

Culvert RFA Quick Reference Guide

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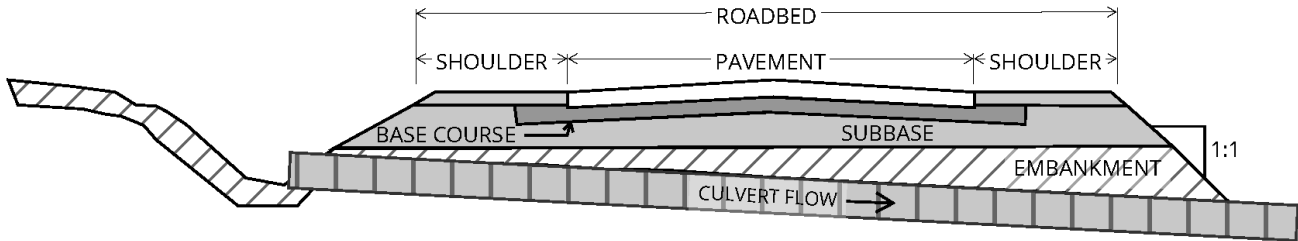
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DEFINITIONS AND DIAGRAMS

Request for Action (RFA)

An RFA is a formal inspection-based document used to identify, communicate, and track structural or maintenance deficiencies that require corrective action. RFAs help ensure that safety concerns or deteriorating conditions are evaluated and prioritized, particularly when a culvert deficiency impacts the roadway or embankment within the 1:1 slope influence of the roadbed, as illustrated below.

1:1 Slope Influence of the Roadbed



ROADWAY NOMENCALTURE

CULVERT RFA PRIORITY LEVELS

RFA Priority 1 – Emergency



- Failure is occurring or imminent
- Impacts the roadway or embankment within a **1:1 slope influence** of roadbed
- **Timeline:** Required as soon as reasonably possible or as determined by engineering judgment

RFA Priority 2 – Critical



- Threatens the roadway or embankment within a **1:1 slope influence** of the roadbed
- **Timeline:** To be completed within 1 year or as determined by engineering judgment

RFA Priority 3 – Primary



- No current threat to roadway within a **1:1 slope influence** of the roadbed, but could if not addressed within the specified timeframe
- **Timeline:** To be completed as determined per engineering judgment

RFA PRIORITY LEVEL 1 ITEMS

1. Major tears, splits, deformation, or bulges with major soil infiltration, voids, piping, and settlement/sinkholes within roadway limits.
2. Holes or major section loss with voids beneath invert, piping, and settlement/sinkholes within roadway limits.
3. Open/displaced joints (misaligned) with soil infiltration or piping causing settlement/sinkholes within roadway limits.
4. Concrete: Large cracks with widespread exposed reinforcement, major corrosion, and soil infiltration with settlement/sinkholes within roadway limits.
5. Metal: Many loose/missing bolts in any seam with major steel yielding or cracking/splitting at bolt holes reducing seam capacity; major soil infiltration/piping with settlement/sinkholes within roadway limits.
6. Plastic: Major wall flattening with reversal of curvature (global buckling) or kinks.
7. Severe embankment erosion or major soil tension cracks perpendicular to slope indicating shifting/settlement within 1:1 slope influence of roadbed.
8. End treatment/apron crushed or separated from barrel; scour protection missing with major erosion/undermining progressing toward impending embankment failure within 1:1 slope influence of roadbed.
9. Footings severely undermined by scour, progressing toward impending roadway/embankment failure within 1:1 slope influence of roadbed.

RFA PRIORITY LEVEL 2 ITEMS

1. Open/displaced joints (misaligned) with significant water/soil infiltration or exfiltration; no settlement/sinkholes within roadway limits.
2. Holes or significant section loss with voids beneath invert and piping; no settlement/sinkholes but threat to roadway/embankment within 1:1 slope influence of roadbed.
3. Concrete: Widespread exposed reinforcement with significant corrosion; soil infiltration/piping but no settlement/sinkholes within roadway limits.
4. Metal: Perforations visible or easily made; loose/missing bolts in any seam; significant section loss/corrosion at bolt holes with steel yielding or cracking/splitting; soil infiltration/piping but no settlement/sinkholes within roadway limits.
5. Plastic: Significant wall flattening or reversal of curvature (global buckling) or kinks; UV degradation at barrel ends causing cracks or broken walls.
6. Soil tension cracks perpendicular to slope with shifting/settlement and/or sloughing threatening roadway/embankment within 1:1 slope influence of roadbed.
7. End treatment/apron crushed or separated from barrel; significantly displaced scour protection with undermining/loss of support threatening roadway/embankment within 1:1 slope influence of roadbed.
8. Longitudinal cracks in crown, invert, or haunches with perceptible cross-section deformation.
9. Significant reconfiguration of inner liner.
10. Mass drift/sediment reducing culvert capacity >50% (verify intentional recess against historical plans). Blockage causing excessive ponding/erosion threatening roadway/embankment within 1:1 slope influence of roadbed.

