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Dear Mitzie:

As requested by NRC, evacuation time estimates (ETEs) for an off-season scenario in the Seabrook Nuclear Power Plant EPZ were calculated by PNL using the CLEAR model. Following are the results and a discussion of both the vehicle demand estimates used as input data and the ETEs.

Most of the demand data used for the ETE calculations were taken from the NRC's draft demand estimate.[1] The vehicle demand estimates for the off-season scenario include contributions from permanent resident, schools, employment sources, recreation, shopping centers, seasonal housing and overnight acommodations. Table 1 shows the off-season vehicle demand estimates for seasonal housing and for rooms in yearly overnight accommodations. Estimates from seasonal housing refer to units (houses, apartments, etc.) that are normally occupied during the summer season which are occasionally occupied during the off-season (non-summer) either by owners or renters. Rooms in yearly overnight accomodations refer to hotels, motels, and guest houses that are open during the entire year. In both instances, an estimate of 1 vehicle per unit was assumed. (Note that no data radii was available for distances greater than 10 miles.)

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1. Demographic and Vechicular Demand Estimates for An Evacuation Analysis of the Seabrook Station. February 1982. Michael Kaltman, Siting Analysis Branch, U.S. Nuclear Regulatory Commission.

IE-35

Table 2 shows the off-season vehicle demand estimates for U.S. Highway 1, manufacturing and industrial employment, and educational facilities. U.S. Highway 1 is a major north-south artery in the Seabrook EPZ. The vehicle demand estimates are based on 100 percent occupancy of the parking capacity of shopping centers, restaurants, municipal parking lots, and large stores found along it. An assumption of one auto per employee was used in determinng the vehicle demand estimates for employment. In addition, an estimate of 2,000 vehicles on the Seabrook station site was included in the employment category. A vehicle demand estimate factor of 20 students per vehicle was used for educational facilities. This factor is based upon the assumptions that these facilities would be evacuated by bus, with 40 students per bus, and one bus being equivalent to two vehicles. (This is the assumption used for non-auto owning residents.[2])

Table 3 shows the vehicle demand estimates for the permanent resident population of the Seabrook EPZ. These demand estimates are identified to those for a peak population scenario (summer weekend case).[2] Table 3 contains data for the auto owning and non-auto owning population categories.

Table 4 shows the total vechicle demand estimates that were used to calculate ETEs for an off-season scenario in the Seabrook EPZ. Included in this table are demand estimates for the Seabrook Greyhound Park. Note that the demand estimates for the Greyhound Park differ from the NRC's draft. The NRC's report stated that the estimate of 3100 vehicles (which was for a 100 percent occupancy of the parking lot) could occur during a summer or a non-summer day. Instead an estimate of 873 vehicles is used in the present ETE

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2. An Independent Assessment of Evacuation Time Estimates for a Peak Population Scenerio in the EPZ of the Seabrook Nuclear Power Station. M.P. Moeller, et. al., 1982. (PNL-4290).

calculations. This is based upon attendance data received from the Greyhound Park and an assumption of one vehicle per two people. Following is a description of this attendance data.

Seabrook Greyhound Park Demand Estimate

Yearly average attendance = 1813 people/performance

June thru October average attendance = 1905 people/performance

8 performances per week at 52 weeks per year equals 416 performances/year

June thru October equals 22 weeks times 8 performances per week equals 176 performances

$$1905 \ \frac{\text{people}}{\text{performance}} \times 176 \text{ performances} = 335{,}280 \text{ people for June thru October}$$

$$1813 \ \frac{\text{people}}{\text{performance}} \times (416) \text{ performances} = 754{,}208 \text{ people for year}$$

$$\begin{array}{r} 754{,}208 \\ -\ 335{,}280 \\ \hline 418{,}928 \end{array} \text{ people for November thru May}$$

$$418{,}928 \text{ people} \div (416 - 176 =) \ 240 \text{ performances for November thru May}$$

Equals 1746 people/performance for November thru May.

