Quality Assurance for Database Project 26 (Barton Springs Salamander)

DR-17-01; October 2016

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Abstract

As part of the Watershed Resource Evaluation Section data locking protocol, data in the Field Sample Database is double checked for accuracy. However, there are 3,177 records (identified by field sample reference numbers) for Project 26 that have not completed this protocol. To reduce the time needed to lock this data, an alternative data locking protocol was pursued. Outliers were identified for each parameter and were cross-referenced with the original datasheet to check for accurate data transcription and accurate calculations. Out of 336 outliers identified, 125 were confirmed as errors. These errors were corrected in the database and the entire record was checked for additional errors. Next, records were randomly checked to determine how many errors remained after the outlier data errors were corrected. Out of the 128 records checked, 23% had errors in the database, and additional records were entered in a method inconsistent with other records. Because each record has multiple data points, the error rate per data point is expected to be closer to 1%. The random record checks determined that the outlier checking method, while effective at identifying obvious errors, did not identify the majority of errors in the database. Recommended next steps include identifying core parameters that will be important for future data analysis, and to check these core parameters for all records.

Introduction

City of Austin monitoring for the Barton Springs Salamander, *Eurycea sosorum*, began in 1993 at Barton Springs Pool (Bendik and Turner 2011) after the salamander was described as a new species (Chippindale et al. 1993). Monitoring began at Eliza Spring and Old Mill Spring in 1995, and began at Upper Barton Spring in 1997. Early monitoring data was recorded in field notebooks, which were entered years later into the City of Austin's Field Sample Database (hereafter referred to as the database). Several different monitoring protocols were used before 2004. The most consistent monitoring protocol occurred from 2004–2014. During this time period, monitoring data was entered onto datasheets created for Project 26 and was frequently entered into the database. A summary of the different monitoring protocols can be found in City Report SR-12-14 (Bendik and Turner 2011).

Database entries are double checked for accuracy as part of the Watershed Resource Evaluation Standard Operation Procedure (City of Austin 2015). When data is entered into the database, it is Q-locked and the database generates a field sample reference number (hereafter referred to as a record) to identify the unique dataset. For each record, there are multiple parameters recorded, such as number of salamanders, water depth, and substrate type. These parameters each have a value. Later, each database entry is compared line by line to the datasheet to check for data entry errors, after which the database entry is P-locked. When this data comparison is repeated a second time, the record is F-locked. Much of the data for Project 26 has not completed this protocol. Due to staff time constraints, it would not be possible to go through this backlog of datasheets comprehensively using this protocol. Therefore, an alternative protocol described below was used to find outlier errors in the data and correct these records. After outlier errors were corrected, records were checked at random to determine if the outlier protocol was effective at removing errors from the database.

Methods

Outlier Evaluation

The program R version 3.2.0 (R Core Team 2014) was used to import all values for each of 113 parameters for Project 26 from the database. The expected range of values for each parameter was determined by looking at the data distribution for the following criteria: 1–values that could not be accurate (for example, a value greater than 100% for vegetation or substrate), 2–values that were disjunct from other values in the distribution, and 3–values that became increasingly uncommon at the ends of the distribution (see Appendix 1 for information for each parameter). When enough data existed, the expected range of values was determined for individual field sites. Values outside of the expected range were considered outlier values. For parameters with small sample sizes, the expected range of values was not determined. Additional outliers were identified by graphing values over time and identifying values that were atypical for the time period. Values with atypical units of measurement were also included as outliers. Outlier values were checked against the original field data for accuracy. Any calculations associated with a value were also checked for accuracy. When an outlier was the result of human error, the other values in the record were checked with the original field data. Errors were corrected in the database.

Random Record Checking

Once errors detected using the outlier protocol above were corrected in the database, records were checked at random for accuracy. The number of records checked corresponded to their locking status, with the expectation that records that have been reviewed thoroughly should contain fewer errors. Records checked included 2% of F-locked records (8/408), 3% of P-locked records (65/2097), and 5% of Q-locked records (55/1080). To ensure random record selection, individual reference numbers for each record were entered into an excel spreadsheet. A random number generator (www.random.org/integers) was used to select the rows in the excel file of the records to check. Datasheets that could not be found were Z-locked and the next record in the excel spreadsheet was checked instead. A record was defined as having errors if any part of the record contained an error.

