

Not Highway Culverts

HYD\_MATERIAL\_CURR\_ID not in Aluminized Steel, Corg. Aluminum (CAP), Corg. Steel (CSP), Structural Plate or Polymeric-Coated or is null

HYD\_MATERIAL\_CURR\_ID not in Concrete, Aluminized Steel, Corg. Aluminum (CAP), Corg. Steel (CSP), Structural Plate or Polymeric-Coated or is null

HYD\_INSP\_COND\_ID IN (1, 2)

All other Highway Culverts in good Condition (1, 2). Materials include various plastics, Timber, Brick/ Masonry, Vitrified Clay, Other (steel casing, cast iron, unknowns), Bituminous-Coated steel or any Liner material type

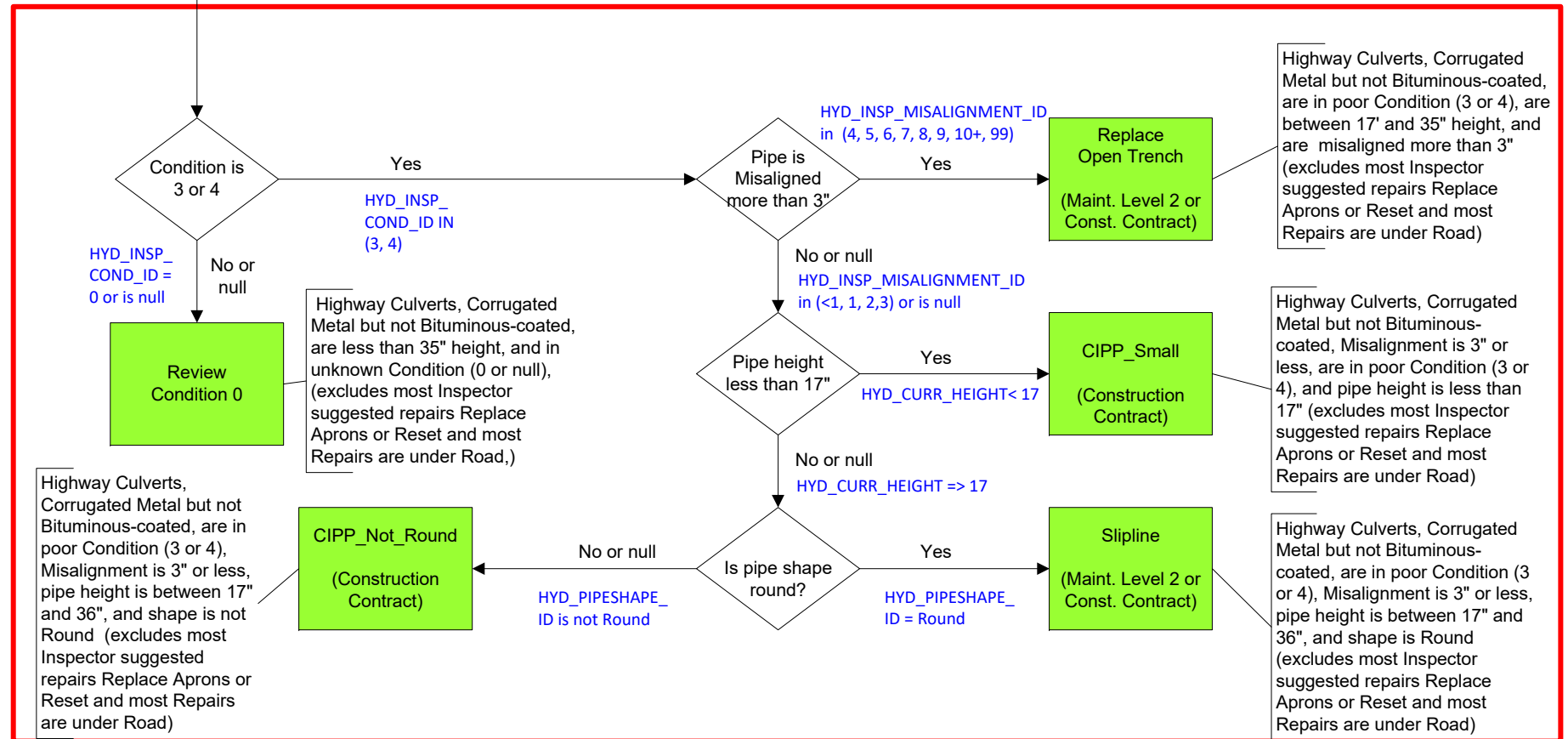
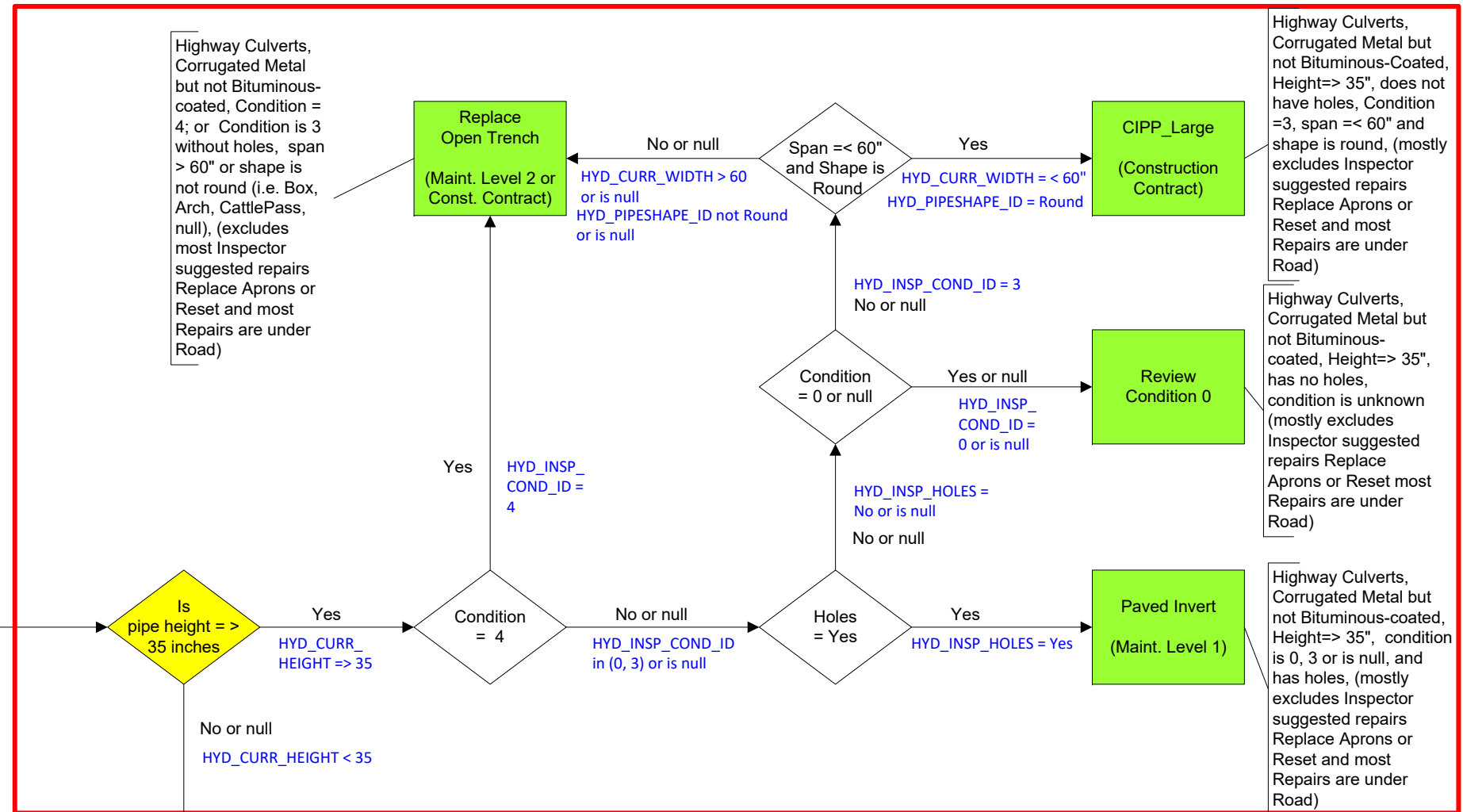
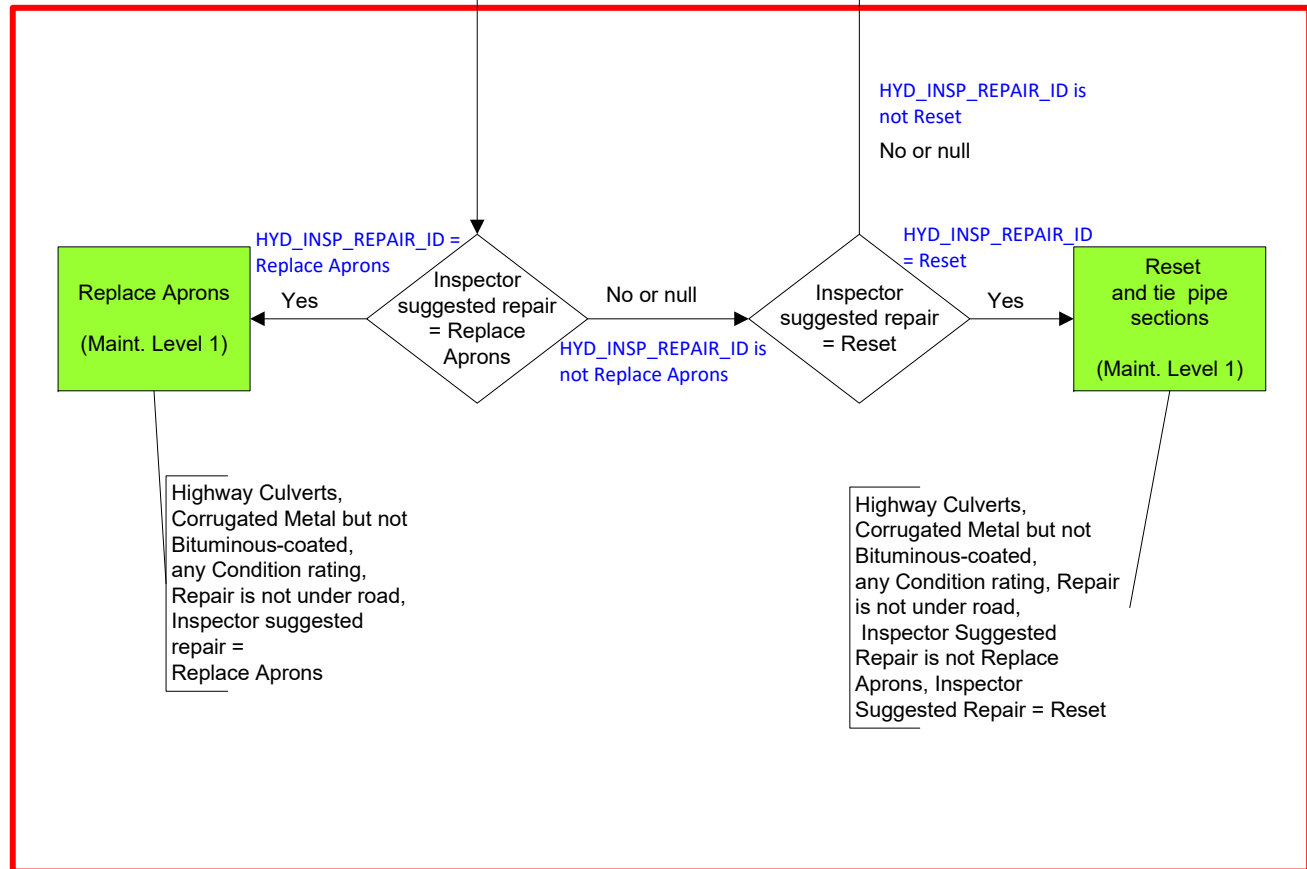
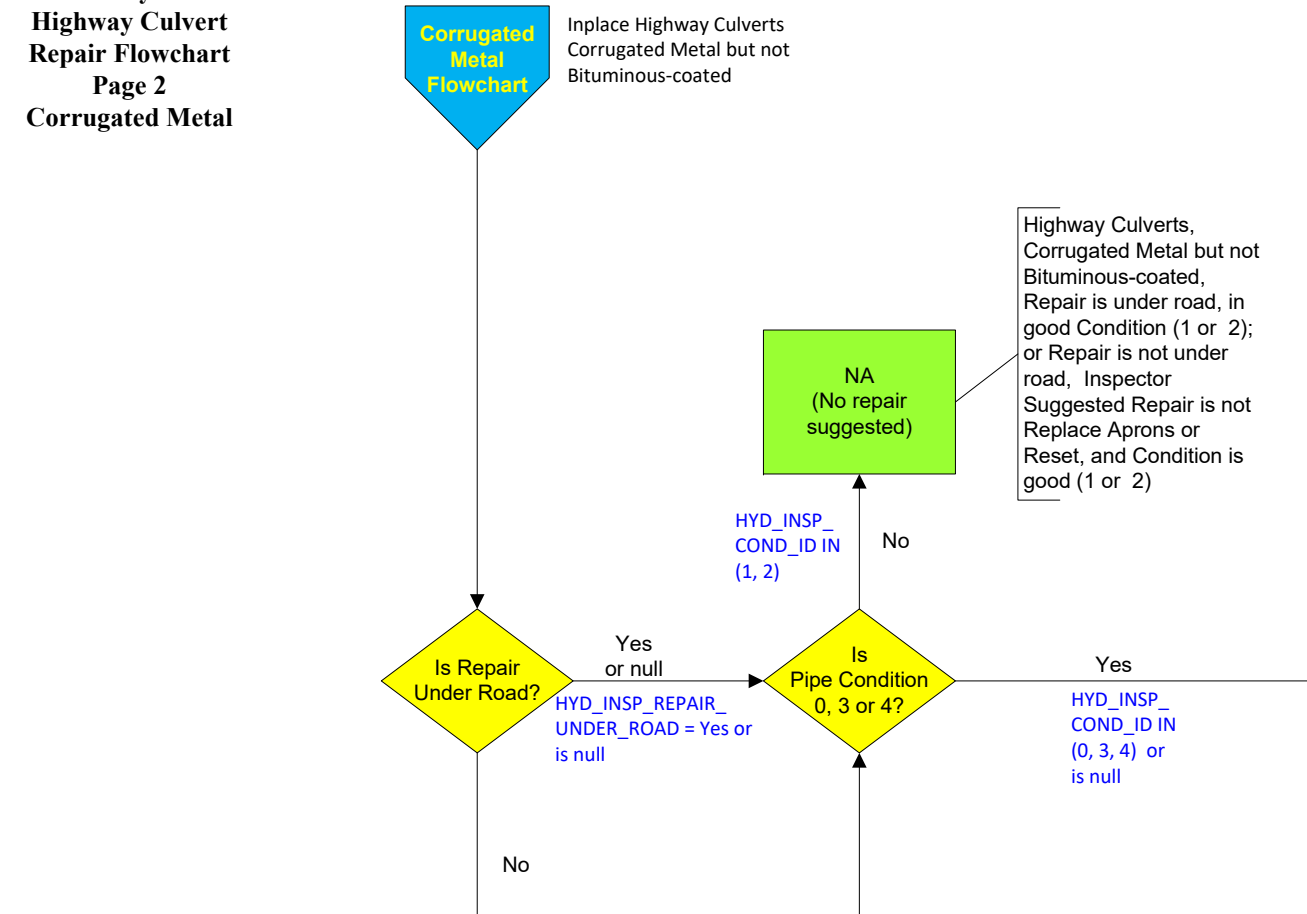
All other Highway Culverts not Concrete or corrugated metal, in poor or unknown Condition (0, 3, 4 or null). Materials include various plastics, Timber, Brick/Masonry, Vitrified Clay, Other (steel casing, cast iron, unknowns), Bituminous-Coated steel or any Liner material type

