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(Board action to adopt plan is pending as of October 4, 2013)

Bistone Municipal Water Supply District
(Limestone County, Texas)

Lake Mexia

Certificate of Adjudication 12-5287

Pass-Through Plan

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LAKE MEXIA

PASS-THROUGH PLAN

A. General

The Bistone Municipal Water Supply District (MWSD) has continually sought to provide a quality drinking water at sufficient capacity to meet all current and future water demands. The District relies on a combination of groundwater and surface water for its treated water needs. The Personville Groundwater Treatment Plant provides iron removal to the District's well fields and supplies all contractual obligations for most of the year. The Surface Water Treatment Plant (SWTP) treats water from Lake Mexia and primarily supplies make up water during peak usage months. The water right for Lake Mexia is authorized under Certificate of Adjudication No. 12-5287.

Bistone MWSD's Public Water System identification number is 1470006 (as assigned by the Texas Commission on Environmental Quality – TCEQ). The District serves a current total population of approximately 14,000. This value includes all direct and indirect wholesale customers including those that only take water during emergency conditions. Table 1 lists all customers.

**Table 1. Bistone MWSD Customer List
(Texas Public Water System Identification Number Listed for Each)**

Direct Purchase	Indirect Purchase Through Mexia
City of Mexia – ID #1470004	Highway 84 West WSC – ID#1470015 Shiloh WSC – ID#1470012 Whiterock WSC – Forest Glade ID#1470026 City of Wortham - ID#0810003
Mexia State School - ID#1470009	
Whiterock WSC – West Lake Mexia ID# 1470027	
Whiterock WSC – Whiterock ID #1470014	
City of Tehuacana – ID#1470013	
<i>Emergency supply only.</i> City of Coolidge – ID#1470001	

Bistone's SWTP operates primarily during the summer months to meet above average demands that the groundwater resources cannot provide. During the peak usage months, the SWTP mainly serves the Mexia State School, Whiterock WSC (West Lake and Whiterock sub-systems), and the City of Tehuacana. The estimated combined population of these systems is approximately 4,000 people. The existing surface water treatment plant treats water from Lake Mexia through conventional surface water treatment with units such as chlorine dioxide contact chamber, rapid mix, flocculator, clarifier/sedimentation basin, filters (dual media sand and anthracite coal with dual air/water backwash capabilities), chloramines disinfection, and associated support facilities. The maximum diversion rate from Lake Mexia according to Bistone's water right permit is 4,839 acre-feet per year or 4.32 MGD. However, the existing SWTP has a peak capacity of approximately 3 MGD.

B. Purpose

The purpose of this Pass-Through Plan is to assist the Bistone MWSD in their operations of Lake Mexia during periods when senior water right calls are invoked.

A local call was made by the City of Groesbeck during the drought of 2011 whereby the city requested that any water accumulated in Lake Mexia from rains be passed to the Navasota River. No pass-through occurred because significant rains in the winter of 2011-12 alleviated the water crisis.

The most recent call for pass-through was issued by the TCEQ (Texas Commission on Environmental Quality) in an order "suspending and adjusting water rights in the Brazos River Basin for a senior call". The Executive Director of the TCEQ received a priority call from Dow Chemical Company on June 26, 2013 under their Certificate of Adjudication No. 12-5328 (priority date of February 14, 1942). Under Findings of Fact - Article 32, Conclusions of Law - Article 18, and Ordering Provisions - Article 9 of the TCEQ order, the Bistone MWSD was identified as having an impoundment of water junior to Dow's priority date. The ordering provisions states that the "water right for impoundment of water may be suspended". Due to the size of the lake, Bistone is required to provide a "pass-through plan" to TCEQ. The purpose of the plan is to indicate how the District is passing inflows into Lake Mexia and releasing these flows downstream to satisfy Dow's senior priority call. According to the TCEQ's Ordering Provision - Article 9, a pass-through plan must be provided to the Executive Director by July 17, 2013. A plan was timely submitted, the TCEQ commented upon said plan, and it has been timely updated accordingly herein.

C. Description of Watershed

Lake Mexia is located on the Navasota River approximately 7 miles southwest of the City of Mexia in Limestone County. The coordinates for the Lake are 31°39' N, 96°35' W. Lake Mexia and watershed information follows:

- Authorized diversion for municipal use of 2,887 acre-feet
- Authorized diversion for industrial use of 65 acre-feet
- Authorized storage of 9,600 acre-feet
- Surface area of approximately 1200 acres
- Watershed area approximately 190 square miles
- Spillway elevation of 448 feet above mean sea level
- Water right priority date of April 15, 1957
- Constructed in 1960-1961

Figure 1 shows the general location map of the Lake.

