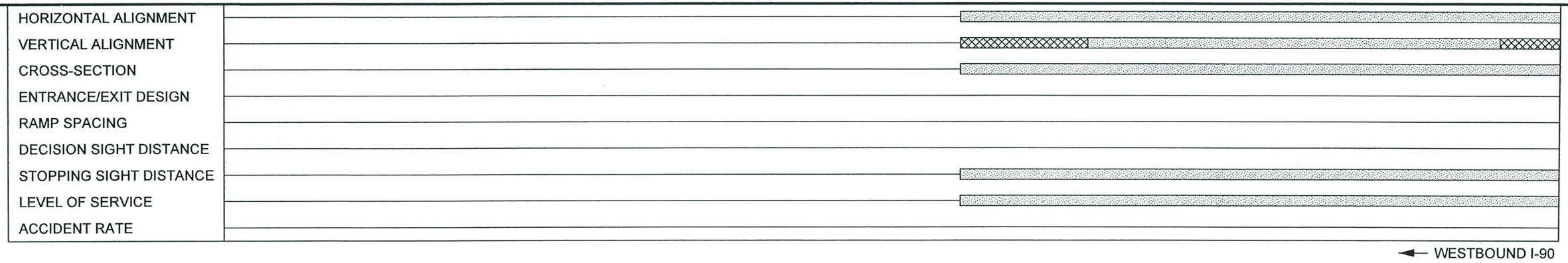
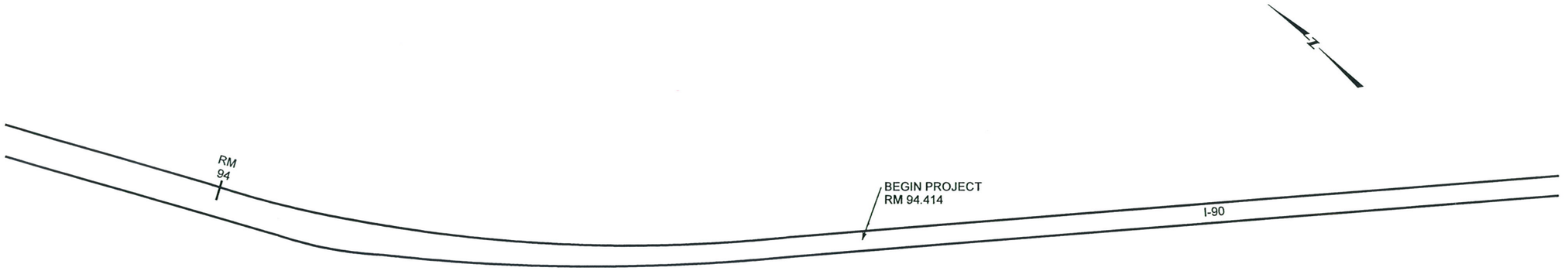
Exhibit 1



LEGEND

RATING OF EXISTING CONDITION

- GOOD
- FAIR
- POOR
- F — FATAL ACCIDENT



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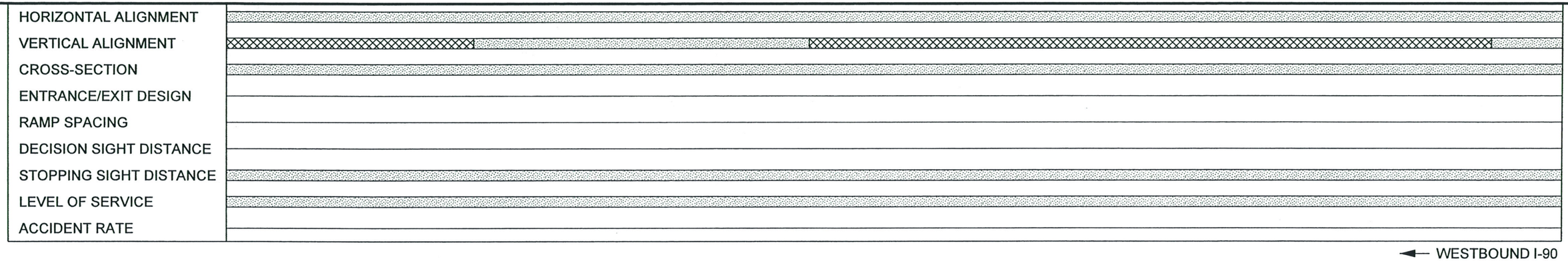
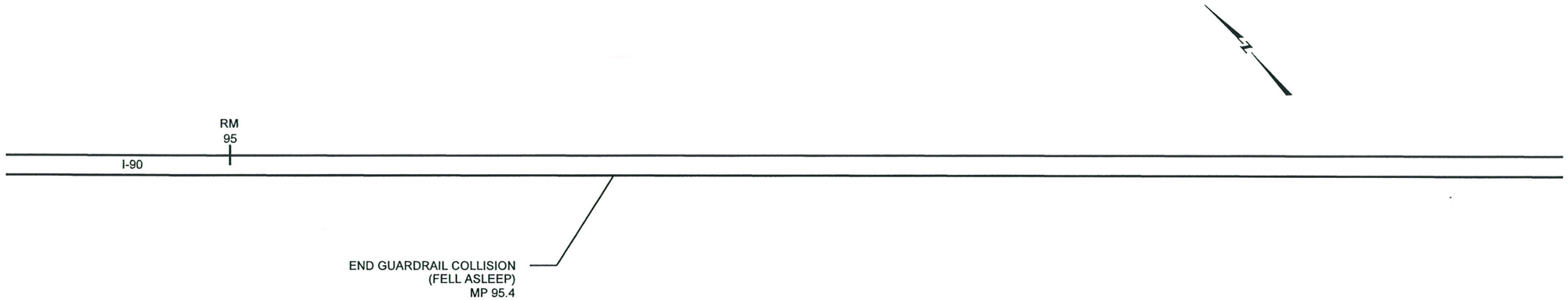
CH2MHILL	MONTANA DEPARTMENT OF TRANSPORTATION MISSOULA MT, I-90 EAST WEST PHASE 1 CORRIDOR STUDY	**EVALUATION OF EXISTING I-90 GEOMETRIC AND OPERATIONAL FEATURES**	SHEET 1

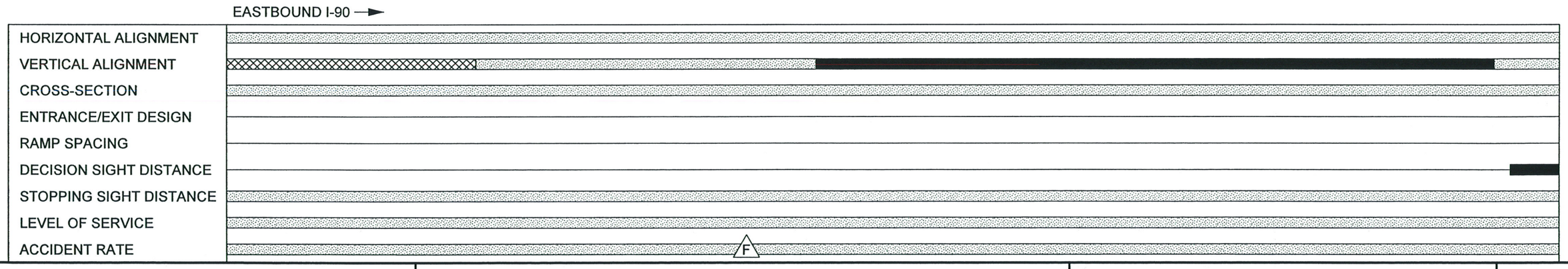


LEGEND

RATING OF EXISTING CONDITION

- GOOD
- FAIR
- POOR
- F — FATAL ACCIDENT





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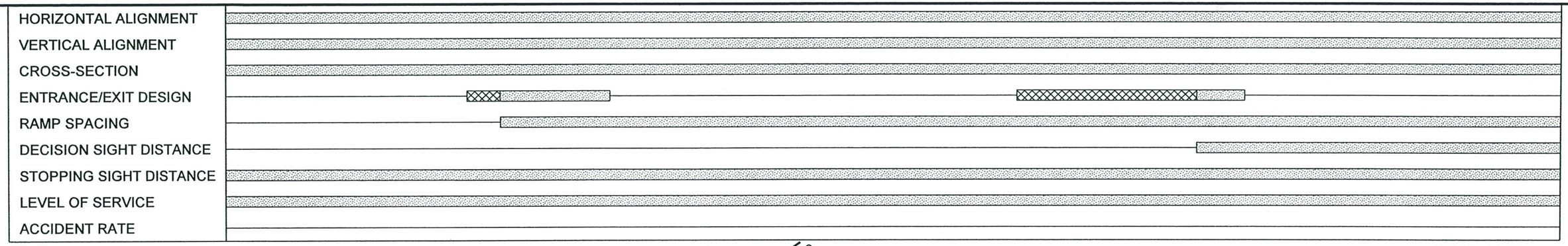
CH2MHILL	MONTANA DEPARTMENT OF TRANSPORTATION MISSOULA MT, I-90 EAST WEST PHASE 1 CORRIDOR STUDY	**EVALUATION OF EXISTING I-90 GEOMETRIC AND OPERATIONAL FEATURES**

SHEET 2

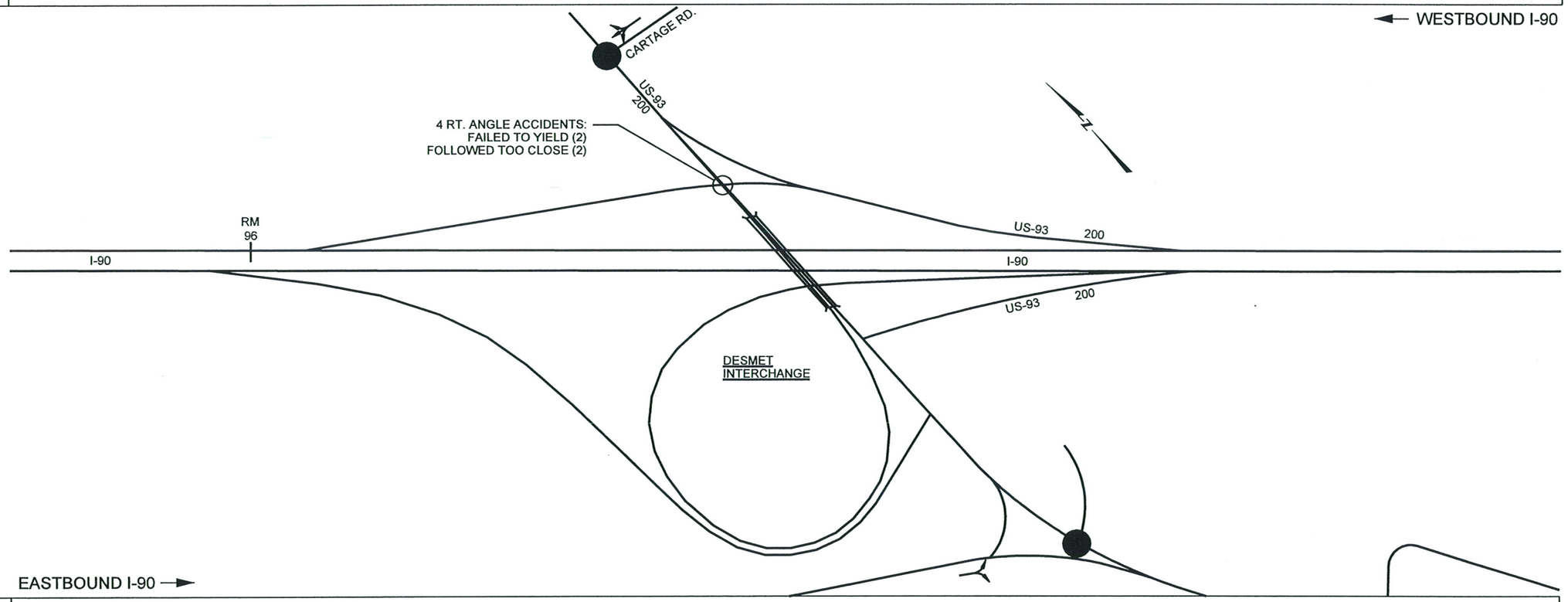


WESTBOUND I-90 ←

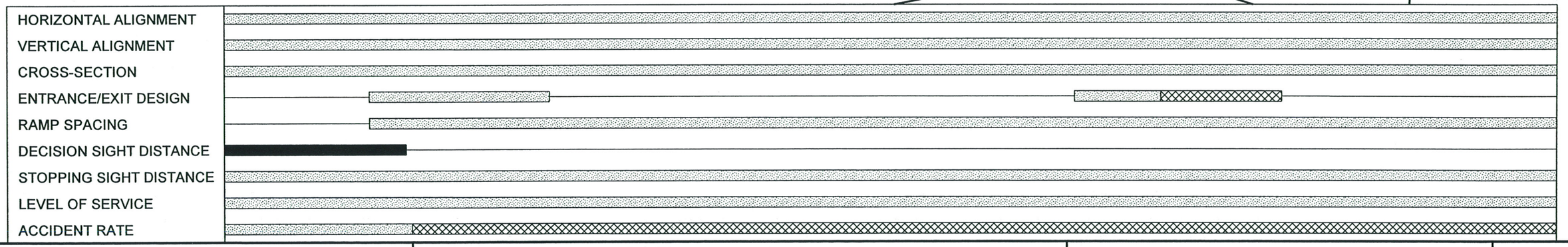
LEGEND

RATING OF EXISTING CONDITION

- GOOD
- FAIR
- POOR
- (F) FATAL ACCIDENT



EASTBOUND I-90 →



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CH2MHILL	MONTANA DEPARTMENT OF TRANSPORTATION MISSOULA MT, I-90 EAST WEST PHASE 1 CORRIDOR STUDY	EVALUATION OF EXISTING I-90 GEOMETRIC AND OPERATIONAL FEATURES	SHEET 3

