APPENDIX M

Air Quality and Noise Appendix

Figure M-1

Noise Sensitive Areas in the Vicinity of the Jordan Cove Site

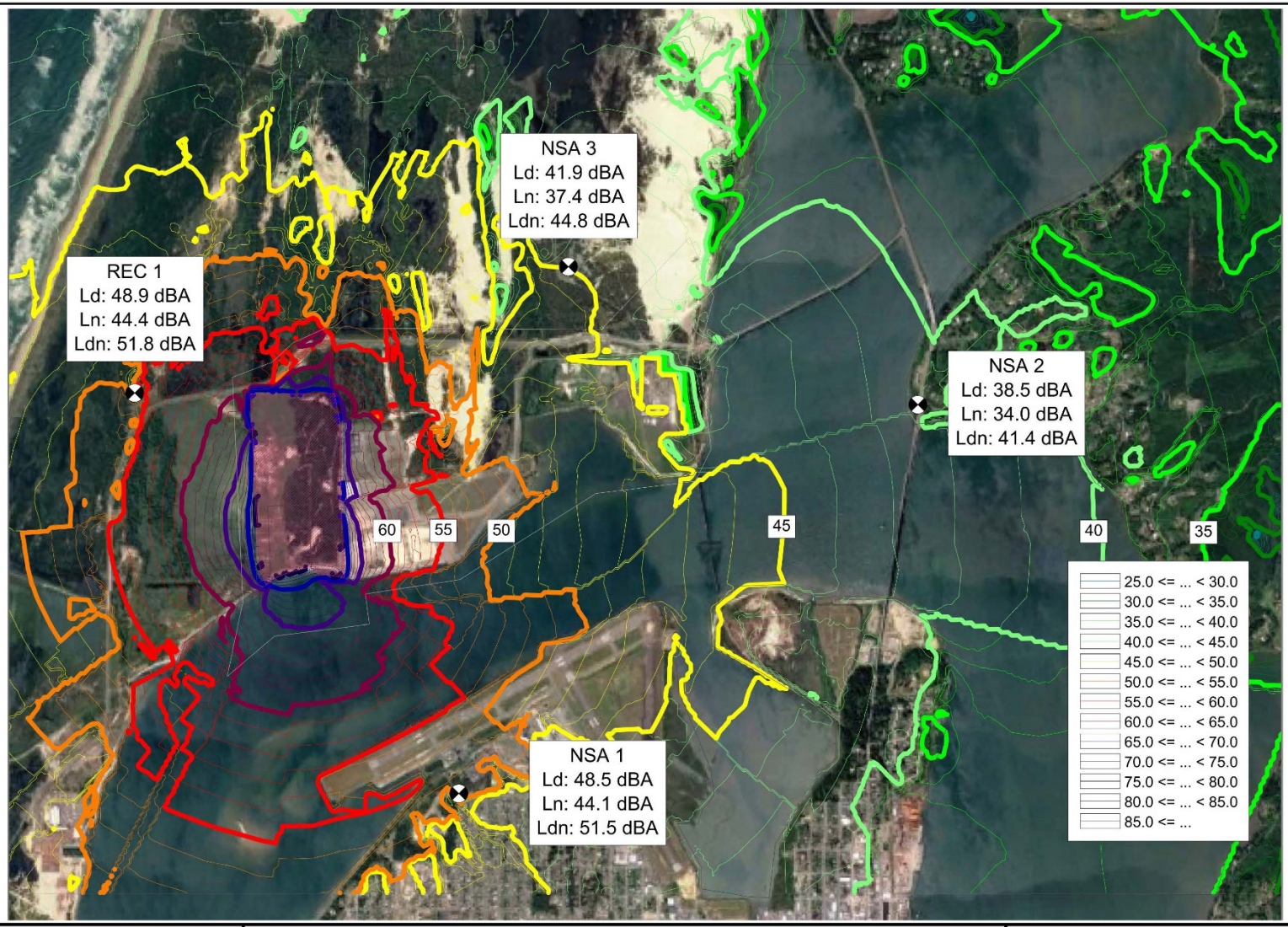

Figure M-2

Estimated Noise Levels From General Construction Activities at the Jordan Cove Terminal Site