Results and Discussion

Outlier Evaluation

A total of 336 outliers were identified from 1995–2013 (Table 1, Appendix 1). Of these outliers, 199 values (59%) were accurately entered into the database based on the datasheet. However, six (2%) of these values were suspected incorrect on the datasheet due to the unusual values (for example, having a decimal place in the barometric pressure that makes the value 77.7 instead of the more probable 777 mmHg). For two outlier values (1%), the datasheet could not be found and the record was Z-locked. For ten values (3%), the parameter in the database was not recorded on the datasheet. The values were incorrect for 125 values (38%) based on the field datasheet. Common errors in the database included transcription errors (extra or incorrect digits inserted, incorrect decimal placement, incorrect units, inserting a value that was for a different parameter) and calculation errors (e.g., for averages and sums). In some cases, a large number of parameters for the same record were incorrect due to each line being entered for the incorrect parameter. Some errors in the survey date were also found. Errors in date or site entry may increase the number of datasheets that could not be located.

For the 135 values that were incorrectly entered or not recorded on the datasheet, nine values (7% of the errors found) were from F-locked records, 65 values (48%) were P-locked, and 61 values (45%) were Q-locked. Comparing this to a parameter with the most values recorded (Sum of BSS Salamanders Per Transect, 2605 values from 2002–2013), 330 values (13% of all values) were F-locked, 1707 values (66%) were P-locked, and 568 values (22%) were Q-locked (Table 2). This suggests that the locking protocol used in the past for this project missed many errors, although the protocol may have reduced the number of errors remaining. Some records also had multiple erroreous values. Overall, these 135 values represent errors found in 108 records (3.4% of total records for Project 26).

Table 1. Results of Reviewing 336 Outlier Values for Accuracy.

	number	percent
Confirmed correct from datasheet	193	57%
Confirmed incorrect from datasheet	125	38%
Correctly reflects datasheet but suspected incorrect	3	1%
Datasheet missing	2	1%
Data not recorded on datasheet	10	3%

Table 2. Comparison of Database Errors to the Amount of Data Available for the Outlier Analysis by Locking Status.

Locking Status	Errors Detected	Data Entries Available
F	9 (7%)	330 (12%)
P	65 (48%)	1707 (65%)
Q	61 (45%)	568 (22%)

Random Record Checking

Thirty (23%) of the 128 records checked at random had errors (sometimes multiple errors). The error rate varied with locking status: two records were F-locked (25% of F-locked records checked), 11 records were P-locked (17%), and 17 records were Q-locked (31%, Table 3). Most errors were transcription errors and calculation errors. Additional sources of error were incorrect site and date entry, corrections on the datasheet that had not been corrected in the database, interchanging zero and null symbols, and incorrect units for a parameter. Two records that were Q-locked had missing datasheets and were Z-locked. One datasheet was not checked due to poor handwriting.

The high error rate indicates that the outlier evaluation did not identify most errors in the database. The errors in the F-locked and P-locked records indicate that the database locking protocol specified in the Standard Operation Procedure did not eliminate all errors from the database, although it probably reduced the total number of errors. This error rate probably underestimates the true error rate for records, since some errors probably were not detected by this review. However, the error rate per parameter will be lower than the error rate for records, because there are multiple parameters incorporated into each record.

Methods for data entry were not always consistent and could lead to problems with data interpretation. The most common inconsistencies were incomplete data entry, data entered into the database that was missing data on the datasheet, salamander counts that were not entered for microhabitat locations, and not entering zeroes for salamander count categories and invertebrate abundance. Failing to enter values into the database deletes the parameters in the database associated with the missing values. These issues affected 23 P-locked records (35%) and 12 Q-locked records (22%) that were checked (Table 3). The inconsistent data entry for P-locked records may result from some database entries transcribed from field notebooks rather than datasheets and from the multiple survey protocols from the past. More people contributed to the large number of P-locked records than to F- and Q-locked records, potentially adding inconsistencies across users.

Table 3. Summary Statistics of Records Checked at Random.

Locking Status	F-locked	P-locked	Q-locked
Number of Records Checked (percent of total)	8 (2%)	65 (3%)	55 (5%)
Number of Records with Errors (percent of checked)	2(25%)	11 (17%)	17 (31%)
Records with Inconsistent Data Entry (percent of checked)	–	23 (35%)	12 (22%)

Not enough F-locked records were evaluated to compare with P- and Q-locked records. However, errors were found in two of the eight F-locked records that were evaluated. The F-locked records are likely to be inconsistent with records due to the large number of entries from field notebooks and different survey methodologies used in the early surveys.