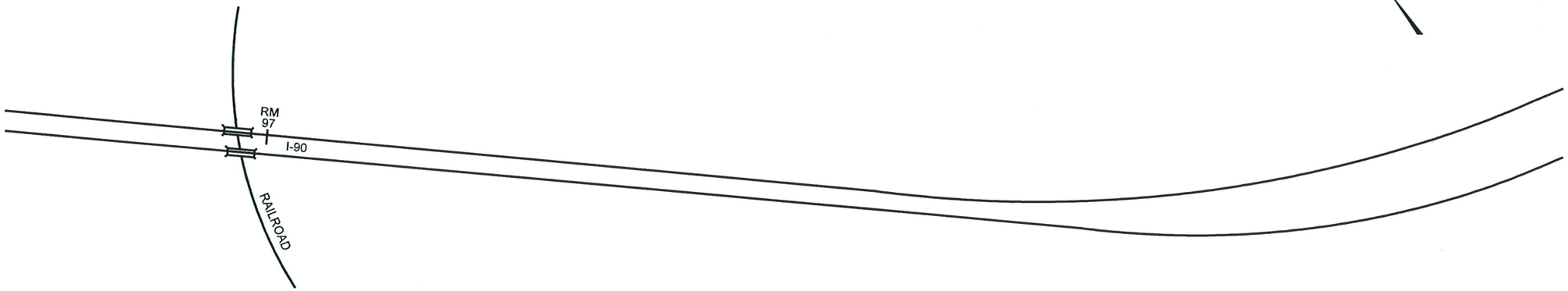
HORIZONTAL ALIGNMENT	
VERTICAL ALIGNMENT	
CROSS-SECTION	
ENTRANCE/EXIT DESIGN	
RAMP SPACING	
DECISION SIGHT DISTANCE	
STOPPING SIGHT DISTANCE	
LEVEL OF SERVICE	
ACCIDENT RATE	

← WESTBOUND I-90

LEGEND

RATING OF EXISTING CONDITION

- GOOD
- FAIR
- POOR
- (F) FATAL ACCIDENT



EASTBOUND I-90 →

HORIZONTAL ALIGNMENT	
VERTICAL ALIGNMENT	
CROSS-SECTION	
ENTRANCE/EXIT DESIGN	
RAMP SPACING	
DECISION SIGHT DISTANCE	
STOPPING SIGHT DISTANCE	
LEVEL OF SERVICE	
ACCIDENT RATE	

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CH2MHILL

MONTANA DEPARTMENT OF TRANSPORTATION
MISSOULA MT, I-90 EAST WEST
PHASE 1 CORRIDOR STUDY

EVALUATION OF EXISTING I-90 GEOMETRIC AND OPERATIONAL FEATURES

SHEET 4

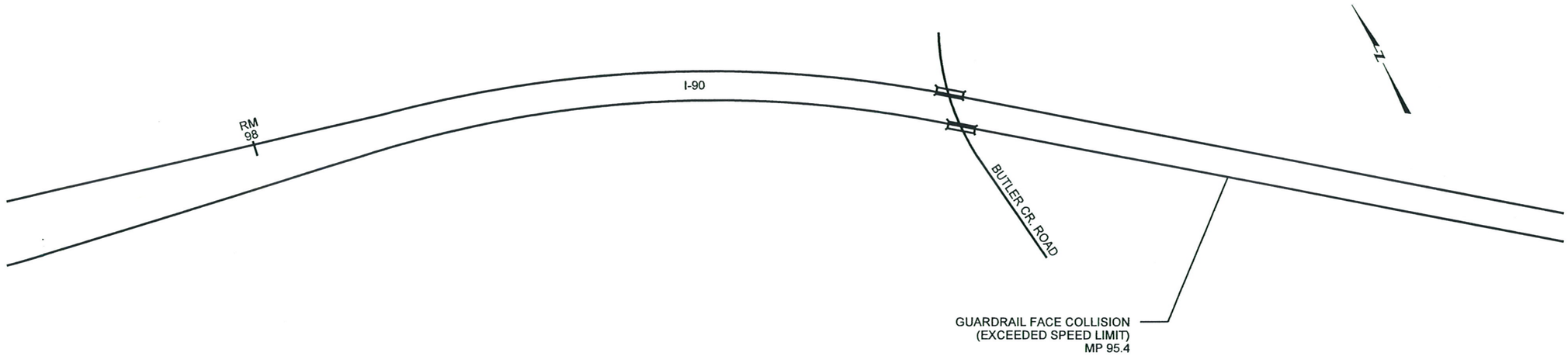
HORIZONTAL ALIGNMENT	
VERTICAL ALIGNMENT	
CROSS-SECTION	
ENTRANCE/EXIT DESIGN	
RAMP SPACING	
DECISION SIGHT DISTANCE	
STOPPING SIGHT DISTANCE	
LEVEL OF SERVICE	
ACCIDENT RATE	

← WESTBOUND I-90

LEGEND

RATING OF EXISTING CONDITION

- GOOD
- FAIR
- POOR
- (F) FATAL ACCIDENT



EASTBOUND I-90 →

HORIZONTAL ALIGNMENT	
VERTICAL ALIGNMENT	
CROSS-SECTION	
ENTRANCE/EXIT DESIGN	
RAMP SPACING	
DECISION SIGHT DISTANCE	
STOPPING SIGHT DISTANCE	
LEVEL OF SERVICE	
ACCIDENT RATE	F

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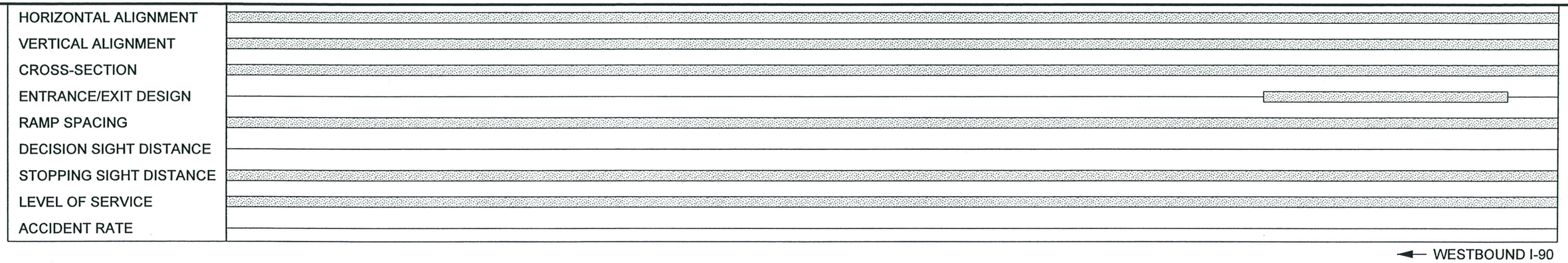
CH2MHILL

MONTANA DEPARTMENT OF TRANSPORTATION

MISSOULA MT, I-90 EAST WEST
PHASE 1 CORRIDOR STUDY

EVALUATION OF EXISTING I-90
GEOMETRIC AND OPERATIONAL FEATURES

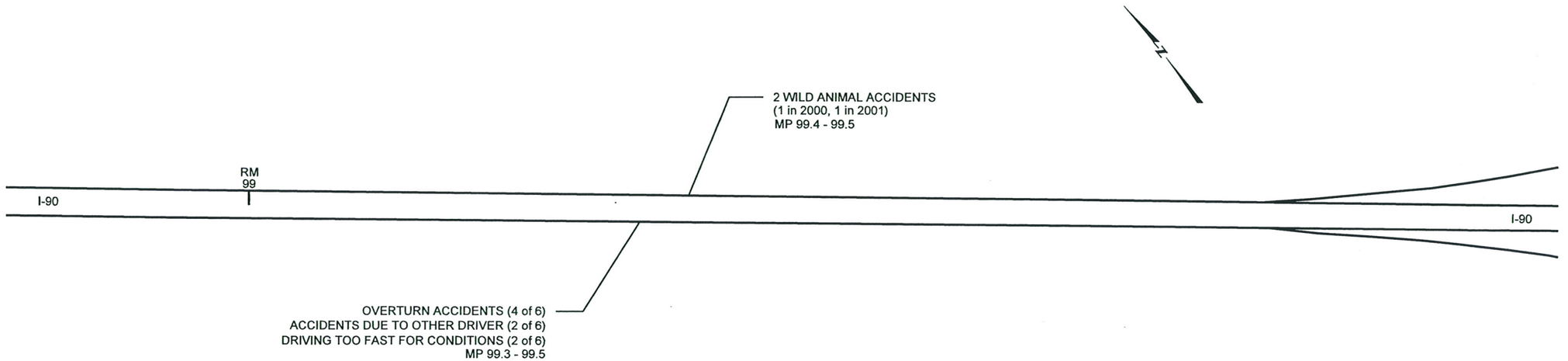
SHEET 5

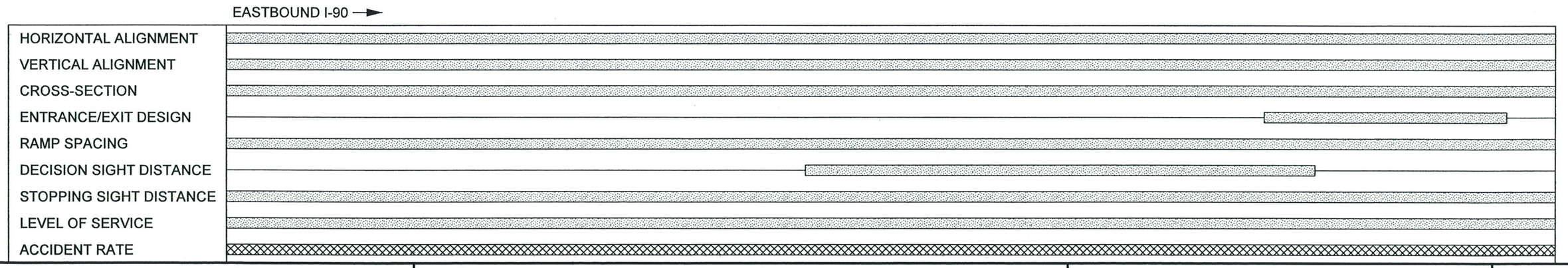


LEGEND

RATING OF EXISTING CONDITION

- GOOD
- FAIR
- POOR
- F — FATAL ACCIDENT





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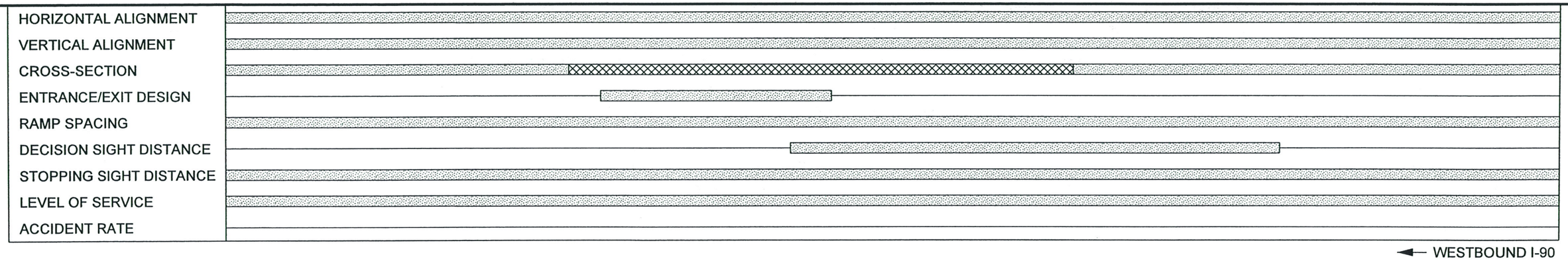
CH2MHILL