It is assumed November thru May is equivalent to the off-season and therefore:

$$1746 \ \frac{\text{people}}{\text{performance}} \div \frac{2 \text{ people}}{\text{vehicle}} = 873 \text{ vehicles/performance}$$

Table 5 shows the ETEs calculated by the CLEAR model for each evacuation tree in the Seabrook EPZ. Table 6 shows comparison between the off-season and peak population scenarios in the Seabrook EPZ, using NRC's vehicle demand estimates as input data. The major results are large reductions in ETEs for evacuation trees no. 1, 2B, and 7B. These three trees include the main evacuation routes for the transient beach population of the peak population scenario. These results were expected since the vehicle demand estimates for the off-season scenario are significantly less than the peak population estimates for these evacuating trees. There was little or no reduction in ETEs of the remaining evacuation trees for the off-season scenario, mainly because the increase in vehicle demand estimates from the manuafacturing and industrial employment category offset decreases in transient population estimates.

If you have any further questions regarding this report, please do not hesitate to contact me.

Sincerely yours,

AE Desrosiers
Staff Scientist
Health Physics Technology Section

Attachments (tables)

MAM/aer

cc: TJ McKenna

TABLE 1

OFF-SEASON VEHICLE DEMAND ESTIMATES FOR SEASONAL HOUSING AND FOR ROOMS IN YEARLY OVERNIGHT ACCOMMODATIONS

	0-2 Mile		2-5 Mile		5-10 Mile		10-EPZ		0-EPZ	
Sector	Seasonal Housing	Overnight: Year Round	Seasonal Housing	Overnight: Year Round	Seasonal Housing	Overnight: Year Round	Seasonal Housing	Overnight: Year Round	Seasonal Housing	Overnight: Year Round
N	1	0	5	196	17	0	0	0	23	196
NNW	3	36	4	0	15	0	0	0	22	36
NW	1	0	5	0	16	90	0	0	22	90
WNW	0	0	3	0	15	0	0	0	18	0
W	2	136	4	0	16	0	0	0	22	136
WSW	3	46	7	0	10	0	0	0	20	46
SW	3	44	8	88	3	0	0	0	14	132
SSW	1	0	4	36	38	11	0	0	43	47
S	1	0	13	32	53	25	0	0	67	57
SSE	1	0	128	202	112	7	0	0	241	209
SE	3	0	44	0	0	0	0	0	47	0
ESE	72	0	0	0	0	0	0	0	72	0
E	69	208	0	0	0	0	0	0	69	208
ENE	95	740	120	540	0	0	0	0	215	1,280
NE	12	0	174	168	23	88	0	0	209	256
NNE	0	0	12	0	15	77	0	0	27	77
Total	267	1,210	531	1,262	333	298	0	0	1,131	2,770

TABLE 2

OFF-SEASON VEHICLE DEMAND ESTIMATES FOR U.S. HIGHWAY 1,
MANUFACTURING & INDUSTRIAL EMPLOYMENT, AND EDUCATIONAL FACILITIES

	0-2 Mile			2-5 Mile			5-10 Mile			10-EPZ			0-EPZ		
Sector	U.S. 1	Employment	Education	U.S. 1	Employment	Education	U.S. 1	Employment	Education	U.S. 1	Employment	Education	U.S. 1	Employment	Education
N	58	30	0	792	387	0	148	87	21.2	0	0	0	998	504	21.2
NNW	24	0	0	0	0	0	0	500	13.6	0	0	0	24	500	13.6
NW	43	9	10.9	0	0	0	0	1,616	287.5	0	0	0	43	1,625	298.4
WNW	35	0	0	0	0	8.1	0	0	8.3	0	0	0	35	0	16.4
W	803	2,560[(a)]	0	0	20	1.6	0	0	2.3	0	0	0	803	2,580	3.9
WSW	37	930	0	0	257	33.9	0	220	65.9	0	0	0	37	1,407	99.8
SW	975	1[illegible]6	0	0	970	18.7	0	864	112.9	0	0	0	975	1,980	131.6
SSW	0	0	0	0	15	0	50	3,025	115.6	0	0	0	50	3,040	115.6
S	0	75	35.3	92	54	34.0	794	395	108.2	0	0	0	886	53[illegible]	117.5
SSE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NE	0	0	0	266	0	0	1,031	0	0	0	0	0	1,297	0	0
NNE	0	0	0	0	84	151.0	0	0	48.7	0	0	0	0	84	199.7
Total	1,975	3,750	46.2	1,150	1,797	247.3	2,023	6,707	784.2	0	0	0	5,148	12,254	1,077.7

(a) Includes the vehicle demand estimate from the Seabrook Nuclear Power Plant site for the year 2000.