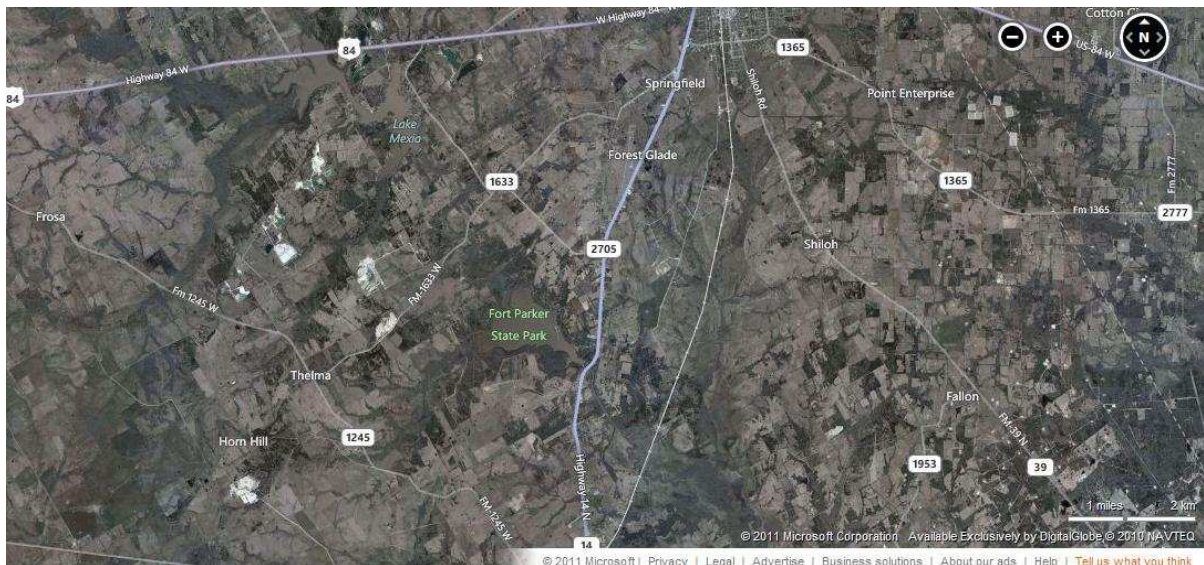


Figure 1. General Location Map

The Lake Mexia watershed is in the upper reaches of the Navasota River (which is a tributary of the Brazos River). As such, the Navasota River above Lake Mexia has no perennial stream flow. At certain times, the Navasota River below Lake Mexia can run dry.

The next downstream body of water from Lake Mexia is the Springfield Lake located within Fort Parker State Park. Approximately 0.5 stream miles further downstream from Springfield Lake is the City of Groesbeck Dam.

Springfield Lake is not owned or controlled by Bistone MWSD or the City of Groesbeck; instead, the Lake is owned by TPWD with its primary purpose being for recreation. The City of Groesbeck's storage rights extend into the Lake. The City is allowed to siphon water from the lake when needed. Information pertinent about Springfield Lake follows.

- The lake was built in 1939.
- The average depth varies but is approximately 4 feet, resulting in minimum storage from the shallow lake.
- When originally constructed, Springfield Lake stored 3,100 ac-ft over surface area of 750 acres.
- In 1991, the City of Groesbeck and TPWD jointly participated to dredge the lake, making the average depth 4 feet over 500 acres.
- During drought conditions like 1950s, annual evaporation rate from the Lake was as high as 4.2 feet.

Figure 2 shows the aerial map of Springfield Lake.



Figure 2. Springfield Lake Site Map

Since the lake is shallow, it is extremely sensitive to low rainfall periods. In spite of the last dredging project, the sediment build up in the reservoir is apparent. Photograph 1 shows the Springfield Lake at the mouth of the Navasota River with the sediment build-up apparent in the reservoir.



**Photograph 1. Springfield Lake at feed point from Navasota River
(November 11, 2011)**

The City of Groesbeck has water rights on the Navasota River with a priority date of June 1921 (Certificate of Adjudication No. 12-5289). According to the Brazos G Regional Water Plan, the City has one of the most senior water rights in the Brazos River Basin. The City's water right allows for a diversion of 2,500 ac-ft/yr (or 2.23 MGD on equivalent average daily basis). The right includes storage of 500 ac-ft (163 MG). The maximum diversion rate is 3.56 cfs (1,600 gpm). The City's dam on the Navasota River is shown in Photograph 2.



