Technical Memorandum

Re: **MNR Climate Data Gap Filling Project – Data Review**

Date: August, 2008

In 2006, the Ontario Ministry of Natural Resources (MNR) entered into a contract with Harold Schroeter and Associates to fill in temporal data gaps associated with climate stations maintained by Environment Canada's Atmospheric Environment Service (AES). These gaps include daily and hourly precipitation and daily temperature records. A detailed description of the procedure used to fill in these gaps is provided by Schroeter and Associates (2007), provided in Appendix A to this memorandum.

In 2007 AquaResource Inc. was contracted to undertake a review of the work completed by Schroeter and Associates. This review involved compiling all climate data processed and generated by Schroeter and Associates into relational databases. The purpose of this memorandum is to discuss the results of the data review component of the project. A companion memo has also been produced which contains documentation of the databases compiled as part of this project.

1 Summary of Previous Work.

Climate records frequently have missing data within the complete climate record. These gaps may be short term in nature (over a number of days due to equipment malfunction), or long term (over a period of years, due to station closures). Daily climate records typically have fewer gaps than hourly records, and are usually associated with stations closures. Hourly datasets typically contain more significant gaps, and are usually associated with equipment malfunction or seasonal closings. Schroeter, et. al. (2000) found that many hourly datasets are missing over 40% of the dataset. Missing data can be estimated, or 'filled in', using nearby climate stations to create a continuous dataset before completing hydrologic modelling tasks.

The MNR contracted Schroeter to infill daily and hourly datasets for climate stations within the Province of Ontario within the time period of 1950 to 2005. Sources of data used for this project included primarily AES climate stations in addition to some stations maintained by Conservation Authorities.. As many as 1400 stations were considered in this project; however many stations had extremely short periods of record, or had periods of record outside the 1950-2005 time frame and were not considered.

The methodology utilized by Schroeter to infill the climate datasets follows the methodology outlined in Schroeter, et.al. (2000), and is also provided in Schroeter (2007). Missing daily records are estimated by assigning a number of nearby surrogate stations to each station having missing data. Surrogate stations are assigned based on the period of record and dataset completeness. For each surrogate station, the long term climatic relationship between the surrogate station and the infill station is determined (ie. surrogate station may receive 10% less rainfall, or 0.5^{o} warmer than the station requiring infill), which results in the ratio/difference required to adjust data from the surrogate station to create synthetic data for

the infill station. When a gap is found within the infill station data record, the data from the 1st surrogate station is used to infill, and is adjusted based on the ratio/difference determined previously (eg. Rainfall is multiplied by 1.10, temperature is increased by 0.5°C, as using above example). If the 1st surrogate station also has a gap during the same time interval as the infill station, data from the next surrogate station is used.

A first step in the procedure for infilling hourly data, is to determine the top 10, 24 hour rainfall patterns for the climate station, for each month. These top 10 patterns are used to distribute daily rainfall totals throughout the 24 hours. Gaps in the hourly record are infilled by using the hourly patterns to distribute the volume of rainfall received, as specified in the daily totals from the infilled daily dataset. Additionally, hourly records are factored to match the daily totals. This adjustment is required because of the tendency for tipping bucket rain gauges to underestimate the total volume of rainfall.

Complications arise when comparing hourly totals with daily totals where daily totals may be reported on a synoptic day basis (8 am to 8 am) and totals calculated from hourly data may be from midnight to midnight. For this reason, the daily total based from the hourly values may not equal the values reported in the daily dataset. The adjustments made to the hourly dataset recognize this difference in reporting period, and have accounted for it.

2 Analysis

This section summarizes the procedure used to review the final climate records prepared by Schroeter and Associates (2007). This procedure included the following steps:

- Development of a relational database to store all climate records;
- All estimated, or infilled, climate records were flagged with a data qualifier;
- Preparation of maps showing the estimated total annual precipitation at all climate stations across Ontario;
- Preparation of tables comparing total annual precipitation at each gauge to the closest nearby gauges; and,
- Preparation of tables comparing total annual precipitation calculated from daily and hourly records.

