



Voluntary Conservation Measures

Karst Invertebrates, Aquifer Invertebrates, and Salamanders for Biological Assessments and Biological Evaluations

Introduction

As described in the Texas Department of Transportation (TxDOT) Environmental Affairs Division's (ENV) [Documentation Standard for a Biological Assessment or a Biological Evaluation](#), voluntary conservation measures (VCMs) are incorporated into many aspects of project design and construction to avoid, minimize, and/or mitigate impacts to federally listed species. The VCMs described in this document are applicable to consultations involving karst invertebrates, aquifer invertebrates, and salamanders in karst features that may contain potential habitat. Projects that may have impacts to known occupied features such as caves, spring runs, and sinkholes, require site-specific VCMs to be developed on a project-by-project basis and must be described in greater detail.

Conservation measures shall be described and included in Section 2.4 of TxDOT consultation documents prepared using ENV's [Template for Biological Evaluation \(BE\) for Informal Consultation with the US Fish and Wildlife Service \(USFWS\) or Biological Assessment \(BA\) for Formal Consultation with the USFWS](#). The VCMs are broken out by phases of project development and construction using subheadings appropriate to the consultation document. All VCMs should be evaluated by the project team. Where appropriate and applicable, VCM language should be included verbatim, as applicable, in consultation documents where subsurface limestone disturbance is included with the project activities and where groundwater may be encountered and impacts to federally listed karst invertebrates, aquifer invertebrates, or salamanders are anticipated.

Directive language is provided in bracketed italics [*like this*]. This text should be deleted once VCMs are imported into the consultation document. Please read carefully and choose VCMs based on the location, conditions, and impacts of the project. Discuss changes to these VCMs with the project team (e.g., design, area engineers, district environmental staff, and ENV Biology SME, etc.) before including them in the consultation document.

2.4 Voluntary Conservation Measures

Voluntary conservation measures (VCMs) are incorporated into many aspects of project design and construction to avoid, minimize, and/or mitigate impacts to federally listed species. The following VCMs are broken out by phases of project development and construction and will assist in minimizing potential impacts to [*delete or modify, as applicable*] subsurface limestone, groundwater, aquifer invertebrates, karst invertebrates, and salamanders.

2.4.1 Measures Previously Implemented

Prior to project design completion and in support of this consultation, TxDOT has completed the following conservation measures:

- completed a karst feature survey [*and/or geologic assessment as applicable*] of the project area and all easements where project activities may occur. [*Required for any project in a USFWS designated karst zone, except those that do not contain endangered karst invertebrate species. Reference the appendix where this report is included*]

[*Include any of the following, as applicable, or add other measures completed:*]

- completed presence/absence surveys in accordance with current USFWS protocols [*or describe other acceptable methods used*] in any features with potential habitat for listed species. [*Reference the appendix where this report is included*]

- surface and subsurface drainage basin delineation for occupied features. [*Reference the appendix where this report is included*]
- geophysical surveys. [*Reference the appendix where this report is included*]
- groundwater flow modelling studies. [*Reference the appendix where this report is included*]

2.4.2 Measures to be Implemented During Project Planning and Design

During the planning and design of the project TxDOT shall:

[*Include any of the following, as applicable, or add other measures:*]

- limit proposed activities to the existing developed right-of-way (ROW), easements, and proposed ROW [*Delete easements and or proposed ROW if not applicable*], which will also minimize vegetation removal;
- minimize the depth of excavation and disturbance to bedrock and maximize the use of areas covered by fill material to the greatest extent practicable [*This may only be appropriate where minimization was used to avoid impacts to known features. If so, please describe those minimization efforts specifically*];
- design appropriate temporary best management practices (BMPs) to minimize construction-phase erosion and sedimentation impacts and to protect sensitive recharge features and include these in any required Texas Commission on Environmental Quality (TCEQ) permitting documents, such as the [*include or delete as applicable to project requirements*] Storm Water Pollution Prevention Plan (SWP3), Water Pollution Abatement Plan (WPAP) or Contributing Zone Plan (CZP), and TxDOT construction plans, in accordance with the Texas Pollutant Discharge Elimination System (TPDES) requirements and Edwards Aquifer Rules.
- Include all conservation measures into the Environmental Permits, Issues, & Commitments (EPIC) sheet in the project plans.