Preventing Future Data Issues

Although there will always be some errors when entering data, many of the errors and inconsistencies found in Project 26 are avoidable. The large amount of data collected for each survey contributed to the backlog of data and the number of errors for Project 26. Salamander data was also entered multiple ways for different microhabitats by salamander size, then reentered in different combinations with summary statistics included as new parameters. For many surveys, data was divided into multiple records and this increased the amount of data to enter and review. For example, the Old Mill site was frequently divided into 10 sections each containing its own data in a separate record. This protocol increased the time needed for data entry, possibly leading to fatigue and data entry errors. Reducing the amount of data by eliminating the redundancy between parameters recorded and only using one record per field site visit should reduce these problems. Transcription errors also resulted from differences in the organization of the field notebooks/datasheets as compared to the database. Some transcription errors could be avoided by either using datasheets that mirror the order that data is entered into the database, or by using electronic data entry. Automatic calculations would eliminate the human error associated with calculations.

Inconsistencies in both methodology and data entry could lead to difficulty with data analysis. Different methodologies were used for surveys, but are not reflected in the project number or parameters collected. It may be possible to retroactively change project numbers to better reflect how data has been handled at different times. Data often was not entered by the project manager and was performed by several different people, which could lead to inconsistencies. Assigning responsibility to one person (ideally the project manager) for either entering data, or the final check of data before locking, should improve accountability for database entries.

Some of the errors found in the data will be resolved by electronic data collection. For example, there should not be missing data or missing datasheets as long as data is not deleted or lost from the database. There also will not be inconsistencies between data collected in the field and entered into the database, because the electronic database acts as a field notebook. However, errors in electronic data could be difficult to verify without a written log of information to compare.

Future Project Needs

Due to errors remaining in Project 26, a thorough review of data is recommended. The following steps are needed to ensure quality control for this project:

- Scan old datasheets to create a digital reference for each record. This should make checking parameters easier than finding paper files.
- Due to the backlog of data, identify a set of core parameters that are the most likely to be used in future analyses. These parameters will be checked for accuracy in all existing records. Parameters outside of this core set will be flagged to indicate they have not completed the locking protocol.
- Dedicate one person to review the core parameters and lock records once reviewed. After sufficient data is reviewed, use the random record method described here to evaluate the effectiveness of the data review for the core parameters.
- To help with issues regarding data consistency, different time periods should be given either different project numbers or different parameter types to denote the differences in data collection between time periods.

References

Bendik, N., M. Turner. 2011. Estimating population trends for the Barton Springs Salamander using two different statistical methods. City of Austin Watershed Protection Department. SR-12-14. 26 p.

City of Austin. 2015. Water Resource Evaluation Standard Operating Procedures Manual. 122 p.

Chippindale, P.T., A.H. Price, and D.M. Hillis. 1993. A new species of perennibranchiate salamander (*Eurycea*: Plethodontidae) from Austin, Texas. *Herpetologica*: 248–259.

R Core Team. 2014. R: A language and environment for statistical computing. R Foundation for Statistical Computing.

Appendix 1. Table of Parameters from Project 26 with their Expected Range of Values. Values outside of this expected range were classified as outliers.

Parameter Number	Parameter	Number of Occurrences	Outliers Detected	Expected Range*
1	DISSOLVED OXYGEN	769	13	2.75 mg/L–9.1 mg/L, except for Upper Barton Spring expect minimum of 4.0 mg/L
2	WATER TEMPERATURE	741	13	17.0–25.0°C Eliza and Barton Springs, 17.0–27.5°C Sunken Garden and Upper Barton, no range for Barton Creek (not spring water)
3	PH	8	0	6.4–8.0
16	ALKALINITY (AS CACO3)	135	1	235–356 all springs, not assessed for Barton Creek
138	FLOW	90	7	0–12 cubic feet per second (cfs) Eliza, 0–14 cfs Sunken Garden, 0–93 cfs Barton Spring, 0–2.75 cfs Upper Barton
169	VASCULAR MACROPHYTES - % COVER	49	1	0–5%
170	ALGAE BLUE-GREEN	1	0	not assessed-few occurrences
398	SAND (1/16–2MM)	1946	1	0–100%
399	GRAVEL/PEBBLE(2–64 MM)	2141	6	0–100%, only found outliers for time period
400	COBBLE(64–256)MM	2205	0	0–100%
401	BOULDER(>256MM)	2074	3	0–35% Eliza and Barton Spring, 0–50% Upper Barton and Sunken Garden
402	BEDROCK	1718	8	0% Eliza and Sunken Garden, 0–5% Sunken Garden Stream, 0–50% Upper Barton, 0–85% Barton Spring
403	LEAF LITTER COVER	1972	5	0–65%