Photograph 2. Water Treatment Plant on Navasota River with City Dam

Based on the City of Groesbeck's water right, the city siphons water from Springfield lake during low flow periods in the Navasota River (below Lake Mexia). Typically the low flow periods result in water ceasing to flow over the Springfield Lake dam. An example of the City' of Groesbeck's siphon is shown in Photograph 3.



Photograph 3. Springfield Lake at Dam with City Siphon

As part of the latest TWDB Brazos G Regional Water Plan, the water availability for Groesbeck was estimated based on the existing supplies for the City. The TWDB yield analysis predicted a firm yield of 200 ac-ft/yr (or 0.17 MGD on equal average day basis). (For comparison, the City's SWTP peak capacity is 2.0 MGD.) The Brazos G WAM (water availability modeling) indicates the seniority of the City's right allows a minimum diversion of 1,142 ac-ft/yr. This value is substantially less than the authorized 2,500 ac-ft-yr (54% less than the permit). The TWDB has concluded that additional storage or a supplement supply of water is needed for the City of Groesbeck.

Given the description of the watershed, the Navasota River above and below Lake Mexia has limiting constraints. Above Lake Mexia, the river is not perennial; therefore, water received in Lake Mexia is primarily from the watershed drainage and not river flow. Below Lake Mexia, the water passes along the River to Springfield Lake and thence the City of Groesbeck in-stream dam. Given the City's senior water right priority dated 1921, it is likely that any downstream call will be junior to Groesbeck's call. It is also likely that any call below the City of Groesbeck's dam for Lake Mexia impoundment will not result in water practically reaching below the City's dam and take point. Therefore, the District should be aware that a release of small amounts of water (such as the volume from a 2" rise in lake level) will result in a waste of water. If released, the small amount of water would be absorbed by the dry river bed. The water would likely not reach Springfield Lake

due to the extreme dry creek bank conditions. If water did reach Springfield Lake, then Groesbeck would control the siphon of water from the Lake into the Navasota River. The City of Groesbeck would also be responsible to release the water past their city dam (which will typically not be assured in a proposed order due to Groesbeck's senior priority rights). Given the physical constraints immediately downstream of Lake Mexia, a small release of water would likely never benefit the senior water rights call holder. However, the District will need to adhere to the water right call and the pass-through plan described herein.

D. Pass-Through Plan - Trigger Conditions

In general, a trigger condition occurs for Lake Mexia pass-through when a more senior water right holder makes a priority call and TCEQ issues an order to that end. The trigger condition for pass-through will be based on a stream gage on the Brazos River (or Navasota River if applicable).

Based on the Dow Chemical Company priority call that occurred on June 26, 2013, the TCEQ's ordering provision defines the trigger stream gage as the USGS Gage 08116650 (Brazos River near Rosharon). The trigger streamflow is 630 cfs. Therefore, if the streamflow is less than 630 cfs, then the District must follow the Pass-Through Plan. Conversely, if the streamflow is greater than 630 cfs, then the District can continue to divert and/or impound water in accordance with the District's water right.

Any water lawfully stored prior to suspension or during temporary higher flow levels are not required to be released.

There is a special circumstance that applies to the trigger conditions which pertains to public health. For example in the TCEQ Order based on Dow's June 26, 2013 call, Ordering Provision - Article 10 allows for suspended or adjusted water right holder with a municipal use to take water if there are "public health, safety and welfare concerns". The critical needs of the District's citizens can be addressed in the Pass-Through Plan. The District is required to document efforts to seek alternative sources and the implementation of conservation efforts through the Drought Contingency Plan.

While the District has groundwater as an alternate source, the surface water will be needed for the wholesale customers to meet public safety and ensure adequate water is available for fire fighting. In general during periods when the surface water plant is using water from Lake Mexia, the District will notify customers of the priority water call and request they implement their Drought Contingency Plans. With the customers on Stage 2 of the Drought Contingency Plans, the District reserves the right to calculate the water needed for public safety. Typical value during summer months is 565 ac-ft/yr_(or approximately 350 gpm).

E. Pass-Through Plan - Protocol

The following action items shall be followed during a triggering event that requires the Bistone MWSD to enact the Lake Mexia Pass-Through Plan:

1. Records

The District operators should continue to record daily data pertinent to Lake Mexia, including but not limited to, the following:

- Lake level (date/time)
- Streamflow level at USGS Gage 08116650 (Brazos River near Rosharon) (date/time)
- Rainfall
- City of Mexia Wastewater Treatment Plant effluent flow to record return flows to the system since Mexia is served by groundwater sources and not the surface water plant.
- Withdrawal for surface water treatment plant (if applicable)
- Total production from all water sources (record monthly until such time that daily data available after AMR system is installed)
- Total wholesale and retail sales (record monthly until such time that daily data available after AMR system is installed).