[*If a project includes permanent BMPs required by TCEQ's Edwards Aquifer Rules for a WPAP or CZP that have yet to be designed, then the following general VCMs should be included in the consultation document as appropriate. If permanent BMPs have been designed, provide details on those here instead.*]

- include appropriate permanent BMPs to comply with TCEQ Edwards Aquifer Rules to remove at least 80 percent of the increase in total suspended solids (TSS) load resulting from additional impervious covered added by the proposed project.
- [*if applicable*] protect sensitive recharge features in the Edwards Aquifer Recharge Zone from water quality impacts by using a combination of temporary and permanent BMPs and/or closure plans as appropriate.
- [*if applicable*] select water quality pond locations to maximize the collection of runoff from the existing and proposed roadway pavement.
- [*if applicable*] design water quality ponds to retain spills of hazardous materials.
- [*if applicable*] design water quality ponds with impermeable liners to prevent infiltration into the underlying material.

2.4.3 Measures to Be Implemented Prior to Project Construction

TxDOT shall implement the following VCMs prior to project construction:

[*Include any of the following, as applicable, or add other measures:*]

- hold a pre-construction meeting with its employees and contractors working on this project. TxDOT shall provide specific instructions on the implementation of TxDOT's proposed VCMs. Instructions specific to the contractor(s) related to implementation of the VCMs shall be documented in the EPICs and project plans. TxDOT shall provide pre-construction awareness training to project contractors, which includes information on protected species and habitat that may occur in the project area and outside the ROW and requirements to avoid effects to these species and their habitats.
- train and instruct personnel and contractors to report voids and seeping groundwater found during construction.

[delete if no surface features are present]

- establish karst feature protection zones for karst features with surface expressions that contain potential habitat for protected species *[delete if not applicable]* or are determined to be sensitive features in accordance with the TCEQ Edwards Aquifer Rules. Karst feature protection zones shall be demarcated with construction fencing to be maintained throughout the duration of construction. These zones shall be clearly delineated on construction plans and discussed with contractors at the preconstruction meeting.

[delete if no surface features are present]

- place BMPs to prevent surface runoff from entering karst features with surface expressions that contain potential habitat for protected species *[delete if not applicable]* or are determined to be sensitive features in accordance with the TCEQ Edwards Aquifer Rules and direct drainage away from such features. BMPs may include temporary vegetation, silt fencing, blanket/matting, mulch, sodding, interceptor swales, diversion dikes, mulch filter berms, biodegradable erosion control logs, silt fencing, rock berms, bio-degradable erosion control logs, and triangular filter dikes. BMPs shall be in place before construction activities are initiated and shall be monitored and maintained in accordance with the *[delete or include as appropriate]* SWP3, WPAP, or CZP.
- place project specific locations (PSL) within the TxDOT ROW *[delete if not applicable]* outside of karst feature protection zones to minimize potential impacts to listed species and their habitat. Storage of chemical substances will only occur in designated PSLs with additional protections described in Section 2.4.4 to prevent materials from running off or entering waterways or groundwater. PSLs may also occur outside of the project area if the contractor chooses. Environmental compliance for PSLs located outside of the ROW is the project contractor's responsibility. TxDOT will notify the contractor of the possibility of listed species and habitats in the project area and the specific requirements to avoid impacts or the need to consult with USFWS.

2.4.4 Measures to be Implemented During Project Construction

TxDOT shall implement the following VCMs during project construction:

[Include any of the following, as applicable, or add other measures completed:]

- adhere to TxDOT's standard plans and specifications.
- adhere to the project SWP3 *[delete or include as appropriate]*, WPAP or CZP regarding equipment maintenance, materials storage, spill containment and response, waste containment and disposal.
- limit the clearing of vegetation and topsoil to only the areas needed to accomplish the project or activity.