Parameter Number	Parameter	Number of Occurrences	Outliers Detected	Expected Range*
506	AMPHIPODA	1808	8	0–120 Eliza, 0–100 Sunken Garden and Barton Spring, 0–5 Upper Barton
518	PETROPHILA (MOTH)	1502	1	0–1 presence/absence, 0–2 relative abundance
528	SUM OF SALAMANDERS PER TRANSECT	290	4	0–150 Eliza, 0–65 Barton Spring, 0–31 Sunken Garden Spring, 0–5 Upper Barton
530	SEDIMENT DEPOSITION	176	0	1–5 ratings, could not assess depth range
532	SILT/SEDIMENT COVER	2225	3	0–100%
780	ANNELIDA (WORM/LEECHES/PLANARIA)	1731	0	0–1 presence/absence, 0–3 relative abundance
799	DIPTERA (MIDGE/FLY)	1609	0	0–1 presence/absence, 0–3 relative abundance
834	TRICHOPTERA (CADDISFLY)	1642	0	0–1 presence/absence, 0–3 relative abundance
859	# SALAMANDERS 20 FT FROM NORTH	8	0	not assessed-few occurrences
860	# SALAMANDERS 30 FT FROM NORTH	25	0	not assessed-few occurrences
861	# SALAMANDERS 40 FT FROM NORTH	64	0	0–10
862	# SALAMANDERS 50 FT FROM NORTH	85	0	0–15
863	# SALAMANDERS 60 FT FROM NORTH	27	0	not assessed-few occurrences
864	# SALAMANDERS 70 FT FROM NORTH	13	0	not assessed-few occurrences
865	# SALAMANDERS 80 FT FROM NORTH	13	0	not assessed-few occurrences

Parameter Number	Parameter	Number of Occurrences	Outliers Detected	Expected Range*
921	BAROMETRIC PRESSURE	708	3	738–764 mmHg
923	DISSOLVED OXYGEN % OF SATURATION	696	2	7–137%
1481	WATER DEPTH	1803	31	0–14" Upper Barton, 0–20" Sunken Garden Stream, 6.5–58" Eliza, 1–60" Sunken Garden, 30–220" Barton Spring
1535	SALAMANDER <1 INCH	11	0	0–25
1536	SALAMANDER 1–2 INCHES	89	0	0–31
1537	SALAMANDER >2 INCHES	66	0	0–10
1539	TOTAL TIME SPENT	2268	6	0–280 Upper Barton, 0–700 Sunken Garden Stream, 0–330 Sunken Garden, 0–530 Eliza section, did not assess combined, 0–850 Side Spring of Barton Springs, 0–450 other sections Barton Springs
1586	CARBON DIOXIDE (AS CO2)	565	0	4–110 mg/L
1628	AVERAGE VELOCITY (LOW)	10	0	not assessed-few occurrences
1866	PSEPHENIDAE (WATER PENNIES)	1825	4	0–1 presence/absence, 0–3 relative abundance
2021	PERCENT ALGAE COVER	200	0	0–50% all springs, except 0–80% Barton Springs
2118	VELOCITY	437	1	-0.56–2.55 feet per second
2119	FISH	1858	11	0–1 presence/absence, 0–3 relative abundance
2124	AREA SAMPLED	2049	11	Eliza 175–225 sq ft, 0–6750 sq ft Barton Spring, 0–500 sq ft Sunken Garden, 0–800 sq ft Sunken Garden Stream, 5–464 Upper Barton
3119	SURFACE COVER - FILAMENTOUS ALGAE	1850	0	0–100%
3120	SURFACE COVER - NON FILAMENTOUS ALGAE	1887	0	0–100%
3121	AQUATIC MACROPHYTE - SUBMERGENT	1678	4	0–1% Upper Barton, 0–5% Sunken Garden Stream,0–25% Sunken Garden, 0–50% Eliza, 0–60% Barton Spring