Although the gaps in the associated climate datasets have been filled, errors in the climate record will still exist. Errors due to improper station siting, or equipment malfunction are likely still present within the datasets. Because of this, the user should exercise caution prior to utilizing any climate data. While the purpose of this analysis is to identify potential errors in the database, it does not identify specific errors and correct them.

2.1 Database Creation

A relational database was created to manage and manipulate the infilled climate records and to provide an effective method of distribution to users across the province. A complete description of this database is provided in a companion memorandum.

2.2 Data Qualifiers

Schroeter and Associates did not assign a qualifier to the climate data sets to identify which records were estimated, and how they were estimated, and this was identified as a significant gap in this deliverable.

Ideally, the qualifiers would be assigned to provide the user with some information about the estimated data (i.e. surrogate gauge, estimation technique).

To partially address this, AquaResource reformatted and imported all the raw climate data into the climate database. The raw data was then compared to the infilled data, and where gaps in the raw data were identified, the estimated records for those periods were assigned a qualifier. This has resulted in an additional field which identifies each record as synthetic or observed data. If a particular day had any one of the 5 climate parameters missing, the entire record was flagged.

The hourly dataset was not analyzed in the same fashion. This is due to the fact that the entire hourly record has had some adjustment, in that the hourly records are adjusted to match the daily totals.

2.3 Annual Total Precipitation Maps

A series of maps have been produced that show the total annual precipitation across the province for each year from 1950 to 2005. Map 1 illustrates the average annual precipitation over the 1950-2005 period. Maps for each year within the 1950-2005 period are included in Appendix C.

The maps are interpolated from the annual precipitation totals at the 339 climate stations where observed and filled-in data were available. The surfaces were created with Surfer (Golden Software, Version 8), using the Kriging interpolation method. Variograms were generated using a Quadratic model and are included in Appendix D. The ground resolution of the resulting grids is 2 km, using the Lambert Conformal Conic projection.

Visual inspection of the maps did not identify any stations as immediate concerns. Where significant variability was detected within the climate surfaces, it was frequently caused by a number of stations, not a single station, which increases the confidence for the mapped precipitation contours. Larger variability is observed across Northern Ontario, however this is likely due to a sparse climate network not being able to accurately display the spatial trends in precipitation.

2.4 Climate Data Comparison

A series of queries were designed and used to prepare tables to analyze the data to identify potential discrepancies. These queries include a comparison of the hourly rainfall totals to the daily rainfall totals; comparison of annual total precipitation values between stations and their nearest neighbour and the monthly max/min temperature values between stations. These comparisons were only carried out for stations with the complete 1950-2005 record.

2.4.1 Nearest Station Annual Precipitation Comparison

As an additional check for stations that may contain potential errors, total annual precipitation for each station was compared to it's nearest neighbour station. Where there is a large difference between the annual precipitation for a station and its nearest neighbour, there is a possibility for error in one of the stations. Note that this error may be due to either the source of information or the estimation method.

Included in Table B1 (located in Appendix B), is the yearly comparison of each station to its nearest neighbour, with respect to total annual precipitation. Years where the station's total annual precipitation was more than 500 mm, or 400 mm, different than its nearest neighbour's total annual precipitation are highlighted in yellow and green, respectively. Table 1 is a summary of Table B1, where any stations which have a difference in annual precipitation greater than 500 mm from their nearest neighbour are listed. Paragraphs following Table 1 discuss each occurrence listed within the table.

