# Texas Hydrological Innovations

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## Memo

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|---|---|
| **Date:** | April 02, 2010 |
| **To:** | Hill Country Alliance |
| **CC:** | Raymond Slade, Jr. PH |
| **From:** | Texas Hydrological Innovations |
| **Subject:** | Progress on Texas Springs Project |

**Team Members:**  Ben Bates, Spatial Analyst  
Jason Pickett, Spatial Analyst  
Mark Pillion, Assistant Project Manager  
Yasmin Sierra, Project Manager

## Purpose

This is a progress report on the status of the Texas springs database compilation as of April 02, 2010.

## Summary

Texas Hydrological Innovations (THI), has been focusing on the completion of the data compilation for the extent of Zone 1.  We have been compiling and cleaning data.  At this point, we have compiled data for Zone 1, which includes almost 1000 springs.

The project is currently on budget and on schedule.  We expect to have the database and final report completed on time, by May 05, 2010.

## Introduction

On Wednesday, February 24, we received the approval of our proposal to create a comprehensive database containing pertinent data for the springs in Texas.  This proposal was based on the need to aggregate data from several sources into a single comprehensive database.  Our database will serve as a platform for further research, data collection, documentation, and analysis aiding in freshwater management in Texas.

Springs are an important and valuable natural resource for Texas that have remarkable economic, cultural, ecological, aesthetic, and recreational value.  Currently, Texas spring data can be found in different databases, which have been developed by various entities.  Listed are the primary databases that have been included in this project:

- Heitmuller and Reece (2003)
- Texas Water Development Board (TWDB)

- USGS Compilation of Historical Water-Quality Data in Texas
- USGS National Water Information System (NWIS)
- Ecological Recovery Foundation (ERF)

Our goal is to create a central database that is user friendly, easy to navigate and interpret, while providing a foundation for continuous research for springs in Texas.

**Project Description**

THI proposed on February 24, 2010 to integrate data from predetermined sources to create a comprehensive map-based database of the springs in Texas. THI has created a systematic standard for the categorization of the spring data. The standard was created by locating commonalities in attributes amongst the primary databases and determining which other attributes are pertinent to the study. This standard is unique to this study. We will then convert into a Geographic Information System (GIS). THI will then be able to categorize the springs, aquifers, limited water quality, and flow discharge data that will provide the user with a comprehensive database to perform further analysis. The results of this analysis will provide clear and concise information about the location of the springs and the source aquifers in the prioritized zones.

**Completed Work**

*Task 1. Created a project standard*

Based on the attributes that exist in the primary databases, THI has created a standard for the categorization of the spring data. The standard was created by locating commonalities in attributes amongst the primary databases and determining which other attributes are pertinent to the study.

*Task 2. Aggregated primary databases*

Based on the standard that THI created, a comparative analysis was completed and pertinent data were added when available. All springs that were common to more than one database were compiled into one Excel table. Springs that existed in only one database were added to a separate Excel table.

*Task 3. Eliminated duplicate data*

When duplicate data were found, THI utilized the most accurate data that was available. When the USGS spatial location for a spring was available, it was determined to be the most accurate.

*Task 4. Simplified attribute table.*

Instead of using numerical codes to identify county name, river basin, and accuracy, we added a column for each of these with the common name.

*Task 5. Converted latitude and longitude into decimal degree format*

Where latitude and longitude coordinates were in the format of degrees, minutes, and seconds, THI converted the coordinates into decimal degrees in order to enter coordinates in a GIS.

*Task 6. Contacted Helen Besse with the Ecological Recovery Foundation*
The data documented by the Ecological Recovery Foundation do not have any spatial reference. After talking with Helen Besse, THI has learned that there are privacy concerns with some of the property owners. THI will meet with Helen Besse to determine how to best incorporate their data.

We have completed all of zone 1 consisting of approximately 1,000 springs, which is approximately 50% of the springs.

