,522
B4	16,366	6,595	81	66	17	108	32	13	16,366
B5	17,236	6,563	82	66	17	111	32	13	17,236
B6	16,737	6,546	82	66	17	116	31	13	16,737
B7	16,241	6,514	81	66	17	112	31	13	16,241
B8	15,467	6,550	81	66	17	112	30	12	15,467
B9	15,334	6,421	80	66	16	113	30	12	15,334
B10	15,713	6,225	79	65	16	113	30	12	15,713
B11	16,395	6,260	79	64	16	119	31	11	16,395
B12	17,225	6,406	79	64	16	120	31	11	17,225
B13	19,008	6,320	79	64	16	152	36	11	19,008
B14	15,833	5,791	78	64	16	101	27	11	15,833
B15	14,723	5,960	78	64	16	100	27	11	14,723
B16	14,555	5,885	78	64	16	102	29	12	14,555
B17	14,897	5,973	79	64	16	107	29	12	14,897
B18	15,112	6,186	79	65	16	113	30	12	15,112
B19	15,302	5,978	79	65	16	114	30	13	15,302
B20	15,236	5,936	79	65	16	96	28	12	15,236
B21	15,408	6,079	80	65	16	94	28	11	15,408
B22	15,499	6,263	81	66	17	94	27	12	15,499
B23	16,442	6,804	83	67	17	87	26	12	16,442
B24	17,359	6,717	83	67	17	88	26	12	17,359
B25	17,851	6,430	83	67	17	100	28	12	17,851
B26	16,973	6,204	81	66	17	110	30	13	16,973
B27	16,847	6,186	82	66	17	140	37	14	16,847

Source: KB Environmental Sciences, Inc. 2008.

Table E-32 No Action 2015 Dispersion Modeling Results (μg/m³)

	Maximum Predicted Concentration (μg/m³)								
	CO		NO2	PM10	PM2.5		SO2		
Receptor ID	1-Hour	8-Hour	Annual	24-Hour	24-Hour	Annual	3-Hour	24-Hour	Annual
Sensitive Receptors									
A1	13,165	5,402	77	63	16	102	28	11	13,165
A2	13,410	5,482	77	64	16	102	28	11	13,410
A3	13,910	5,494	78	64	16	115	30	11	13,910
A4	13,952	5,904	80	65	16	113	30	11	13,952
A5	13,215	5,492	79	64	16	100	28	11	13,215
A6	14,199	5,814	81	66	17	105	32	13	14,199
Fenceline Receptors									
B1	13,836	5,705	82	67	18	138	41	17	13,836
B2	14,591	5,846	82	66	17	109	38	14	14,591
B3	15,554	6,066	84	67	17	113	34	14	15,554
B4	14,539	6,022	81	66	17	111	32	13	14,539
B5	14,849	5,969	82	66	17	116	32	13	14,849
B6	15,030	5,828	82	66	17	121	32	12	15,030
B7	14,628	5,784	82	66	17	124	32	12	14,628
B8	14,145	5,912	81	66	17	117	31	12	14,145
B9	14,043	5,911	81	66	16	115	31	12	14,043
B10	13,943	5,804	80	65	16	124	32	11	13,943
B11	14,070	5,707	79	65	16	129	32	11	14,070
B12	15,061	5,886	79	64	16	127	32	11	15,061
B13	15,456	5,728	79	64	16	138	34	11	15,456
B14	13,700	5,507	77	64	16	103	28	11	13,700
B15	13,596	5,522	77	64	16	105	28	11	13,596
B16	13,556	5,525	78	64	16	108	29	11	13,556
B17	13,512	5,569	78	64	16	113	30	12	13,512
B18	13,721	5,624	79	64	16	121	31	12	13,721
B19	13,936	5,567	79	65	16	125	32	13	13,936
B20	13,562	5,541	80	65	16	116	31	12	13,562
B21	13,958	5,685	80	65	16	86	27	11	13,958
B22	14,074	5,800	82	65	16	87	26	11	14,074
B23	14,456	5,968	83	67	17	87	27	11	14,456
B24	14,395	5,949	83	66	17	89	27	12	14,395
B25	14,871	5,867	83	66	17	96	29	12	14,871
B26	14,737	5,755	82	66	17	113	33	13	14,737
B27	14,923	5,720	82	66	17	138	37	14	14,923

Source: KB Environmental Sciences, Inc. 2008.

Table E-33 No Action 2020 Dispersion Modeling Results (µg/m^3)

	Maximum Predicted Concentration (µg/m^3)								
	CO		NO2	PM10	PM2.5		SO2		
Receptor ID	1-Hour	8-Hour	Annual	24-Hour	24-Hour	Annual	3-Hour	24-Hour	Annual
Sensitive Receptors									
A1	13,016	5,373	77	64	16	102	28	11	13,016
A2	13,152	5,411	77	64	16	99	27	11	13,152
A3	13,541	5,422	78	64	16	110	29	11	13,541
A4	13,840	5,713	80	66	16	117	30	11	13,840
A5	13,054	5,468	79	64	16	103	28	11	13,054
A6	13,876	5,720	82	66	17	112	33	13	13,876
Fenceline Receptors									
B1	13,908	5,690	82	67	18	133	43	18	13,908
B2	14,152	5,697	82	66	17	113	39	15	14,152
B3	14,839	5,905	84	67	17	115	35	14	14,839
B4	14,016	5,763	81	66	17	113	33	13	14,016
B5	14,409	5,746	82	66	17	121	32	13	14,409
B6	14,544	5,675	82	66	17	125	33	13	14,544
B7	14,208	5,626	82	66	17	121	32	12	14,208
B8	13,904	5,730	82	66	17	122	32	12	13,904
B9	13,855	5,717	81	66	16	120	31	12	13,855
B10	13,625	5,624	80	65	16	122	31	11	13,625
B11	13,673	5,583	79	65	16	125	32	11	13,673
B12	14,361	5,649	78	65	16	125	32	11	14,361
B13	15,138	5,675	80	64	16	165	38	11	15,138
B14	13,441	5,419	77	64	16	101	27	11	13,441
B15	13,228	5,427	77	64	16	102	28	11	13,228
B16	13,256	5,439	78	64	16	104	28	12	13,256
B17	13,129	5,448	78	64	16	109	30	12	13,129
B18	13,205	5,489	78	64	16	116	31	12	13,205
B19	13,514	5,498	79	65	16	119	32	13	13,514
B20	13,452	5,498	79	64	16	119	31	12	13,452
B21	13,649	5,583	80	65	16	89	27	11	13,649
B22	13,745	5,674	82	65	16	89	27	11	13,745
B23	13,996	5,792	83	66	17	88	27	12	13,996
B24	13,968	5,779	83	66	17	89	27	12	13,968
B25	14,295	5,712	82	66	17	100	30	12	14,295
B26	14,181	5,623	81	66	17	118	33	13	14,181
B27	14,322	5,619	82	67	17	167	42	15	14,322

Source: KB Environmental Sciences, Inc. 2008.

Table E-34 West Terminal Alternative 2015 Dispersion Modeling Results ($\mu g/m^3$)

	Maximum Predicted Concentration ($\mu g/m^3$)								
	CO		NO2	PM10	PM2.5		SO2		
Receptor ID	1-Hour	8-Hour	Annual	24-Hour	24-Hour	Annual	3-Hour	24-Hour	Annual
Sensitive Receptors									
A1	13,157	5,396	77	64	16	81	26	11	13,157
A2	13,179	5,472	77	64	16	81	27	11	13,179
A3	13,881	5,474	78	64	16	83	29	11	13,881
A4	14,085	5,813	80	65	16	84	30	11	14,085
A5	13,215	5,492	79	64	16	81	27	11	13,215
A6	14,191	5,769	81	66	17	86	32	13	14,191
Fenceline Receptors									
B1	13,878	5,722	82	67	18	96	42	17	13,878
B2	14,626	5,824	82	66	17	91	37	14	14,626
B3	15,588	6,090	84	67	17	88	34	14	15,588
B4	14,527	5,907	81	66	17	86	32	13	14,527
B5	14,843	5,940	82	66	17	88	34	13	14,843
B6	15,061	5,854	82	66	17	86	32	12	15,061
B7	14,677	5,747	82	66	17	86	32	12	14,677
B8	14,296	5,878	81	66	17	86	31	12	14,296
B9	14,189	5,848	81	66	16	85	31	12	14,189
B10	13,973	5,704	80	65	16	86	31	12	13,973
B11	13,949	5,730	79	65	16	86	31	11	13,949
B12	15,136	5,909	79	65	16	86	31	11	15,136
B13	15,963	5,865	79	64	16	89	35	11	15,963
B14	13,455	5,583	77	64	16	82	28	11	13,455
B15	13,213	5,448	77	64	16	82	28	11	13,213
B16	13,259	5,451	78	64	16	83	28	11	13,259
B17	13,291	5,534	78	64	16	83	29	12	13,291
B18	13,650	5,579	78	64	16	85	30	12	13,650
B19	13,644	5,577	79	65	16	86	31	13	13,644
B20	13,562	5,541	80	65	16	83	29	12	13,562
B21	13,958	5,686	80	65	16	82	27	11	13,958
B22	14,074	5,800	82	65	16	81	27	11	14,074
B23	14,457	5,969	83	67	17	81	27	11	14,457
B24	14,399	5,951	83	66	17	82	27	12	14,399
B25	14,878	5,884	83	66	17	85	31	12	14,878
B26	14,740	5,732	82	66	17	87	32	13	14,740
B27	14,926	5,722	82	66	17	92	38	14	14,926

Source: KB Environmental Sciences, Inc. 2008.