The District should maintain the data pertinent to the water impoundment during the time the TCEQ Order is in effect. The data that should be maintained includes the streamflow level at the gage, time the gage was read, and level of impounded water. This data must be maintained for a period of two years for review by the TCEQ Executive Director upon 48 hour written request.

2. Pass Through Plan Protocol

The purpose of the Pass-Through Plan for Lake Mexia is to determine when flows should be passed during a potential priority call, determine the amount of flow to be passed, and track the passage of those flows. The proposed Pass-Through Plan:

- Determines on a daily basis conditions when pass-through of inflows would be appropriate;
- Calculates daily inflows into Lake Mexia; and
- Determines the volume of water that should be released from the reservoir based on the previous two weeks of inflow, less the inflow needed to protect human health and safety.

Conditions for Pass-Through

As noted in Section D, conditions for a pass-through occur when all of the following conditions have been met:

- A priority call has been made by a water right senior to Lake Mexia and TCEQ has notified the District that it must be in pass-through operation.
- Flows are below the 33rd percentile at the Brazos River at Rosharon (USGS 0811650).
- If the priority call is made by Dow Chemical Company, flows at the USGS stream gage at Rosharon (USGS 08116650) are below 600 cfs. (This assumes that Dow is the only priority call in effect. Other criteria may be required if other water rights make priority calls.)
- Lake Mexia has sufficient storage to protect human health and safety.
- Additionally, the District will coordinate its operations with the City of Groesbeck pursuant to the City's rights associated with Certificate of Adjudication No. 12-5289 to address rights in the upper watershed of the Navasota River during the duration of a valid call.

Inflow Calculation

Inflows to Lake Mexia are calculated on a daily basis based on a mass balance of the reservoir. Occasionally inflow calculations result in negative inflows. Negative inflows are set to zero.

The mass balance inflow calculation uses the following data:

- Diversion data and reservoir outflow data;
- Pan evaporation data;
- Reservoir elevation data; Pan factors from the Texas Water Development Board and weighting factors for the pan coefficients from the Brazos WAM.

In these calculations, precipitation on the reservoir is considered as part of the inflows.

Pass-Through Calculation

The Pass-Through plan will set outflows from Lake Mexia on a rolling average of flows for the last two weeks, adjusted on a weekly basis. Once pass-through operations have been initiated, inflows into Lake Mexia will be accumulated over a two-week period. Accumulated flows are limited to times when all criteria for a pass-through have been met. Lake Mexia will release

the accumulated pass-through flows during the next week. At the end of each week, the bi-weekly average will be recalculated and the release adjusted as needed. This operation will continue until the priority call has been rescinded.

Diversions to Protect Human Health and Safety

According to TCEQ rules, in the event of a priority call, TCEQ can exempt water rights holders to protect human health and safety. The amount of water needed to protect human health and safety is the water needed after all non-essential uses have been eliminated. Outdoor water use accounts for the majority of non-essential water use in the State of Texas. In November 2012, the Texas Water Development Board published Technical Note 12-01 "The Grass is Always Greener...Outdoor Residential Water Use in Texas". This report analyzed outdoor residential use for cities across Texas. Based on this study, outdoor water use for the City of Mexia and the District's other wholesale customers is estimated at the statewide average of 31%. Essential water use, which would be the water needed to protect human health and safety, should be 70% of the total water use for the District's customers.

Between December 2011 and November 2012, the District produced 1,735.768 acre-feet of water or an average of 4.755 acre-feet per day (or 1.55 MGD). Assuming that 30% of the average annual water use was used for non-essential purposes, the amount needed to protect human health and safety is 3.32 acre-feet per day (1.08 MGD or 753 gpm).

In order to protect the ability of the District to divert water, pass-through operation will cease when the reservoir reaches elevation 444 feet msl. At this point, there is 1,307 acre-feet of water in storage, or approximately 365 days of supply at 3.32 acre-feet per day (1.08 MGD or 1,215 acre-feet per year), plus 0.25 acre-feet per day (0.08 MGD or 92 acre-feet per year) allowance for evaporative losses (Lake Mexia averages approximately 60 inches per year of evaporative losses). In the future, this value may need to be changed to account for population growth.

F. Pass-Through Plan - Termination

Once a TCEQ's Order expires (or after expiration of any approved extensions) or the senior water right holder rescinds or withdraws the call, then the District is no longer subject to the Pass-Through Plan.