Table 1: Stations with Annual Precip Difference from Nearest Neighbour > 500mm

Station ID	Station	Nearest ID	Nearest Station	Distance (km)	Year of Occurrence
6120819	BLYTH	6121025	BRUCEFIELD	23.3	1995
6121940	CYPRUS LAKECS	6097426	SANDFIELD	61.1	1982
6124127	KINCARDINE	6126210	PAISLEY	22.8	2005
6110617	BEAUSOLEIL	6115127	MIDLAND WATER POLLUTION	10.0	1998, 1999, 2005
6110731	BIG CHUTE	6116843	RAGGED RAPIDS	15.6	1998, 1999, 2005
6101920	CROW LAKE	6103470	HINCHINBROOKE	17.9	1959
6052259	ELLIOT LAKE A	6065006	MASSEY	45.0	1950, 1952, 1953
6055378	MONTREAL RIVER (AUT)	6059408	WAWA (AUT)	81.2	1984, 1985, 1989
6026852	RAINY RIVER	6028128	STRATTON ROMYN	26.9	1985

The Blyth climate station reported a significant amount of rainfall in the year 1995, which caused its annual precipitation to be over 500mm higher than its nearest neighbour. This high amount of precipitation was also present in the raw data for Blyth, which indicates that while this may be a problem with the original data, it is not a result of the estimation technique.

Cyprus Lake CS reported an annual total precipitation that was more than 500 mm less than its nearest neighbour, Sandfield in 1982. Although, considering the distance from its nearest neighbour, and Cyprus Lake's location on the Bruce Peninsula, this large difference in annual precipitation may be physically reasonable.

Data for Kincardine may be missing a portion of its total precipitation for 2005. Adjacent years for both the Kincardine station, and its nearest neighbour Paisley, indicate that total annual precipitation to be in the 1100-1200 mm range. Kincardine for 2005 reports only 625 mm, which is significantly less than other years as well as Paisley's 2005 total of 1200 mm. The 2005 raw data for Kincardine also reports 625 mm of precipitation, therefore the large difference is not caused by the estimation technique. It is probable that a significant portion of the precipitation was not reported for this year, or that the lowered precipitation totals are correct. It should be recognized that 2005 data was obtained via the Canadian Climate Center website, versus the published AES CD-ROM. This may suggest the 2005 data has undergone less rigorous quality assurance/control procedures than the data published within the CD-ROM.

Climate stations Beausoleil and Big Chute seem to under-report total precipitation for the years 1998 and 1999. This is evident in their annual totals precipitation of 250-500 mm for these identified years. This under-reporting issue is likely a station operation issue, rather than a data climate in-fill issue. For 2005, these stations had no data, as did their surrogate infill stations, therefore report 0 as the annual total. This seems to be a shortcoming of the applied methodology, where there is missing data in the incomplete station record, as well as the surrogate stations, the data values are set to 0. Ideally such records would be identified as "missing".

The stations Elliot Lake A and Montreal River (AUT) seem to be significantly higher than their nearest neighbour, Massey and Wawa (AUT), respectively. These large differences are likely caused by the low density of climate stations in the North, and the fact that Schroeter was forced to use surrogate stations that are located great distances from the infilled station. Therefore, the large difference in total annual precipitation for the stations does not necessarily reflect a problem with neither the infilling technique nor the original data.

For most years Rainy River total precipitation is reported to be significantly lower than its nearest neighbour, Stratton Romyn. In 1985 this difference was more than 500 mm. From the low totals from Rainy River, it would seem that the gauge may underestimate actual precipitation. This is typically caused by the gauge being shielded, or the snow measurements being done improperly. Rainfall totals should be confirmed before using this data for modelling purposes.

From this comparison, it appears that no significant outliers have been introduced into the dataset by the climate estimation methodology. Note that these outliers correspond to annual precipitation differences greater than 500 mm/year and additional outliers may be identified if a lower threshold were used. In general, the comparison suggests that the data estimation technique appropriately reflects spatial trends and the relationships between nearby climate stations.

Given these results and the fact that the comparison techniques identify problems with original records, practitioners are encouraged to review the temporal and spatial trends in all recorded and estimated data before proceeding with hydrologic modelling and analysis.