MONTANA DEPARTMENT OF TRANSPORTATION

MISSOULA MT, I-90 EAST WEST
PHASE 1 CORRIDOR STUDY

EVALUATION OF EXISTING I-90
GEOMETRIC AND OPERATIONAL FEATURES

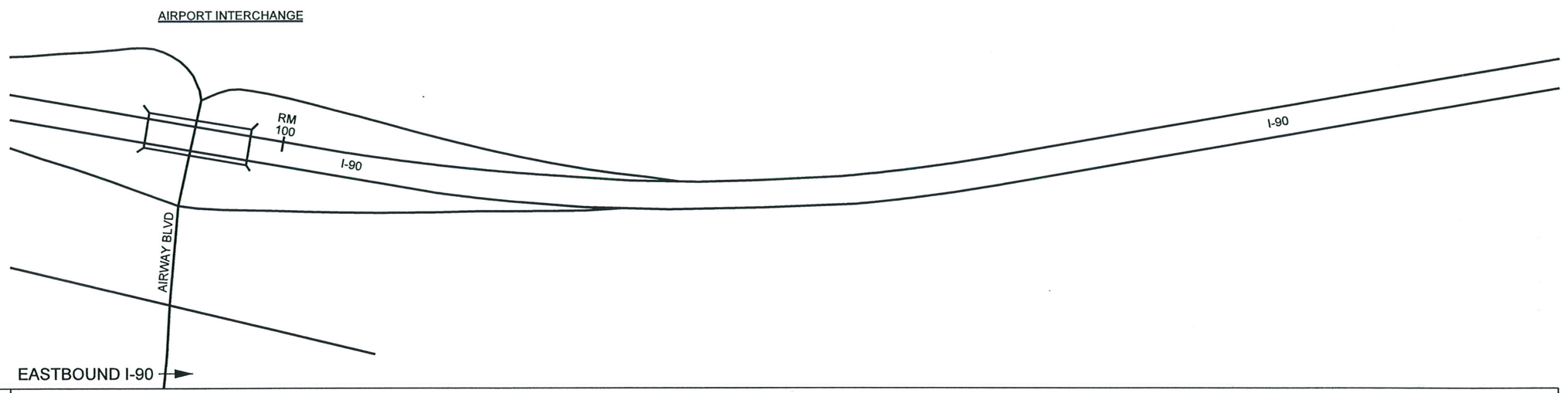
SHEET
6

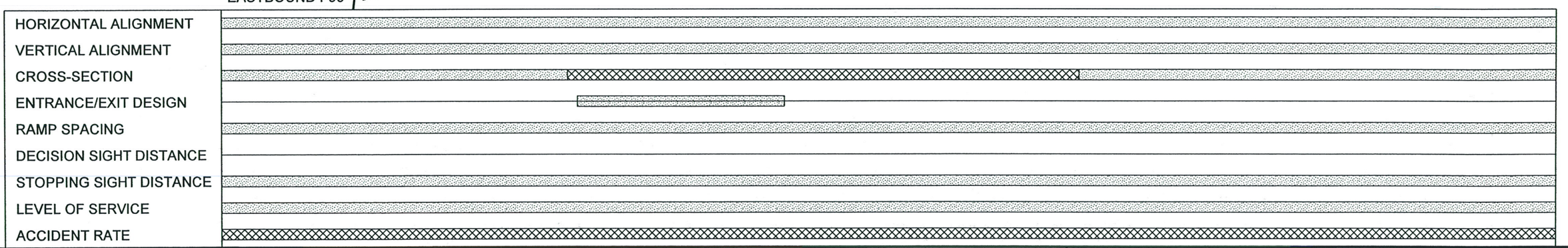


LEGEND

RATING OF EXISTING CONDITION

- GOOD
- FAIR
- POOR
- (F) FATAL ACCIDENT





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CH2MHILL

MONTANA DEPARTMENT OF TRANSPORTATION

MISSOULA MT, I-90 EAST WEST
PHASE 1 CORRIDOR STUDY

EVALUATION OF EXISTING I-90
GEOMETRIC AND OPERATIONAL FEATURES

SHEET 7

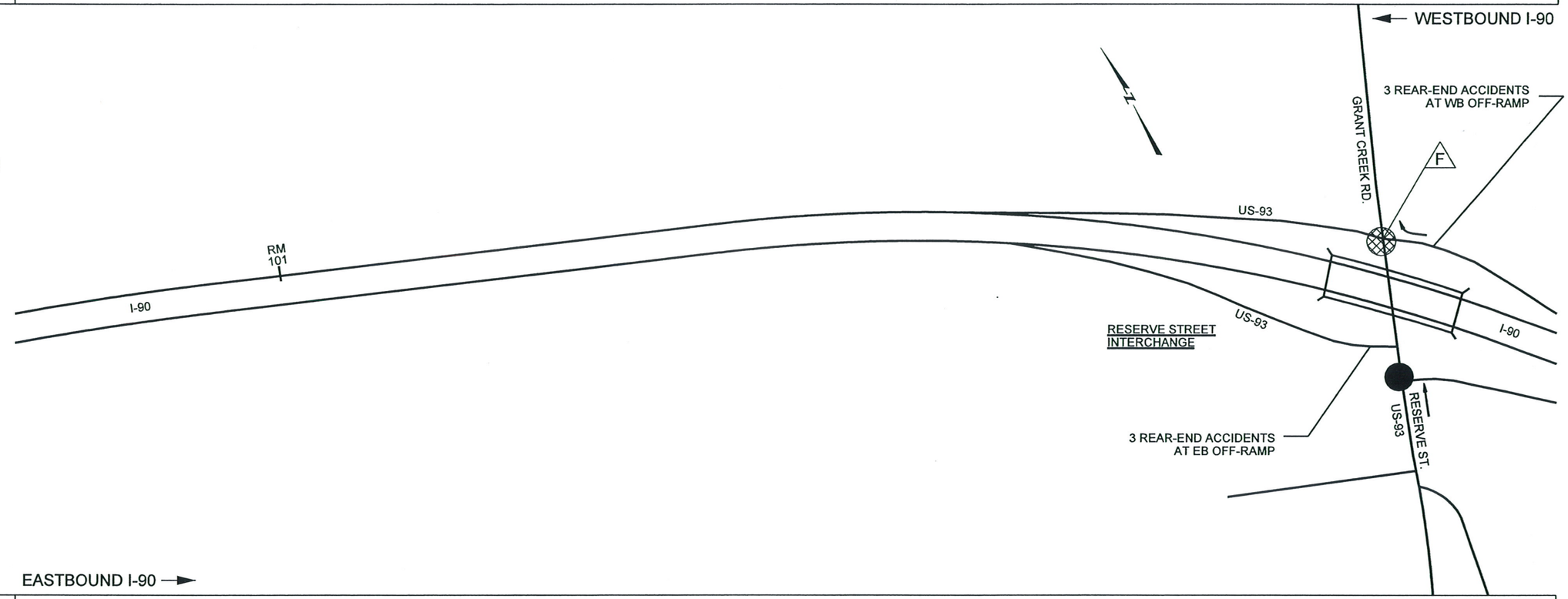
HORIZONTAL ALIGNMENT	
VERTICAL ALIGNMENT	
CROSS-SECTION	
ENTRANCE/EXIT DESIGN	
RAMP SPACING	
DECISION SIGHT DISTANCE	
STOPPING SIGHT DISTANCE	
LEVEL OF SERVICE	
ACCIDENT RATE	

WESTBOUND I-90 ←

LEGEND

RATING OF EXISTING CONDITION

- GOOD
- FAIR
- POOR
- (F) FATAL ACCIDENT



EASTBOUND I-90 →

HORIZONTAL ALIGNMENT	
VERTICAL ALIGNMENT	
CROSS-SECTION	
ENTRANCE/EXIT DESIGN	
RAMP SPACING	
DECISION SIGHT DISTANCE	
STOPPING SIGHT DISTANCE	
LEVEL OF SERVICE	
ACCIDENT RATE	

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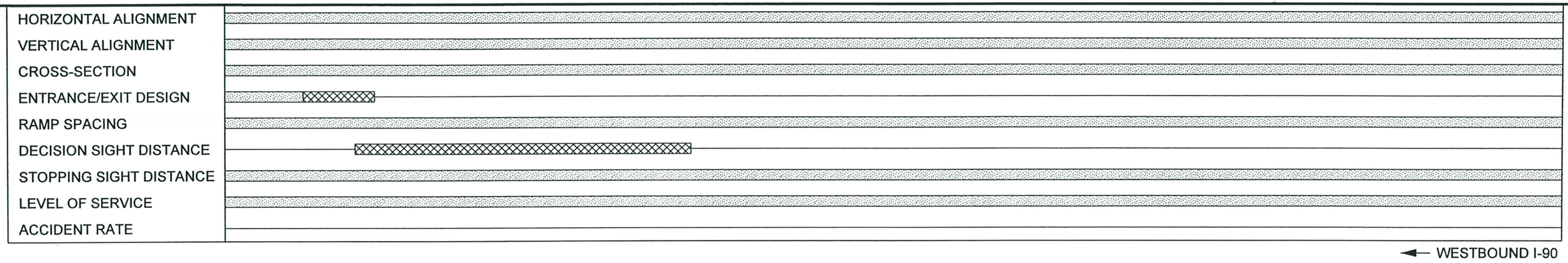
CH2MHILL

MONTANA DEPARTMENT OF TRANSPORTATION
MISSOULA MT, I-90 EAST WEST
PHASE 1 CORRIDOR STUDY

EVALUATION OF EXISTING I-90 GEOMETRIC AND OPERATIONAL FEATURES

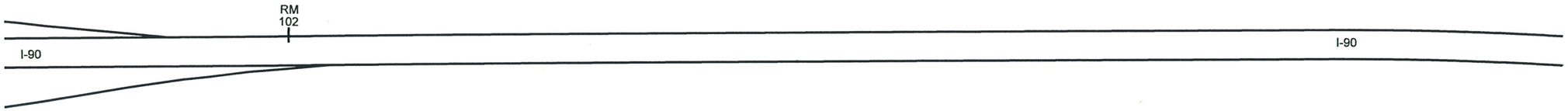
SHEET 8

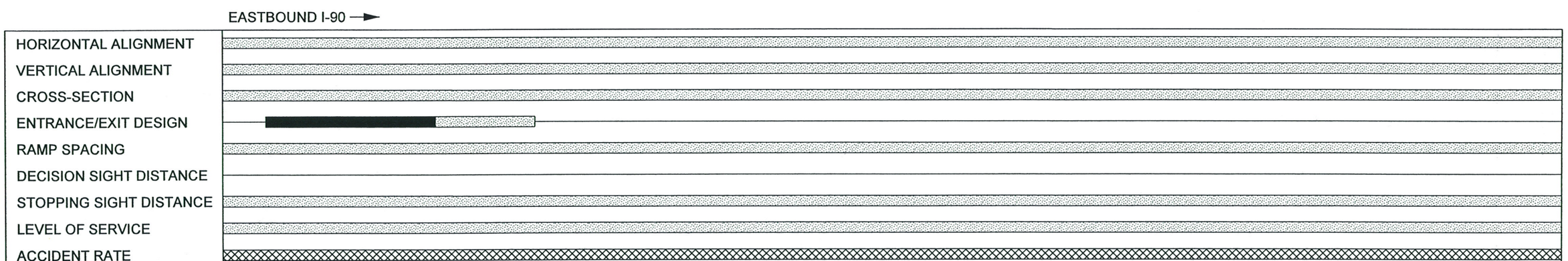


LEGEND

RATING OF EXISTING CONDITION

- GOOD
- FAIR
- POOR
- F — FATAL ACCIDENT





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CH2MHILL

MONTANA DEPARTMENT OF TRANSPORTATION

MISSOULA MT, I-90 EAST WEST
PHASE 1 CORRIDOR STUDY

EVALUATION OF EXISTING I-90 GEOMETRIC AND OPERATIONAL FEATURES

SHEET 9

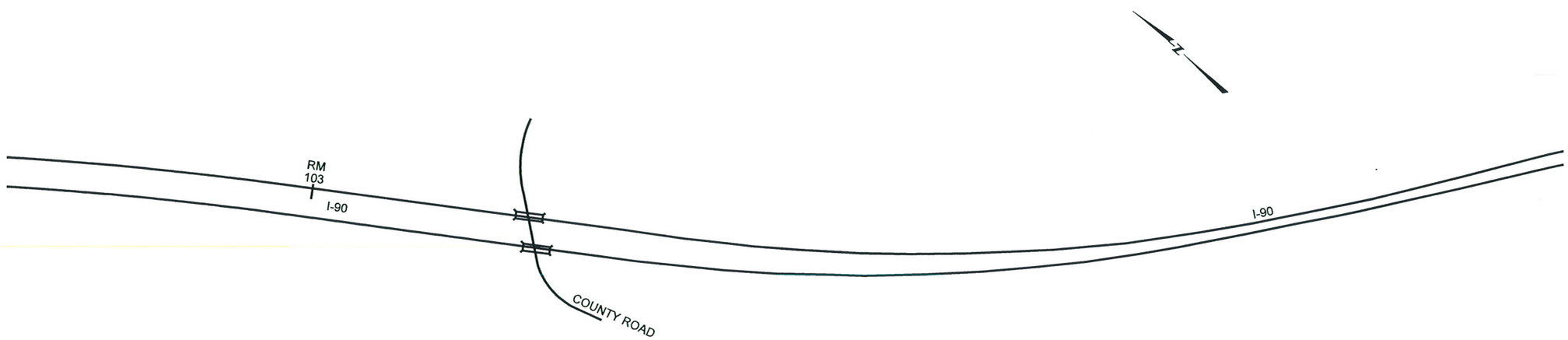
HORIZONTAL ALIGNMENT	
VERTICAL ALIGNMENT	
CROSS-SECTION	
ENTRANCE/EXIT DESIGN	
RAMP SPACING	
DECISION SIGHT DISTANCE	
STOPPING SIGHT DISTANCE	
LEVEL OF SERVICE	
ACCIDENT RATE	

← WESTBOUND I-90

LEGEND

RATING OF EXISTING CONDITION

- GOOD
- FAIR
- POOR
- (F) FATAL ACCIDENT



EASTBOUND I-90 →

HORIZONTAL ALIGNMENT	
VERTICAL ALIGNMENT	
CROSS-SECTION	
ENTRANCE/EXIT DESIGN	
RAMP SPACING	
DECISION SIGHT DISTANCE	
STOPPING SIGHT DISTANCE	
LEVEL OF SERVICE	
ACCIDENT RATE	

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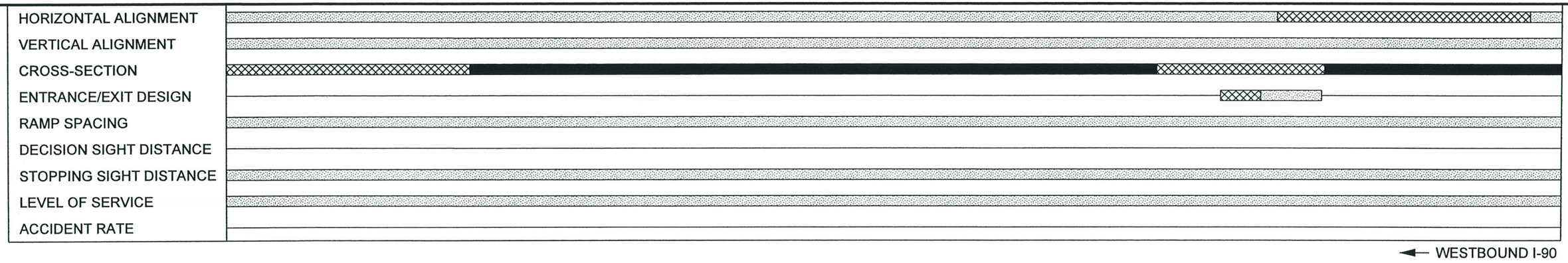
CH2MHILL