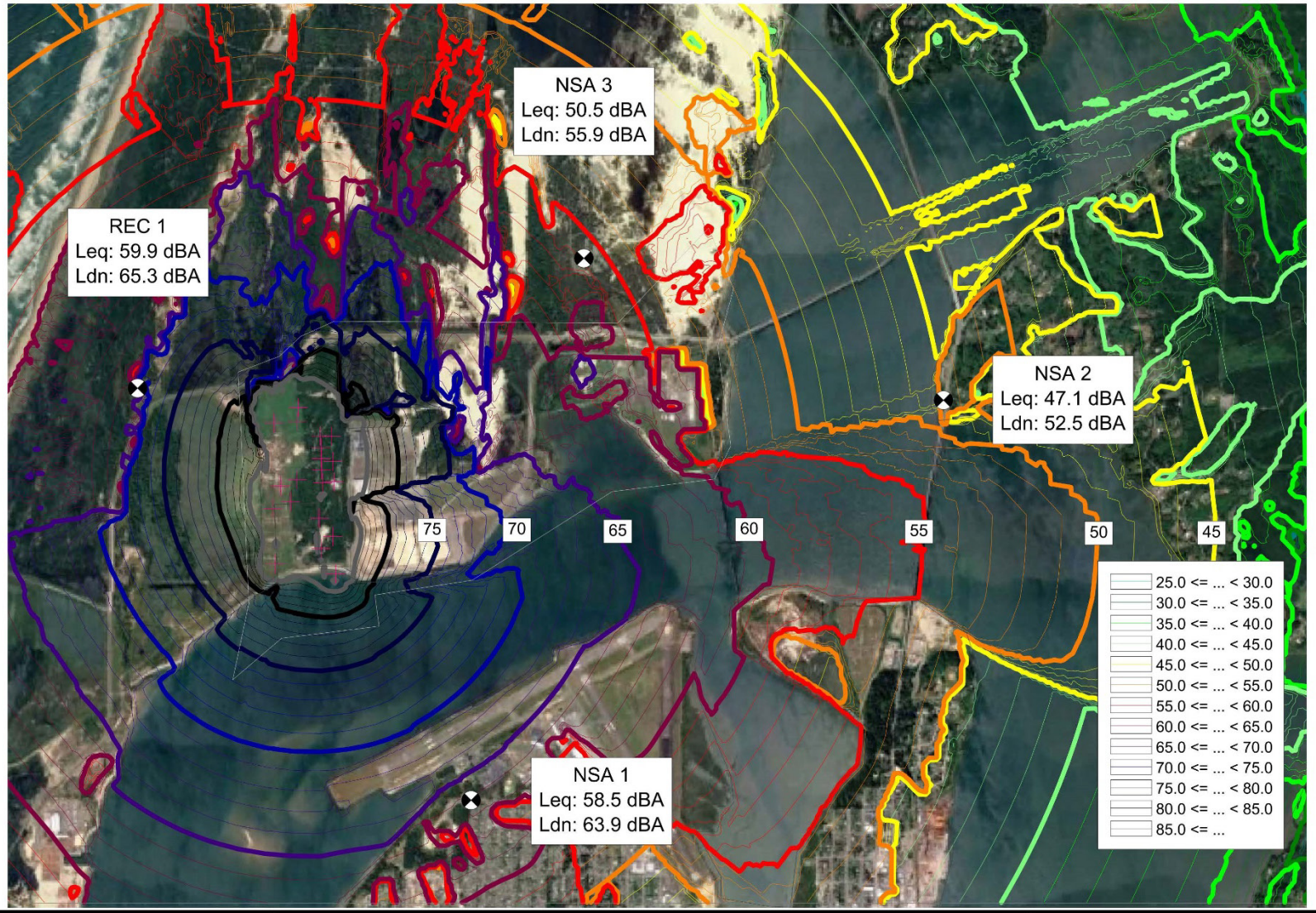

Figure M-3

Estimated Noise Levels From Pile Driving at the Jordan Cove Terminal Site

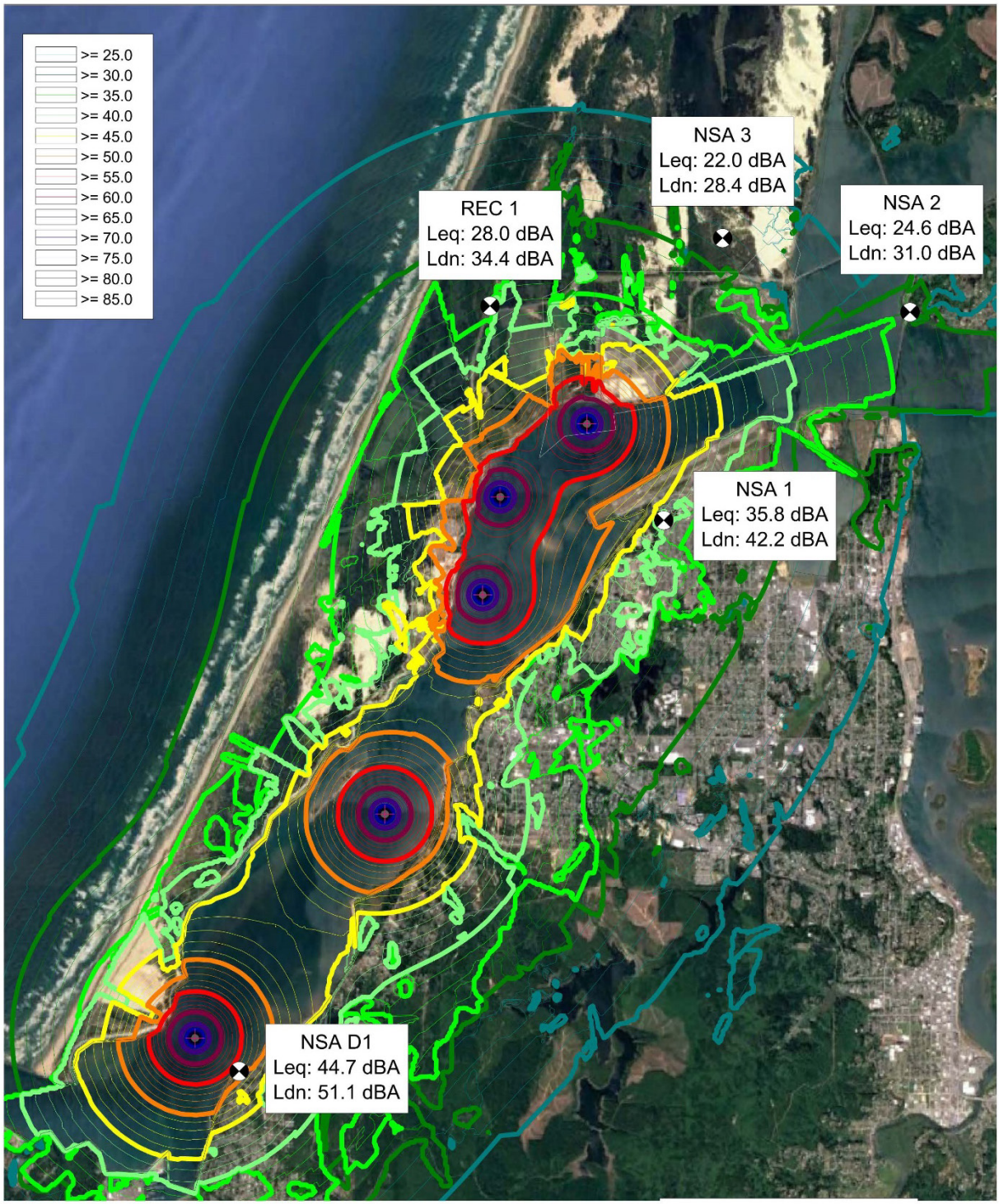

Figure M-4

Estimated Noise Levels From Dredging at the Jordan Cove Terminal Site

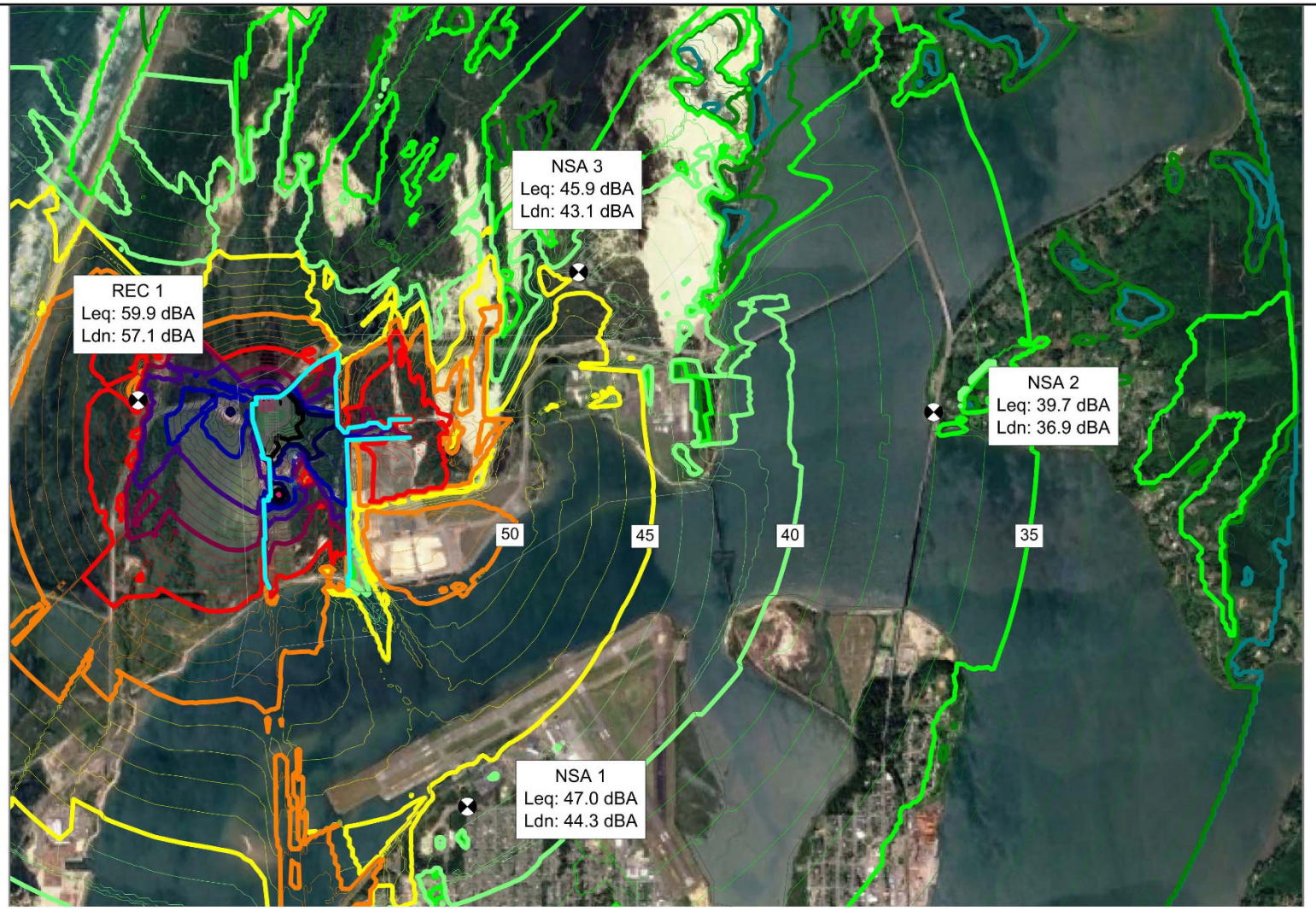

Figure M-5

Estimated Noise Levels from Flaring Activity

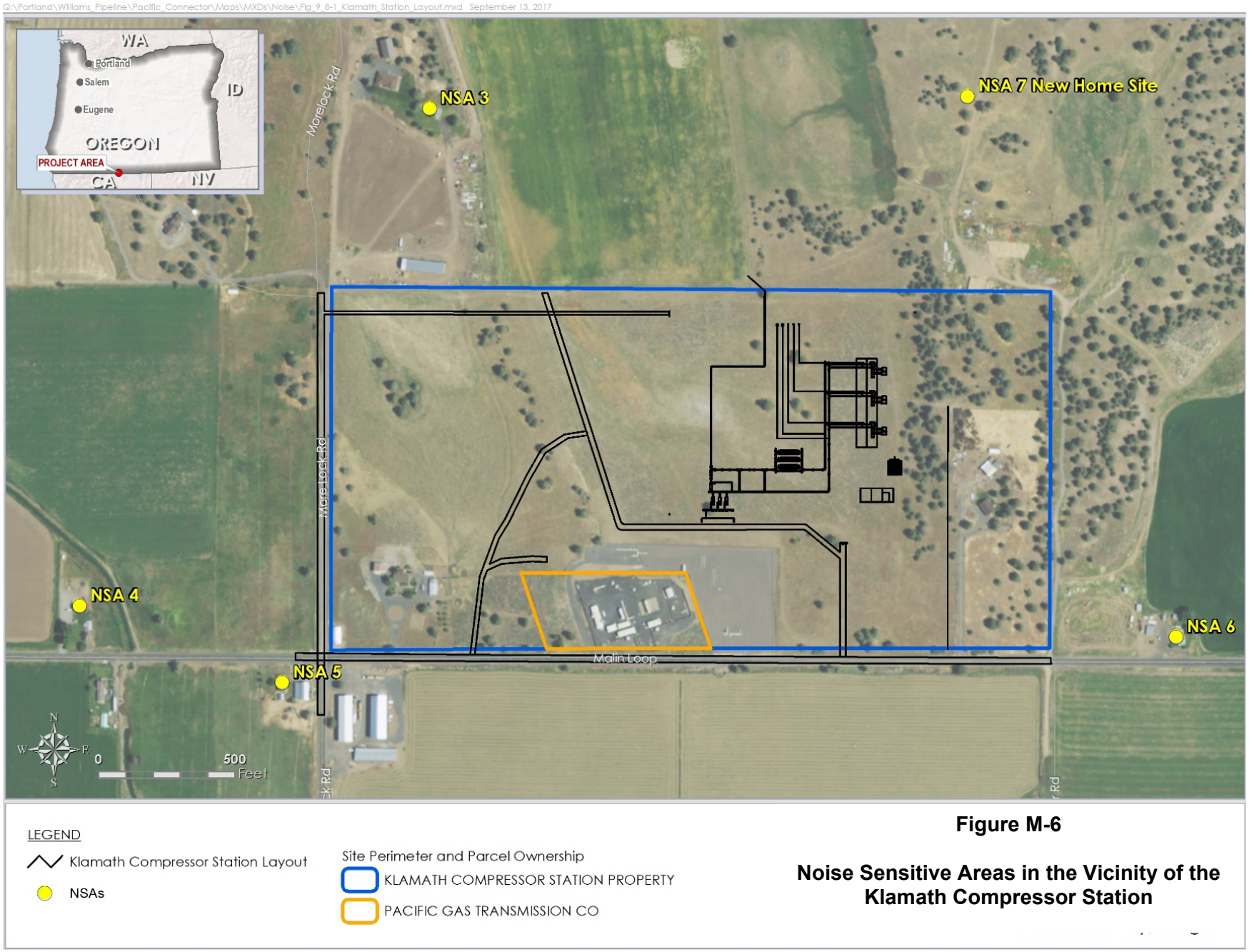