2.4.2 Hourly Rainfall Check

To determine if the hourly rainfall dataset has been adjusted to match the daily rainfall dataset, a query was constructed that compared the sum of the 24 hourly values for each day to the corresponding daily rainfall.

Due to the difference in reporting time between the datasets (daily rainfall totals being reported on a synoptic day basis, hourly data summed on a midnight-to-midnight basis), the query returned a number of days where the rainfall totals did not equal each other. However, it was observed that over the entire length of the rainfall event, the total depths did equal each other. Table 2 includes an example of the daily comparison between the hourly and daily datasets.

Table 2: Comparison of Hourly and Daily Rainfall Values

Date	Hourly Rainfall Sum (mm)	Daily Rainfall Record (mm)	Daily Difference (mm)	Sum of Difference for Event (mm)
20-Aug-05	0.1	3.3	-3.2	
21-Aug-05	3.2	0	3.2	**0.0**
22-Aug-05	0	0	0.0	
23-Aug-05	0	0	0.0	
24-Aug-05	0	0	0.0	
25-Aug-05	0	0	0.0	
26-Aug-05	0	0	0.0	
27-Aug-05	27.9	27.9	0.0	**0.0**
28-Aug-05	0	0	0.0	
29-Aug-05	0	0	0.0	
30-Aug-05	0.2	7.7	-7.5	
31-Aug-05	17.1	11.3	5.8	
01-Sep-05	1.7	0	1.7	**0.0**

Table 2 shows the precipitation data over a 12 day period in late August 2005 for Amherstberg. There are 3 precipitation events, denoted by the shaded days with bold borders. One event was a single day event, with 2 events being multi-day events. For both the multi-day events, the specific daily totals from the hourly dataset and the daily total reported for that day do not match. This difference is due to differing reporting times for the hourly and daily datasets. However, when the total rainfall observed over the entire event is compared, the depths contained within the hourly and daily datasets are found to be equal.

To minimize the impact of differing reporting times when comparing the hourly and daily rainfall datasets, an additional query was constructed that summed the entire rainfall record for both the hourly and daily datasets. This query is included in Table B2 (located in Appendix B). Results of the query indicated that for all stations, both the daily and hourly datasets were equal in terms of total rainfall for the 1950-2005 period. The largest difference between the hourly and daily totals was approximately 2%. From this, it can be concluded that the hourly dataset has been accurately reconciled with the daily dataset.

2.4.3 Nearest Station Monthly Maximum/Minimum Temperature Comparison

Similarly to the nearest station annual precipitation comparison, the monthly maximum and minimum temperatures for each station were compared to the temperatures from its nearest neighbour. However, due to the significant natural variability in maximum and minimum air temperatures, it was not possible to accurately identify possible outliers. As with the precipitation data, it is recommended that the end user exercise caution when using the temperature data, and manually check individual stations against adjacent stations for possible data anomalies.