MONTANA DEPARTMENT OF TRANSPORTATION

MISSOULA MT, I-90 EAST WEST
PHASE 1 CORRIDOR STUDY

EVALUATION OF EXISTING I-90 GEOMETRIC AND OPERATIONAL FEATURES

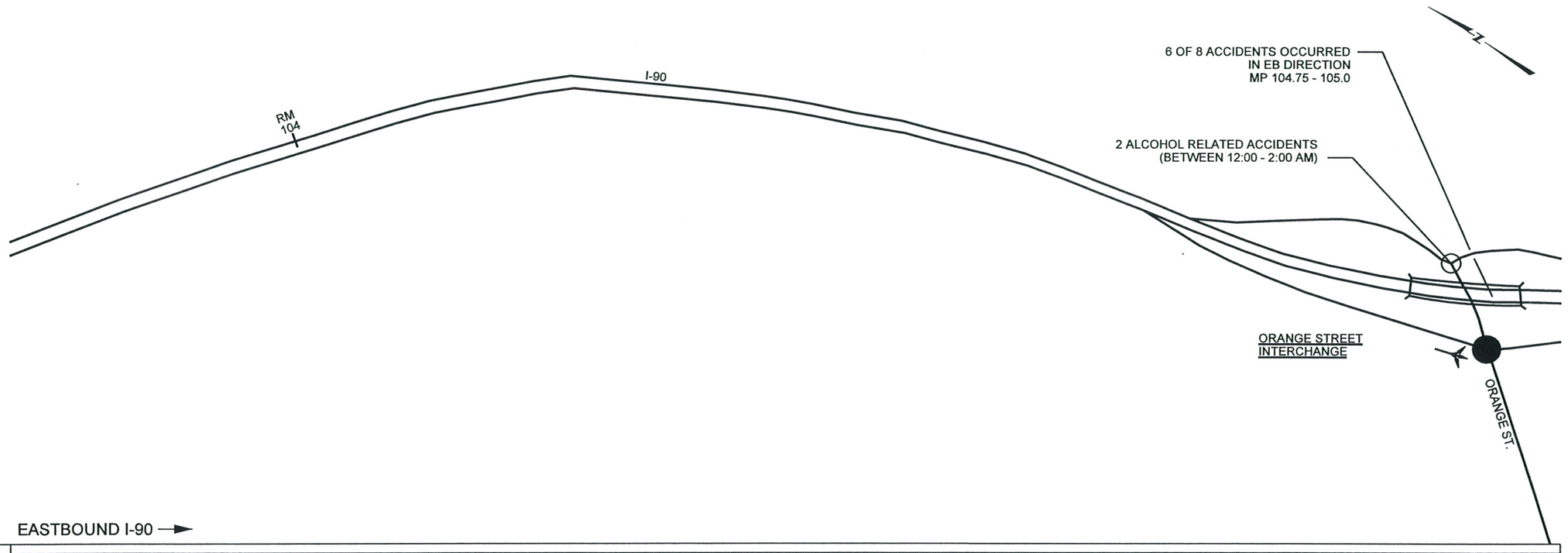
SHEET 10

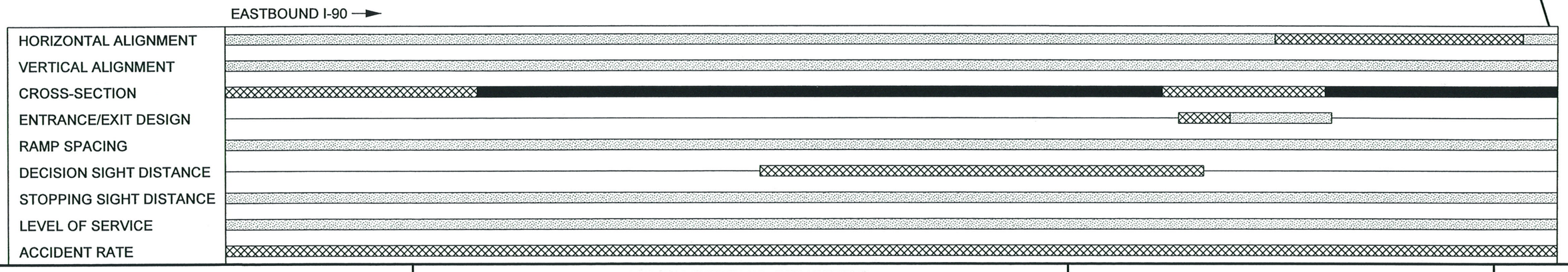


LEGEND

RATING OF EXISTING CONDITION

- GOOD
- FAIR
- POOR
- (F) FATAL ACCIDENT





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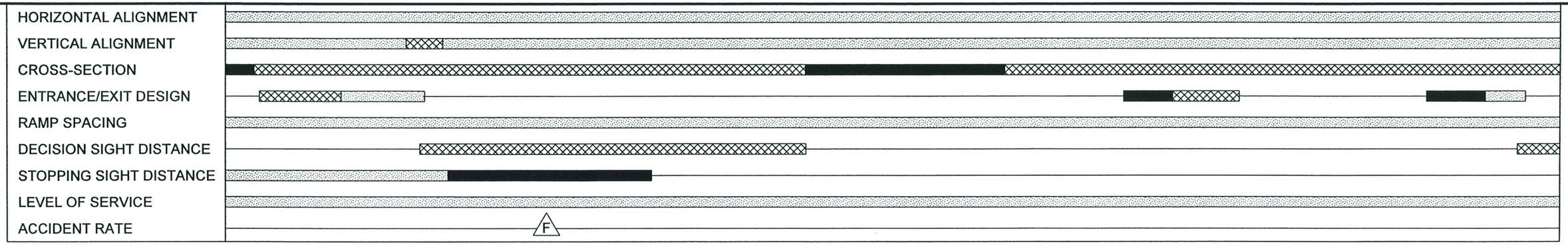
CH2MHILL	MONTANA DEPARTMENT OF TRANSPORTATION MISSOULA MT, I-90 EAST WEST PHASE 1 CORRIDOR STUDY	**EVALUATION OF EXISTING I-90 GEOMETRIC AND OPERATIONAL FEATURES**

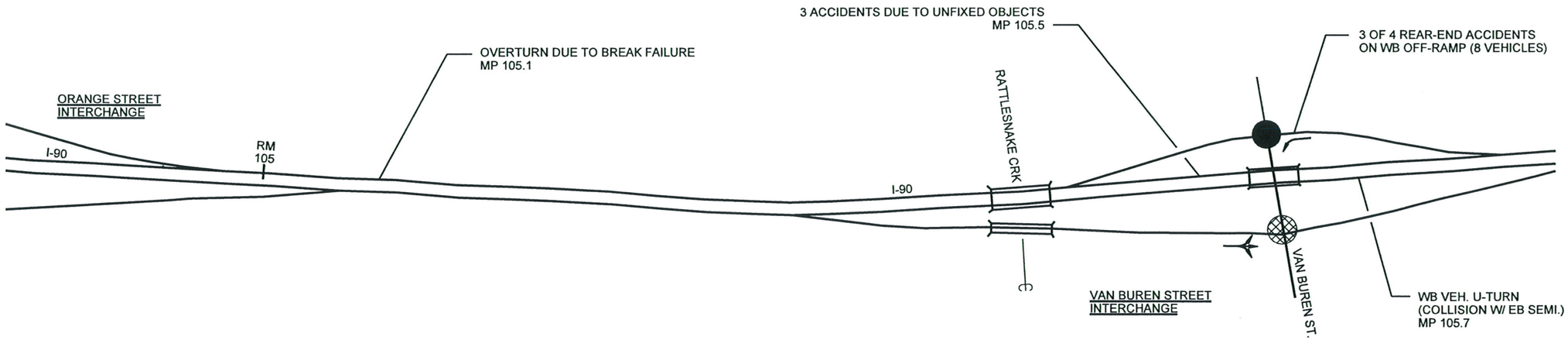
SHEET 11



LEGEND

RATING OF EXISTING CONDITION

- GOOD
- FAIR
- POOR
- F — FATAL ACCIDENT



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CH2MHILL	MONTANA DEPARTMENT OF TRANSPORTATION MISSOULA MT, I-90 EAST WEST PHASE 1 CORRIDOR STUDY	**EVALUATION OF EXISTING I-90 GEOMETRIC AND OPERATIONAL FEATURES**	SHEET 12

HORIZONTAL ALIGNMENT	
VERTICAL ALIGNMENT	
CROSS-SECTION	
ENTRANCE/EXIT DESIGN	
RAMP SPACING	
DECISION SIGHT DISTANCE	
STOPPING SIGHT DISTANCE	
LEVEL OF SERVICE	
ACCIDENT RATE	

← WESTBOUND I-90

LEGEND

RATING OF EXISTING CONDITION

- GOOD
- FAIR
- POOR
- F — FATAL ACCIDENT

EASTBOUND I-90 →

HORIZONTAL ALIGNMENT	
VERTICAL ALIGNMENT	
CROSS-SECTION	
ENTRANCE/EXIT DESIGN	
RAMP SPACING	
DECISION SIGHT DISTANCE	
STOPPING SIGHT DISTANCE	
LEVEL OF SERVICE	
ACCIDENT RATE	

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CH2MHILL

MONTANA DEPARTMENT OF TRANSPORTATION
MISSOULA MT, I-90 EAST WEST
PHASE 1 CORRIDOR STUDY

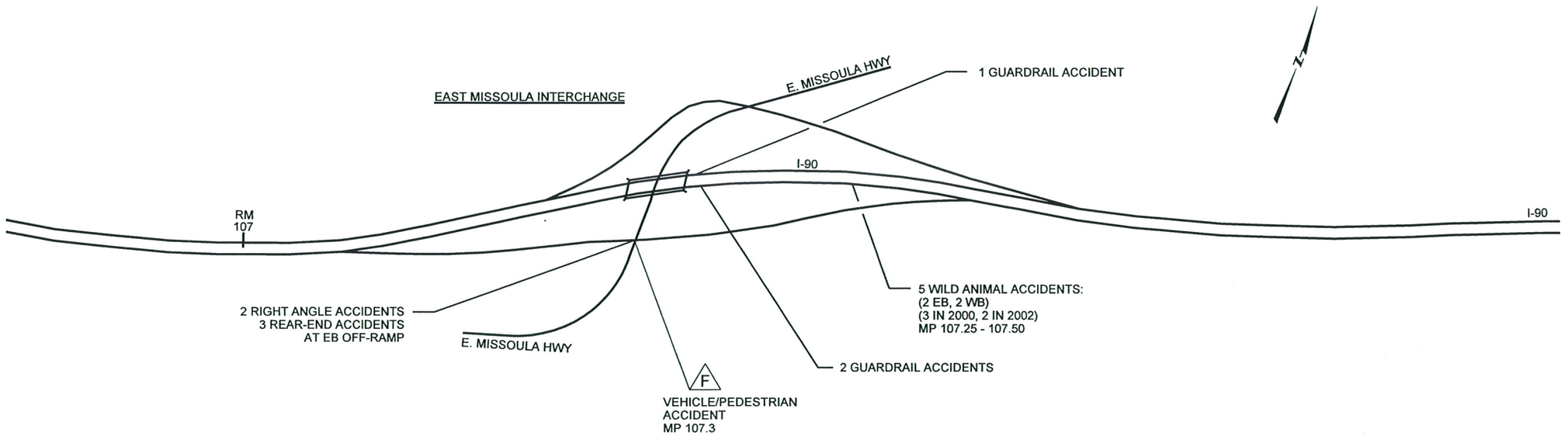
EVALUATION OF EXISTING I-90 GEOMETRIC AND OPERATIONAL FEATURES

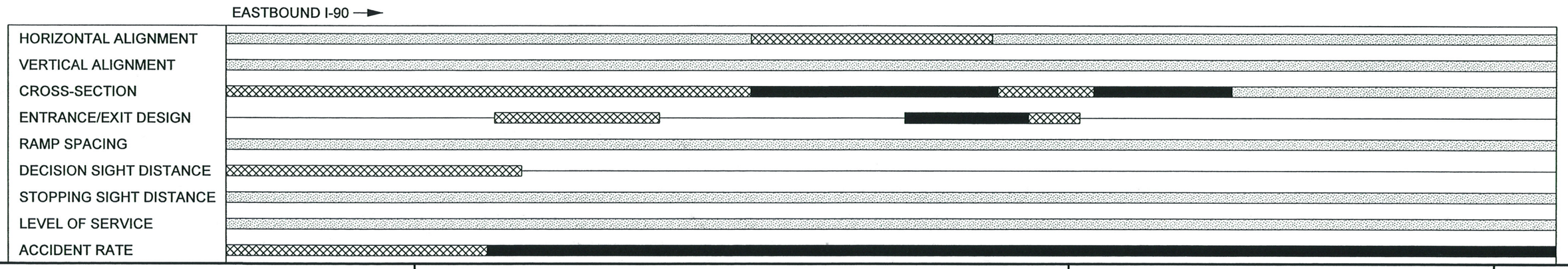
SHEET 13

LEGEND

RATING OF EXISTING CONDITION

- GOOD
- FAIR
- POOR
- (F) FATAL ACCIDENT





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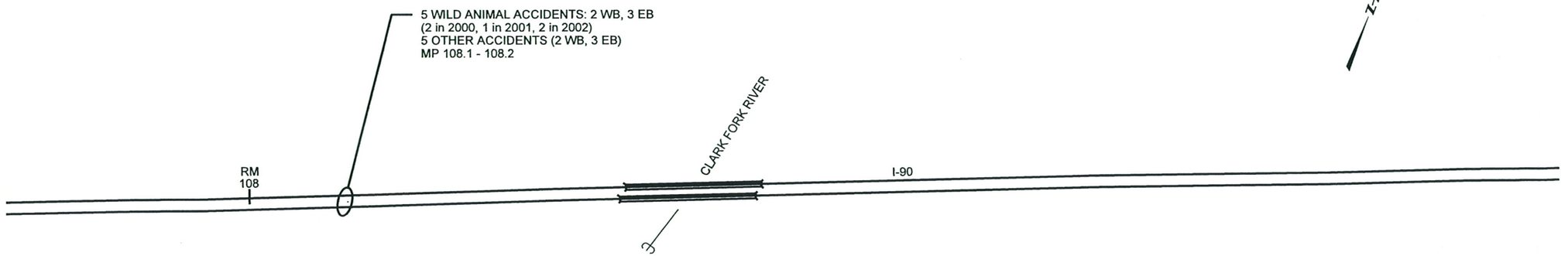
CH2MHILL	MONTANA DEPARTMENT OF TRANSPORTATION MISSOULA MT, I-90 EAST WEST PHASE 1 CORRIDOR STUDY	**EVALUATION OF EXISTING I-90 GEOMETRIC AND OPERATIONAL FEATURES**

LEGEND

RATING OF EXISTING CONDITION

- GOOD
- FAIR
- POOR
- (F) FATAL ACCIDENT



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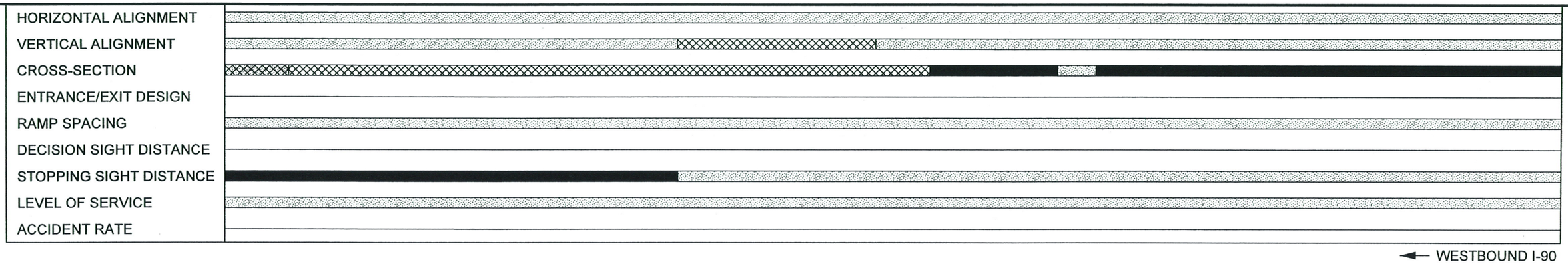
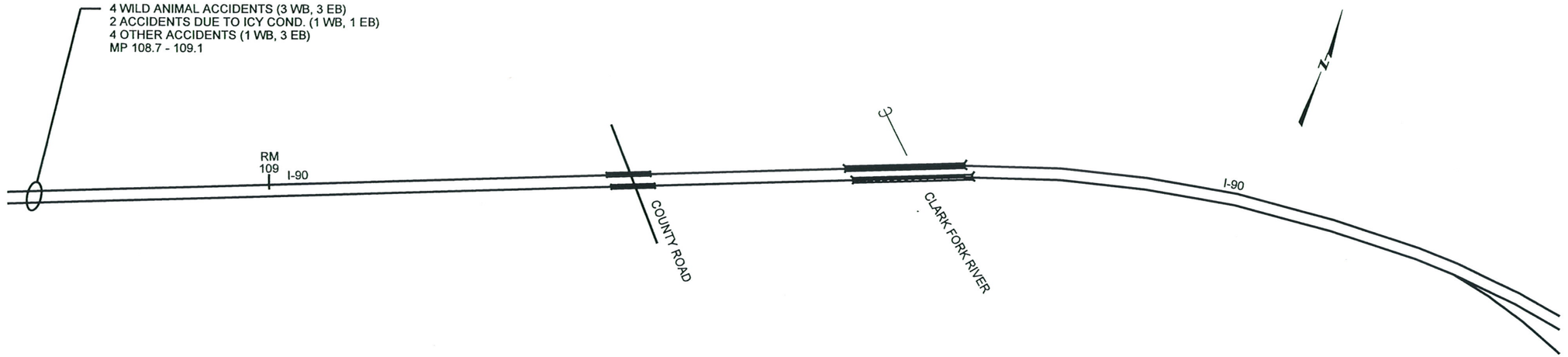
CH2MHILL	MONTANA DEPARTMENT OF TRANSPORTATION MISSOULA MT, I-90 EAST WEST PHASE 1 CORRIDOR STUDY	**EVALUATION OF EXISTING I-90 GEOMETRIC AND OPERATIONAL FEATURES**	SHEET 15