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**TAMS-HydInfra  
Culvert Repair Flowchart  
For Estimating Repairs of  
Highway Culverts**

DEPARTMENT OF  
TRANSPORTATION

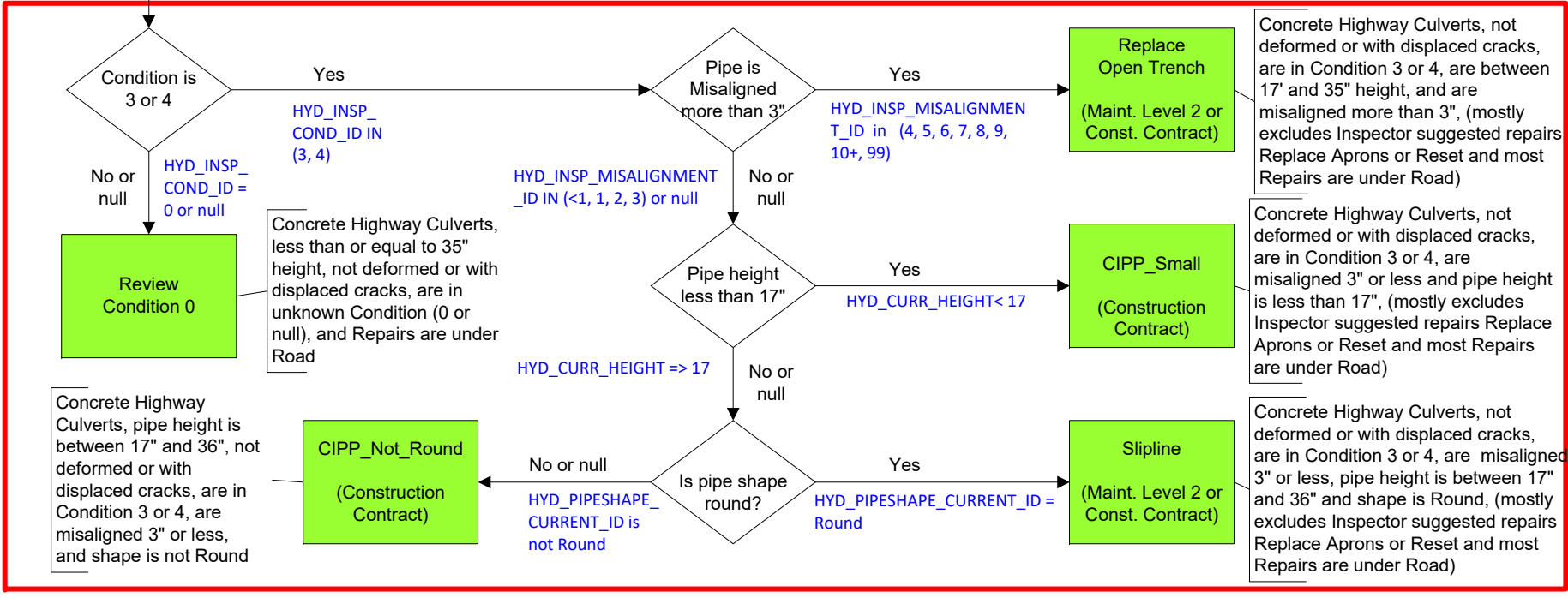
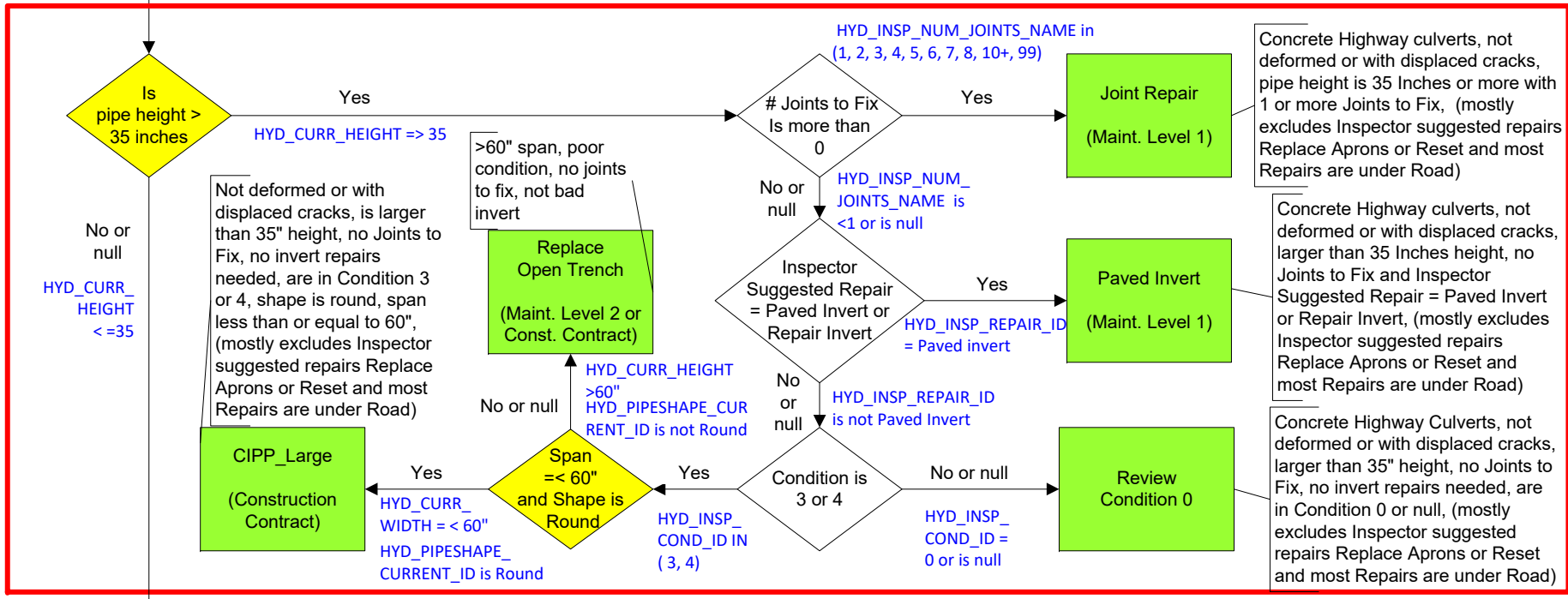
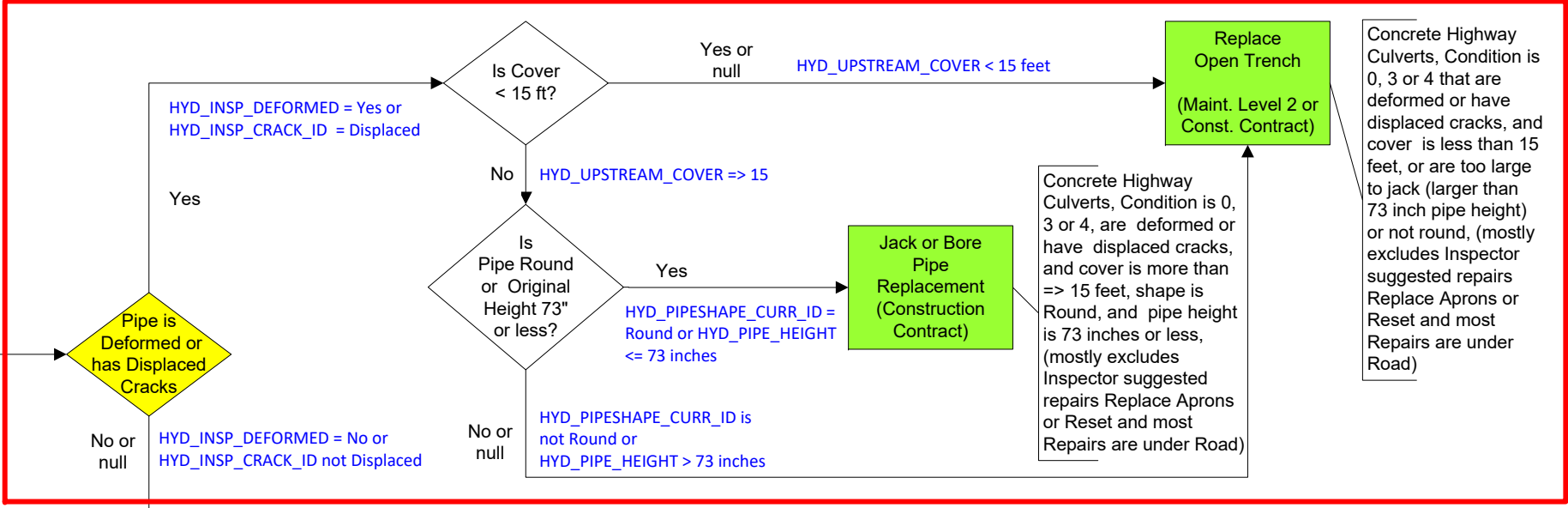