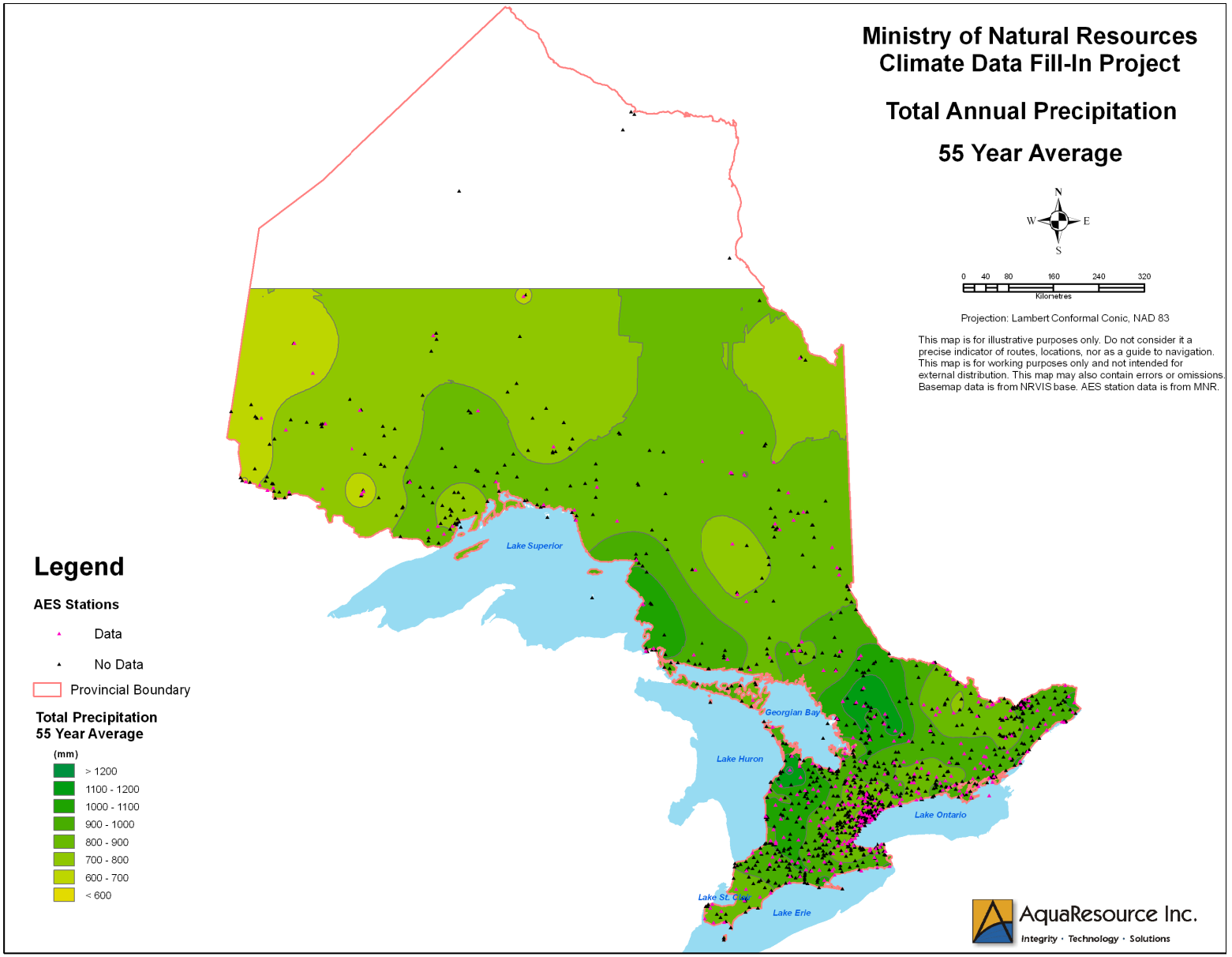
3 Conclusions

To aid in manipulation and analysis of the continuous climate datasets, a database solution has been developed to house the continuous temperature and precipitation data for approximately 340 climate stations for the time period of 1950-2005. The data includes the daily reported maximum/minimum temperatures, daily rainfall/snowfall, as well as hourly rainfall depths. Additionally, a data qualifier has now been attached to data values to indicate where data has been estimated from adjacent stations.

Maps of annual total precipitation have been generated to visually inspect the data for possible outliers. The dataset has also been quantitatively inspected by creating a series of queries that compare annual precipitation of a station, to its nearest neighbour's annual precipitation. No significant outliers were found that could be caused by the estimation technique. The outliers that were found seem to originate from the original data.

A comparison between the total amount of rainfall contained within the hourly records and the total amount contained within the daily records was made. Ideally both datasets should contain the same amount of rainfall. The largest difference between the hourly and daily station totals was 2%, which indicates that volumes contained within the datasets have been accurately reconciled.