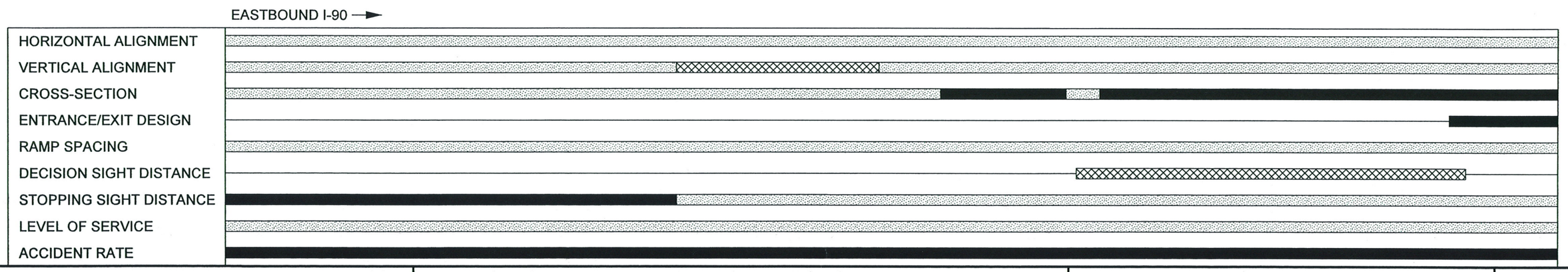


LEGEND

RATING OF EXISTING CONDITION

- GOOD
- FAIR
- POOR
- (F) FATAL ACCIDENT





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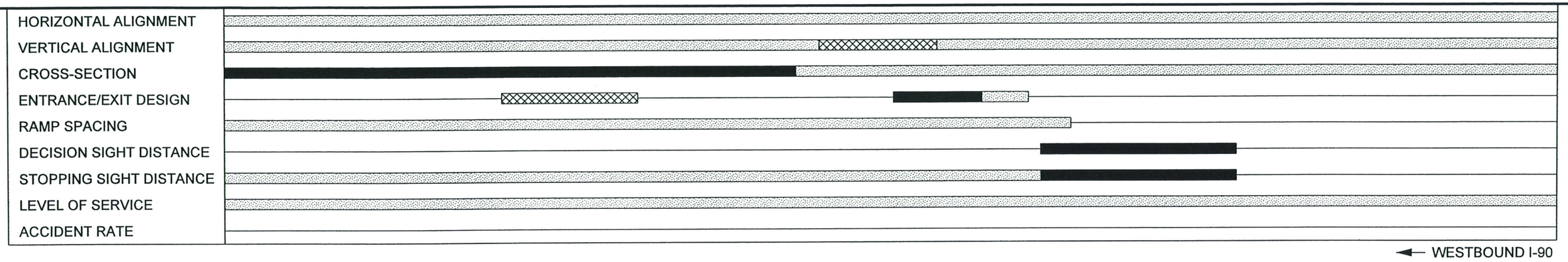
CH2MHILL

MONTANA DEPARTMENT OF TRANSPORTATION
MISSOULA MT, I-90 EAST WEST
PHASE 1 CORRIDOR STUDY

EVALUATION OF EXISTING I-90 GEOMETRIC AND OPERATIONAL FEATURES

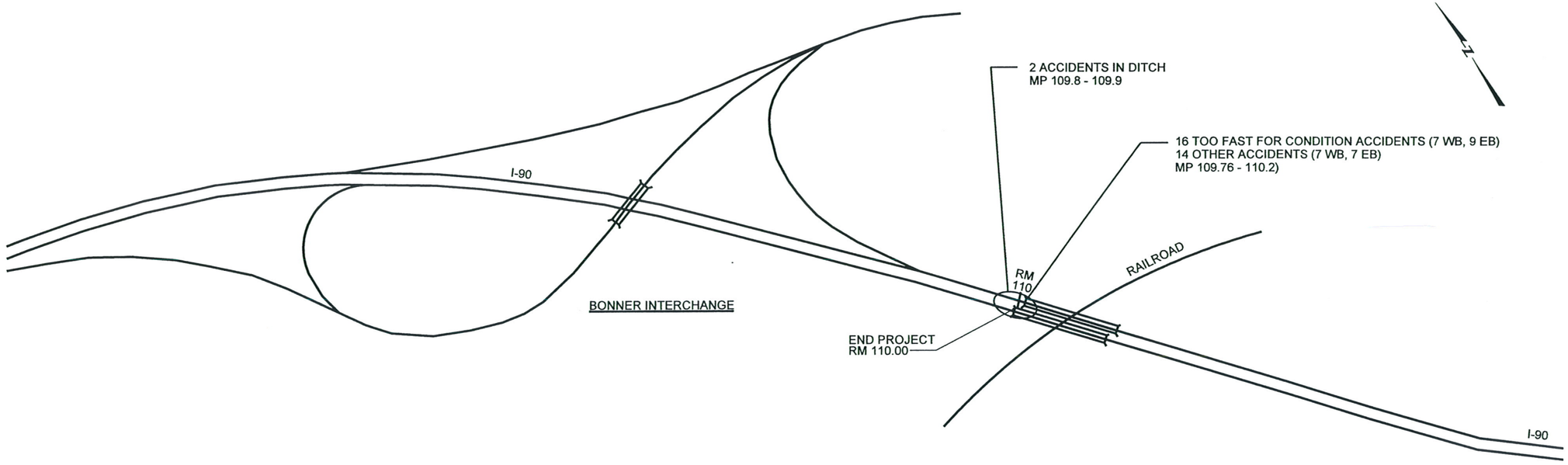
SHEET 16

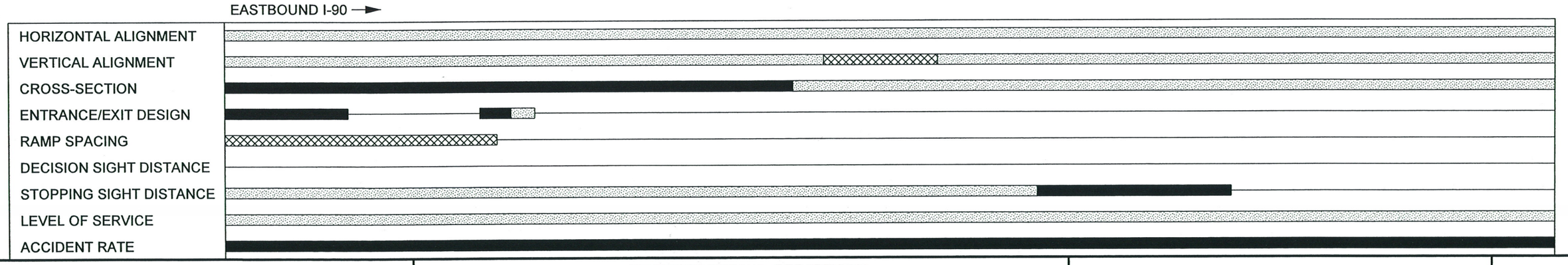


LEGEND

RATING OF EXISTING CONDITION

- GOOD
- FAIR
- POOR
- (F) FATAL ACCIDENT





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CH2MHILL

MONTANA DEPARTMENT OF TRANSPORTATION
MISSOULA MT, I-90 EAST WEST
PHASE 1 CORRIDOR STUDY

EVALUATION OF EXISTING I-90 GEOMETRIC AND OPERATIONAL FEATURES

SHEET 17

APPENDIX EXHIBIT 1.2.1

Ramp Geometry Analyses -- DeSmet Interchange

WB On Ramp "F1"

Criteria	Measured (ft)	Measured (m)	Grade Factor	Exist Queue (AM/PM) ft.	2025 Queue (AM/PM) ft.	Required (ft)	Adjusted* Required (ft.)	Adjusted* Required (m)	Meets Geometrics	Queue Impacts	Notes:
L_a	1300	397	0.6	N/A	N/A	1520	912	278	YES		Assumed 20 mph at Critical Point
L_g	450	138		N/A	N/A	300	300	92	YES		
Taper Rate	50:1					50:1 to 70:1			YES		
Grade	-5.00%										ASSESSMENT: Meets geometric guidelines.

WB Off Ramp "F2"

Criteria	Measured (ft)	Measured (m)	Grade Factor	Exist Queue (AM/PM) ft.	2025 Queue (AM/PM) ft.	Required (ft)	Adjusted* Required (ft.)	Adjusted* Required (m)	Meets Required	Queue Impacts	Notes:
L_d	900	275	0.8	17 / 86	237 / N.C.	590	472	180	YES	YES	Assumed 20 mph at Critical Point.
Total Ramp Length	1551	473						0			328 feet of queue storage beyond L_d to Left Turn at Broadway
Diverge Angle	4.50					2 - 5 degrees			YES		
Grade	5.00%										ASSESSMENT: Meets geometric guidelines. 2025 PM queues must not exceed 428 ft.

EB On Ramp "F3" Taper

Criteria	Measured (ft)	Measured (m)	Grade Factor	Exist Queue (AM/PM) ft.	2025 Queue (AM/PM) ft.	Required (ft)	Adjusted* Required (ft.)	Adjusted* Required (m)	Meets Required	Queue Impacts	Notes:
L_a	2245	685	0.6	N/A	N/A	1600	960	488	YES		Assumed acceleration from Stop Condition
L_g	1600	488		N/A	N/A	300	300	92	YES		
Taper Rate	55:1					50:1 to 70:1			YES		
Grade	-5.00%										ASSESSMENT: Meets geometric guidelines.

EB Off Ramp "F4"

Criteria	Measured (ft)	Measured (m)	Grade Factor	Exist Queue (AM/PM) ft.	2025 Queue (AM/PM) ft.	Required (ft)	Adjusted* Required (ft.)	Adjusted* Required (m)	Meets Required	Queue Impacts	Notes:
L_d	1675	511	1	38 / 24	793 / 651	1620	1620	494	YES		Assumed 20 mph at Critical Point
Total Ramp Length	3010.23	918						0			1335 feet of queue storage beyond L_d to stop condition.
Diverge Angle	4.56					2 - 5 degrees			YES		
Grade	0.42%										ASSESSMENT: Meets geometric guidelines. Accomodates projected 2025 queues.

EB On Ramp "F5" LOOP

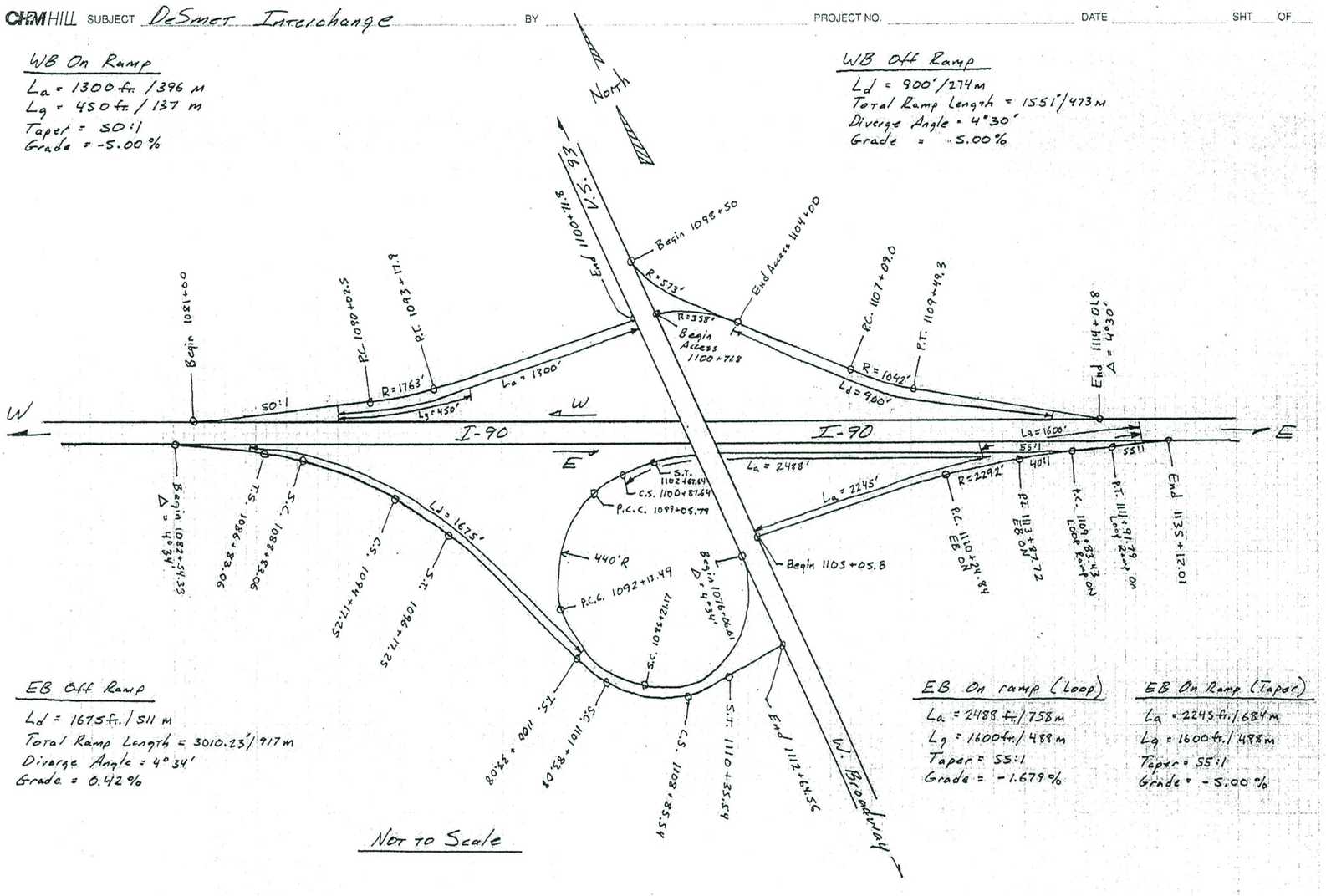
Criteria	Measured (ft)	Measured (m)	Grade Factor	Exist Queue (AM/PM) ft.	2025 Queue (AM/PM) ft.	Required (ft)	Adjusted* Required (ft.)	Adjusted* Required (m)	Meets Required	Queue Impacts	Notes:
L_a	2488	759	1	N/A	N/A	1420		433	YES		Assumed 30 mph at Critical Point
L_g	1600	488		N/A	N/A	300	300	92	YES		
Taper Rate	55:1					50:1 to 70:1			YES		
Grade	-1.68%										ASSESSMENT: Meets geometric guidelines.