RFA PRIORITY LEVEL 3 ITEMS

1. Open/displaced joints (misaligned) with moderate water infiltration through leak-resistant seams; possible repeated patching or pavement cracking over culvert alignment.
2. Concrete: Cracks with no perceptible cross-section deformation; heavy abrasion/scaling with exposed reinforcement.
3. Metal: Moderate wall buckling/deformation or local bulging; surface corrosion with minor section loss, moderate steel yielding, or cracking/splitting at bolt holes.
4. Plastic: Moderate wall buckling, deformation at worst section, or local bulging.
5. Localized scour protection displacement exposing footing face or progressing toward embankment threat within 1:1 slope influence of roadbed; no undermining/rotation of footing.
6. Moderate reconfiguration of inner liner.
7. Mass drift/sediment reducing culvert capacity 33–50% (verify intentional recess against historical plans). Blockage causing ponding/erosion not currently threatening roadway/embankment within 1:1 slope influence of roadbed but could if unaddressed within specified timeframe.

TABLE 1. RFA PRIORITY LEVEL BY MATERIAL TYPE

Material Type	RFA Priority Level 1	RFA Priority Level 2	RFA Priority Level 3
Concrete	Large cracks with widespread exposed reinforcement exhibiting major corrosion; soil infiltration through cracks with settlement/sinkholes within roadway limits.	Cracks with widespread exposed reinforcement with significant corrosion; evidence of soil infiltration/piping, but no settlement/sinkholes within roadway limits.	Cracks present with no perceptible cross-section deformation; heavy abrasion/scaling with exposed reinforcement.
Metal	Connection hardware has many loose/missing bolts in any seam with major yielding or cracking/splitting at bolt holes reducing seam capacity and/or major soil infiltration/piping with settlement/sinkholes within roadway limits.	Perforations visible or easily made; loose/missing bolts in any seam; corrosion with significant section loss around bolt holes or on bolts with significant yielding or cracking/splitting at bolt holes and/or soil infiltration/piping, but no settlement/sinkholes within roadway limits.	Moderate wall buckling; deformation/local bulging; surface corrosion with minor section loss and moderate yielding; or cracking/splitting at bolt holes.
Plastic	Major wall flattening with reversal of curvature (global buckling) or kinks.	Significant wall flattening or reversal of curvature (global buckling) or kinks; UV degradation at barrel ends resulting in cracks or broken culvert walls.	Moderate wall buckling; deformation at worst section or local bulging.
Vitrified Clay	Major fractures/breaks or missing sections with major soil infiltration/voids/piping and accompanying settlement or sinkholes within roadway limits; joints severely separated/misaligned causing soil migration and roadway settlement.	Cracks/fractures or joint separation/misalignment with significant infiltration/exfiltration or evidence of soil migration/piping, but no settlement or sinkholes within roadway limits; threat exists within a 1:1 slope influence of the roadbed.	Moderate cracking/crazing or minor joint displacement with moderate infiltration; no perceptible cross-section deformation and no settlement/sinkholes within roadway limits (monitor and address within the specified timeframe).

TABLE 2. RFA PRIORITY LEVEL BY MiASIM ELEMENT CONDITION

MiASIM Element / Condition Category	RFA Priority Level 1	RFA Priority Level 2	RFA Priority Level 3
Barrel (shape deformation / buckling / holes / section loss)	Major tears/splits/deformation/bulges with major soil infiltration/voids/piping and settlement/sinkholes; holes or major section loss with voids beneath invert and piping with settlement/sinkholes.	Holes or significant section loss with voids beneath invert and piping, but no settlement/sinkholes; longitudinal cracks with perceptible cross-section deformation.	Concrete cracks with no perceptible deformation but heavy abrasion/scaling and exposed reinforcement; metal/plastic moderate buckling/deformation/local bulging.
Joints / Seams	Open/displaced (misaligned) joints with soil infiltration/piping causing settlement/sinkholes within roadway limits; (metal) seam connection failures reducing capacity with settlement/sinkholes.	Open/displaced (misaligned) joints with significant infiltration/exfiltration of water or soil, but no settlement/sinkholes within roadway limits; (metal) loose/missing bolts and section loss at bolt holes.	Open/displaced (misaligned) joints with moderate water infiltration through leak-resistant seams; possible evidence of repeated patching or cracking in pavement over culvert alignment.
Embankment (erosion / tension cracks / sloughing)	Severe erosion of embankment material or major soil tension cracks perpendicular to slope indicating shifting/settlement within a 1:1 slope influence of the roadbed.	Soil tension cracks perpendicular to slope indicating shifting/settlement and/or sloughing that threatens the roadway/embankment within a 1:1 slope influence of the roadbed.	Localized scour protection displacement progressing toward a threat within a 1:1 slope influence, but no undermining/rotation of footing exists.