In general, the comparisons made suggest that the data estimation technique appropriately reflects spatial trends and the relationships between nearby climate stations. While this review was focused on large scale outliers caused by the estimation technique, it should be noted that with all climate data, there will exist erroneous or biased values within the dataset. These values may be affected by equipment malfunction/vandalism, or improper station siting/operation. The users of this climate data should exercise caution when utilizing this data, and be aware that discrepancies still exist.



Map 1. Total Annual Precipitation - 55 Year Average

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AquaResource Project 2007006

Ontario

Appendix A

Schroeter References

Appendix B

Tables

Appendix C

Annual Precipitation Maps

Appendix D

Variograms for Precipitation Surfaces

Technical Memorandum

Re: **MNR Climate Data Gap Filling Project – Database Documentation**

Date: August, 2008

In 2006, the Ontario Ministry of Natural Resources (MNR) entered into a contract with Harold Schroeter and Associates (Schroeter) to fill in temporal data gaps associated with climate stations maintained by Environment Canada's Atmospheric Environment Service (AES). These gaps include daily and hourly precipitation and temperature records. A detailed description of the procedure used to fill in these gaps is provided by Schroeter and Associates (2007).

In 2007 AquaResource Inc. was contracted to undertake a review of the work completed by Schroeter and Associates. This review involved compiling all climate data processed and generated by Schroeter and Associates into relational databases. The purpose of this memorandum is to document the database designed to support the data review project. A companion memo has also been produced which discusses the results of the data review component of this project.

The climate data is stored in a set of 8 Microsoft Access databases, all stored on one DVD. The database "Ontario Daily In-filled Climate Data.mdb" contains the daily climate parameters for the 339 major AES stations having filled in parameters during the period of 1950 to 2005. The remaining 7 databases contain a table containing hourly rainfall records for stations during the same period. Table 1 at the end of this document provides a list of AES stations and the database in which the hourly rainfall data is located for each.

Daily Climate Data Database Structure

Specifications for the main database of the MNR Climate Data In-fill project are as follows. Table prefixes denote the type of data and include; dt = data table; l = lookup table; tbl = derived or summary table.