*Adjusted required lengths = (Required Length x Grade Factor).

CH2MHILL SUBJECT DeSmet Interchange BY PROJECT NO. DATE SHT OF

WB On Ramp
L_a = 1300 ft. / 396 m
L_g = 450 ft. / 137 m
Taper = 50:1
Grade = -5.00 %

WB Off Ramp
L_d = 900'/274m
Total Ramp Length = 1551'/473m
Diverge Angle = 4°30'
Grade = -5.00%



Not to Scale

EB Off Ramp
Ld = 1675 ft. / 511 m
Total Ramp Length = 3010.23' / 917 m
Diverge Angle = 4°34'
Grade = 0.42%

EB On ramp (Loop)
La = 2488 ft. / 758 m
Lg = 1600 ft. / 488 m
Taper = 55:1
Grade = -1.679%

EB On Ramp (Taper)
La = 2245 ft. / 684 m
Lg = 1600 ft. / 488 m
Taper = 55:1
Grade = -5.00%

APPENDIX EXHIBIT 1.2.2

Ramp Geometry Analyses -- Airport Interchange

	Criteria	Measured (ft)	Measured (m)	Grade Factor	Exist Queue (AM/PM) ft.	2025 Queue (AM/PM) ft.	Required (ft)	Adjusted* Required (ft.)	Adjusted* Required (m)	Meets Required	Queue Impacts	Notes:
WB On Ramp "G1"	L_a	2781	848	1.5	N/A	N/A	1620	2430	741	YES		Assumed from Stop Condition.
	L_g	1643	501		N/A	N/A	300		92	YES		
	Taper Rate	25:1					50:1 to 70:1			**NO**		Taper less than recommended 50:1 rate.
	Grade	3.02%										ASSESSMENT: Meets Acceleration geometric guidelines. Taper rate is less than recommended.

	Criteria	Measured (ft)	Measured (m)	Grade Factor	Exist Queue (AM/PM) ft.	2025 Queue (AM/PM) ft.	Required (ft)	Adjusted* Required (ft.)	Adjusted* Required (m)	Meets Required	Queue Impacts	Notes:
WB Off Ramp "G2"	L_d	1188	363	1	15 / 9	79 / 72	570	570	174	YES		Assumed 20 mph at Critical Point.
	Total Ramp Length	1651	504						0			
	Diverge Angle	Varies					2 - 5 degrees			YES		
	Grade	-2.2%										ASSESSMENT: Meets geometric guidelines. Accomodates projected 2025 queues.

	Criteria	Measured (ft)	Measured (m)	Grade Factor	Exist Queue (AM/PM) ft.	2025 Queue (AM/PM) ft.	Required (ft)	Adjusted* Required (ft.)	Adjusted* Required (m)	Meets Required	Queue Impacts	Notes:
EB On Ramp "G3"	L_a	2504	764	1.5	N/A	N/A	1620	2430	494	YES		Assumed acceleration from Stop Condition
	L_g	1433	437		N/A	N/A	300		92	YES		
	Taper Rate	25:1					50:1 to 70:1			**NO**		Taper less than recommended 50:1 rate.
	Grade	3.49%										ASSESSMENT: Meets Acceleration geometric guidelines. Taper rate is less than recommended.

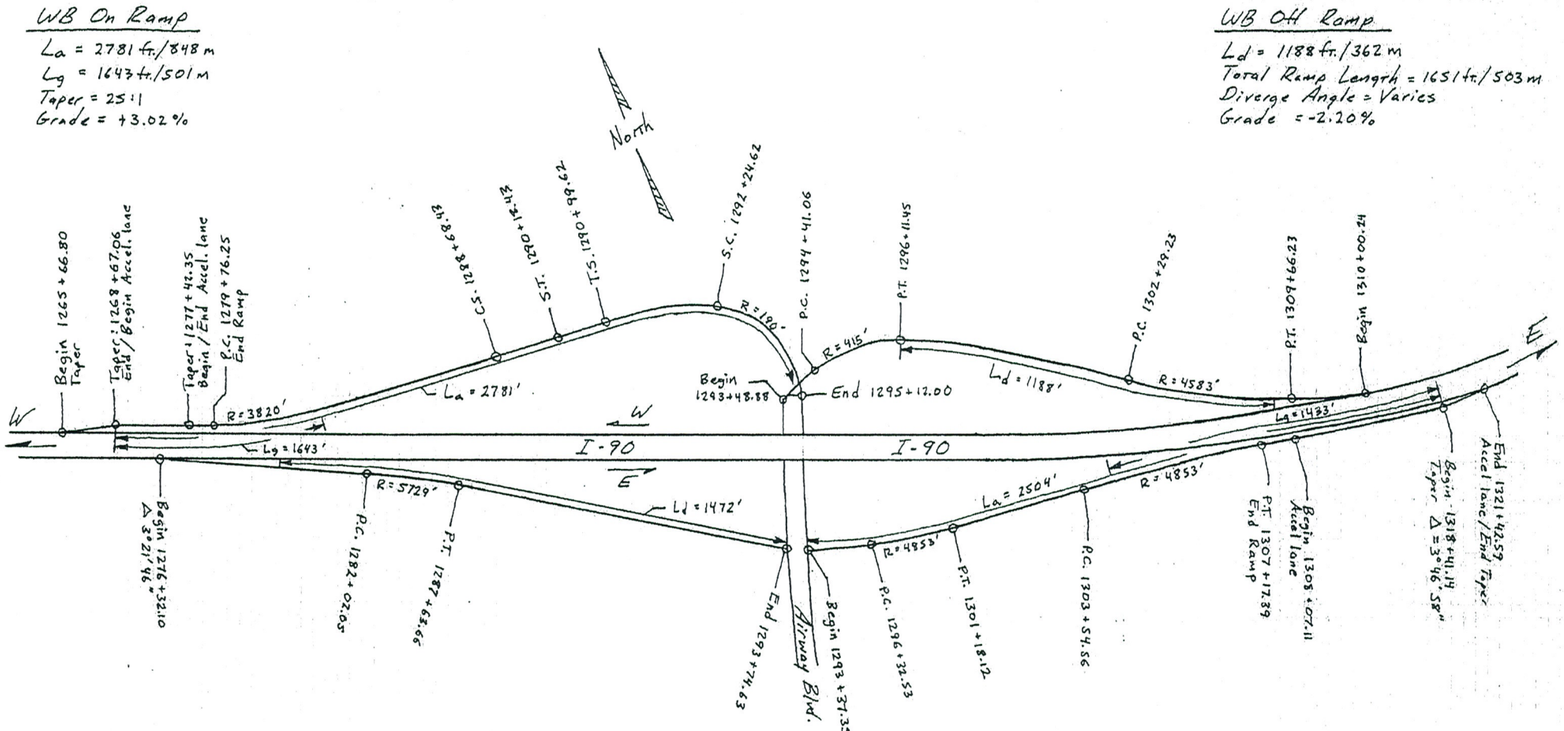
	Criteria	Measured (ft)	Measured (m)	Grade Factor	Exist Queue (AM/PM) ft.	2025 Queue (AM/PM) ft.	Required (ft)	Adjusted* Required (ft.)	Adjusted* Required (m)	Meets Required	Queue Impacts	Notes:
EB Off Ramp "G4"	L_d	1472	449	1.2	13 / 5	61 / 19	570	684	174	YES		Assumed to terminate at Stop Condition
	Total Ramp Length	1772	541									
	Diverge Angle	3.363					2 - 5 degrees			YES		
	Grade	-4.00%										ASSESSMENT: Meets geometric guidelines. Accomodates projected 2025 queues.

***Adjusted required lengths = (Required Length x Grade Factor).**

CH2MHILL SUBJECT Airport Interchange BY PROJECT NO. DATE SHT. OF

WB On Ramp
L_a = 2781 ft./848 m
L_g = 1643 ft./501 m
Taper = 25:1
Grade = +3.02%

WB Off Ramp
L_d = 1188 ft./362 m
Total Ramp Length = 1651 ft./503 m
Diverge Angle = Varies
Grade = -2.20%



EB Off Ramp
L_d = 1472 ft./449 m
Total Ramp Length = 1772 ft./540 m
Diverge Angle = 3°21'46"
Grade = -4.00%

EB On Ramp
L_a = 2504 ft./763 m
L_g = 1433 ft./437 m
Taper = 25:1
Grade = +3.49%

Not to Scale

APPENDIX EXHIBIT 1.2.3

Ramp Geometry Analyses -- Reserve Interchange

WB On Ramp "I1"

Criteria	Measured (ft)	Measured (m)	Grade Factor	Exist Queue (AM/PM) ft.	2025 Queue (AM/PM) ft.	Required (ft)	Adjusted* Required (ft.)	Adjusted* Required (m)	Meets Required	Queue Impacts	Notes:
L_a	1165	356	1.5	N/A	N/A	1620	2430	741	NO		Assumed from Stop Condition.
L_g	500	153		N/A	N/A	300	300	92	YES		
Taper Rate	50:1					50:1 to 70:1			YES		
Grade	3.56%										ASSESSMENT: Does not meet geometric guidelines

WB Off Ramp "I2"

Criteria	Measured (ft)	Measured (m)	Grade Factor	Exist Queue (AM/PM) ft.	2025 Queue (AM/PM) ft.	Required (ft)	Adjusted* Required (ft.)	Adjusted* Required (m)	Meets Required	Queue Impacts	Notes:
L_d	1100	336	1.2	210 / 160	1035 / 502	620	744	227	NO	YES	2025 queues would reduce effective L_d below guidelines
Total Ramp Length	1279	390									Assumed to terminate at Stop Condition
Diverge Angle	4.50					2 - 5 degrees			YES		
Grade	-3.91%										ASSESSMENT: Projected 2025 queues would impact Ld.

EB On Ramp "I3"

Criteria	Measured (ft)	Measured (m)	Grade Factor	Exist Queue (AM/PM) ft.	2025 Queue (AM/PM) ft.	Required (ft)	Adjusted* Required (ft.)	Adjusted* Required (m)	Meets Required	Queue Impacts	Notes:
L_a	1520	464	1.5	N/A	N/A	1620	2430	741	NO		Assumed from Stop Condition
L_g	400	122		N/A	N/A	300		92	YES		
Taper Rate	50:1					50:1 to 70:1			YES		
Grade	-3.40%										ASSESSMENT: Does not meet geometric guidelines

EB Off Ramp "I4"

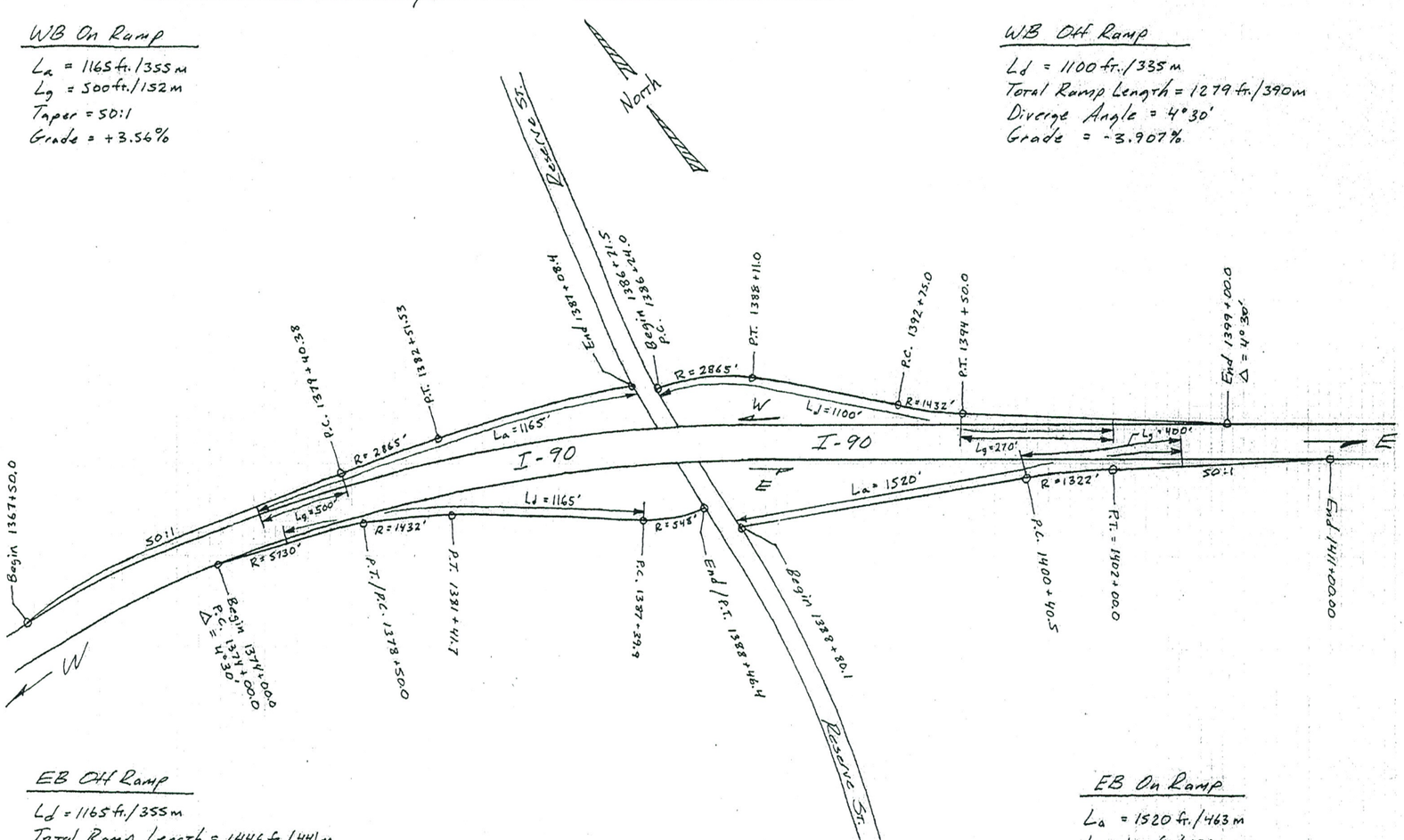
Criteria	Measured (ft)	Measured (m)	Grade Factor	Exist Queue (AM/PM) ft.	2025 Queue (AM/PM) ft.	Required (ft)	Adjusted* Required (ft.)	Adjusted* Required (m)	Meets Required	Queue Impacts	Notes:
L_d	1165	356	1.2	46 / 62	417 / N/A	615	738	225	YES		Assumed 0 mph at Critical Point (30 m from Stop Condition).
Total Ramp Length	1446	441									
Diverge Angle	4.50					2 - 5 degrees			YES		
Grade	3.94%										ASSESSMENT: Meets geometric guidelines. Accomodates projected 2025 queues.