TABLE 2. RFA PRIORITY LEVEL BY MİASIM ELEMENT CONDITION

End treatment / apron / scour protection	End treatment (with any apron) crushed or separated; scour protection missing; major erosion/undermining progressing toward impending embankment failure within a 1:1 slope influence of the roadbed.	End treatment (with any apron) crushed or separated; scour protection significantly displaced; scour has caused significant undermining/loss of support threatening roadway/embankment within a 1:1 slope influence of the roadbed.	Localized displacement of scour protection with scour exposing vertical face of footing or progressing toward a threat; no undermining or rotation of footing exists.
Footings / scour	Footings severely undermined due to scour, which could progress toward impending failure of roadway/embankment within a 1:1 slope influence of the roadbed.	Scour-related undermining/loss of support threatens roadway/embankment within a 1:1 slope influence of the roadbed (as applicable to end treatment/apron/scour protection conditions).	Scour exposes vertical face of a footing or progresses toward a threat, but no undermining/rotation exists.
Inner liner	—	Significant reconfiguration of inner liner.	Moderate reconfiguration of inner liner.
Capacity reduction / blockage (mass drift or sediment)	—	Capacity reduced > 50%; blockage creates excessive ponding and/or erosion that threatens roadway/embankment within a 1:1 slope influence of the roadbed.	Capacity reduced from 33% to < 50%; blockage creates excessive ponding and/or erosion that does not threaten roadway/embankment within a 1:1 slope influence but could if not addressed within the specified timeframe.

CONCRETE RFA PRIORITY LEVEL 1 PHOTOS



Sinkhole in asphalt shoulder



Structural cracking and barrel misalignment beneath roadway depression



Significant section loss exposing reinforcement



Three-sided culvert wall rotation



Significant soffit spall with exposed reinforcement



Sinkhole undermining roadway

Updated as of 06/05/2026

CONCRETE RFA PRIORITY LEVEL 2 PHOTOS



Barrel failure beneath embankment



Moderate concrete section loss exposing steel reinforcement



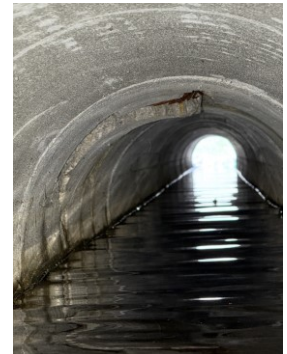
Hairline to wide cracking along culvert soffit



Joint failure with sediment infiltration through joints



Soffit spalling exposing reinforcement



Failed barrel section

Updated as of 06/05/2026

CONCRETE RFA PRIORITY LEVEL 3 PHOTOS



Failed wingwall with active embankment erosion



7LF from eb paved shoulder south embankment

Sinkhole over open culvert joints



Active water infiltration through culvert joints within embankment



Wide joint separation with coarse grain infiltration



Culvert wall block displacement



Wide longitudinal cracking along soffit

Updated as of 06/05/2026

METAL RFA PRIORITY LEVEL 1 PHOTOS



100 percent section loss along invert



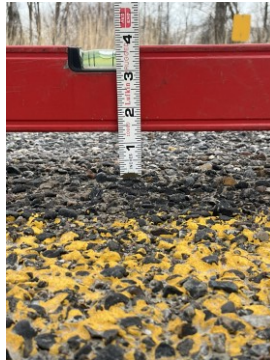
100 percent section loss along invert with backfill migration



Invert section loss beneath roadway



100 percent section loss along invert with backfill migration



Roadway depression above section loss



Invert section loss beneath roadway

Updated as of 06/05/2026

METAL RFA PRIORITY LEVEL 2 PHOTOS



Visible perforations near end treatment



Moderate corrosion along invert (perforations visible and easily made)



Isolated areas of full section loss



Culvert sidewall buckling and section loss



Visible section loss with perforations of CMP



Culvert sidewall buckling and section loss

Updated as of 06/05/2026

METAL RFA PRIORITY LEVEL 3 PHOTOS



Moderate corrosion with minor section loss throughout barrel



Localized deep pitting



Localized section loss less than 1 inch in diameter



Uniform corrosion loss along invert. Wall penetration possible with pick



Isolated section loss beneath embankment



Corrosion along invert with holes less than inch in diameter

Updated as of 06/05/2026

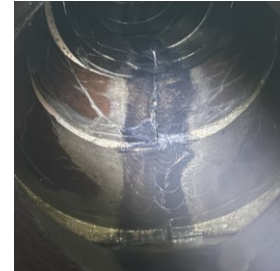
CLAY RFA PRIORITY LEVEL 1-3 PHOTOS



RFA Priority level 1: Barrel failure under roadway



RFA Priority level 2: Joint separation with backfill infiltration



RFA Priority level 3: Barrel invert cracking and joint misalignment