Table E-35 West Terminal Alternative 2020 Dispersion Modeling Results (µg/m^3)

	Maximum Predicted Concentration (µg/m^3)								
	CO		NO2	PM10	PM2.5		SO2		
Receptor ID	1-Hour	8-Hour	Annual	24-Hour	24-Hour	Annual	3-Hour	24-Hour	Annual
Sensitive Receptors									
A1	13,016	5,362	77	63	16	102	28	11	13,016
A2	13,243	5,384	78	64	16	107	29	11	13,243
A3	13,657	5,438	78	64	16	113	30	11	13,657
A4	13,735	5,719	81	66	16	116	31	12	13,735
A5	13,049	5,469	79	64	16	102	28	11	13,049
A6	13,874	5,689	82	67	17	109	33	13	13,874
Fenceline Receptors									
B1	14,049	5,729	82	67	18	137	43	18	14,049
B2	14,219	5,699	82	66	17	114	38	15	14,219
B3	14,879	5,931	84	67	17	117	35	14	14,879
B4	14,057	5,728	81	66	17	112	33	13	14,057
B5	14,414	5,753	82	66	17	121	33	13	14,414
B6	14,581	5,702	82	66	17	124	32	13	14,581
B7	14,263	5,634	82	66	17	128	33	12	14,263
B8	13,965	5,786	82	66	17	118	32	12	13,965
B9	13,853	5,751	81	66	16	116	31	12	13,853
B10	13,721	5,625	80	65	16	128	33	12	13,721
B11	13,504	5,632	80	65	16	132	33	11	13,504
B12	14,490	5,747	79	65	16	132	33	11	14,490
B13	14,994	5,651	79	64	16	147	35	11	14,994
B14	13,583	5,443	78	64	16	109	29	11	13,583
B15	13,216	5,398	78	64	16	110	29	11	13,216
B16	13,242	5,423	78	64	16	112	29	12	13,242
B17	13,035	5,425	78	64	16	116	30	12	13,035
B18	13,138	5,441	79	64	16	124	32	12	13,138
B19	13,443	5,449	79	65	16	127	33	13	13,443
B20	13,453	5,498	79	64	16	117	31	12	13,453
B21	13,650	5,584	80	65	16	91	27	11	13,650
B22	13,746	5,674	82	65	16	90	27	11	13,746
B23	13,997	5,792	83	66	17	89	27	12	13,997
B24	13,974	5,780	83	66	17	91	27	12	13,974
B25	14,301	5,723	82	66	17	104	31	12	14,301
B26	14,184	5,637	81	66	17	117	33	13	14,184
B27	14,325	5,620	82	67	17	168	42	15	14,325

Source: KB Environmental Sciences, Inc. 2008.

Table E-36 East Terminal Alternative 2015 Dispersion Modeling Results (μg/m^3)

	Maximum Predicted Concentration (μg/m^3)								
	CO		NO2	PM10	PM2.5		SO2		
Receptor ID	1-Hour	8-Hour	Annual	24-Hour	24-Hour	Annual	3-Hour	24-Hour	Annual
Sensitive Receptors									
A1	13,144	5,397	77	64	16	102	28	11	13,144
A2	13,371	5,462	77	64	16	102	28	11	13,371
A3	13,864	5,493	78	64	16	115	30	11	13,864
A4	13,952	5,873	80	65	16	113	30	11	13,952
A5	13,215	5,492	79	64	16	100	28	11	13,215
A6	14,188	5,804	81	66	17	105	32	13	14,188
Fenceline Receptors									
B1	13,834	5,704	82	67	18	139	41	17	13,834
B2	14,544	5,833	82	66	17	109	38	14	14,544
B3	15,506	6,049	84	67	17	113	34	14	15,506
B4	14,523	5,973	81	66	17	110	32	13	14,523
B5	14,797	6,016	82	66	17	116	32	13	14,797
B6	14,928	5,807	82	66	17	121	32	13	14,928
B7	14,561	5,750	82	66	17	124	32	12	14,561
B8	14,116	5,906	81	66	17	117	31	12	14,116
B9	14,041	5,885	81	66	16	115	31	12	14,041
B10	13,853	5,763	80	65	16	124	32	11	13,853
B11	14,003	5,760	79	65	16	129	32	11	14,003
B12	14,869	5,876	79	65	16	127	32	11	14,869
B13	15,913	5,804	79	64	16	140	34	11	15,913
B14	13,621	5,556	77	64	16	103	28	11	13,621
B15	13,531	5,467	77	64	16	105	28	11	13,531
B16	13,545	5,490	78	64	16	108	29	12	13,545
B17	13,300	5,520	78	64	16	113	30	12	13,300
B18	13,441	5,533	79	64	16	121	31	12	13,441
B19	13,708	5,530	79	65	16	125	32	13	13,708
B20	13,562	5,541	80	65	16	116	31	12	13,562
B21	13,958	5,686	80	65	16	86	27	11	13,958
B22	14,074	5,800	82	65	16	87	26	11	14,074
B23	14,457	5,969	83	67	17	87	27	11	14,457
B24	14,398	5,950	83	66	17	89	27	12	14,398
B25	14,877	5,883	83	67	17	99	30	12	14,877
B26	14,740	5,760	82	66	17	112	32	13	14,740
B27	14,926	5,722	82	66	17	139	37	14	14,926

Source: KB Environmental Sciences, Inc. 2008.

Table E-37 East Terminal Alternative 2020 Dispersion Modeling Results ($\mu g/m^3$)

	Maximum Predicted Concentration ($\mu g/m^3$)								
	CO		NO2	PM10	PM2.5		SO2		
Receptor ID	1-Hour	8-Hour	Annual	24-Hour	24-Hour	Annual	3-Hour	24-Hour	Annual
Sensitive Receptors									
A1	13,022	5,363	77	64	16	100	27	11	13,022
A2	13,193	5,391	77	64	16	104	28	11	13,193
A3	13,641	5,437	78	64	16	113	29	11	13,641
A4	13,936	5,707	80	66	16	120	31	11	13,936
A5	13,049	5,469	79	64	16	100	28	11	13,049
A6	13,873	5,719	82	66	17	108	33	13	13,873
Fenceline Receptors									
B1	13,802	5,658	81	67	18	134	42	18	13,802
B2	14,129	5,722	82	66	17	110	38	15	14,129
B3	14,799	5,918	84	67	17	115	35	14	14,799
B4	13,994	5,790	81	66	17	114	33	13	13,994
B5	14,377	5,820	82	66	17	122	33	13	14,377
B6	14,470	5,680	82	66	17	127	33	13	14,470
B7	14,161	5,626	81	66	17	124	33	12	14,161
B8	13,996	5,752	81	66	17	124	32	12	13,996
B9	13,949	5,721	81	66	16	123	32	12	13,949
B10	13,607	5,599	80	65	16	125	32	12	13,607
B11	13,687	5,580	79	65	16	130	33	11	13,687
B12	14,206	5,639	79	65	16	127	33	11	14,206
B13	15,562	5,746	80	64	16	159	37	11	15,562
B14	13,444	5,414	77	64	16	105	28	11	13,444
B15	13,210	5,403	78	64	16	108	29	11	13,210
B16	13,262	5,414	78	64	16	110	29	12	13,262
B17	13,076	5,422	78	64	16	114	30	12	13,076
B18	13,095	5,448	79	64	16	122	31	13	13,095
B19	13,352	5,453	79	65	16	125	32	13	13,352
B20	13,453	5,498	80	65	16	114	30	12	13,453
B21	13,650	5,584	80	65	16	88	27	11	13,650
B22	13,745	5,674	82	65	16	88	27	11	13,745
B23	13,997	5,792	83	66	17	89	27	12	13,997
B24	13,973	5,779	83	66	17	90	27	12	13,973
B25	14,301	5,722	82	66	17	99	31	12	14,301
B26	14,184	5,641	81	66	17	109	33	13	14,184
B27	14,324	5,598	82	66	17	156	40	15	14,324

Source: KB Environmental Sciences, Inc. 2008.

Construction Activities

Emissions from construction activities were estimated based on the projected construction activity schedule, the number of vehicles/pieces of equipment, and vehicle/equipment utilization rates. Emissions from several components of construction activities were evaluated. These included emissions from on-site construction equipment (i.e., backhoes, bulldozers, graders, etc.); haul vehicles (i.e., cement trucks, dump trucks, etc.); and construction worker vehicles getting to and from the site. Construction activities for individual projects would begin in 2008 and extend through the year 2012.

Data regarding the number of pieces and types of construction equipment to be used on the project, the deployment schedule of equipment (monthly and annually), and the approximate daily operating time were estimated for each individual construction project based on a schedule of construction activity.