Figure M-6

Noise Sensitive Areas in the Vicinity of the Klamath Compressor Station

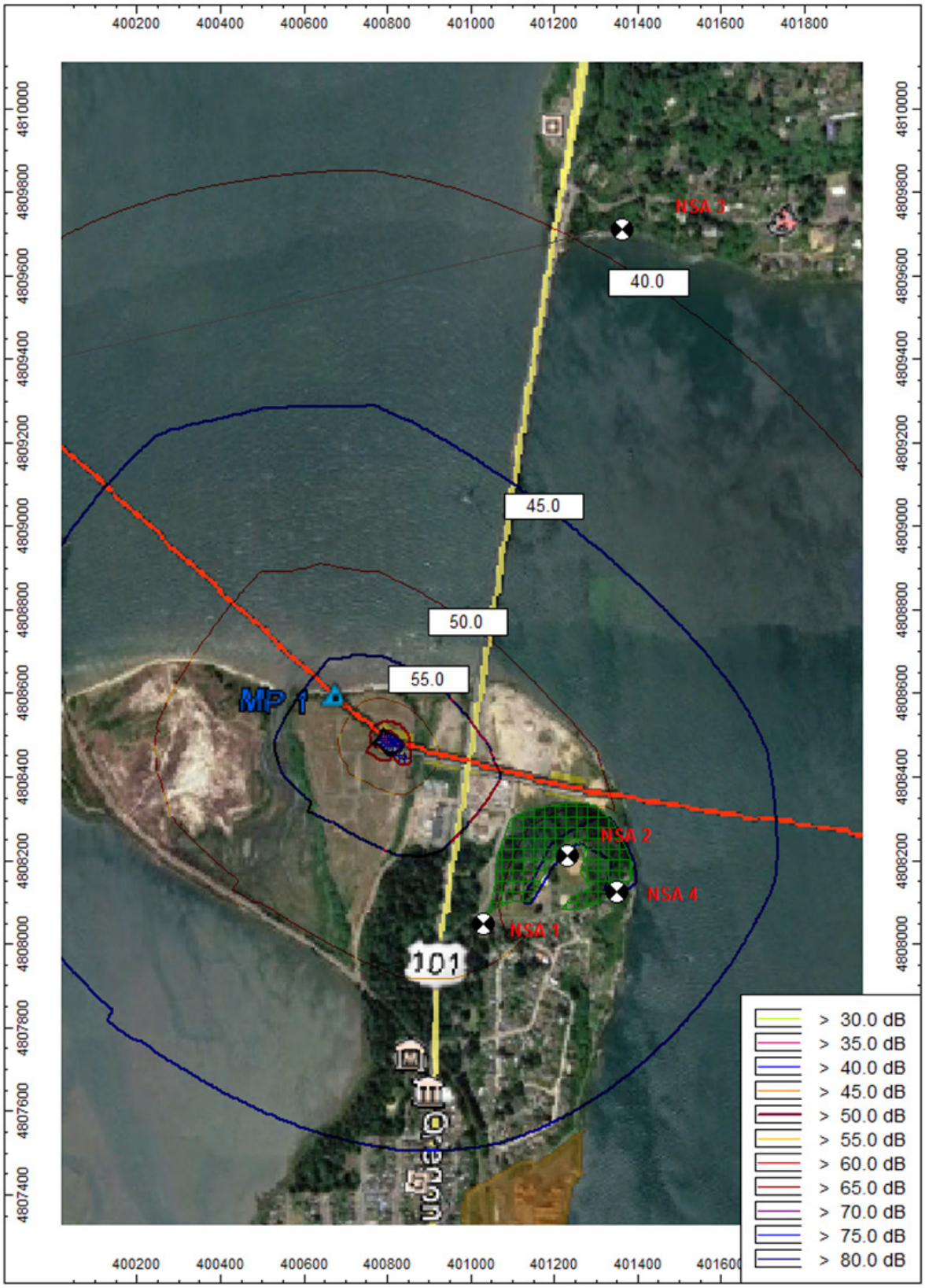

Figure M-7. Coos Bay West Crossing HDD Noise Levels

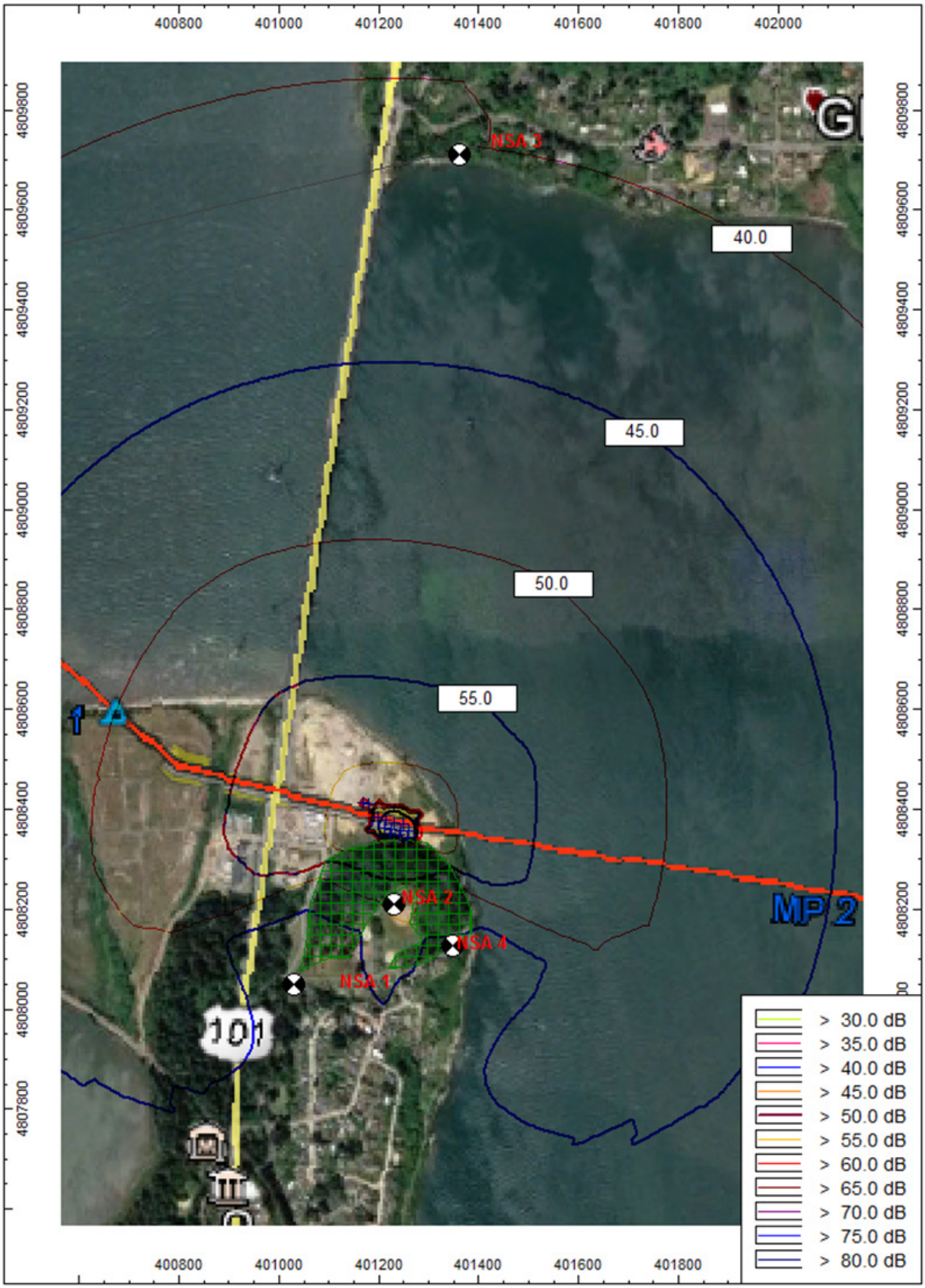

Figure M-8. Coos Bay East Crossing HDD Noise Levels

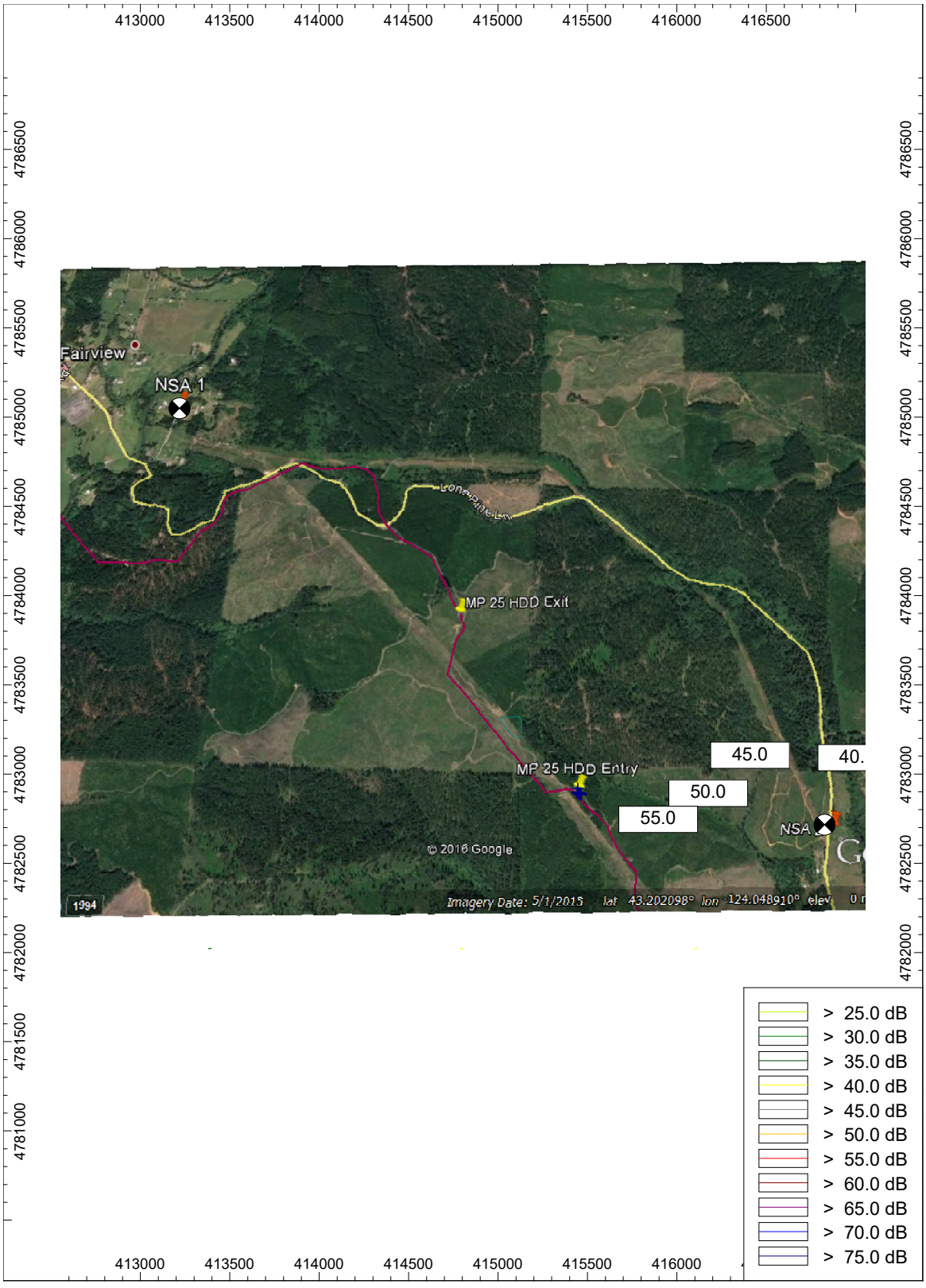

Figure M-9. Milepost 25 BPA Powerline Corridor HDD Noise Levels