- provide an on-call construction monitor throughout ground-disturbing activities to inspect and report karst voids encountered during construction in accordance with the Void Discovery Oversight and Reporting protocol described below. [*If the consultation includes salamanders and other subsurface aquatic invertebrate species include this statement here and the Groundwater Flow Mitigation and Protection Measures section below: If standing, seeping, or flowing water is encountered, the Groundwater Flow Mitigation and Protection Measures described below shall be implemented*]
- [*include for BAs only*] provide biannual monitoring reports to USFWS documenting the status of the project and results of void evaluations, presence/absence surveys, and the status of void closures, as applicable. Biannual monitoring reports shall be provided in January and June throughout the duration of construction.

Void Discovery Oversight and Reporting for Terrestrial Karst Invertebrates

It is possible that karst features or caves without surface expressions (voids) may be revealed during excavation or drilling (drilled shafts or boreholes) in previously undisturbed bedrock. If a potential karst void is encountered during excavation or drilling activities, work within a minimum of 50 feet of the feature will cease to ensure surveyor safety until the feature is evaluated for potential karst invertebrate habitat by a karst scientist holding an appropriate 10(a)(1)(A) permit following current USFWS karst survey protocols.

For small diameter geotechnical boreholes (six inches or less), the work stoppage area may be determined by TxDOT based on safety, feature protection, site conditions, and other activities in the area, but will not be less than 10 feet from the borehole to ensure surveyor safety. When karst voids that are not humanly enterable are encountered, including those in drilled shafts or geotechnical boreholes, the feature will be evaluated using a side-viewing downhole camera or other similar means, if feasible.

If the feature does not meet the criteria for potential karst habitat, then the results of the evaluation shall be documented, and work shall continue. If a karst feature meets the USFWS criteria for potential karst invertebrate habitat, work within the immediate area will remain stopped while presence/absence surveys are conducted in accordance with current USFWS karst survey protocols. Presence/absence surveys will not be conducted if surface conditions make it unsafe to do so. Examples of unsafe conditions could include situations where:

- the feature is in an active traffic lane that would have to be closed for an extended period to conduct the survey,
- the excavation cannot be stabilized to make the feature safe to survey, or;
- environmental conditions (e.g., bad air, flooding, excessive temperature) that create unsafe survey conditions.

Reasons for not conducting a presence/absence survey when a feature meets the USFWS criteria for potential habitat shall be documented in writing. [*Include only for BAs/formal consultations: Results of void evaluations and presence/absence surveys shall be provided to USFWS.*] Occupation of any karst feature will be presumed if potentially listed karst invertebrates collected during surveying are immature or otherwise cannot be identified to species. [*In the case of a BE or informal consultation for karst invertebrates, also include this statement: If a feature is determined to be occupied or presumed occupied by a listed karst invertebrate, work shall cease on the entire project and TxDOT will reinitiate consultation with USFWS.*]

While a feature is being evaluated, the surface opening shall be covered to minimize the influence of diurnal variations in surface temperature. Protection of the feature may include a wood cover, plastic

sheeting, and/or a blanket that is weighed down with rocks around the perimeter. During periods of high temperatures (>100° F), a piece of insulation shall be added to the cover. Hazard fencing or barricades may be used to protect the area if there is a fall hazard, such as an open shaft. Appropriate BMPs shall be implemented to prevent surface runoff from entering the feature.

Once evaluation is completed and if it is possible within the needs of the project, the feature shall be closed or capped to preserve as much of the subsurface void space as possible. *[Include for projects where TCEQ rules apply: All feature closures shall be completed and reported in accordance with TCEQ Edwards Aquifer Rules.]* If work must continue at the feature, disturbance to the feature shall be minimized and the final status of the feature shall be determined on a case-by-case basis following recommendations from a permitted scientist, geoscientist, and an engineer, as applicable. When features are closed, they shall be closed in a condition as similar as possible to pre-excavation conditions to preserve water and nutrient inflow and void volume, while protecting the feature from contaminated runoff. Geotechnical boreholes shall be plugged above the void, preserving the void space, then backfilled above the plug. *[Include for projects where TCEQ rules apply: The TCEQ Edwards Aquifer Rules require borings in the recharge zone to be plugged with non-shrink grout from the bottom of the borehole (top of the plug in the case of a void) to within 3 feet of the surface. The remainder of the borehole must be filled with cuttings or gravel.]*

[The following section only applies to consultations involving salamanders and other subsurface aquatic invertebrate species. Otherwise, do not include.]

