just beyond the aperture of the void. This section of the void will be prepared by cleaning all lose material from the interior of the aperture. Sandbags and/or other approved obstructions such as bull rock and filter fabric will be placed in the void from the floor to the ceiling and along both side walls to complete a solid barrier that effectively close off the remainder of the enclosed void space. Following the barrier, 24 inches of Class C 2,500 PSI concrete can then be placed in the aperture from the barrier to entrance at the base of the excavated pit per the engineer's design (See Attachment 3B). This method of mitigation was chosen to allow for the maximum amount of enclosed void space to be preserved in its natural condition.

Phase III

This section of the void is an excavated pit adjacent to NB-02. The greatest dimensions of the open pit are approximately 33 feet by 25 feet with a depth of 8 feet. The mitigation for the excavated pit was prepared by a TxDOT engineer (see Attachment 3B). After mitigation Phases I and II have been completed, mitigation of the excavated pit will be achieved by placing a layer of Type II filter fabric along the floor and side walls of the open pit. The filter fabric will be followed by large rock (≥1 foot in diameter) in an approximately 4-foot thick layer from the bottom. Another layer of filter fabric will then be installed on top of the large rock, followed by approximately 4 feet of clean bull rock (3-5 inches). These layers will be followed by another layer of filter fabric and an 18-inch thick reinforced concrete cap that will terminate at final subgrade. The concrete cap will be reinforced with a double layer of longitudinal and transverse #3 rebar and will be comprised of TxDOT Class C concrete, which is designed to break at or above 3600 PSI. Additionally, the cap will extend a minimum of 4 feet past the perimeter of the open pit in all directions in order to provide greater load capacity as well as to assure a watertight seal is developed around the void perimeter.

Phase IV

In order to achieve a watertight seal around this feature, several measures were taken. Per the permanent plans, the cap will be covered by a minimum of 12 inches of Type C impermeable clay liner seeded with the permanent seed mix design. This impermeable clay liner has been tested by the TxDOT District Laboratory and verified to meet the full extent of the TxDOT specifications for this material.

Attachment 3C Continued
Mopac Intersections
EAPP #: 11000467
Void PF-019C
Station 1074+50 (NB-02 Station 14+40)
N 30.190063°, W -97.873823°

MITIGATION RATIONAL

In determining a protective mitigation method several options were considered to address worker safety, structural, integrity, water quality, and preservation of natural void spaces.

Phase I of the mitigation allows for structural components of NB-02 to be satisfied in a safe and effective manner.

Phase II of the mitigation will allow for the maximum amount of natural void space to be preserved. The use of sandbags and/or other approved obstructions with 24 inches of concrete will minimize the potential for concrete to migrate into the open void space through cracks and mesocavernous spaces while providing a permanent concrete seal of the opening.

Phase III of the mitigation addresses structural constructability of Detention Pond F.2 and water quality. The large rock will provide for a consistent base material and is readily available on site. The bull rock is a stable founding material and will provide a solid foundation to support the 18 inch concrete cap beneath the detention pond. The filter fabric between the layers of fill rock will prevent finer sediment from filing open spaces between the larger rocks below.

Phase IV of the mitigation will be installation of the 12-inch thick Type C clay liner. Several pond liners were considered, ultimately the 12-inch Type C clay liner was chosen to ensure that water cannot migrate from the surface to the subsurface void spaces below as it is designed and tested to be impermeable.

Attachment 3C
Mopac Intersections
EAPP #: 11000467
Void PF-046
Station 1073 + 12
N 30.1905027, W. -97.8745171

PF-046C MITIGATION PLAN

PF-046 is located in proposed Detention Pond F.1 near retaining wall RW-02. On initial inspection, it was determined that 1-2 feet of additional excavation was required to be at final grade. With the permission of TCEQ, the void was excavated on 05/23/2019, under the supervision of an aci geologist. The area surrounding the feature is now at final grade. See attachment 3A for final dimensions.