To calculate emissions that would result from the construction activities, an estimate of daily equipment requirements for each general construction activity (i.e., demolition, earthwork, building construction, subgrade preparation and paving) was made. Equipment requirements were then assigned to each activity. The types of equipment include (but are limited to) motor graders, rollers, water trucks, loaders, cranes, drill rigs, pavers, asphalt spreaders, excavators, pickup trucks and dual tandem trucks. Emission factors for each equipment type were applied to the anticipated equipment work output (horsepower-hours of expected equipment use or hours of operation). Operating times for the equipment were based on a six-day workweek and a 12-hour workday during which the equipment would be running continuously except for two 15-minute breaks and a 1-hour lunch break. **Table E-38** presents the construction equipment for this project, along with the size, fuel, and load factors for the equipment. **Tables E-39 through E-43** present the CARB OFFROAD emission factors for 2008 through 2012, respectively.

Table E-38 Construction Equipment Information

Equipment	SCC	Size (hp)	Load Factor	Fuel
Cranes	2270002045	208	0.43	D
Forklifts	2270003020	149	0.3	D
Generator Sets	2270006005	84	0.74	D
Other Construction Equipment	2270002081	13	0.62	D
Off-Highway Trucks	2270002051	381	0.57	D
Air Compressors	2270006015	78	0.48	D
Bore/Drill Rigs	2270002033	82	0.75	D
Paving Equipment	2270002021	82	0.53	D
Rubber Tired Dozers	2270002063	358	0.59	D
Pumps	2270006010	84	0.74	D
Other Construction Equipment	2270002081	327	0.62	D
Graders	2270002048	162	0.61	D
Aerial Lifts	2270003010	34	0.46	D
Plate Compactors	2270002009	8	0.43	D
Concrete/Industrial Saws	2270002039	81	0.73	D
Pavers	2270002003	89	0.62	D
Rollers	2270002015	84	0.56	D
Tractors/Loaders/Backhoes	2270002066	75	0.55	D
Welders	2270006025	46	0.45	D
Plate Compactors	2260002009	4	0.55	G2

Source: CARB OFFROAD2007; KB Environmental Sciences, Inc. 2007.

Table E-39 Construction Equipment Emission Factors for 2008

Equipment	ROG	CO	NOx	SOx	PM10
Cranes	0.30	0.84	3.02	0.003	0.12
Forklifts	0.26	1.01	1.95	0.002	0.12
Generator Sets	0.82	2.76	5.28	0.005	0.41
Other Construction Equipment	0.41	2.15	2.61	0.005	0.16
Off-Highway Trucks	0.32	1.04	3.16	0.003	0.12
Air Compressors	0.63	1.96	3.72	0.003	0.33
Bore/Drill Rigs	0.57	2.73	4.18	0.005	0.33
Paving Equipment	0.79	2.31	4.61	0.004	0.40
Rubber Tired Dozers	0.49	2.51	4.43	0.003	0.19
Pumps	0.85	2.80	5.36	0.005	0.42
Other Construction Equipment	0.27	0.98	3.16	0.003	0.11
Graders	0.55	2.09	4.28	0.004	0.24
Aerial Lifts	1.08	2.63	2.69	0.003	0.27
Plate Compactors	0.29	1.49	1.86	0.004	0.12
Concrete/Industrial Saws	0.86	2.85	5.39	0.005	0.44
Pavers	0.93	2.73	5.42	0.004	0.47
Rollers	0.74	2.30	4.42	0.004	0.38
Tractors/Loaders/Backhoes	0.66	2.24	3.94	0.004	0.36
Welders	1.29	3.03	2.73	0.003	0.30
Plate Compactors	2.87	123.56	2.16	0.010	1.98

Source: KB Environmental Sciences, Inc. 2007

Table E-40 Construction Equipment Emission Factors for 2009

Equipment	ROG	CO	NOx	SOx	PM10
Cranes	0.29	0.80	2.86	0.003	0.11
Forklifts	0.24	1.01	1.80	0.002	0.11
Generator Sets	0.78	2.74	5.05	0.005	0.39
Other Construction Equipment	0.41	2.15	2.58	0.005	0.13
Off-Highway Trucks	0.31	0.96	2.95	0.003	0.11
Air Compressors	0.60	1.95	3.57	0.003	0.32
Bore/Drill Rigs	0.48	2.69	3.77	0.005	0.29
Paving Equipment	0.75	2.28	4.40	0.004	0.38
Rubber Tired Dozers	0.47	2.35	4.24	0.003	0.18
Pumps	0.80	2.78	5.13	0.005	0.41
Other Construction Equipment	0.25	0.90	2.94	0.003	0.10
Graders	0.52	2.08	4.03	0.004	0.23
Aerial Lifts	1.03	2.59	2.66	0.003	0.26
Plate Compactors	0.29	1.49	1.82	0.004	0.10
Concrete/Industrial Saws	0.81	2.81	5.09	0.005	0.42
Pavers	0.88	2.69	5.17	0.004	0.45
Rollers	0.69	2.28	4.20	0.004	0.36
Tractors/Loaders/Backhoes	0.60	2.21	3.67	0.004	0.34
Welders	1.23	2.98	2.70	0.003	0.29
Plate Compactors	2.87	123.56	2.16	0.010	1.98

Source: KB Environmental Sciences, Inc. 2007

Table E-41 Construction Equipment Emission Factors for 2010

Equipment	ROG	CO	NOx	SOx	PM10
Cranes	0.27	0.75	2.70	0.003	0.10
Forklifts	0.22	1.00	1.66	0.002	0.10
Generator Sets	0.73	2.71	4.82	0.005	0.38
Other Construction Equipment	0.41	2.15	2.57	0.005	0.11
Off-Highway Trucks	0.30	0.90	2.76	0.003	0.10
Air Compressors	0.57	1.93	3.41	0.003	0.31
Bore/Drill Rigs	0.40	2.66	3.40	0.005	0.25
Paving Equipment	0.71	2.26	4.20	0.004	0.37
Rubber Tired Dozers	0.46	2.20	4.06	0.003	0.17
Pumps	0.76	2.75	4.89	0.005	0.39
Other Construction Equipment	0.24	0.84	2.75	0.003	0.09
Graders	0.49	2.07	3.79	0.004	0.22
Aerial Lifts	0.97	2.53	2.62	0.003	0.25
Plate Compactors	0.29	1.49	1.80	0.004	0.09
Concrete/Industrial Saws	0.75	2.78	4.81	0.005	0.40
Pavers	0.83	2.66	4.93	0.004	0.44
Rollers	0.65	2.25	3.98	0.004	0.35
Tractors/Loaders/Backhoes	0.55	2.19	3.43	0.004	0.31
Welders	1.17	2.92	2.66	0.003	0.28
Plate Compactors	2.87	123.56	2.16	0.010	1.98

Source: KB Environmental Sciences, Inc. 2007.

Table E-42 Construction Equipment Emission Factors for 2011

Equipment	ROG	CO	NOx	SOx	PM10
Cranes	0.26	0.71	2.51	0.003	0.09
Forklifts	0.20	1.00	1.54	0.002	0.09
Generator Sets	0.69	2.69	4.58	0.005	0.36
Other Construction Equipment	0.41	2.15	2.57	0.005	0.10
Off-Highway Trucks	0.28	0.84	2.53	0.003	0.09
Air Compressors	0.54	1.92	3.24	0.003	0.30
Bore/Drill Rigs	0.33	2.63	3.08	0.005	0.22
Paving Equipment	0.67	2.23	4.01	0.004	0.36
Rubber Tired Dozers	0.44	2.05	3.85	0.003	0.16
Pumps	0.71	2.73	4.65	0.005	0.38
Other Construction Equipment	0.22	0.79	2.51	0.003	0.08
Graders	0.46	2.07	3.56	0.004	0.21
Aerial Lifts	0.91	2.46	2.58	0.003	0.23
Plate Compactors	0.28	1.49	1.78	0.004	0.07
Concrete/Industrial Saws	0.70	2.76	4.54	0.005	0.38
Pavers	0.79	2.63	4.71	0.004	0.42
Rollers	0.61	2.23	3.78	0.004	0.33
Tractors/Loaders/Backhoes	0.50	2.17	3.20	0.004	0.29
Welders	1.10	2.85	2.62	0.003	0.26
Plate Compactors	8.65	13.52	0.00	0.029	0.10

Source: KB Environmental Sciences, Inc. 2007.

Table E-43 Construction Equipment Emission Factors for 2012

Equipment	ROG	CO	NOx	SOx	PM10
Cranes	0.24	0.68	2.34	0.003	0.08
Forklifts	0.19	1.01	1.41	0.002	0.08
Generator Sets	0.64	2.66	4.31	0.005	0.34
Other Construction Equipment	0.41	2.15	2.57	0.005	0.10
Off-Highway Trucks	0.27	0.79	2.32	0.003	0.08
Air Compressors	0.51	1.90	3.05	0.003	0.28
Bore/Drill Rigs	0.28	2.61	2.78	0.005	0.18
Paving Equipment	0.64	2.21	3.81	0.004	0.34
Rubber Tired Dozers	0.42	1.92	3.65	0.003	0.15
Pumps	0.66	2.71	4.38	0.005	0.35
Other Construction Equipment	0.21	0.75	2.30	0.003	0.08
Graders	0.44	2.06	3.34	0.004	0.19
Aerial Lifts	0.84	2.39	2.54	0.003	0.22
Plate Compactors	0.28	1.49	1.78	0.004	0.07
Concrete/Industrial Saws	0.65	2.73	4.27	0.005	0.36
Pavers	0.75	2.60	4.48	0.004	0.40
Rollers	0.57	2.21	3.57	0.004	0.31
Tractors/Loaders/Backhoes	0.46	2.15	2.97	0.004	0.26
Welders	1.02	2.77	2.58	0.003	0.25
Plate Compactors	2.87	123.56	2.16	0.010	1.98

Source: KB Environmental Sciences, Inc. 2007.