Groundwater Flow Mitigation and Protection Measures for Salamanders and Aquatic Invertebrates

If standing, seeping, or flowing water is encountered in an excavation, work within a minimum of 50 feet of the excavation shall cease until an evaluation is completed. Appropriate BMPs shall be implemented to minimize surface runoff from entering the excavation. A geoscientist shall evaluate the excavation to determine the source of the water and potential connectivity to the Edwards Aquifer. If it is determined that the water is connected to the Edwards Aquifer, a site-specific groundwater mitigation and solution feature closure plan shall be developed before work can continue near the groundwater feature. All groundwater mitigation and solution feature closure plans shall be completed and approved in accordance with TCEQ Edwards Aquifer Rules, as applicable.

The groundwater mitigation and solution feature closure plan shall be designed to permanently seal off the excavation from the groundwater feature. Where a feature contains flowing water that could be a groundwater flow path of the Edwards Aquifer, the plan will also include measures designed to maintain hydrologic connectivity across, under, or around the excavation. This may include the use of clean, porous media such as clean washed rock, and PVC pipe of assorted sizes. The plan for excavations with flowing groundwater shall also include measures designed to permanently isolate and seal off the groundwater flow path from the rest of the excavation.

For dilled shafts, the groundwater mitigation and solution feature closure plan shall typically use permanent casing to seal off the groundwater source and prevent contamination before pouring concrete. Casing is intended to prevent the migration of concrete into voids. If flowing water is encountered during the excavation of drilled shafts, the plan may include the permanent placement of casing in a manner that seals the drilled shaft off from the area of groundwater conductivity while allowing continuity of groundwater flow through the annular space surrounding the casing. If casing is not used, concrete migration into voids will be addressed on a case-by-case basis based on the nature of the void and the engineering needs of the project with an emphasis on groundwater protection.

If accumulated groundwater must be pumped from an excavation, all pump intakes must be screened to exclude salamanders by placing cages with 1/16" or smaller mesh over any intake to exclude

salamanders. Water must be removed at a low velocity (≤ 1 cubic feet per second), to prevent salamanders from becoming trapped on intake screens/cages.

For geotechnical boring activities, the groundwater mitigation and solution feature closure plan shall typically involve filling the borehole with clean-washed 1-inch rock to approximately 2 feet above the groundwater level, placing a hole plug above the rock surface, capping the hole plug with a packed bentonite plug, and then sealing the top of the boring with suitable materials. [*Include for projects where TCEQ rules apply: The TCEQ Edwards Aquifer Rules require borings in the recharge zone to be plugged with non-shrink grout from the bottom of the borehole, or the top of the plug, in the case of a void) to within 3 feet of the surface. The remainder of the borehole must be filled with cuttings or gravel.*]

2.4.5 Measures to be Implemented Following Construction

TxDOT shall implement the following VCMs at or after the completion of construction:

- Disturbed areas shall be re-vegetated according to TxDOT's standard practices and the TCEQ Construction General Permit. Re-vegetation efforts shall provide appropriate and sustainable cover to prevent erosion and siltation.
- [*add any other proposed site-specific post-construction surveys or monitoring*]

[*The following section must only be included in BAs for projects where take is anticipated and a formal consultation with the USFWS is required.*]

2.4.6 Other Conservation Measures

For unavoidable impacts to the federally listed species affected by the project, TxDOT and/or the Project Sponsor shall [*described proposed offset, which could include additional species surveys, specimen collections for genetic sampling, payment to a third-party mitigation provider or habitat conservation plan, or other mitigative measures suggested by the USFWS and agreed to by TxDOT (or vice versa)*]. Mitigation measures shall be secured before the start of construction [*or within a timeframe agreed to by USFWS*].



Appendix A: Revision History

The following table shows the revision history for this interim guidance document.

Revision History	
Effective Date Month, Year	Reason for and Description of Change
May 2022	Version 1 was released.