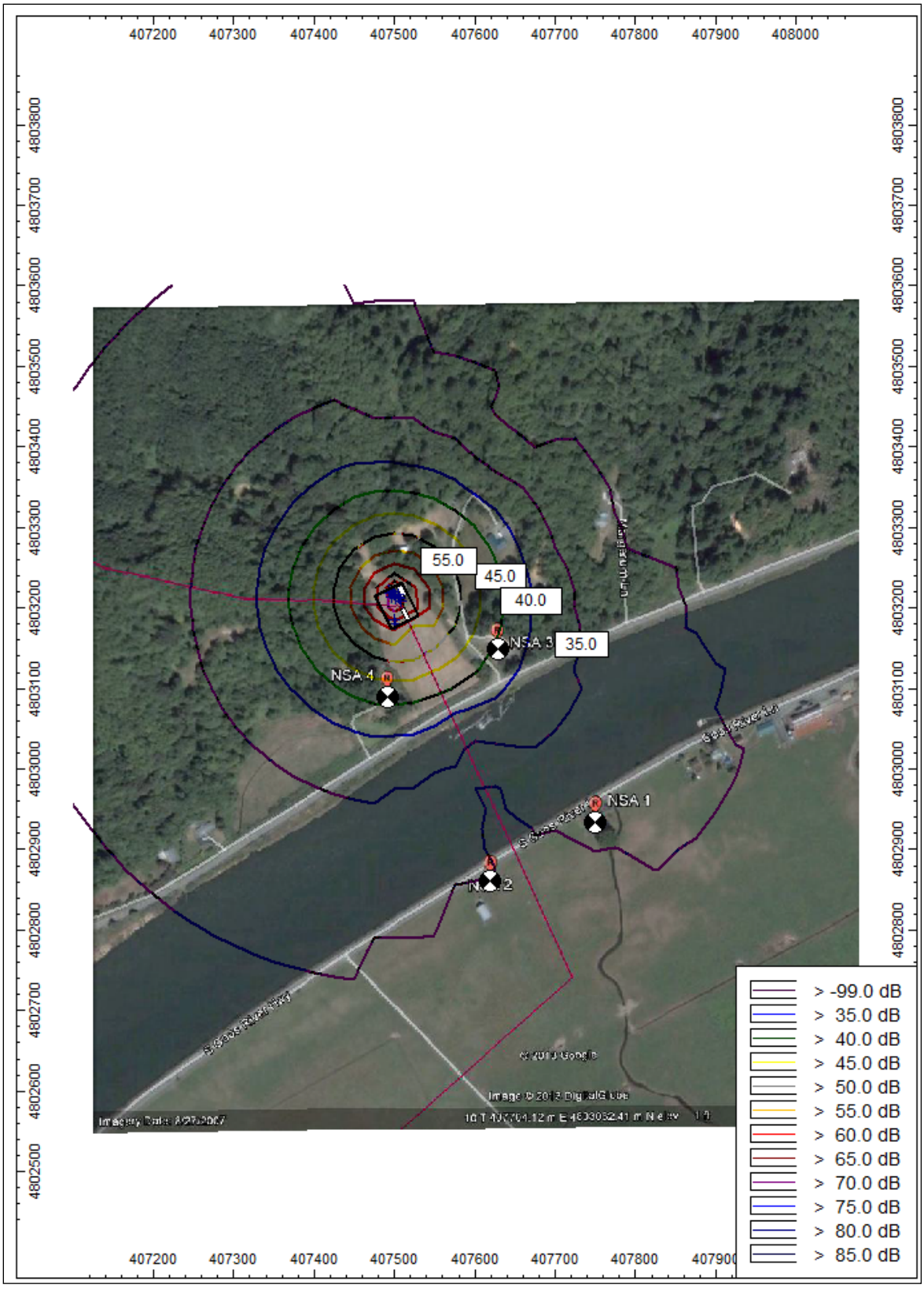

Figure M-10. Coos River Crossing HDD Noise Levels

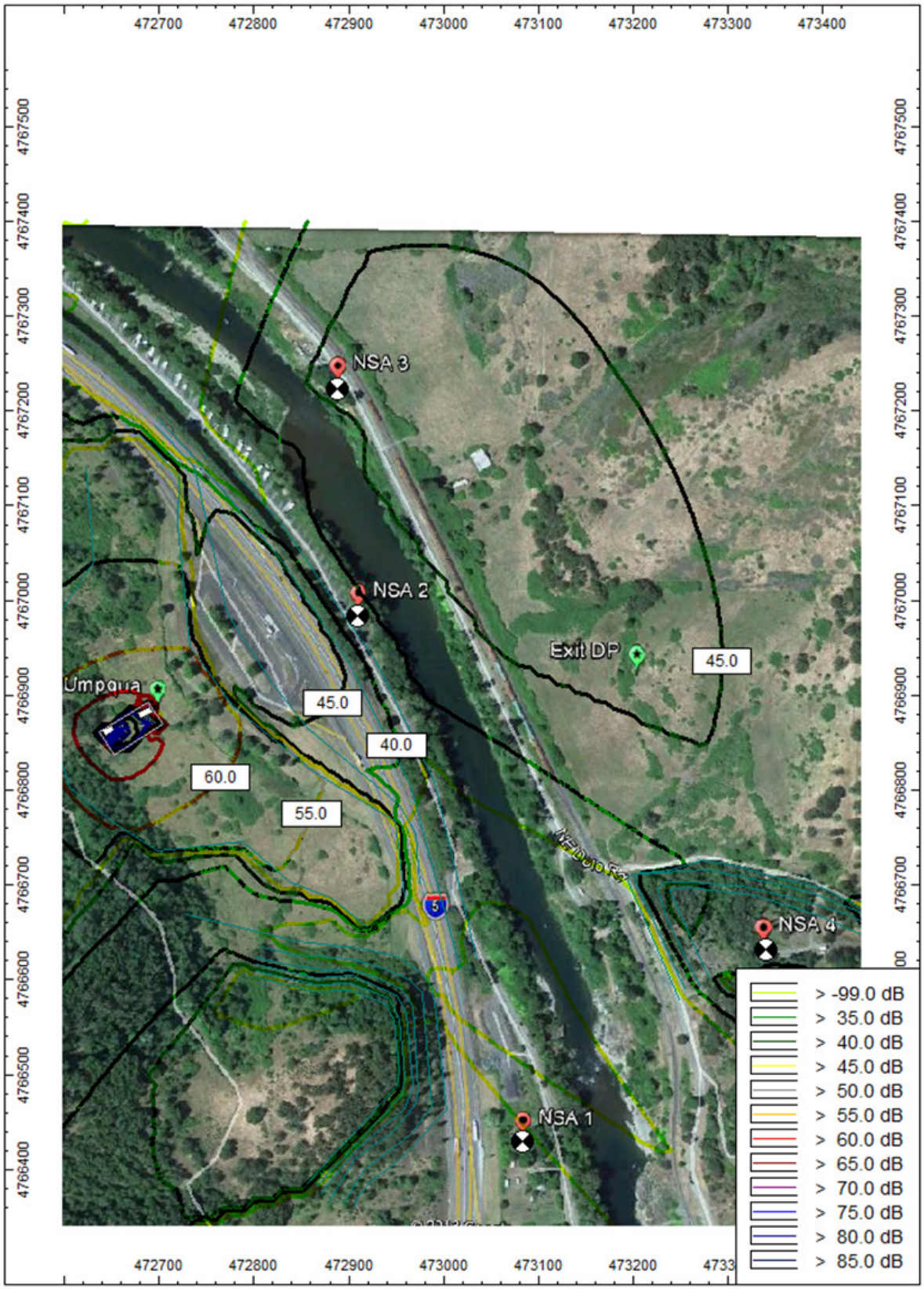

Figure M-11. South Umpqua Crossing HDD Noise Levels

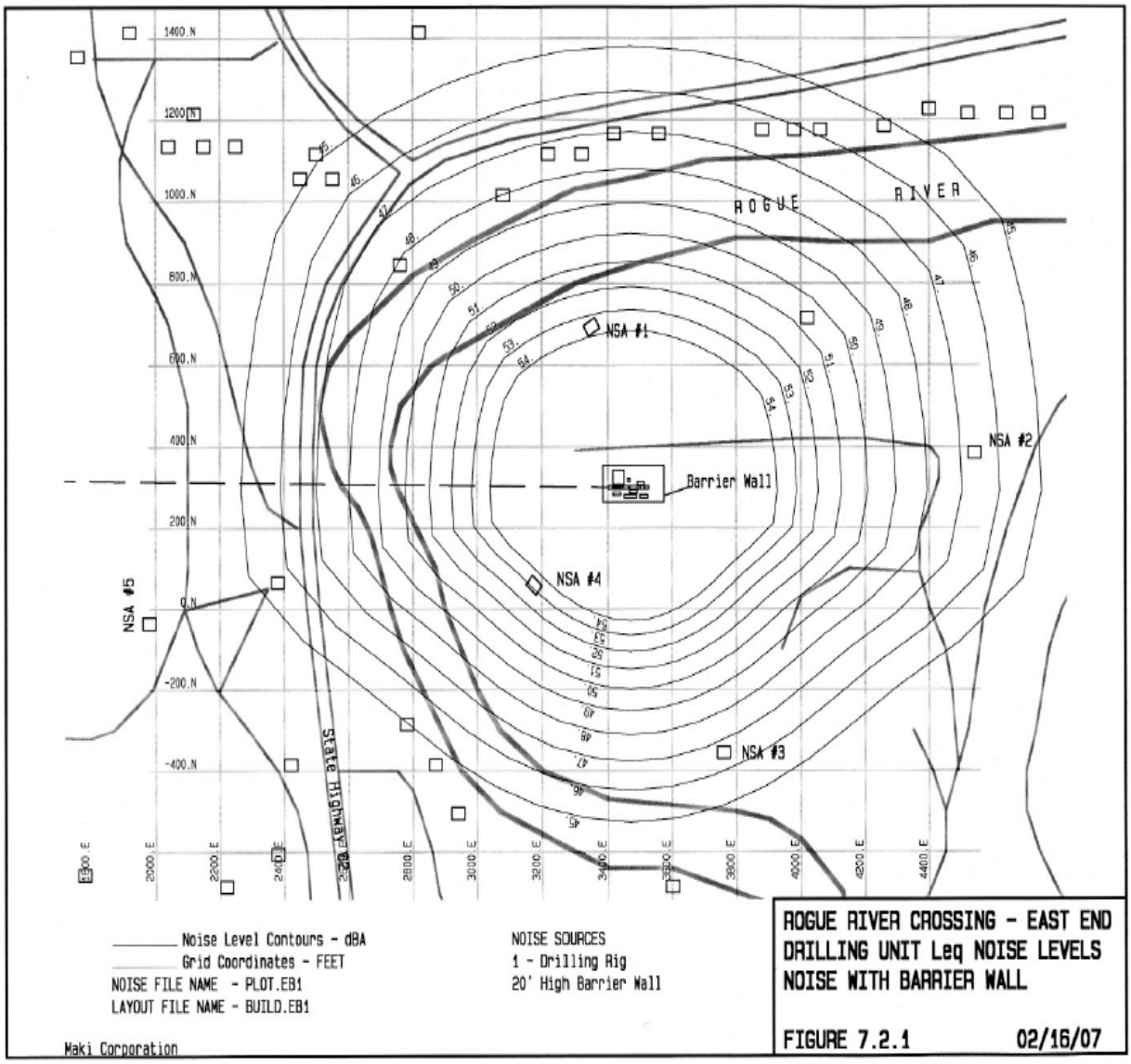

Figure M-12. Rogue River Crossing HDD Noise Levels

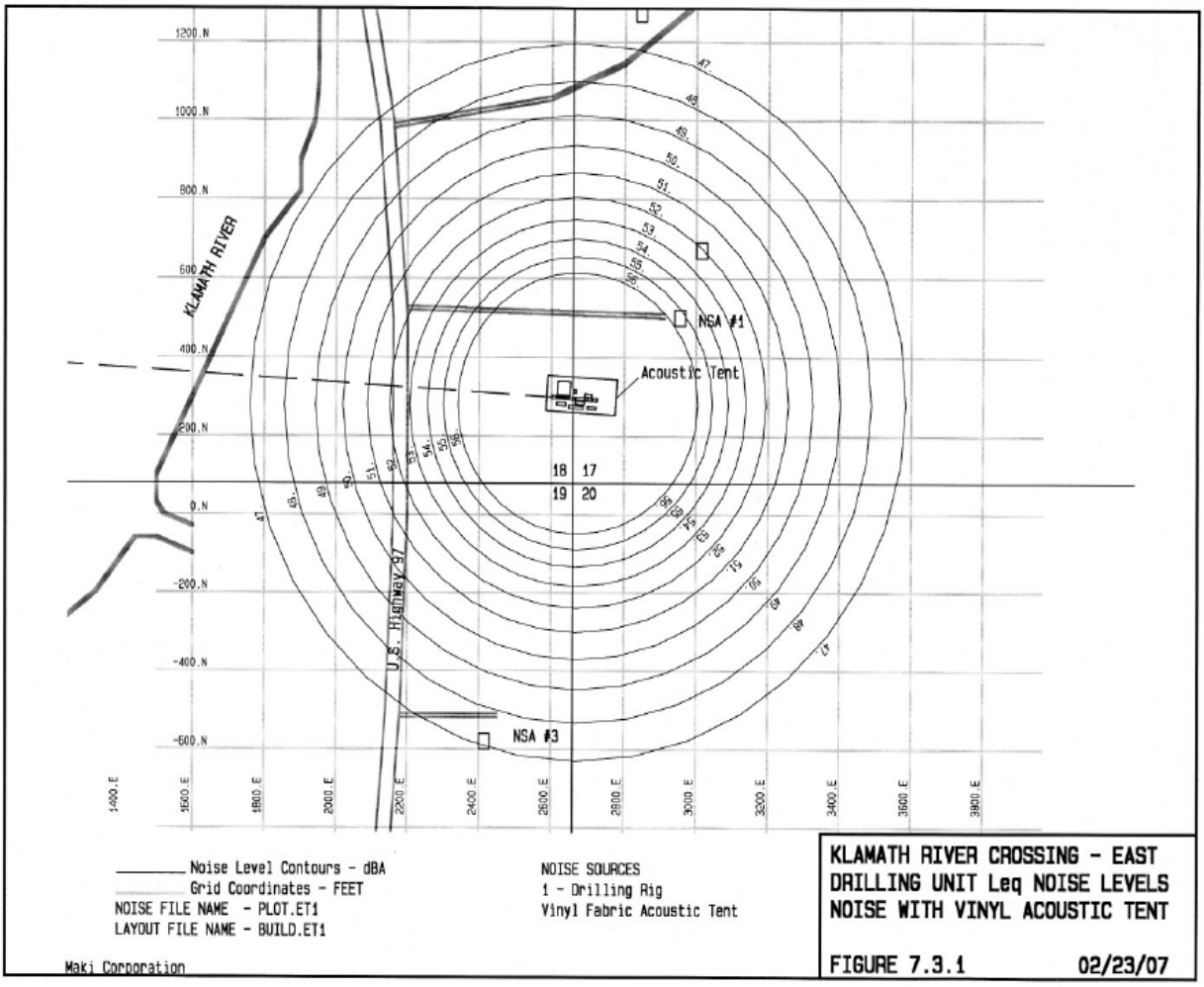

Figure M-13. Klamath River Crossing HDD Noise Levels

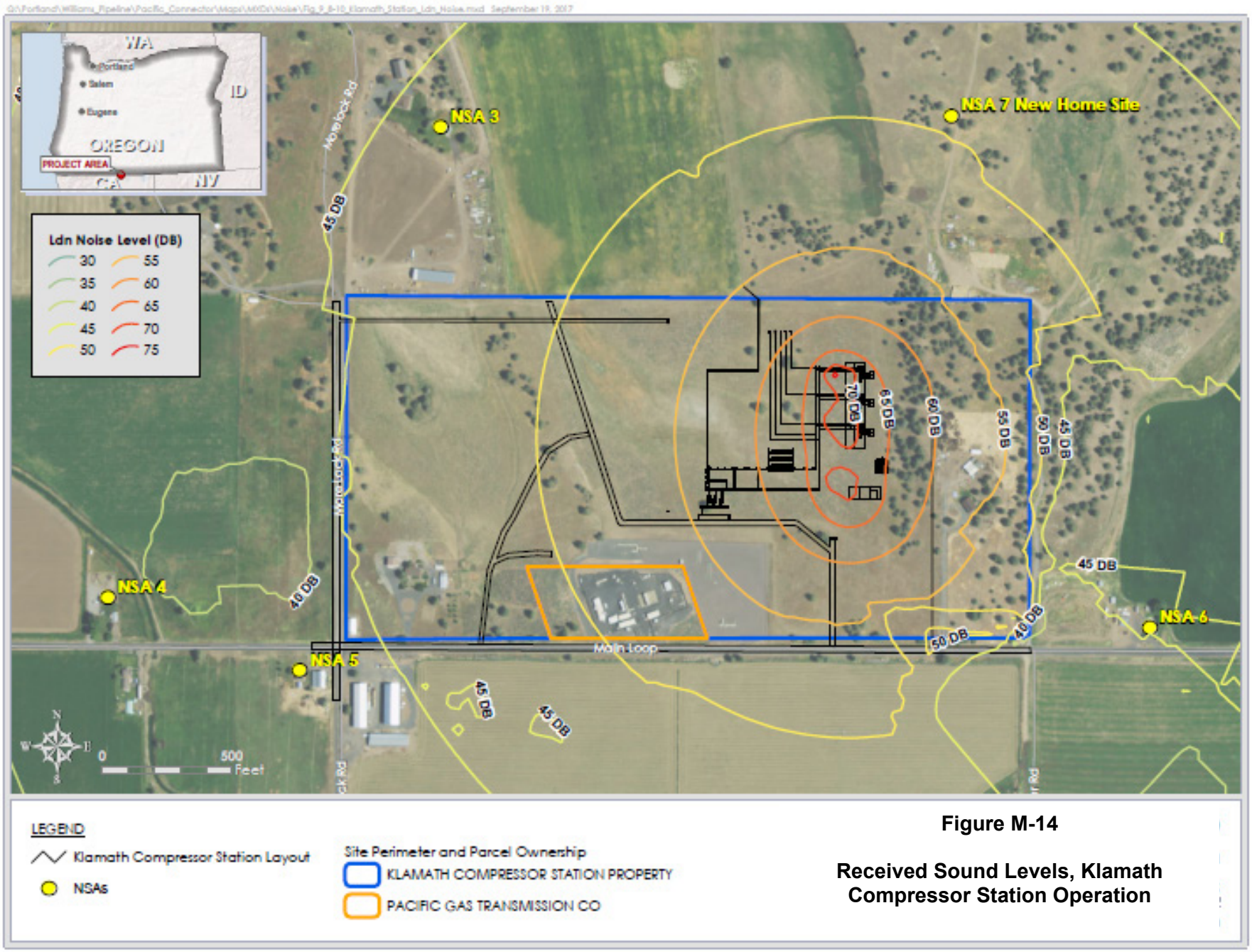