The construction-related emission inventories were calculated using emission factors obtained from the CARB's OFFROAD2007 and EMFAC2007 as well as USEPA's Compilation of Air Pollutant Emission Factors (AP-42) and URBEMIS for fugitive dust.

The following equations were used to develop emission factors:

*Emission Rate (tons/month) = Emission Factor (g/hp-hr) * size (hp) * usage factor (%) * 12 hours per day * 24 days/month * Load Factor * (453.59/2000)*

*Emission Rate (tons/month) = Emission Factor (g/mile) * speed (miles/hour) * usage factor (%) * 12 hours per day * 24 days/month *(453.59/2000)*

Fugitive particulate matter emissions (emissions in the ambient air that result from anthropogenic (manmade) sources other than point sources) would also occur from the handling of raw materials for construction purposes. The methodology used to estimate the level of particulate emissions from this activity is provided by URBEMIS as a factor of 26.4 pounds per day per acre disturbed. A daily maximum disturbed acreage of 16 acres was assumed and an annual average daily disturbed acreage of 4 acres was assumed. $PM_{2.5}$ was assumed to be 10 percent of PM_{10}. Finally, control efficiency due to watering daily was also assumed.

CO Intersection Analysis

The dispersion model used for CO Hot-spot Analysis is CAL3QHC: the EPA-preferred model for the assessment of CO concentrations near roadways and intersections.[4] Emissions factors were obtained from EMFAC2007 based upon input parameters such as fleet mix and ambient temperatures.

[4] User's Guide to CAL3QHC Version 2: A Modeling Methodology for Predicting Pollutant Concentration near Roadway Intersections, EPA-454/R-92-006, U.S. Environmental Protection Agency, Research Triangle Park, NC, November 1992.

The most recent version of CAL3QHC (Version 95221) was used for the dispersion analysis. CAL3QHC is an EPA-approved "micro-scale" atmospheric dispersion computer model that combines roadway design and operational parameters, motor vehicle emission factors and meteorological conditions to predict pollution concentrations at specified receptor locations along roadways, interchanges, or intersections.

The following meteorological conditions and input parameters were used:

- Stability Class: D (neutral atmosphere)
- Wind Speed: 1 meter per second (m/s)
- Wind Directions: 360° in 10° increments, then refined to 1° increments
- Mixing Height: 1,000 meters (m)
- Surface Roughness: 100 centimeters (cm)
- Saturation Flow Rate: 1,800 vehicles per hour (vehicles/hr)

Receptors were located at the corners of each intersection and at distances of 25 m, 50 m, and 100 m from the corner receptor along both the approach and departure lane for a total of 28 receptors at each intersection.[5] The receptors were also placed approximately 10 feet from the edge of the roadways since this is where the maximum CO concentrations are expected to occur and also where the public has access.

To account for the affects of CO sources that were not included in the modeling, worst-case "background" CO levels recorded at the air monitoring station in downtown San Diego were added to the results. Following standard conventions, a 1-to-8 hour conversion factor of 0.7 was used to calculate the 8-hour concentrations from the modeled 1 hour.

HAP Emissions Inventory

In recent years, public and agency interest has increased regarding the contribution of airports to hazardous air pollutants (HAPs).[6] HAPs are gaseous organic and inorganic chemicals and particulate matter that are either known or suspected to cause cancer (to be carcinogenic) or known or suspected to cause other serious health effects (non-carcinogenic). In response to Scoping comments from agencies and the public, an evaluation related to HAP emissions was undertaken. To identify a quantity of an individual HAP, speciation factors are used. These factors estimate the quantity of an individual HAP based on emissions of volatile organic compounds and particulate matter. Nationwide, limited testing has been performed to identify and quantify HAP emissions levels associated with airport sources in general and aircraft engines in particular.

Based on the information obtained from resources[7], the HAPs selected for this analysis comprise the following:

- 1,3-Butadiene – most commonly formed during the combustion of fossil fuels, also found in tobacco smoke and a known human carcinogen by inhalation.

- Acetaldehyde – a byproduct of the combustion of fuels and tobacco smoke. Acute exposure may result in eye and respiratory tract irritation. Chronic exposure may result in skin irritations.

- Acrolein - formed during the combustion of fossil fuels, wood, tobacco, and from the heating of cooking oils; a possible non-cancer health hazard usually limited to eye irritation.

- Benzene - a human carcinogen formed during the combustion of fossil fuels, contained in motor vehicle exhaust and an evaporative component of gasoline. Acute exposures can result in irritation of the respiratory tract and chronic exposures can result in blood disorders.

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[5] Receptors are defined as locations where the general public has unrestricted access.

[6] HAPs are also referred to as toxic air contaminants and, more generally, as air toxics.

[7] FAA, *Select Resource Materials and Annotated Bibliography on the Topic of Hazardous Air Pollutants (HAPs) Associated with Aircraft, Airports and Aviation,* prepared for the Office of Environment and Energy, July 1, 2003.

- Diesel Particulate Matter (diesel PM) – regulated as a human carcinogen in California and formed from the combustion of diesel fuels in motor vehicles, construction and farm equipment and other off-road machinery.
- Formaldehyde – similar to acrolein (discussed above) and considered to be the most prevalent species of HAPs in aircraft engine exhaust.

These six HAPs were selected as they have the combined characteristics of being those that are normally associated with airports.

The HAPs emissions inventory for the Existing (2005) Conditions, No Action, West Terminal Alternative, and East Terminal Alternative are presented in **Tables E-44 through E-50** and present the HAP emissions by source category. Generally, aircraft tends to be the greatest contributor of acetaldehyde, acrolein, 1,3-butadiene, and formaldehyde. Motor vehicles tend to be the greatest contributor of acetaldehyde, benzene, and diesel particulate matter.

Table E-44 Existing (2005) Conditions Emissions of HAPs (tons/year)

HAP Species	Aircraft	GSE/APU	Motor Vehicles	Stationary Sources	Total
Acetaldehyde	1.84	0.30	1.01	0.00	3.16
Acrolein	0.85	0.03	0.14	0.00	1.03
Benzene	1.89	0.74	2.13	0.02	4.79
1,3-butadiene	1.41	0.14	0.41	0.00	1.96
Formaldehyde	11.09	0.56	2.90	0.00	14.60
DPM	-	1.74	2.45	0.55	4.74

HAPs Hazardous air pollutants
DPM Diesel particulate matter

Table E-45 No Action 2015 Emissions of HAPs (tons/year)

HAP Species	Aircraft	GSE/APU	Motor Vehicles	Stationary Sources	Total
Acetaldehyde	2.16	0.14	0.62	0.00	2.94
Acrolein	1.01	0.01	0.07	0.00	1.10
Benzene	2.15	0.24	0.97	0.03	3.41
1,3-butadiene	1.66	0.04	0.18	0.00	1.89
Formaldehyde	13.11	0.28	1.61	0.00	15.08
DPM	-	0.65	2.43	0.55	3.62

HAPs Hazardous air pollutants
DPM Diesel particulate matter

Table E-46 No Action 2020 Emissions of HAPs (tons/year)

HAP Species	Aircraft	GSE/APU	Motor Vehicles	Stationary Sources	Total
Acetaldehyde	2.45	0.11	0.49	0.00	3.07
Acrolein	1.14	0.01	0.06	0.00	1.21
Benzene	2.44	0.14	0.79	0.03	3.40
1,3-butadiene	1.87	0.02	0.15	0.00	2.05
Formaldehyde	14.82	0.22	1.29	0.00	16.42
DPM	-	0.27	2.33	0.55	3.14

HAPs Hazardous air pollutants
DPM Diesel particulate matter

Table E-47 West Terminal Alternative 2015 Emissions of HAPs (tons/year)

HAP Species	Aircraft	GSE/APU	Motor Vehicles	Stationary Sources	Total
Acetaldehyde	2.17	0.14	0.62	0.00	2.95
Acrolein	1.01	0.01	0.07	0.00	1.10
Benzene	2.16	0.24	0.97	0.03	3.41
1,3-butadiene	1.66	0.04	0.18	0.00	1.89
Formaldehyde	13.15	0.28	1.61	0.00	15.13
DPM	-	0.65	2.43	0.55	3.63

HAPs Hazardous air pollutants
DPM Diesel particulate matter

Table E-48 West Terminal Alternative 2020 Emissions of HAPs (tons/year)

HAP Species	Aircraft	GSE/APU	Motor Vehicles	Stationary Sources	Total
Acetaldehyde	2.45	0.11	0.49	0.00	3.08
Acrolein	1.15	0.01	0.06	0.00	1.22
Benzene	2.44	0.14	0.79	0.03	3.41
1,3-butadiene	1.88	0.02	0.15	0.00	2.06
Formaldehyde	14.86	0.22	1.30	0.00	16.46
DPM	-	0.27	2.33	0.55	3.15