*Adjusted required lengths = (Required Length x Grade Factor).

CH2MHILL SUBJECT Reserve St. Interchange BY PROJECT NO. DATE SHT OF

WB On Ramp
L_a = 1165 ft./355 m
L_g = 500 ft./152 m
Taper = 50:1
Grade = +3.56%

WB Off Ramp
L_d = 1100 ft./335 m
Total Ramp Length = 1279 ft./390 m
Diverge Angle = 4°30'
Grade = -3.907%



EB Off Ramp
L_d = 1165 ft./355 m
Total Ramp Length = 1446 ft./441 m
Diverge Angle = 4°30'
Grade = -3.40%

Not to Scale

EB On Ramp
L_a = 1520 ft./463 m
L_g = 400 ft./122 m
Taper = 50:1
Grade = +3.936%

APPENDIX EHXIBIT 1.2.4

Ramp Geometry Analyses -- Orange Interchange

	Criteria	Measured (ft)	Measured (m)	Grade Factor	Exist Queue (AM/PM) ft.	2025 Queue (AM/PM) ft.	Required (ft)	Adjusted* Required (ft.)	Adjusted* Required (m)	Meets Required	Queue Impacts	Notes:
WB On Ramp "H1"	L_a	1150	351	1.5	N/A	N/A	1620	2430	741	NO		Assumed from Stop Condition.
	L_g	275	84		N/A	N/A	300		92	NO		
	Taper Rate	50:1					50:1 to 70:1			YES		
	Grade	3.42%										ASSESSMENT: Does not meet geometric guidelines

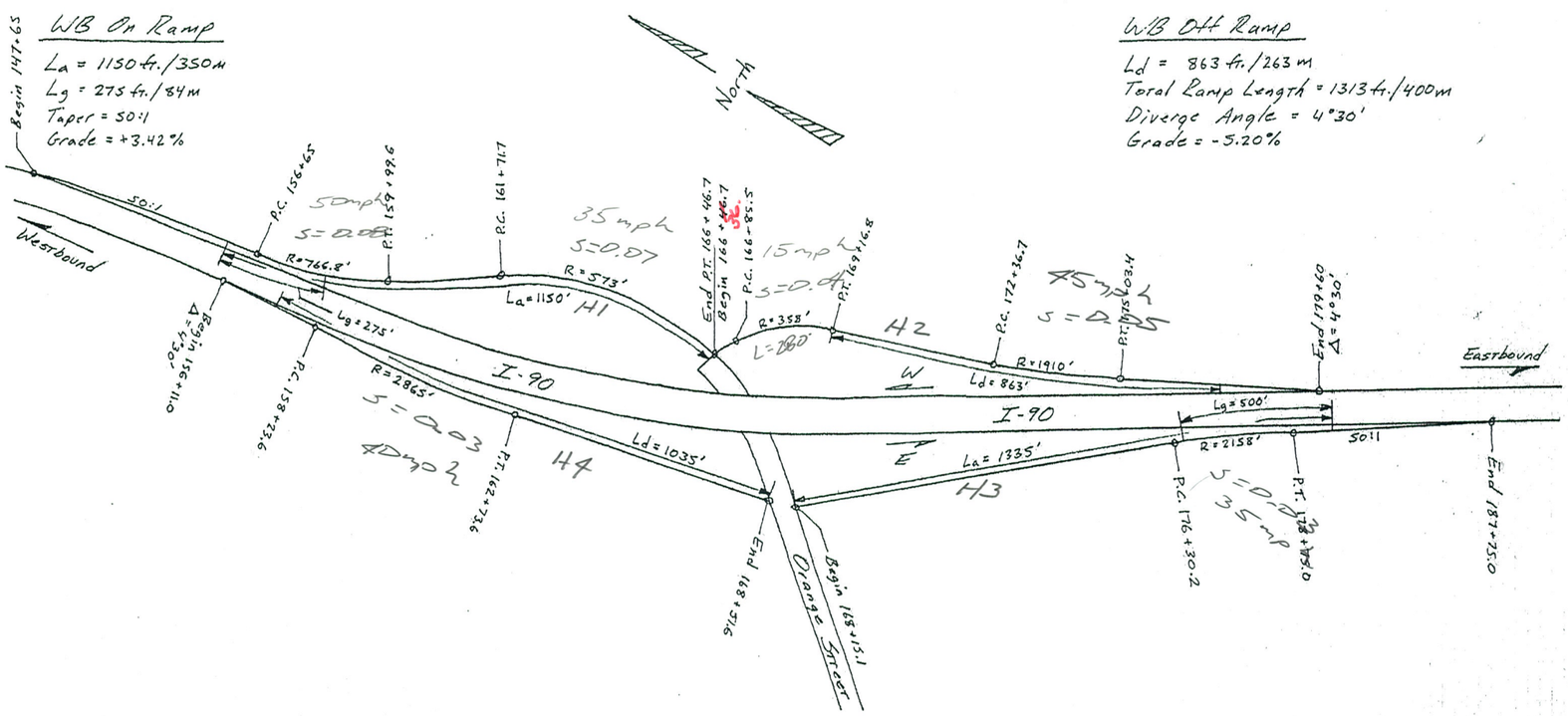
	Criteria	Measured (ft)	Measured (m)	Grade Factor	Exist Queue (AM/PM) ft.	2025 Queue (AM/PM) ft.	Required (ft)	Adjusted* Required (ft.)	Adjusted* Required (m)	Meets Required	Queue Impacts	Notes:
WB Off Ramp "H2"	L_d	1043	318	1.35	103 / 74	331 / 306	620	837	256	NO	YES	2025 queues would reduce effective L_d below guidelines
	Total Ramp Length	1313	401									L_d terminates at Stop Condition - no additional queue storage.
	Diverge Angle	4.50					2 - 5 degrees			YES		
	Grade	-5.2%										ASSESSMENT: Projected 2025 queues would impact Ld.

	Criteria	Measured (ft)	Measured (m)	Grade Factor	Exist Queue (AM/PM) ft.	2025 Queue (AM/PM) ft.	Required (ft)	Adjusted* Required (ft.)	Adjusted* Required (m)	Meets Required	Queue Impacts	Notes:
EB On Ramp "H3"	L_a	1335	407	2	N/A	N/A	1620	3240	988	NO		Assumed from Stop Condition
	L_g	500	153		N/A	N/A	300		92	YES		
	Taper Rate	50:1					50:1 to 70:1			YES		
	Grade	5.70%										ASSESSMENT: Does not meet geometric guidelines

	Criteria	Measured (ft)	Measured (m)	Grade Factor	Exist Queue (AM/PM) ft.	2025 Queue (AM/PM) ft.	Required (ft)	Adjusted* Required (ft.)	Adjusted* Required (m)	Meets Required	Queue Impacts	Notes:
EB Off Ramp "H4"	L_d	1035	316	1.35	376 / 51	1421 / 298	615	830.25	254	YES	YES	Assumed to terminate at Stop Condition
	Total Ramp Length	1241	379									L_d terminates at Stop Condition - no additional queue storage.
	Diverge Angle	4.50					2 - 5 degrees			YES		2025 AM queues exceed Total Ramp Length
	Grade	-4.60%										ASSESSMENT: Projected 2025 queues would impact Ld.

*Adjusted required lengths = (Required Length x Grade Factor).

CH2MHILL SUBJECT Orange Street Interchange BY PROJECT NO. DATE SHT OF



APPENDIX EXHIBIT 1.2.5

Ramp Geometry Analyses -- Van Buren Interchange

WB On Ramp "J1"

Criteria	Measured (ft)	Measured (m)	Grade Factor	Exist Queue (AM/PM) ft.	2025 Queue (AM/PM) ft.	Required (ft)	Adjusted* Required (ft.)	Adjusted* Required (m)	Meets Required	Queue Impacts	Notes:
L_a	1393	425	2	N/A	N/A	1620	3240	988	NO		Assumed from Stop Condition.
L_g	675	206		N/A	N/A	300	300	92	YES		
Taper Rate	50:1					50:1 to 70:1			YES		
Grade	6.00%										ASSESSMENT: Does not meet geometric guidelines.

WB Off Ramp "J2"

Criteria	Measured (ft)	Measured (m)	Grade Factor	Exist Queue (AM/PM) ft.	2025 Queue (AM/PM) ft.	Required (ft)	Adjusted* Required (ft.)	Adjusted* Required (m)	Meets Required	Queue Impacts	Notes:
L_d	605	185	1	401 / 221	N.C. / N.C.	570	570	174	YES	YES	Assumed 20 mph at Critical Point.
Total Ramp Length	1072	327									Existing & 2025 queues reduce effective L_d below guidelines
Diverge Angle	4.50					2 - 5 degrees			YES		287 feet of queue storage beyond L_d to Stop Condition.
Grade	-2.77%										ASSESSMENT: Existing & Projected queues impact Ld.

EB On Ramp "J3"

Criteria	Measured (ft)	Measured (m)	Grade Factor	Exist Queue (AM/PM) ft.	2025 Queue (AM/PM) ft.	Required (ft)	Adjusted* Required (ft.)	Adjusted* Required (m)	Meets Required	Queue Impacts	Notes:
L_a	1301	397	1.5	N/A	N/A	1620	2430	494	NO		Assumed acceleration from Stop Condition
L_g	420	129		N/A	N/A	300	300	92	YES		
Taper Rate	50:1					50:1 to 70:1			YES		
Grade	4.60%										ASSESSMENT: Does not meet geometric guidelines

EB Off Ramp "J4"

Criteria	Measured (ft)	Measured (m)	Grade Factor	Exist Queue (AM/PM) ft.	2025 Queue (AM/PM) ft.	Required (ft)	Adjusted* Required (ft.)	Adjusted* Required (m)	Meets Required	Queue Impacts	Notes:
L_d	1454	444	1.35	88 / 91	691 / 272	615	830	188	YES	YES	Assumed to terminate at Stop Condition
Total Ramp Length	1604	489									
Diverge Angle	4.50					2 - 5 degrees			YES		
Grade	-4.50%										ASSESSMENT: Projected 2025 AM queues would impact Ld.

*Adjusted required lengths = (Required Length x Grade Factor).

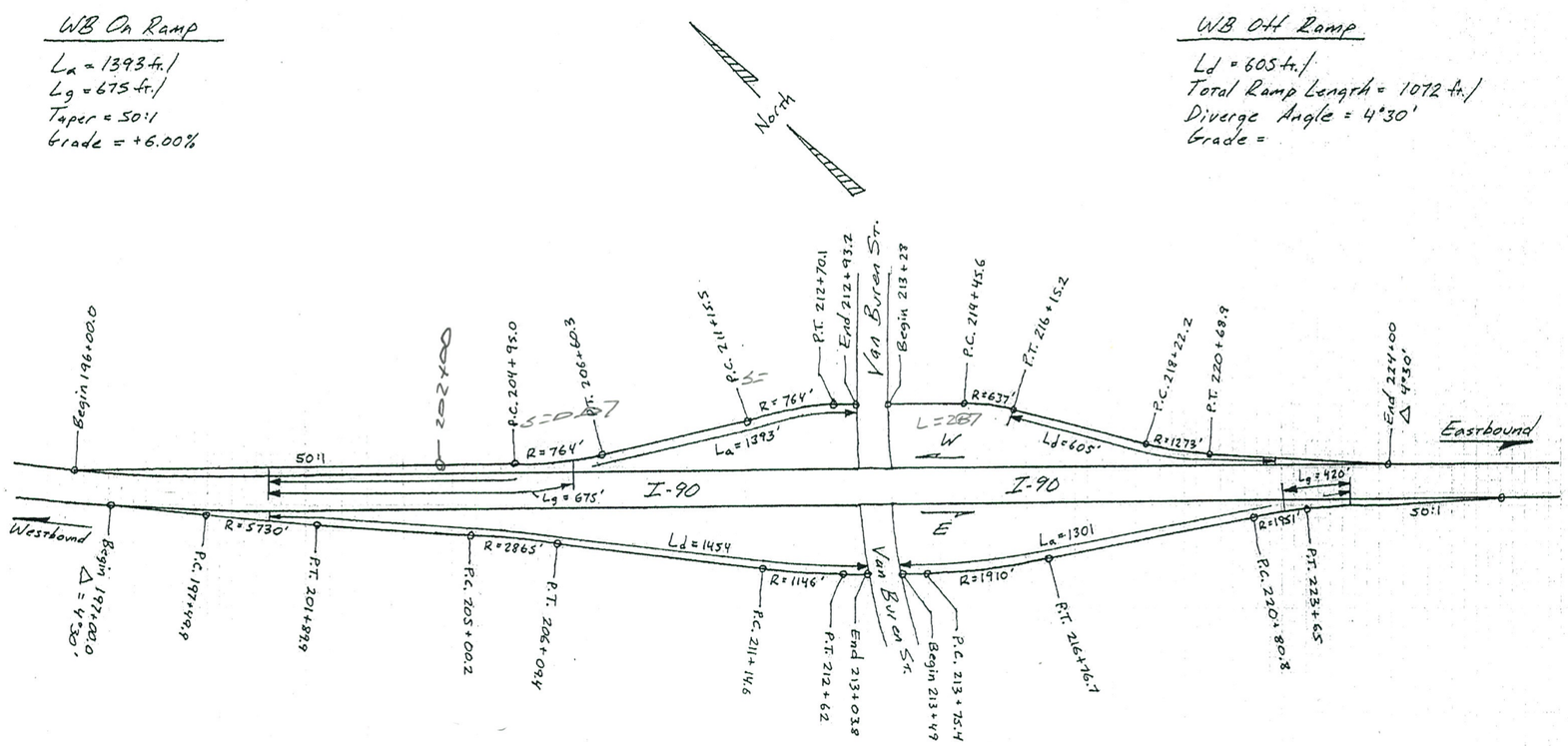
CH2MHILL SUBJECT Van Buren Street Interchange BY PROJECT NO. DATE SHT OF