Figure M-14

Received Sound Levels, Klamath Compressor Station Operation

TABLE M-1

Construction Equipment Noise Emission Levels for Pile Installation and Dredging

Equipment Type	Make/ Model	Usage (%)	L_{max} at 50 feet dBA	L_{eq} at 50 feet dBA	Units Operating Simultaneously
Pickup Trucks	Ford F-150	40%	75	71	35
Large Trucks	Ford F-350	40%	75	71	61
Offroad Trucks	Caterpillar 740	40%	77	73	3
RT Cranes	Grove RT770E	16%	81	73	42
Dozers	Caterpillar D6	40%	82	78	7
Forklifts	Xtreme XR3034	40%	79	75	43
Loaders	Caterpillar 966F	40%	79	75	3
Tractors	Caterpillar Challenger 65	40%	84	80	3
Lifts / Hoists	80' Manlift	20%	75	68	63
Rollers	Caterpillar 563 - 84"	20%	80	73	2
Scrapers	Caterpillar 657	40%	84	80	1
Motor Graders	Caterpillar 14H	40%	85	81	1
Backhoes	Caterpillar 330, John Deere 330	40%	78	74	3
Compressors	Air Compressor (185 CFM)	40%	78	74	18
Generators / Light Plants	Portable Light Plant	50%	81	78	11
Welders	Welder (400-450 Amp)	40%	74	70	30
Crawler Cranes	Manitowoc 999	16%	81	73	13
Augers/Soil Mix Equipment	Soilmec SR 90 Rotary Drill	50%	80	77	17
Pumps	Centrifugal Pump (10")	50%	81	78	1
Excavator	Caterpillar 390F L	40%	81	77	0
Concrete Pumps	BSA 14000 Series	20%	81	74	3