HAPs Hazardous air pollutants
DPM Diesel particulate matter

Table E-49 East Terminal Alternative 2015 Emissions of HAPs (tons/year)

HAP Species	Aircraft	GSE/APU	Motor Vehicles	Stationary Sources	Total
Acetaldehyde	2.19	0.14	0.62	0.00	2.97
Acrolein	1.02	0.01	0.07	0.00	1.11
Benzene	2.18	0.24	0.97	0.03	3.43
1,3-butadiene	1.68	0.04	0.18	0.00	1.91
Formaldehyde	13.25	0.28	1.61	0.00	15.23
DPM	-	0.65	2.43	0.55	3.62

HAPs Hazardous air pollutants
DPM Diesel particulate matter

Table E-50 East Terminal Alternative 2020 Emissions of HAPs (tons/year)

HAP Species	Aircraft	GSE/APU	Motor Vehicles	Stationary Sources	Total
Acetaldehyde	2.47	0.11	0.49	0.00	3.10
Acrolein	1.16	0.01	0.06	0.00	1.22
Benzene	2.46	0.14	0.79	0.03	3.43
1,3-butadiene	1.90	0.02	0.15	0.00	2.07
Formaldehyde	14.97	0.22	1.29	0.00	16.57
DPM	-	0.27	2.33	0.55	3.14

HAPs Hazardous air pollutants
DPM Diesel particulate matter

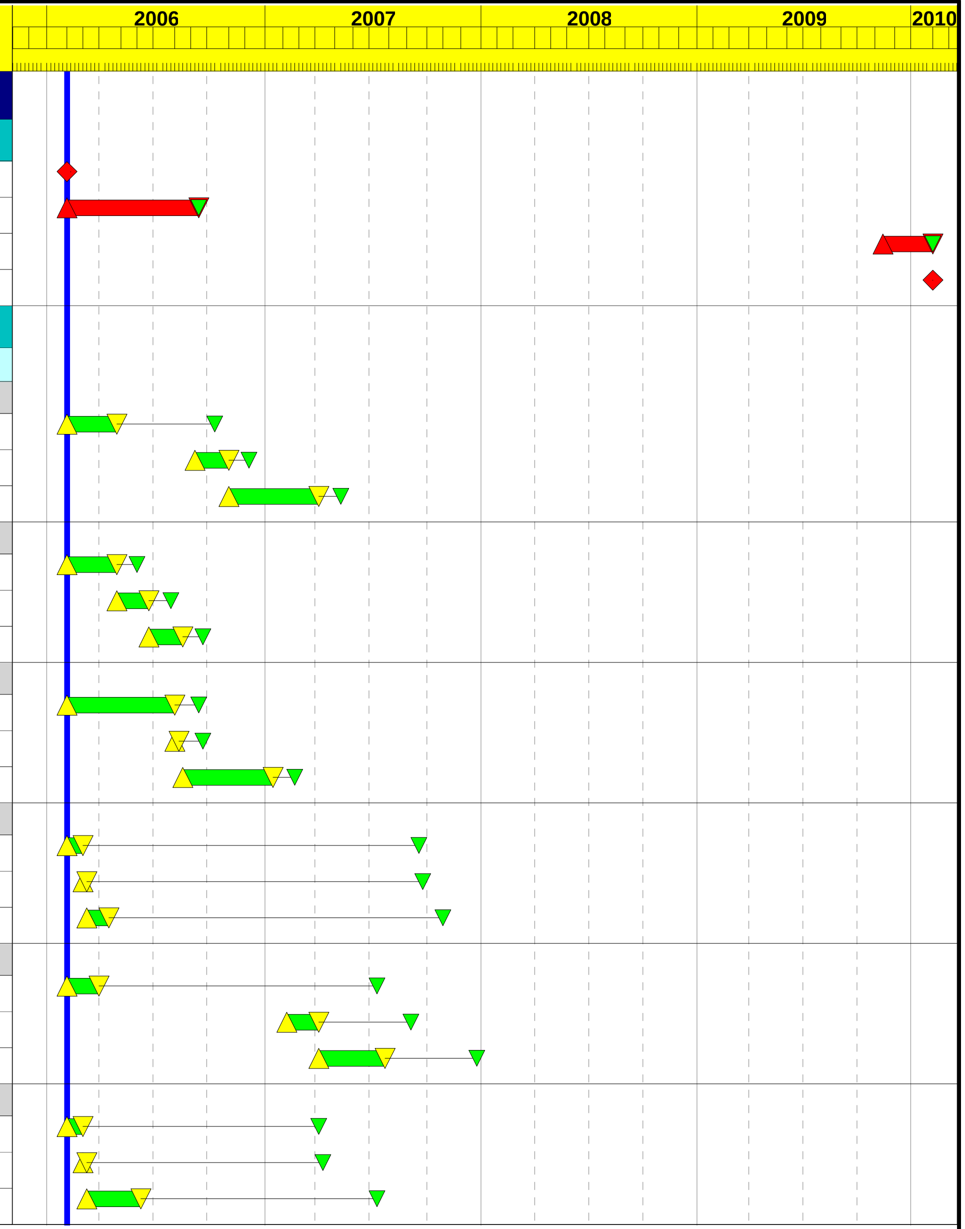
APPENDIX E
Part II

Construction Emissions

The following pages include the construction schedule as provided by HNTB, including a timeline for each project element and memoranda summarizing the project elements (including a description of each project, the crew(s) and specific construction equipment required, and a timing of operation).

While the construction start date has shifted since the construction timeline was completed, the timing of the individual elements is still reasonable, as are the summarizations of the project elements and the description of the project, crew, and construction equipment required. The construction schedule as of November 2008 indicates that enabling projects for the terminal building construction will begin in 2009.

Activity Description	Orig Dur	Early Start	Early Finish
1 San Diego International Airport Program Study			
1.01 Overall Program			
Begin Program	0	30JAN06	
Bridging Documents	32	30JAN06	10SEP06
Comissioning	12	09NOV09	31JAN10
End Program	0		31JAN10
1.02 Southern Project			
1.02.01 Enabling Projects:			
1.02.01.01 Site Remediation Package			
Design of Site Remediation	12	30JAN06	23APR06
Bid and Award	8	04SEP06	29OCT06
Construction of Remediation Package	22	30OCT06	01APR07
1.02.01.02 McCain Interchange Improvement Package			
Design of McCain Intersection	12	30JAN06	23APR06
Bid and Award	8	24APR06	18JUN06
Construction of McCain Intersection	8	19JUN06	13AUG06
1.02.01.03 Airside Utility Relocation Package			
Design of Utility Relocation Package	26	30JAN06	30JUL06
Issuance of Task Order	1	31JUL06	06AUG06
Construction of Utility Relocation Package	22	14AUG06	14JAN07
1.02.01.04 Relocation of USO and Offices			
Design of USO Relocation	4	30JAN06	26FEB06
Issuance of Task Order	1	27FEB06	05MAR06
Construction of USO and Office Relocations	5	06MAR06	09APR06
1.02.01.05 Temporary Parking and Roadways			
Design of Temp Parking and Roads	8	30JAN06	26MAR06
Bid and Award	8	05FEB07	01APR07
Construction of Temporary Roads and Parking	16	02APR07	22JUL07
1.02.01.06 Relocation of FAA facilities emergency generator			
Design of FAA Emerg Gen Relocation	4	30JAN06	26FEB06
Issuance of Task Order	1	27FEB06	05MAR06
Relocation of FAA Emergency Generator	13	06MAR06	04JUN06