TABLE 3
VEHICLE DEMAND ESTIMATES FOR PERMANENT RESIDENT POPULATION

	0-2 Mile		2-5 Mile		5-10 Mile		10-EPZ		0-EPZ		
Sector	Auto Own	Non-auto Own	Auto Own	Non-auto Own	Auto Own	Non-auto Own	Auto Own	Non-auto Own	Auto Own	Non-auto Own	Total Resident
N	22	0.3	571	4.4	1,144	10.1	1,868.6	39.3	3,605.6	54.1	3,659.7
NNW	76	1.1	227	2.0	920	12.2	306.9	4.5	1,529.9	19.8	1,549.7
NW	64	0.9	109	1.7	3,541	84.8	278.1	4.5	3,992.1	91.9	4,084
WNW	21	0.3	235	3.5	520	7.2	749.2	9.7	1,525.2	20.7	1,545.9
W	306	4.0	363	5.2	792	11.5	824.2	8.8	2,285.2	29.5	2,314.7
WSW	248	3.3	1,262	34.9	3,566	93.8	183.5	3.4	5,259.5	135.4	5,394.9
SW	276	3.7	1,141	35.1	1,835	52.8	118.0	4.6	3,370	96.2	3,466.2
SSW	160	2.1	455	14.0	3,155	91.0	273.1	3.0	4,043.1	110.1	4,153.2
S	149	2.0	731	20.1	2,459	55.4	0	0	3,339	77.5	3,416.5
SSE	35	0.5	380	11.2	473	11.5	0	0	888	23.2	911.2
SE	20	0.3	191	4.3	0	0	0	0	211	4.6	215.6
ESE	350	4.2	0	0	0	0	0	0	350	4.2	354.2
E	184	1.5	0	0	0	0	0	0	184	1.5	185.5
ENE	172	1.4	360	2.9	0	0	0	0	532	4.3	536.3
NE	25	0.2	1,135	8.8	821	2.8	174.6	0.6	2,155.6	12.4	2,168
NNE	0	0	1,533	11.8	2,299	35.1	6,063.9	134.6	9,895.9	181.5	10,077.4
Total	2,108	25.8	8,693	159.9	21,525	468.2	10,840.1	213	43,166.1	866.9	44,033

TABLE 4
VEHICLE DEMAND ESTIMATES FOR AN OFF-SEASON SCENARIO IN THE SEABROOK EPZ

Sector	0-2 Mile Total	2-5 Mile Total	5-10 Mile Total	10-EPZ Total	0-EPZ Total
N	111	1,955	1,427	1,908	5,401
NNW	140	233	1,461	311	2,145
NW	129	116	5,635	283	6,163
WNW	56	250	551	759	1,616
W	3,811	1,267[a]	822	833	6,733
WSW	1,267	1,595	3,956	187	7,005
SW	1,448	2,261	2,868	123	6,700
SSW	163	524	6,486	276	7,449
S	262	986	3,890	0	5,138
SSE	37	721	603	0	1,361
SE	23	239	0	0	262
ESE	426	0	0	0	426
E	463	0	0	0	463
ENE	1,009	1,023	0	0	2,032
NE	37	1,752	1,966	175	3,930
NNE	0	1,792	2,475	6,198	10,465
TOTAL	9,382	14,714	32,140	11,053	67,289

(a) Includes the vehicle demand estimate of 873 for the Seabrook Greyhound Park.

TABLE 5

Calculation of Evacuation Time Estimates Using the CLEAR Model for an Off-Season population scenario in the Seabrook EPZ. (NRC Data)

Evacuation Tree	Evacuation Time Estimates * (Hours:Minutes)	(Minutes)
1	6:45	405
2B	3:20	200
3	2:35	155
4	6:10	370
5	2:30	150
6	3:55	235
7B	2:55	175
8	4:25	265

* Includes 15 minute notification time.

TABLE 6

Comparison of Evacuation Time Estimates as Calculated by the CLEAR Model for a Peak Population and an Off-Season Population Scenario in the Seabrook EPZ. (NRC Data)

Evacuation Tree	Peak Population ETE* (Hours:Minutes)	Off-Season Population ETE* (Hours:Minutes)
1	9:40	6:45
2B	11:40	3:20
3	2:20	2:35
4	6:15	6:10
5	2:45	2:30
6	3:40	3:55
7B	10:25	2:55
8	6:25	4:25

* Includes 15 minute notification time.