Parameter Number	Parameter	Number of Occurrences	Outliers Detected	Expected Range*
3122	AQUATIC MACROPHYTE - EMERGENT	1727	0	0-15% Barton Spring,0-30% Sunken Garden Stream, 0-60% Sunken Garden, 0–75% Eliza
3125	BARTON SPRINGS SLMNDR (TOTAL <1IN.)	2517	0	all values were date specific
3126	BARTON SPGS SALMNDR (ADULT) > 1 INCH	2515	1	all values were date specific
3127	AUSTIN BLIND SLMNDR (<1IN.) (JUVENILE)	2359	2	0–20 Old Mill, 0–2 other springs
3128	AUSTIN BLIND SALMNDR (ADULT) > 1 INCH	2353	4	0–20 Old Mill, 0–3 other springs
3129	CRAYFISH (JUVENILE)	2068	3	0–1 presence/absence, 0–3 relative abundance
3130	CRAYFISH (ADULT)	2096	3	0–1 presence/absence, 0–3 relative abundance
3131	OTHER INVERTEBRATES	1350	0	0–1 presence/absence, 0–3 relative abundance
3132	BARTON SPRINGS SLMNDR (<1IN.) IN VEGETATION/MOSS	533	0	0–15
3133	BARTON SPRINGS SALAMANDER (ADULT) IN VEGETATED SUBSTRATE	44	0	0–12 Old Mill, 0–2 other springs
3134	AUSTIN BLIND SLMNDR (<1IN.) IN VEGETATION/MOSS	508	0	0–12 Old Mill, 0–1 other springs
3135	AUSTIN BLIND SALAMANDER (ADULT) IN VEGETATED SUBSTRATE	21	0	not assessed-few occurrences
3219	PERCENT BRYOPHYTE COVER	2170	0	0–100%
3220	AUSTIN BLIND SLMNDR (<1IN.) IN COBBLE/BOULDER	640	1	0–5
3221	AUSTIN BLIND SLMNDR (<1IN.) IN LEAF LITTER	410	0	0–1
3222	AUSTIN BLIND SLMNDR (<1IN.) ON EXPOSED SUBSTRATE	414	0	0–2

Parameter Number	Parameter	Number of Occurrences	Outliers Detected	Expected Range*
3223	AUSTIN BLIND SALAMANDER (ADULT) IN ROCK SUBSTRATE	7	0	not assessed-few occurrences
3224	AUSTIN BLIND SALAMANDER (ADULT) IN LEAF LITTER SUBSTRATE	5	0	not assessed-few occurrences
3225	AUSTIN BLIND SALAMANDER (ADULT) ON EXPOSED SUBSTRATE	5	0	not assessed-few occurrences
3226	BARTON SPRINGS SLMNDR (<1IN.) IN COBBLE/BOULDER	1219	3	all values were date specific
3227	BARTON SPRINGS SLMNDR (<1IN.) IN LEAF LITTER	418	0	0–3
3228	BARTON SPRINGS SLMNDR (<1IN.) ON EXPOSED SUBSTRATE	423	0	0–3
3229	BARTON SPRINGS SALAMANDER (ADULT) IN ROCK SUBSTRATE	116	0	all values were date specific
3230	BARTON SPRINGS SALAMANDER (ADULT) IN LEAF LITTER SUBSTRATE	5	0	not assessed-few occurrences
3231	BARTON SPRINGS SALAMANDER (ADULT) ON EXPOSED SUBSTRATE	16	0	not assessed-few occurrences
3259	AMPHIBIAN/REPTILE (ABUNDANCE)	1576	3	0–1 presence/absence, 0–3 relative abundance
3539	CONCRETE	1115	4	0% Upper Barton, 0–5% Old Mill Stream, 0–30% Barton Spring, 0–50% Old Mill, 0–100% Eliza
3719	MARL	126	3	0–10%
3720	AVERAGE SEDIMENT DEPTH	1898	39	0–1.3" Upper Barton, 0–5" Eliza, 0–8.25" Barton Spring, 0–10" Old Mill Stream, 0–12" Old Mill