WB On Ramp

L_a = 1393 ft./
L_g = 675 ft./
Taper = 50:1
Grade = +6.00%

WB Off Ramp

L_d = 605 ft./
Total Ramp Length = 1072 ft./
Diverge Angle = 4°30'
Grade =



EB Off Ramp

L_d = 1454 ft./
Total Ramp Length = 1604 ft./
Diverge Angle = 4°30'
Grade = -4.50%

Not to Scale

EB On Ramp

L_a = 1301 ft./
L_g = 420 ft./
Taper = 50:1
Grade = +4.6%

APPENDIX EXHIBIT 1.2.6

Ramp Geometry Analyses -- East Missoula Interchange

WB On Ramp "K1"

Criteria	Measured (ft)	Measured (m)	Grade Factor	Exist Queue (AM/PM) ft.	2025 Queue (AM/PM) ft.	Required (ft)	Adjusted* Required (ft.)	Adjusted* Required (m)	Meets Required	Queue Impacts	Notes:
L_a	1106	338	1	N/A	N/A	1620	1620	494	NO		Assumed from Stop Condition.
L_g	310	95		N/A	N/A	300	300	92	YES		
Taper Rate	50:1					50:1 to 70:1			YES		
Grade	2.74%										ASSESSMENT: Does not meet geometric guidelines

WB Off Ramp "K2"

Criteria	Measured (ft)	Measured (m)	Grade Factor	Exist Queue (AM/PM) ft.	2025 Queue (AM/PM) ft.	Required (ft)	Adjusted* Required (ft.)	Adjusted* Required (m)	Meets Required	Queue Impacts	Notes:
L_d	1017	310	1.2	12 / 6	N/A / N/A	620	744	227	YES		Assumed to terminate at Stop Condition
Total Ramp Length	1215	371									
Diverge Angle	Varies					2 - 5 degrees			YES		
Grade	-4.00%										ASSESSMENT: Meets geometric guidelines. Accomodates projected 2025 queues.

EB On Ramp "K3"

Criteria	Measured (ft)	Measured (m)	Grade Factor	Exist Queue (AM/PM) ft.	2025 Queue (AM/PM) ft.	Required (ft)	Adjusted* Required (ft.)	Adjusted* Required (m)	Meets Required	Queue Impacts	Notes:
L_a	1348	411	1.5	N/A	N/A	1620	2430	741	NO		Assumed from Stop Condition
L_g	375	115		N/A	N/A	300		92	YES		
Taper Rate	50:1					50:1 to 70:1			YES		
Grade	5.00%										ASSESSMENT: Does not meet geometric guidelines

EB Off Ramp "K4"

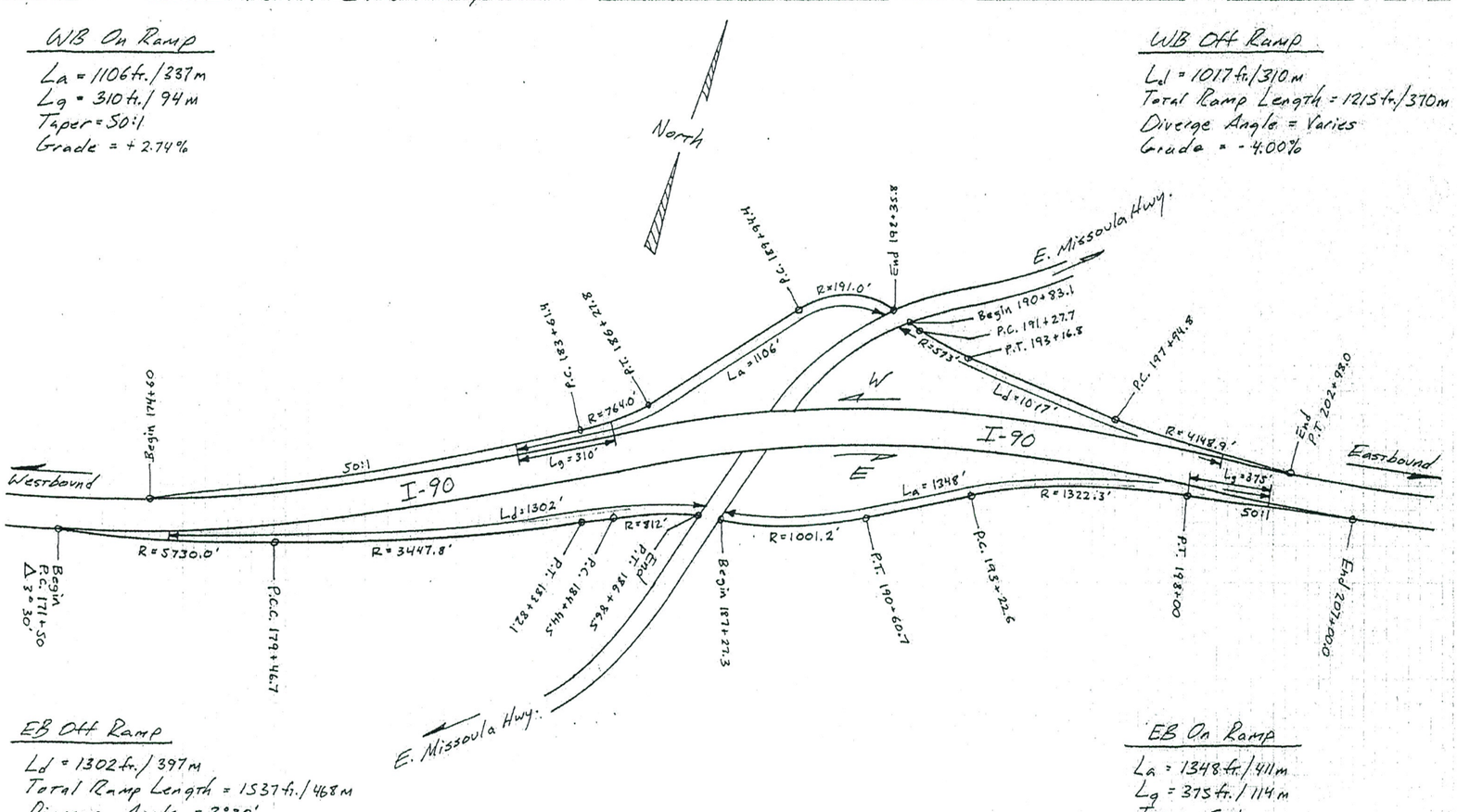
Criteria	Measured (ft)	Measured (m)	Grade Factor	Exist Queue (AM/PM) ft.	2025 Queue (AM/PM) ft.	Required (ft)	Adjusted* Required (ft.)	Adjusted* Required (m)	Meets Required	Queue Impacts	Notes:
L_d	1302	397	1.2	19 / 83	N/A / 219	615	738	225	YES		Assumed to terminate at Stop Condition
Total Ramp Length	1537	469									
Diverge Angle	4.50					2 - 5 degrees			YES		
Grade	-4.00%										ASSESSMENT: Meets geometric guidelines. Accomodates projected 2025 queues.

*Adjusted required lengths = (Required Length x Grade Factor).

CH2MHILL SUBJECT East Missoula Interchange BY PROJECT NO. DATE SHT OF

WB On Ramp
L_a = 1106 ft./337 m
L_g = 310 ft./ 94 m
Taper = 50:1
Grade = + 2.74%

WB Off Ramp
L_d = 1017 ft./310 m
Total Ramp Length = 1215 ft./370 m
Diverge Angle = Varies
Grade = - 4.00%



EB Off Ramp
L_d = 1302 ft./ 397 m
Total Ramp Length = 1537 ft./ 468 m
Diverge Angle = 3°30'
Grade = - 4.00%

EB On Ramp
L_a = 1348 ft./ 411 m
L_g = 375 ft./ 114 m
Taper = 50:1
Grade = + 5.00%

Not to Scale

APPENDIX EXHIBIT 1.2.7

Ramp Geometry Analyses -- Bonner Interchange

WB On Ramp "L1"

Criteria	Measured (ft)	Measured (m)	Grade Factor	Exist Queue (AM/PM) ft.	2025 Queue (AM/PM) ft.	Required (ft)	Adjusted* Required (ft.)	Adjusted* Required (m)	Meets Required	Queue Impacts	Notes:
L_a	1905	581	1	N/A	N/A	1520	1520	464	YES		Assumed 20 mph at Ramp Begin
L_g	300	92		N/A	N/A	300	300	92	YES		
Taper Rate	50:1					50:1 to 70:1			YES		
Grade	-1.55%										ASSESSMENT: Meets geometric guidelines

WB Off Ramp "L2"

Criteria	Measured (ft)	Measured (m)	Grade Factor	Exist Queue (AM/PM) ft.	2025 Queue (AM/PM) ft.	Required (ft)	Adjusted* Required (ft.)	Adjusted* Required (m)	Meets Required	Queue Impacts	Notes:
L_d	373	114	1	N/A	N/A / N/A	570	570	174	NO		Assumed 20 mph at Critical Point.
Total Ramp Length	1476	450									
Diverge Angle	4.50					2 - 5 degrees			YES		
Grade	2.63%										ASSESSMENT: Does not meet geometric guidelines

EB On Ramp "L3"

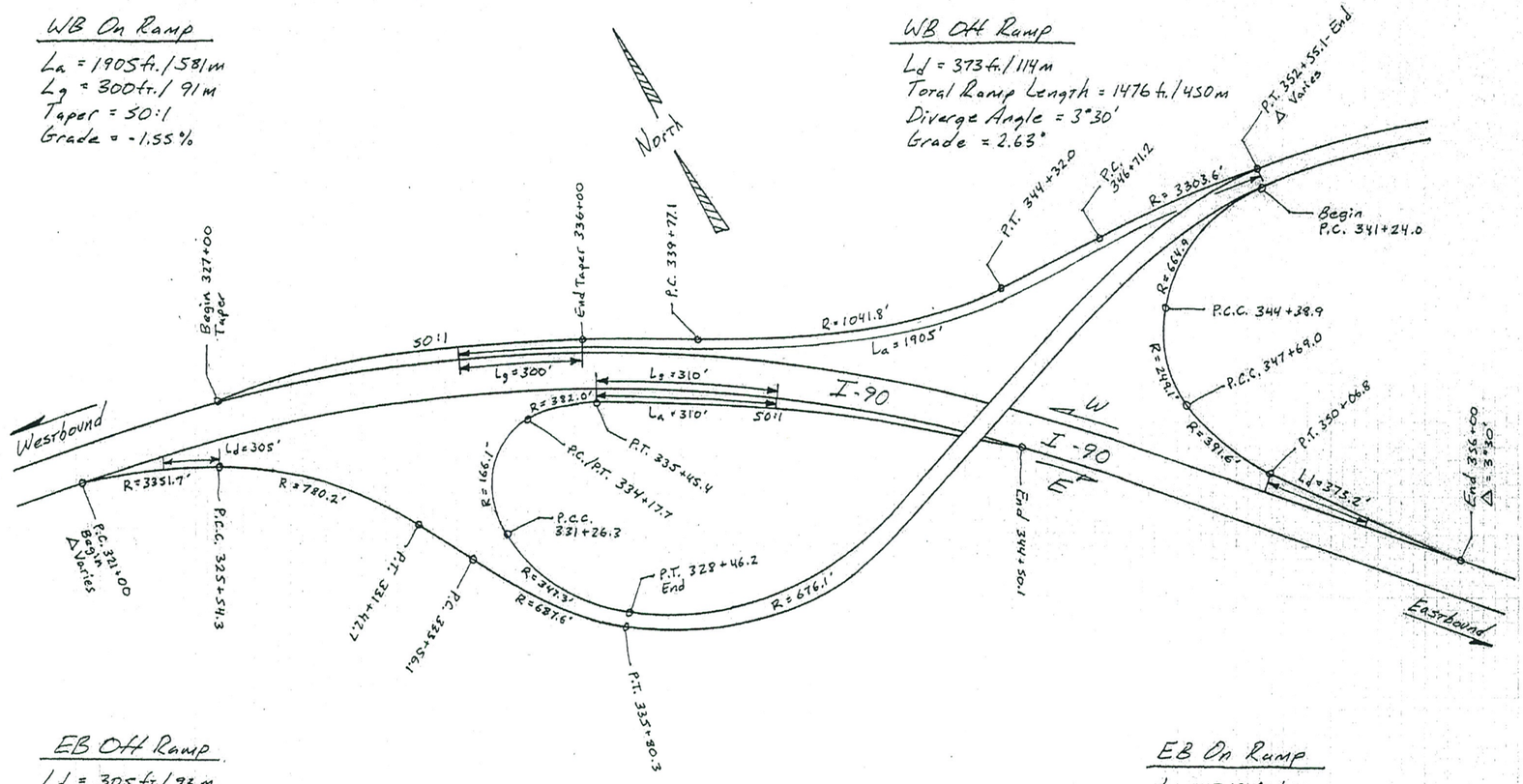
Criteria	Measured (ft)	Measured (m)	Grade Factor	Exist Queue (AM/PM) ft.	2025 Queue (AM/PM) ft.	Required (ft)	Adjusted* Required (ft.)	Adjusted* Required (m)	Meets Required	Queue Impacts	Notes:
L_a	310	95	1	N/A	N/A	1520	1520	464	NO		Assumed 20 mph at Critical Point.
L_g	310	95		N/A	N/A	300		92	YES		
Taper Rate	50:1					50:1 to 70:1			YES		
Grade	-1.75%										ASSESSMENT: Does not meet geometric guidelines

EB Off Ramp "L4"

Criteria	Measured (ft)	Measured (m)	Grade Factor	Exist Queue (AM/PM) ft.	2025 Queue (AM/PM) ft.	Required (ft)	Adjusted* Required (ft.)	Adjusted* Required (m)	Meets Required	Queue Impacts	Notes:
L_d	305	93	1	N/A	N/A / N/A	570	570	174	NO		Assumed 20 mph at Critical Point.
Total Ramp Length	1480	452									
Diverge Angle	Varies					2 - 5 degrees			YES		
Grade	-0.64%										ASSESSMENT: Does not meet geometric guidelines

***Adjusted required lengths = (Required Length x Grade Factor).**

CH2M HILL SUBJECT Bonner Interchange BY _____ PROJECT NO. _____ DATE _____ SHT ___ OF ___



Not to Scale