Database Name - Ontario Daily In-Filled Climate Data.mdb

Database Format – Microsoft Access 2000

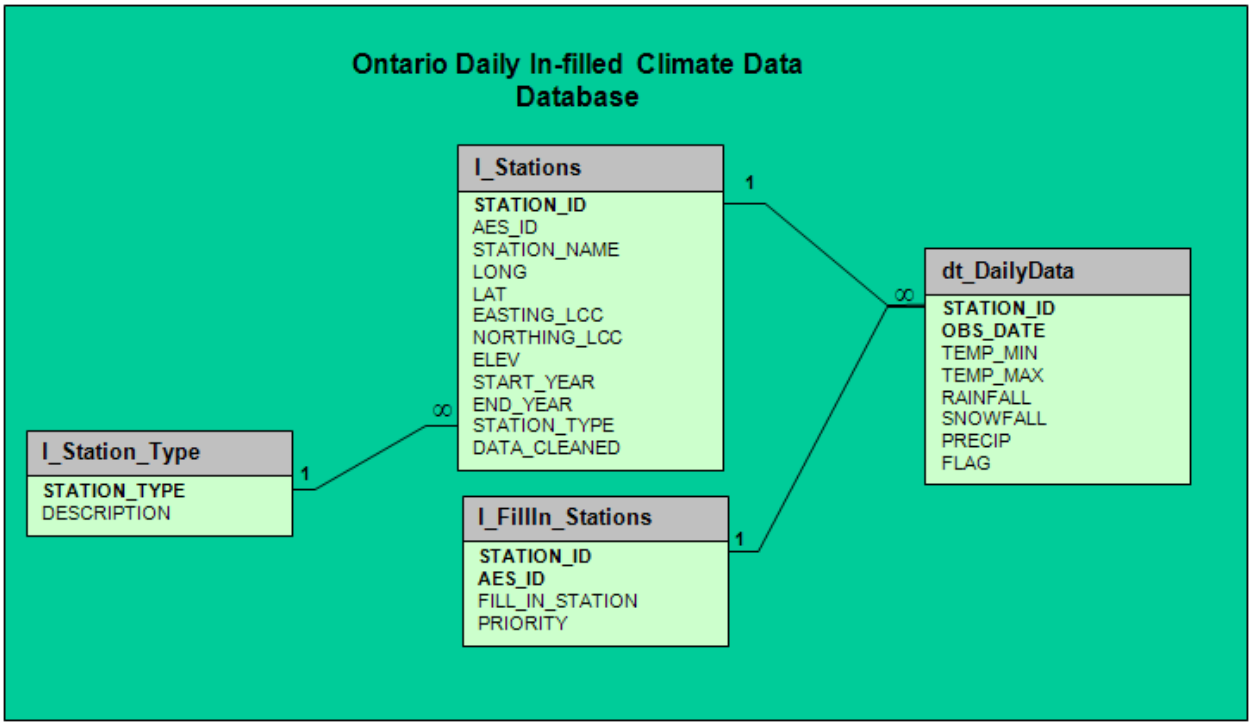


Figure 1. Ontario Daily In-Filled Climate Data database structure. Primary data tables are shown with relationships.

Primary Tables

dt_DailyData – Daily climate data for stations from 1950 to 2005. Compiled from COLDAY3 format CSV files.

l_FillIn_Stations –Lookup table, listing main AES stations and the stations used to fill in data for missing time periods.

l_Station_Type – Lookup table, type of station, listed by measuring frequency.

l_Stations – lookup table with AES station data. This table was constructed using the inventory of available data from the document “AES Climate Station for Daily Data Summary” created by Schroeter & Associates.

Summary Tables

tbl_NearestStations - Stations nearest to each of the 339 major AES stations. Derived using GIS script in ArcGIS. Central to queries comparing consistency of values for precipitation and temperature between nearest stations.

tbl_AnnualPrecip_NearestStations – Summary table with comparison of total annual precipitation values between a station and its nearest neighbour.

tbl_TempMax_NearestStations - Summary table with comparison of monthly maximum temperature values between a station and its nearest neighbour.

tbl_TempMin_NearestStations - Summary table with comparison of monthly minimum temperature values between a station and its nearest neighbour.

tbl_DataFillIndicator – Summary table showing annual precipitation totals and an indicator flag identifying which years include any filled in data values (including precipitation and temperature).

Fields

The database fields corresponding to each of the tables discussed above are described below.

dt_DailyData

- STATION_ID – Long Integer: unique station identifier internal to database.Relates to STATION_ID in l_Stations table.
- OBS_DATE – DateTime: Observation date of sampling
- TEMP_MIN – Single: Daily Minimum Temperature (Degrees C)
- TEMP_MAX – Single: Daily Maximum Temperature (Degrees C)
- RAINFALL – Single: Daily total depth of Rainfall (mm)
- SNOWFALL – Single: Daily Snow Accumulation (mm)
- PRECIP – Single: Total Precipitation (Rainfall and Snowfall) (mm)
- FLAG – Boolean: Flag indicating filled in data (YES indicates at least one field of filled in data values; NO indicates raw data or unknown)

l_Stations

- STATION_ID – Long Integer: unique station identifier internal to database.
- AES_ID – Text: Atmospheric Environmental Service climate station identifer. Derived from raw data files.
- STATION_NAME – Text: Atmospheric Environmental Service climate station name. Derived from raw data files.
- LONG – Real: Longitude in decimal degrees.
- LAT – Real: Latitude in decimal degrees.