Parameter Number	Parameter	Number of Occurrences	Outliers Detected	Expected Range*
3721	AUSTIN BLIND SLMNDR (>=2IN.) IN VEGETATION/MOSS	411	0	0–1
3722	AUSTIN BLIND SLMNDR (1–2IN.) IN VEGETATION/MOSS	422	0	0–2
3723	AUSTIN BLIND SLMNDR (1–2IN.) IN COBBLE/BOULDER	633	0	0–3
3724	AUSTIN BLIND SLMNDR (>=2IN.) IN COBBLE/BOULDER	613	0	0–2
3725	AUSTIN BLIND SLMNDR (>=2IN.) IN LEAF LITTER	404	0	0
3726	AUSTIN BLIND SLMNDR (1–2IN.) IN LEAF LITTER	404	0	0
3727	AUSTIN BLIND SLMNDR (>=2IN.) ON EXPOSED SUBSTRATE	405	0	0
3728	AUSTIN BLIND SLMNDR (1–2IN.) ON EXPOSED SUBSTRATE	405	0	0–1
3729	BARTON SPRINGS SLMNDR (>=2IN.) IN VEGETATION/MOSS	495	2	all values were date specific
3730	BARTON SPRINGS SLMNDR (1–2IN.) IN VEGETATION/MOSS	516	3	all values were date specific
3731	BARTON SPRINGS SLMNDR (>=2IN.) IN COBBLE/BOULDER	1145	0	all values were date specific
3732	BARTON SPRINGS SLMNDR (1–2IN.) IN COBBLE/BOULDER	1185	2	all values were date specific
3733	BARTON SPRINGS SLMNDR (>=2IN.) IN LEAF LITTER	414	0	all values were date specific
3734	BARTON SPRINGS SLMNDR (1–2IN.) IN LEAF LITTER	415	0	all values were date specific

Parameter Number	Parameter	Number of Occurrences	Outliers Detected	Expected Range*
3735	BARTON SPRINGS SLMNDR (1–2IN.) ON EXPOSED SUBSTRATE	407	0	0–1
3736	BARTON SPRINGS SLMNDR (>=2IN.) ON EXPOSED SUBSTRATE	406	0	0–1
3737	SUM OF BSS SALAMANDERS PER TRANSECT	2605	1	all values were date specific
3738	SUM OF ABS SALAMANDERS PER TRANSECT	2468	4	all values were date specific
3740	AUSTIN BLIND SLMNDR (1–2IN.)	2327	0	0–3
3741	AUSTIN BLIND SLMNDR (>=2IN.)	2321	0	0–3
3782	EPHEMEROPTERA (MAYFLY)	1685	0	0–1 presence/absence, 0–3 relative abundance
3783	ODONATA (DAMSELFLY/DRAGONFLY)	1602	0	0–1 presence/absence, 0–3 relative abundance
3784	MOLLUSCA	1693	0	0–1 presence/absence, 0–3 relative abundance
3802	BARTON SPRINGS SLMNDR (TOTAL 1–2IN.)	2134	2	all values were date specific
3803	BARTON SPRINGS SLMNDR (TOTAL >=2IN.)	2135	0	all values were date specific
3922	DISSOLVED GAS PRESSURE	694	3	662–1002 mmHg
3923	PARTIAL PRESSURE OF OXYGEN	687	4	29–213 mmHg
3924	PRESSURE OF OTHER GASSES	693	9	579–862 mmHg
3925	CARBON DIOXIDE (CO2) PRESSURE	530	16	3–45 mmHg
3927	GAS SATURATION	694	6	89–135%
3928	DELTA-PRESSURE (TOTAL-BAROMETRIC)	691	10	-50–260 mmHg

Parameter Number	Parameter	Number of Occurrences	Outliers Detected	Expected Range*
4422	CARBON DIOXIDE SATURATION	526	30	6670–18400%
4423	NITROGEN + ARGON PRESSURE	294	3	500–760 mmHg
4424	NITROGEN + ARGON CONCENTRATION	294	11	14–21 mg/L
4425	NITROGEN + ARGON SATURATION	293	2	95–135%
4426	VAPOR PRESSURE	696	5	14–34 mmHg
5256	SALAMANDER >1 INCH	2391	1	all values were date specific
5257	SALAMANDER (UNKNOWN LENGTH)	2479	7	0–12
5744	AUSTIN BLIND SALAMANDER (UNKNOWN LENGTH)	2335	0	0
6343	LEDGES	315	5	0–80% but varied greatly based on section surveyed

*Some values may be considered outliers within the ranges stated when they were unusual for the time period.