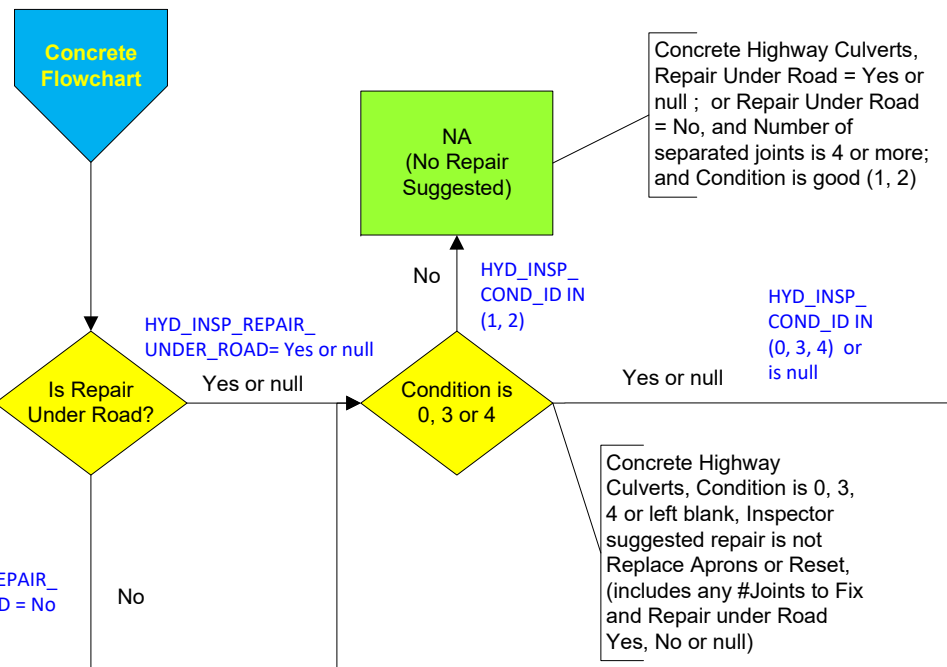
**TAMS-HydInfra  
Highway Culvert  
Repair Flowchart  
Page 2  
Corrugated Metal**