**Present Work**
*Task 7. THI* is currently gathering and analyzing water discharge data.
At this point THI has discharge data from Heitmueller and Reece (2003), TWDB, and the ERF. THI is identifying our options for displaying desirable discharge data. When applicable, THI will include statistics for 90th percentile, 10th percentile and mean flow.

*Task 8. Evaluating water quality.*
THI is evaluating water quality data from the TWDB.

*Task 9. Working on Zone 2.*
Following the same criteria and procedures of Zone 1, THI is moving forward with the completion of Zone 2.

**Future Work**
*Task 10. Complete Zone 3.*
We will follow the same criteria and procedures of Zone 1 and Zone 2 in order to complete Zone 3.

*Task 11. Construct a Piper Diagram.*
A Piper diagram will be used to show inorganic chemical characteristics for selected springs. These characteristics will be used to determine the source aquifer where the aquifers are unknown. Currently we have water quality data for 820 springs. Of those, 48 springs have unknown aquifers.

*Task 12. Import data into Arc GIS*
We will convert tables, currently in Excel format, to .dbf files

*Task 13. Complete final deliverables.*
- Create metadata
- Final report
- CD containing all project components
- Poster

*Task 14. Create a user friendly map.*
  We will explore the option of creating a map that caters to individuals unfamiliar with GIS or without Arc GIS access.

*Task 15.* Create a website.
  Utilizing Adobe Dream Weaver software, THI will create a website that will provide access to all works created for this project.

**Problems**

| Problems | Affects | Solution |
|---|---|---|
| **Incomplete water quality data and Inability to identify source aquifers** | The lack of major cations and anions in the water quality data make it difficult to run the Piper Diagram in order to identify unknown aquifers.<br><br>Of the 48 springs with water quality data, 40 of them are missing potassium measurements | Create a separate layer with interpolated source aquifers.<br><br>Acquisition of alternative water quality data from other sources such as The Texas Stream Team and The Edwards Aquifer Authority has not improved data quality. There is still a need for more complete water quality data. |
| **Discharge- Some springs have 40 records and some spring have only 1 record** | How much discharge data should be included?<br><br>Should we include a count of the existing records for each spring? | Mean, 10th percentile, 90th percentile and date range for each spring is included.<br><br>A link to the full datasets will be provided if user wants to view all available records for an individual spring. |
| **Discharge data is from one source only (USGS)** | Lack of multiple sources subjects data to inconsistencies. | Note in the metadata that USGS is the only source and that discharge readings are lacking for many springs. |
| **Privacy Issues** | Prevent precise latitude and longitude data for some springs on private land. | Helen Besse is talking to private landowners about the disclosure of some spring locations. |
| **TWDB Elevation Data is estimated from 7.5 minute topographic maps** | Inaccurate data is present when TWDB was referenced for elevation data. | Note the metadata<br>Possible Solution?-Use LIDAR data with two foot contours for accurate elevation. |

**Conclusion**

This progress report outlines the project progression as of April 02, 2010, for the database compilation of the springs in Texas by THI. This report reviews the project work completed, problems THI has encountered thus far, and the present and future work schedules. As of April 02, 2010, THI has completed the creation of the project standard, the aggregation of the primary databases, the elimination of duplicate data, the simplification of the attribute table, the conversion of latitude and longitude, and we contacted Helen Besse with the Ecological Recovery Foundation. The project is currently on schedule and will be complete by the project deadline of May 05, 2010.

Please contact Yasmin Sierra (850) 499-2838, regarding any further questions and comments.

**Participation**

| Team Member | Contribution |
|---|---|
| Ben Bates (Spatial analyst) | Budget, conclusion |
| Jason Picket (Spatial analyst) | Summary, purpose, scope, logo |
| Mark Pillion (Spatial analyst/Assistant Manager) | Problems, editing |
| Yasmin Sierra (Spatial analyst/Project Manager) | Summary, methodology, data collection, maps |