Start Date	14NOV05
Finish Date	31JAN10
Data Date	30JAN06
Run Date	20FEB06 12:29

Early Bar
Float Bar
Progress Bar
Critical Activity

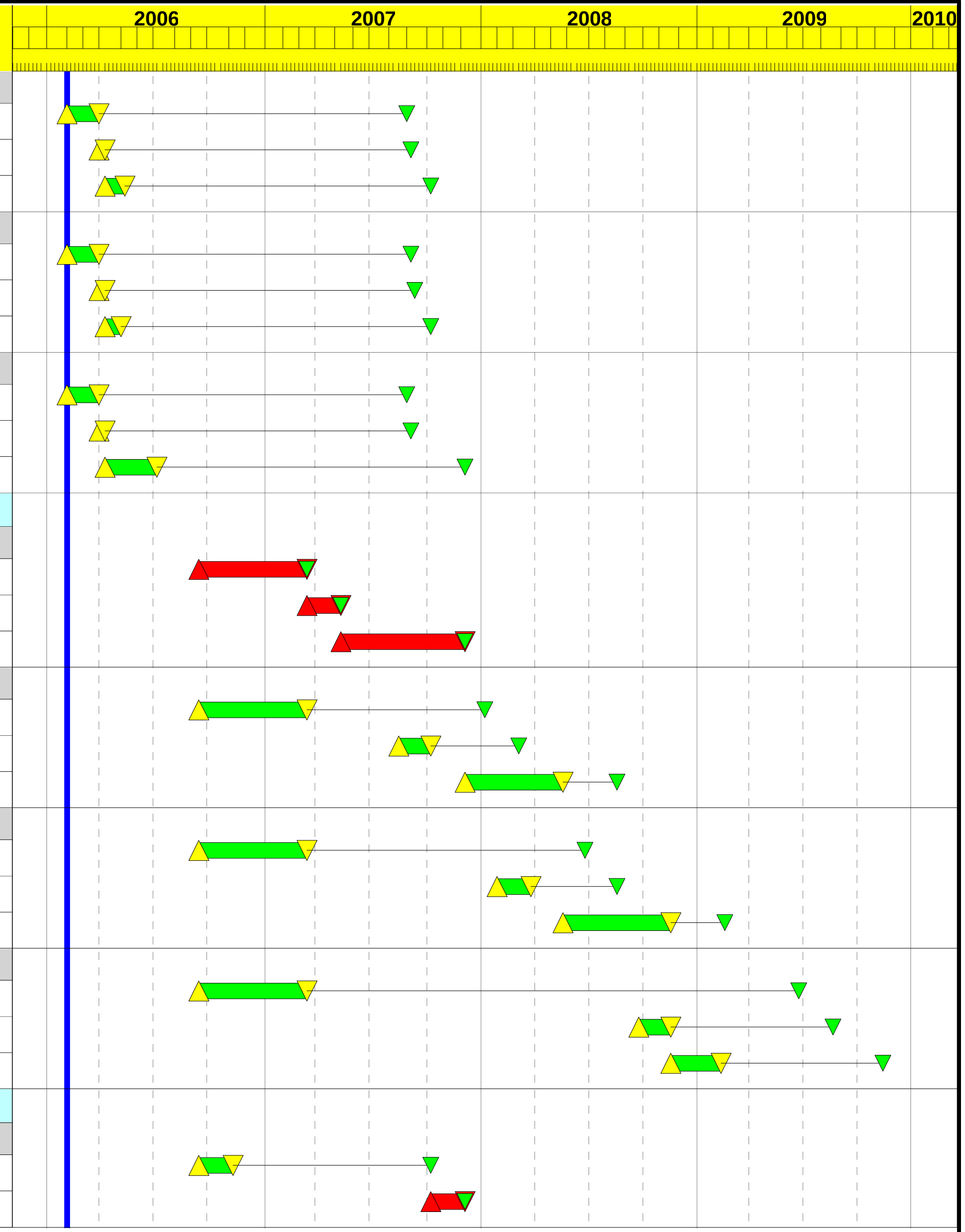
SDIA

HNTB Corporation

San Diego International Airport

Date	Revision	Checked	Approved

	Activity Description	Orig Dur	Early Start	Early Finish
	1.02.01.07 Concessions Distribution Center relocation			
	Design of Concession Relocation	8	30JAN06	26MAR06
	Issuance of Task Order	1	27MAR06	02APR06
	Relocation of Concession Distribution	5	03APR06	07MAY06
	1.02.01.08 System Testing Facility			
	Design of System Testing Facility	8	30JAN06	26MAR06
	Issuance of Task Order	1	27MAR06	02APR06
	Construction of System Testing Facility	4	03APR06	30APR06
	1.02.01.09 Tenant Relocations			
	Design of Tenant Relocations	8	30JAN06	26MAR06
	Issuance of Task Order	1	27MAR06	02APR06
	Relocation of Tenants	13	03APR06	02JUL06
	1.02.02 Airside Construction			
	1.02.02.01 Airfield Construction Site Preparation and Rough			
	Design of Rough Grade Package	26	11SEP06	11MAR07
	Bid and Award	8	12MAR07	06MAY07
	Construction of Site Prep and Rough Grade	30	07MAY07	02DEC07
	1.02.02.02 Hydrant Fueling System			
	Design of Hydrant Fuel System	26	11SEP06	11MAR07
	Bid and Award	8	13AUG07	07OCT07
	Construction of Hydrant Fuel System	24	03DEC07	18MAY08
	1.02.02.03 Apron Paving Package			
	Design of Apron Paving Package	26	11SEP06	11MAR07
	Bid and Award	8	28JAN08	23MAR08
	Construction of Apron Paving Package	26	19MAY08	16NOV08
	1.02.02.04 Fencing and Security package			
	Design of Fencing and Security Package	26	11SEP06	11MAR07
	Bid and Award	8	22SEP08	16NOV08
	Construction of Fencing and Security	12	17NOV08	08FEB09
	1.02.03 Terminal Construction			
	1.02.03.01 Site Preparation Package			
	Design of Terminal Site Prep	8	11SEP06	05NOV06
	Bid and Award	8	08OCT07	02DEC07



Start Date	14NOV05
Finish Date	31JAN10
Data Date	30JAN06
Run Date	20FEB06 12:29

Early Bar
Float Bar
Progress Bar
Critical Activity

SDIA

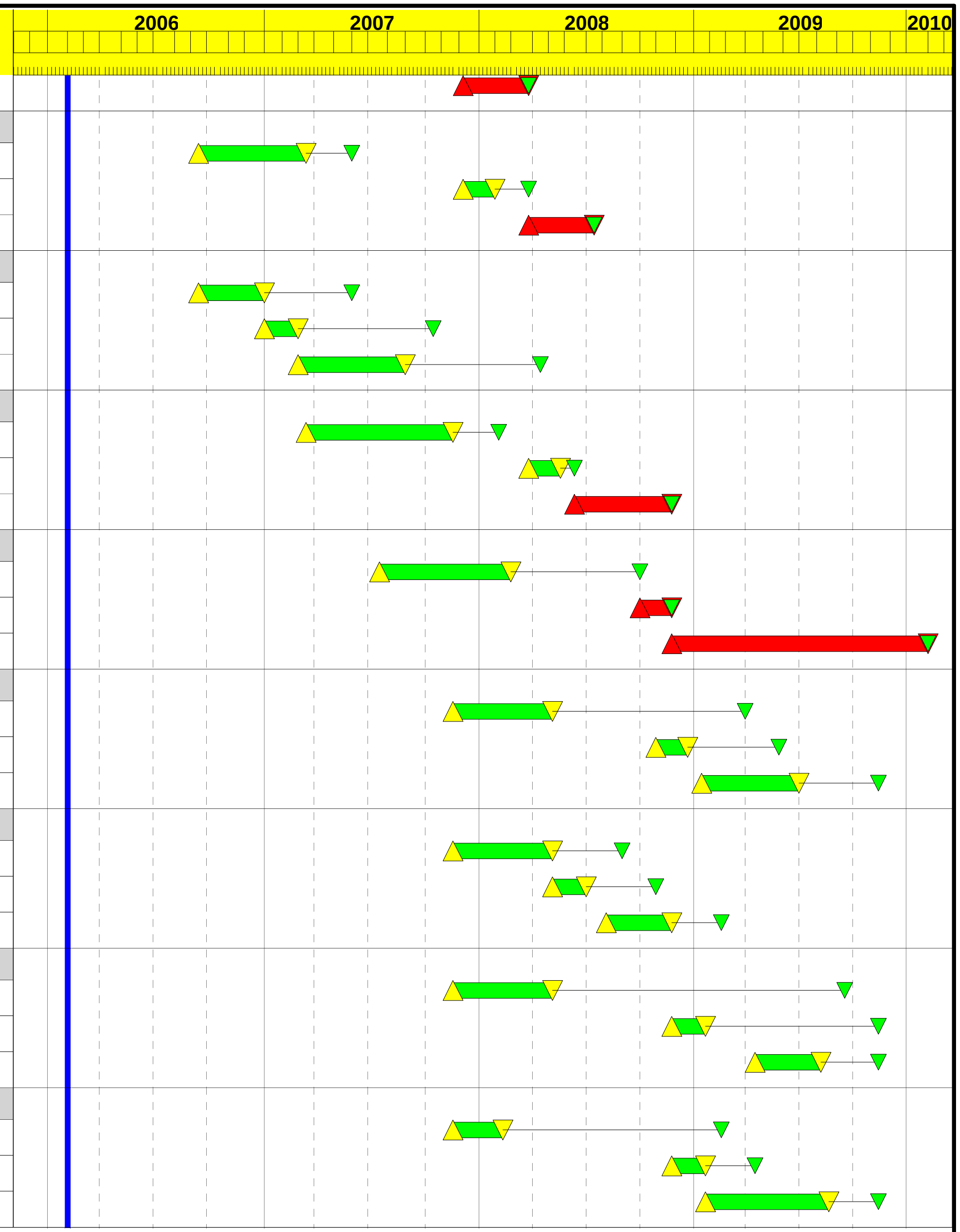
Sheet 2 of 7

HNTB Corporation

San Diego International Airport

Date	Revision	Checked	Approved

Activity Description	Orig Dur	Early Start	Early Finish
Construction of Site Prep	16	03DEC07	23MAR08
1.02.03.02 Terminal Foundation and Ramp Control Package			
Design of Terminal Foundation	26	11SEP06	11MAR07
Bid and Award	8	03DEC07	27JAN08
Construction of Foundation Package	16	24MAR08	13JUL08
1.02.03.03 Terminal Structural Package			
Design of Terminal Structural	16	11SEP06	31DEC06
Bid and Award	8	01JAN07	25FEB07
Fabrication and Delivery of Terminal Structural	26	26FEB07	26AUG07
1.02.03.04 Terminal Shell Package			
Design of Terminal Shell	36	12MAR07	18NOV07
Bid and Award	8	24MAR08	18MAY08
Construction of Terminal Shell	24	09JUN08	23NOV08
1.02.03.05 Terminal Interior Package			
Design of Terminal Interior Package	32	16JUL07	24FEB08
Bid and Award	8	29SEP08	23NOV08
Construction of Terminal Interior Package	62	24NOV08	31JAN10
1.02.03.06 Terminal Pedestrian Bridges			
Design of Pedestrian Bridge	24	19NOV07	04MAY08
Bid and Award	8	27OCT08	21DEC08
Construction of Pedestrian Bridge	24	12JAN09	28JUN09
1.02.03.07 Mechanical Systems Package			
Design of Long Lead Mech System	24	19NOV07	04MAY08
Bid and Award	8	05MAY08	29JUN08
Installation of Long Lead Mech	16	04AUG08	23NOV08
1.02.03.08 Baggage Handling System			
Design of Baggage Handling System	24	19NOV07	04MAY08
Bid and Award	8	24NOV08	18JAN09
Installation of BHS	16	13APR09	02AUG09
1.02.03.09 Jet Bridges			
Design of Jet Bridges	12	19NOV07	10FEB08
Bid and Award	8	24NOV08	18JAN09
Installation of Jet Bridges	30	19JAN09	16AUG09