Person Entry Repairs

Not-Person Entry Repairs

Repairs Not Under Traffic



Repairs Not Under Traffic

Not Repairable

Person Entry Repairs

Not-Person Entry Repairs



# TAMS-HydInfra Culvert Repair Flowchart for Maintenance Repair Planning

## Repair Methods:

- 1 = Reset (reset apron)
- 2 = Joint Repair
- 3 = Paved Invert
- 4 = Slipline
- 5 = CIPP (Cured In Place Pipe Liner)
- 6 = Trench
- 7 = Jack (or auger, ramming, drilling, bursting etc.)
- 8 = Review (needs repair, no suggestion given)
- 9 = NA (not applicable)
- 10 = Replace Aprons

## Highway Culvert Definition:

Culverts under MnDOT highway traffic lanes (including Roadway Types Centerline, Median, Ramp/Loop, Collector-Distributor, Mainline)

## Assumptions used for Repair Options:

- This flowchart describes how TAMS HydInfra inventory and inspection records are sorted into suggested repair methods based on pipe traits. This new version is aimed at finding specific pipes that might be repairable by Maintenance, or others that might be done in Construction Projects. The previous version of the flowchart was used for District or State-wide cost estimates and were not a final repair recommendation.
- The flowchart selected repairs are more likely to fit if inspection flags are filled in. The selected repair should be reviewed against the entire pipe inspection – flags, Inspector Suggested Repair and Inspection Comments.
- Repair suggested is weighted by most common failure mode for that material type.
- Permanence, low cost and simplicity of installation are primary considerations.
- Fixes done by MnDOT Maintenance are favored in the selection process.
- Maintenance is equipped to do some repairs (like joint repair, paved invert, slipline, and reset end sections) but not others (like CIPP or Jack).
- Maintenance does not do Cured in Place Pipe Liner repairs or Jacked pipe replacements.
- Reduction in diameter reduces hydraulic capacity. Sliplining reduces internal diameter more than cured in place liner or other methods, and limits its use.
- In pipes less than 36" diameter (2.90 meters) difficulty of human access will favor sliplining or cured-in-place pipe liner over other methods.
- Open trench replacement is least preferred for highways if traffic is disrupted and likely more expensive when repaving costs are included.
- Pipes under deep cover are more difficult and expensive to open trench.

## Consider many additional factors before repairing a pipe:

- 1) If you reduce the hydraulic capacity of the repaired pipe you may cause problems – get a recommendation from Hydraulics/WRE before you line or replace a pipe.
- 2) Verify Pipe's size, shape, material, length before a doing a major repair.
- 3) Compare the Field Recommended Repair to the Flowchart Suggested Repair and critically review each suggestion against the condition problems (inspection flags and measures).
- 3) Additional work may be required with any repair method, especially filling the road voids around a bad pipe.
- 4) Soundness of road – can voids outside of the repaired pipe be adequately filled?
- 5) Structural integrity – will the pipe be structurally sound after repair?
- 6) Cost reduction by combining repairs – can several pipes be repaired together in a project?
- 7) Local costs of repair methods may suggest a different repair method.
- 8) Open trenching costs must include pavement cost except when part of a paving project.
- 9) The scope of the construction project (re-construction, overlay, maintenance) may suggest choosing replacement over repair, or vice versa
- 10) Traffic requirements – are lane closures required, or are they feasible?
- 11) Right-of-Way – is the highway-owned work area sufficient for the repair method?
- 12) Accessibility – Can equipment or materials needed for the repair method reach the pipe?
- 13) Presence of large rocks prevents jacking – consult Materials Office for soils information.
- 14) Other repair methods may be appropriate for any pipe, for example, "Joint Repair" may include internal bands, grouting, or other method.
- 15) Pipes with Roadway Types "Entrance", "Township Road" or "City Road" might be open trenched, whereas Mainline, Centerline, Ramp/Loop, Collector/Distribut and County Roadway Types often may not be, due to traffic.
- 16) Permit requirements – work with District Hydraulics-Water Resources Engineer to determine if any permits are required or conditions that need to be met.
- 17) CIPP Liners cured with hot water may contain Styrene that has caused fish kills in streams. Capture all heated water used in resin-curing process and truck to a proper disposal site.
- 18) If you can't do it safely, don't do it.