For the mitigation of PF-046, the feature will be cleaned of all loose material and construction millings, including the exposed void floor proceeding the enclosed void space. The void will be cleared of all materials beyond the enclosed void space to allow for sandbags and/or other approved obstructions such as clean rock with filter fabric to be placed into the void. Per the design of TxDOT engineers, the sandbags and/or other approved obstructions will be followed by a minimum of 18 inches Pneumatically Placed Concrete (shotcrete) and Class C 2,500 PSI concrete. The exposed void floor proceeding the enclosed void space will be filled with clean bull rock. Following the bull rock, a layer of Type II filter fabric will be installed over the bull rock across the exposed void floor. After the filter fabric has been installed, the remaining void space will receive a #5 rebar reinforced concrete cap that is a minimum thickness of 18 inches Class C 2,500 PSI concrete to the surface grade. This will create a functional seal around the limits of the opening. See Attachment 3B for complete mitigation details as prepared by the TxDOT engineer.

In order to achieve a watertight seal around this feature, several measures will be taken. Per the site plans, the concrete cap will be covered by a minimum of 12 inches of Type C impermeable clay liner seeded with the permanent seed mix design. This impermeable clay liner has been tested by the TxDOT District Laboratory and verified to meet the full extent of the TxDOT specifications for this material. As an added measure to protect water quality, there will be a layer of Type II filter fabric below the concrete cap will incidental leakage ever occur.

Attachment 3C Continued
Mopac Intersections
EAPP #: 11000467
Void PF-046
Station 1073 + 12
N 30.1905027, W. -97.8745171

REASONING

In a cautious approach several mitigation plans were evaluated to consider environmental impacts, site safety, and constructability. Given that the void is located within competent bedrock, the proposed method was chosen to maintain the maximum amount of void space and minimize potential impacts to water quality. The use of sandbags and/or other approved obstructions, filter fabric, and a low slump concrete (2,500 PSI or greater) will minimize the vertical and lateral migration of concrete into mesocavernous void spaces and cracks within the void. Several impermeable pond liners were considered, the impermeable clay liner was ultimately chosen to ensure that water could not migrate from the surface to the subsurface void spaces below. The filter fabric below the concrete cap is an extra precautionary measure used to filter water in the event of any incidental water leakage into the void.

Attachment 3C
Mopac Intersections
EAPP #: 11000467
Void PF-047
Station 1077+00 on RWSB-02 Station 17+95
N. 30.1903291, W. -97.8750844

PF-047 MITIGATION PLAN

PF-047 is located in proposed Detention Pond F.1 near retaining wall RWSB-02. The current ground surface surrounding the void is at final grade, no additional excavation was needed. The interior dimensions are presented in Attachment 3A.

The mitigation for PF-047 has been prepared by a TxDOT engineer, mitigation details are presented in Attachment 3B. The void will be cleaned of all loose material and construction millings. The void entrance will be lined with sandbags and/or other approved obstructions such as bull rock and filter fabric from the floor to the ceiling and along both side walls to complete a solid barrier and effectively close off the remainder of the void space. This will be followed by a minimum of 18 inches of Class C 2,500 PST concrete against the sandbags to create a secondary seal. After these materials have been installed, PF-047 will be filled with Type C 2,500 PSI concrete to the surface grade. Additionally, there will be an 18 inch thick #5 rebar reinforced concrete cap that will extend over the void foot print to ensure a functional seal is achieved.

In order to achieve a watertight seal around this feature, several measures were taken. Per the permanent site plans, the reinforced concrete cap will be covered by a minimum of 12 inches of Type C impermeable clay liner seeded with the permanent seed mix design. This impermeable clay liner has been tested by the TxDOT District Laboratory and verified to meet the full extent of the TxDOT specifications for this material. See Attachment 3B for a complete mitigation detail as prepared by the TxDOT engineer.

Attachment 3C Continued
Mopac Intersections
EAPP #: 11000467
Void PF-047
Station 1077+00 on RWSB-02 Station 17+95
N. 30.1903291, W. -97.8750844

Mitigation Rationale

In a cautious approach several mitigation plans were evaluated to consider environmental impacts, worker safety, and constructability. Given that the void is located within competent bedrock, the proposed method was chosen to maintain the maximum amount of void space and minimize potential impacts to water quality. Several pond liners were considered, the 12-inch Type C clay liner was ultimately chosen to ensure that water could not migrate from the surface to the subsurface void spaces below.