Start Date	14NOV05
Finish Date	31JAN10
Data Date	30JAN06
Run Date	20FEB06 12:29

Early Bar
Float Bar
Progress Bar
Critical Activity

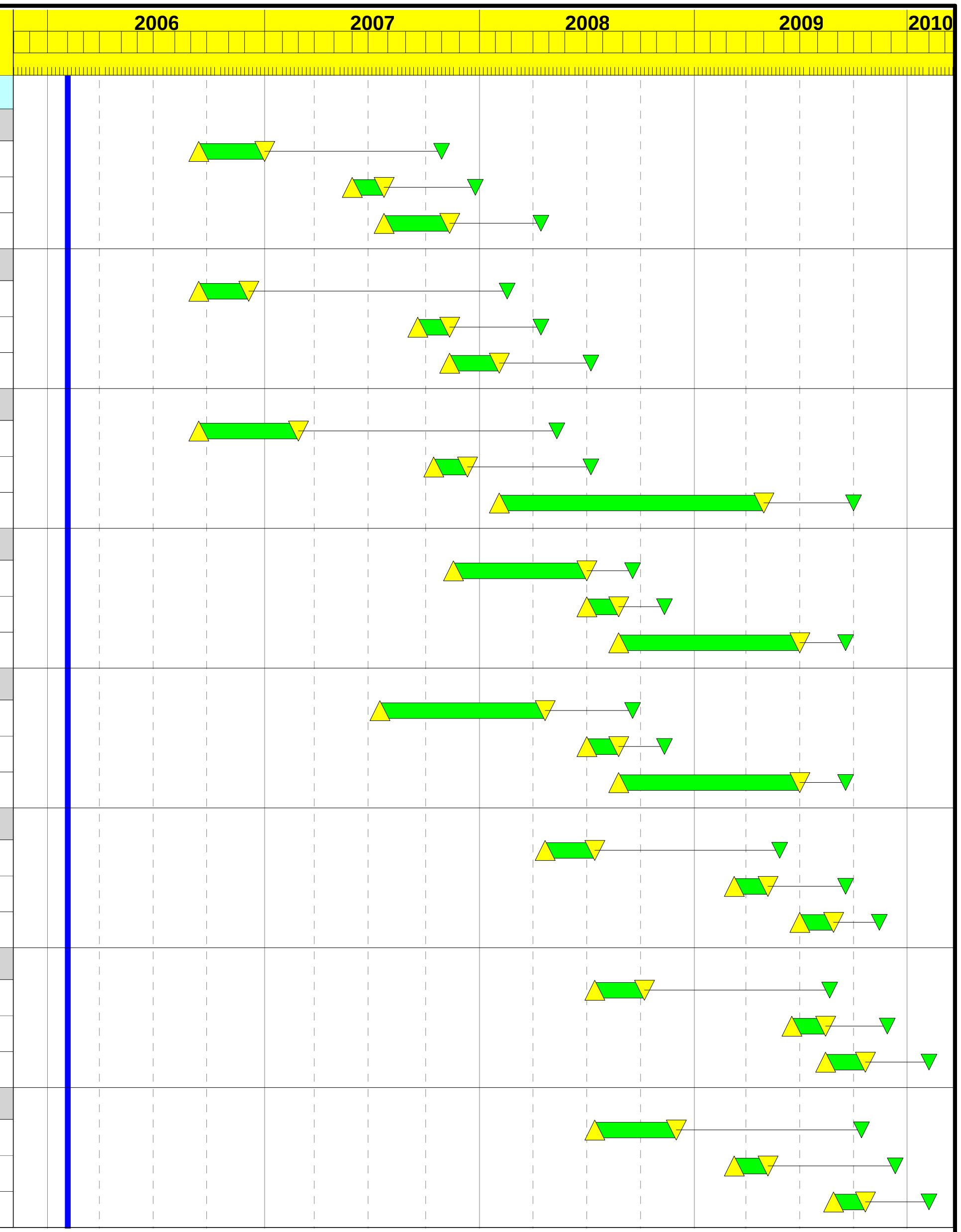
SDIA
Sheet 3 of 7

HNTB Corporation

San Diego International Airport

Date	Revision	Checked	Approved

Activity Description	Orig Dur	Early Start	Early Finish
1.02.04 Landside Construction			
1.02.04.01 Demolition of the Baggage Handling Bldg and Ped			
Design of Landside Demolition Package	16	11SEP06	31DEC06
Bid and Award	8	28MAY07	22JUL07
Demolition of USO and BHS Building	16	23JUL07	11NOV07
1.02.04.02 Site Preparation			
Design of Landside Site Preparation	12	11SEP06	03DEC06
Bid and Award	8	17SEP07	11NOV07
Construction of Landside Site Prep	12	12NOV07	03FEB08
1.02.04.03 Parking Garage			
Design of Parking Garage	24	11SEP06	25FEB07
Bid and Award	8	15OCT07	09DEC07
Construction of Parking Garage	64	04FEB08	26APR09
1.02.04.04 Elevated Roadways			
Design of Elevated Roadways	32	19NOV07	29JUN08
Bid and Award	8	30JUN08	24AUG08
Construction of Elevated Roadways	44	25AUG08	28JUN09
1.02.04.05 Civil Roadway Project			
Design of Civil Roadway Package	40	16JUL07	20APR08
Bid and Award	8	30JUN08	24AUG08
Construction of Civil Roadway Project	44	25AUG08	28JUN09
1.02.04.06 New Surface Parking Lot / Ground Transportation			
Design of Surface Parking Lot	12	21APR08	13JUL08
Bid and Award	8	09MAR09	03MAY09
Construction of Surface Parking Lot	8	29JUN09	23AUG09
1.02.04.07 Streetscape and Landscape Package			
Design of Streetscape and Landscape	12	14JUL08	05OCT08
Bid and Award	8	15JUN09	09AUG09
Construction of Streetscape and Landscape	10	10AUG09	18OCT09
1.02.04.08 Signage Package			
Design of Signing Package	20	14JUL08	30NOV08
Bid and Award	8	09MAR09	03MAY09
Construction of Signage Package	8	24AUG09	18OCT09