TABLE M-2

Typical Compressor Station Construction Noise Levels at Reference Distances

Construction Equipment	Quantity	Usage Factor %	L_{max} SPL @ 50 Feet (dBA)	Sound Pressure Level at Distance, L_{eq} (dBA)			
				250	500	1000	1500
Tractor W/Trailer	2	40	84	69	63	57	53
Air Compressor	2	40	78	63	57	51	47
Generator	3	50	81	69	63	57	53
Ext-Boom RT Hoe	1	40	78	60	54	48	44
RT Forklift	1	40	75	57	51	45	41
Welding Rigs	10	40	74	66	60	54	50
60 ft Manlift	2	20	75	57	51	45	41
Ramax Compactor	1	20	83	62	56	50	46
Excavator	2	40	81	66	60	54	50
Side boom	3	16	85	68	62	56	52
Crane	2	16	81	62	56	50	47
Haul Truck	5	40	76	65	59	53	49

a/ Source: FHWA 2006

TABLE M-3

Summary of Typical Non-HDD Pipeline Construction Noise Levels (L_{eq})

Phase Number a/	Pipeline Construction Sequence	Equipment Expected b/	Equipment Noise (dBA L_{max}) Level at 50 feet	Composite Noise (dBA L_{eq}) at 50 feet	Composite Noise (dBA L_{eq}) at 100 feet	Composite Noise (dBA L_{eq}) at 300 feet
1	Right-of-Way Acquisition and Survey	Pickup Truck Chain Saw	75 84	81	73	60
2	Clearing and Grading	Pickup Truck Chain Saw Excavator Dozer Flatbed Truck Loader Shovel Logger-Cutter Skidder Crawler-Chipper	75 84 81 82 74 79 87 84 84 79	87	79	67
3	Fencing	Pickup Truck Auger Drill Rig	75 84	78	70	57
4	Centerline Survey of Ditch	Pickup Truck	75	71	63	50
5	Ditching (Rock-Free)	Pickup Truck Backhoe Excavator Dozer Flatbed Truck Dump Truck Tracked Ditcher	75 78 81 82 74 76 80	83	75	63
6	Ditching (Rock)	Pickup Truck Backhoe Excavator Dozer Flatbed Truck Auger Drill Rig Impact Hammer Rock Drill Blasting (Mitigated) Dump Truck	75 78 81 82 74 84 90 81 98 76	95	87	74
7	Padding Ditch Bottom	Pickup Truck Backhoe Excavator Dump Truck	75 78 74 81	82	74	61
8	Stringing	Pickup Truck Excavator Flatbed Truck Crane	75 81 74 81	80	72	59
9	Bending	Pickup Truck Excavator Dozer	75 81 82	83	75	62
10	Line Up, Stringer Bead and Hot Pass	Pickup Truck Excavator Dozer Side-Boom Welder/Torch	75 81 82 75 74	82	74	61

TABLE M-3 (continued)

Summary of Typical Non-HDD Pipeline Construction Noise Levels (L_{eq})

Phase Number a/	Pipeline Construction Sequence	Equipment Expected b/	Equipment Noise (dBA L_{max}) Level at 50 feet	Composite Noise (dBA L_{eq}) at 50 feet	Composite Noise (dBA L_{eq}) at 100 feet	Composite Noise (dBA L_{eq}) at 300 feet
11	Fill and Cap Weld	Pickup Truck Welder/Torch	75 74	77	69	56
12	As-Built Footage	Pickup Truck Welder/Torch	75 74	75	67	55
13	X-Ray and Weld Repair	Pickup Truck Welder/Torch	75 74	74	66	53
14	Coating Field and Factory Welds	Pickup Truck Welder/Torch	75 74	74	66	53
15	Inspection (Jeeping) and Repair of Coating	Pickup Truck	75	71	63	50
16	Lowering In and Tie-Ins	Pickup Truck Backhoe Excavator Dozer	75 81 74 76	83	75	62
17	As-Built Survey	Pickup Truck	75	71	63	50
18	Pad and Backfill	Pickup Truck Backhoe Excavator Dozer Dump Truck	75 78 74 82 76	83	75	63
19	Test and Final Tie-In	Pickup Truck Backhoe Pumps	75 78 81	82	74	61
20	Replace Topsoil and Cleanup	Pickup Truck Backhoe Excavator Dozer Tractor	75 78 81 82 84	84	76	63

a/ Equipment expected, based on "typical" pipeline construction requirements at a given location.
b/ Estimated Cumulative Noise at 50 feet is based on equipment-specific noise values (WSDOT 2015; FHWA 2006).

TABLE M-4

HDD Equipment Sound Power Level Data

HDD Equipment	Quantity	Sound Power (Lw) / Octave Band Frequency									
		31.5	63	125	250	500	1000	2000	4000	8000	dBA
630 Hp Power Unit	2	110	109	108	108	109	110	110	105	108	116
630 Hp Mud Pump	2	110	109	108	108	109	110	110	105	108	116
360 hp Crane	1	80	83	85	79	81	82	79	75	65	86
Power Unit Exhaust	2	96	85	76	72	66	65	67	70	64	75
Crane Exhaust	1	100	91	80	71	71	64	64	60	50	75
360 hp Mud Cleaner	1	104	101	102	97	89	85	83	79	82	94
Mud Cleaner Exhaust	2	100	91	80	71	71	64	64	60	50	73
Shale Shaker	1	104	99	99	100	99	93	89	83	81	99
Mud Pump Exhaust	2	96	85	76	72	66	65	67	70	64	75

TABLE M-5

Compressor Station Sound Power Data

Compressor Station Equipment	Quantity	Sound Power (Lw) / Octave Band Frequency								dBA
		63	125	250	500	1000	2000	4000	8000	
Air Intake	3	115	104	91	87	84	77	71	87	94
Centrifugal Compressor	3	97	99	94	96	96	98	96	92	103
Centrifugal Compressor Baseplate	3	88	89	85	87	87	89	87	83	94
Exhaust Duct	3	118	111	106	97	92	91	88	87	102
Exhaust Outlet	3	123	117	105	91	84	82	95	118	117
Gas Turbine Baseplate	3	111	111	102	95	89	90	81	53	100
Gas Turbine Enclosure Ext Ventilation	3	122	113	106	98	89	96	94	98	105
Gas Turbine Enclosure Inlet Ventilation	3	123	113	106	100	91	93	90	103	106
Gas Turbine Vent Discharge	3	108	96	80	66	62	59	55	86	88
Gas Turbine	3	120	114	104	100	88	96	94	94	104
Inlet Duct	3	108	97	85	77	76	92	72	81	94
Inlet Filter House	3	116	102	89	85	76	75	67	91	94

TABLE M-6

Compressor Station Insert Loss Values

Description	Octave Band Center Frequencies (Hz)/Loss (dB)								
	31.5	63	125	250	500	1000	2000	4000	8000
Inlet Silencer	0	-8	-24	-53	-65	-68	-79	-77	-50
Inlet Duct Walls	0	-21	-27	-35	-41	-39	-39	-46	-52
Inlet Filter House Walls	0	-8	-13	-20	-24	-29	-30	-30	-29
Double Exhaust Silencers Klamath	-4	-16	-24	-44	-78	-84	-88	-64	-48
Exhaust Duct Walls	0	-30	-35	-40	-48	-53	-50	-55	-58
Building Attenuation	-17	-19	-24	-34	-43	-50	-55	-55	-55