Start Date	14NOV05
Finish Date	31JAN10
Data Date	30JAN06
Run Date	20FEB06 12:29

Early Bar
Float Bar
Progress Bar
Critical Activity

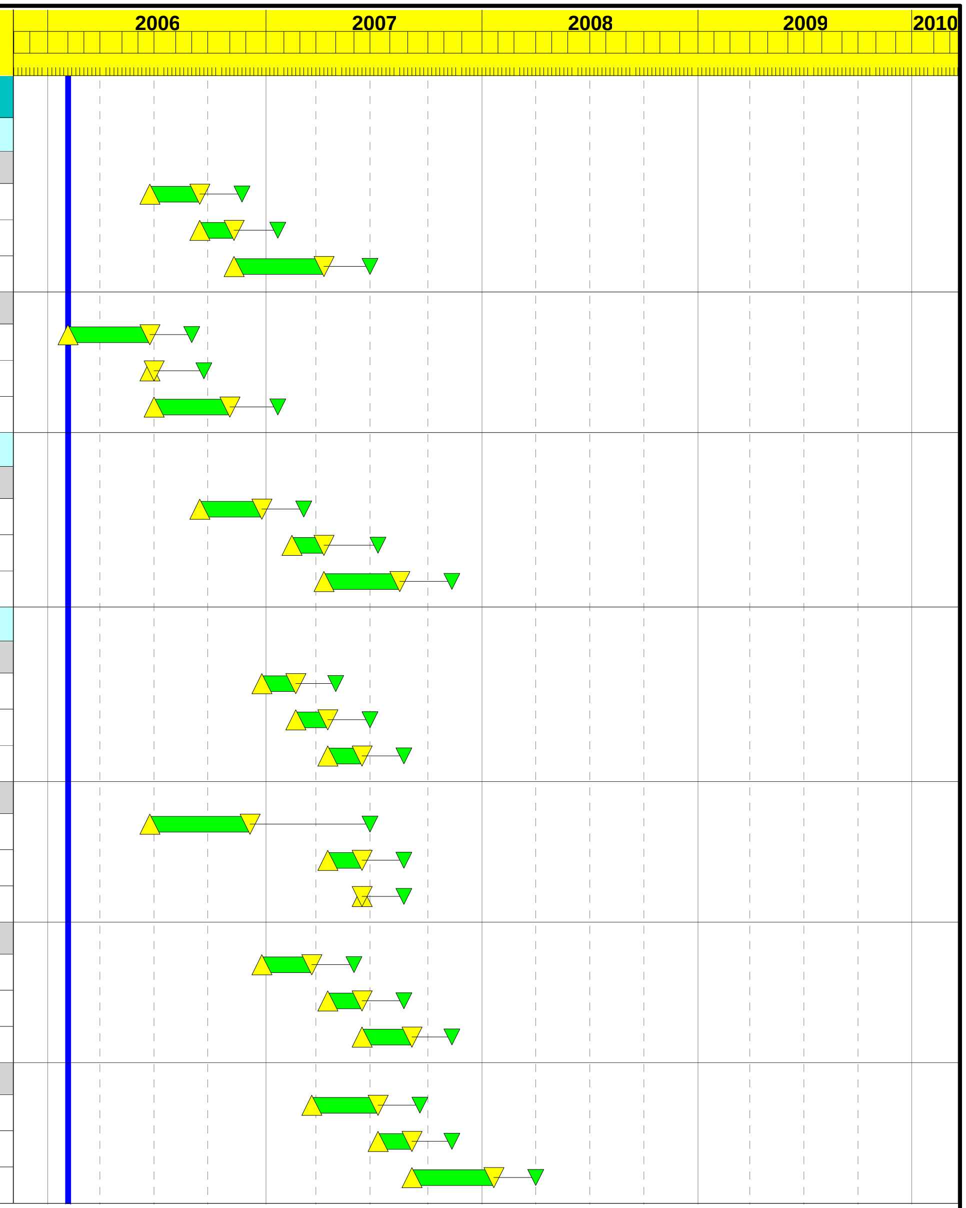
SDIA

HNTB Corporation

San Diego International Airport

Date	Revision	Checked	Approved

Activity Description	Orig Dur	Early Start	Early Finish
1.03 North Projects			
1.03.01 Enabling Projects			
1.03.01.01 Site Remediation			
Design of Site Remediation	12	19JUN06	10SEP06
Bid and Award	8	11SEP06	05NOV06
Construction of Site Remediation	22	06NOV06	08APR07
1.03.01.02 Utility Relocation			
Design of Utility Relocation	20	30JAN06	18JUN06
Issue Task Order	1	19JUN06	25JUN06
Construction of Utility Relocation Package	18	26JUN06	29OCT06
1.03.02 Ground Transportation			
1.03.02.01 Ground Transportation			
Design of Ground Transportation	15	11SEP06	24DEC06
Bid and Award	8	12FEB07	08APR07
Construction of Ground Transportation	18	09APR07	12AUG07
1.03.03 Airport Support			
1.03.03.01 Site Preparation			
Design of Site Preparation	8	25DEC06	18FEB07
Bid and Award	8	19FEB07	15APR07
Construction of Site Preparation	8	16APR07	10JUN07
1.03.03.02 Hydrant Fuel & Misc. Utilities			
Design of Hydrant Fuel System & Misc Utilities	24	19JUN06	03DEC06
Bid and Award	8	16APR07	10JUN07
Construction Hydrant Fuel System & Misc Utility	0	11JUN07	10JUN07
1.03.03.03 Building Foundation			
Design of Building Foundation	12	25DEC06	18MAR07
Bid and Award	8	16APR07	10JUN07
Construction of Building Foundation	12	11JUN07	02SEP07
1.03.03.04 General Aviation Building			
Design of General Avaiation Building	16	19MAR07	08JUL07
Bid and Award	8	09JUL07	02SEP07
Construction of General Aviation Building	20	03SEP07	20JAN08



Start Date	14NOV05
Finish Date	31JAN10
Data Date	30JAN06
Run Date	20FEB06 12:29

Early Bar
Float Bar
Progress Bar
Critical Activity

SDIA

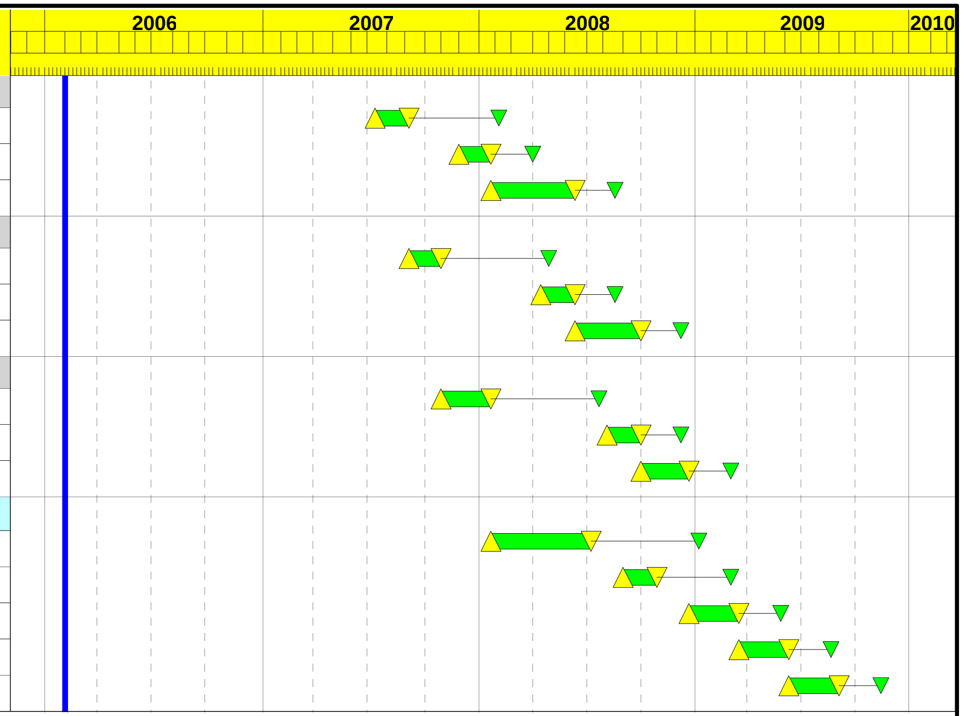
Sheet 5 of 7

HNTB Corporation

San Diego International Airport

Date	Revision	Checked	Approved

Activity Description	Orig Dur	Early Start	Early Finish
1.03.03.05 Apron Paving			
Design of Apron Paving	8	09JUL07	02SEP07
Bid and Award	8	26NOV07	20JAN08
Construction of Apron Paving	20	21JAN08	08JUN08
1.03.03.06 Access Road			
Design of Access Road	8	03SEP07	28OCT07
Bid and Award	8	14APR08	08JUN08
Construction of Access Road	16	09JUN08	28SEP08
1.03.03.07 Demolition/Remediation			
Design of Demolition/Remediation	12	29OCT07	20JAN08
Bid and Award	8	04AUG08	28SEP08
Demolition and Remediation	12	29SEP08	21DEC08
1.03.04 Airfield Paving			
Design of Airfield Paving	24	21JAN08	06JUL08
Bid and Award	8	01SEP08	26OCT08
Construction of Airfield Paving - Phase 1	12	22DEC08	15MAR09
Construction of Airfield Paving - Phase 2	12	16MAR09	07JUN09
Construction of Airfield Paving - Phase 3	12	08JUN09	30AUG09



Row	Group Name	2006	2007	2008	2009	2010
1	Asphalt Crew	1	4		4	
2	Baggage Handling Crew				16	
3	Contractor Utility Crew		16	4		
4	Demolition Crew		16	4		
5	Drainage Crew		36	4	4	
6	Electrical Utility Crew	38	2			
7	Electrical Crew	1	16			
8	Exterior Building Crew		16	22		
9	Fence and Security Crew			7	5	
10	Foundation Crew		12	16		
11	Garage Crew			48	16	
12	Gas Utility Crew	38	2			
13	Grading Crew		51	15		
14	Hydrant Crew		5	19		
15	Interior Renovation Crew	24		6	52	4
16	Jet Bridge Crew				4	
17	Landscape Crew				10	

Start Date	14NOV05
Finish Date	31JAN10
Data Date	30JAN06
Run Date	20FEB06 12:29

Early Bar
Float Bar
Progress Bar
Critical Activity

SDIA

HNTB Corporation

San Diego International Airport

Date	Revision	Checked	Approved

Row	Group Name		2006	2007	2008	2009	2010
18	Mechnical Systems Crew				16		
19	PCC Paving Crew				48	34	
20	Roadway Modification Crew				19	25	
21	Relocation Team		8				
22	Remediation Crew		17	27	8		
23	Roadway Construction Crew		8	34	16	8	
24	Roadway Construction Crew						
25	Sewer Utility Crew		38	2			
26	Signing Crew					8	
27	Structural Erection Crew			4	16		
28	Streetscape Crew					10	
29	Structural Crew				19	49	

Start Date	14NOV05
Finish Date	31JAN10
Data Date	30JAN06
Run Date	20FEB06 12:29

Early Bar
Float Bar
Progress Bar
Critical Activity

SDIA

Sheet 7 of 7

HNTB Corporation

San Diego International Airport

Date	Revision	Checked	Approved