- EASTING_LCC – Real: X_coordinate Easting, Lambert Conformal Conic NAD 83.
- NORTHING_83 – Real: Y_coordinate Northing, Lambert Conformal Conic NAD 83.
- ELEV – Real: Station elevation in metres above sea level (masl)
- START_YEAR – Integer: Year of initial data gathering.
- END_YEAR – Integer: Final year of data gathering.
- STATION_TYPE – Integer: Code indicating Station Type. Linked to l_Station_Type table in Access database. Valid values include Daily, Hourly, Daily/Hourly.
- DATA_CLEANED – Boolean: Indicates whether or not the stations data has been cleaned up / filled in. Yes indicates station has filled in data, No indicates station has not yet been filled in.

l_Station_Type

- STATION_TYPE – Integer: Code indicating Station Type. Linked to Station Table.
- DESCRIPTION – Text: Description of station type. Valid values include Daily, Hourly, Daily/Hourly.

l_FillIn_Stations

- STATION_ID – Long Integer: unique station identifier internal to database.Relates to STATION_ID in l_Stations table.
- AES_ID – Text: Atmospheric Environmental Service climate station identifer.
- FILL_IN_STATIONS: Text: AES Station identifier of stations whose data was used to fill in the associated station.
- PRIORITY – Integer: The order in which the stations were used to fill in the associated stations.

tbl_Nearest_Stations

- OBJECT_ID – Long Integer: Object ID used by GIS routine to determine nearest station.
- STATION_ID – Long Integer: Internal database unique station identifer. Relates to STATION_ID in l_Stations.
- STATION_NAME – Text: AES station name for stations with data fill in
- LONG – Double: Longitude in decimal degrees
- LAT - Double: Latitude in decimal degrees
- ELEV – Double: Station elevation in metres above sea level
- START_YEAR – Long Integer: Monitoring start year

- END_YEAR – Long Integer: Monitoring end year
- STATION_TYPE – Integer: Station type, relates to STATION_TYPE in l_Station_Type table
- EASTING – Double: Easting coordinate value, Lambert Conformal Conic NAD 83
- NORTHING – Double: Northing coordinate value, Lambert Conformal Conic NAD 83
- NearOID – Long Integer: Object ID of Nearest station, created by GIS routine
- NearDis – Double: Distance to the nearest station, calculated by GIS
- NEAR_STATION_ID – Long Integer: Corresponding STATION_ID of nearest station
- NearName – Text: AES name of nearest station with data fill in.

tbl_AnnualPrecip_NearestStations

- STATION_ID – Long Integer: Internal database unique station identifer. Relates to STATION_ID in l_Stations.
- AES_ID – Text: Atmospheric Environmental Service climate station identifer.
- STATION_NAME – Text: AES station name for stations with data fill in
- LONG – Double: Longitude in decimal degrees
- LAT - Double: Latitude in decimal degrees
- EASTING_LCC – Double: Easting coordinate value, Lambert Conformal Conic NAD 83
- NORTHING_LCC – Double: Northing coordinate value, Lambert Conformal Conic NAD 83
- NEAR_STATION_ID – Long Integer: Corresponding STATION_ID of nearest station
- NEAR_AES_ID – Text: Atmospheric Environmental Service climate station identifer of nearest station.
- NearName – Text: AES name of nearest station with data fill in.
- yyyyA – Double: Total precipitation for year for the reference station.
- yyyyB – Double: Total precipitation for year for the nearest station to the reference station.

tbl_TempMax_NearestStations

- STATION_ID – Long Integer: Internal database unique station identifer. Relates to STATION_ID in l_Stations.
- AES_ID – Text: Atmospheric Environmental Service climate station identifer.

- STATION_NAME – Text: AES station name for stations with data fill in
- LONG – Double: Longitude in decimal degrees
- LAT - Double: Latitude in decimal degrees
- EASTING_LCC – Double: Easting coordinate value, Lambert Conformal Conic NAD 83
- NORTHING_LCC – Double: Northing coordinate value, Lambert Conformal Conic NAD 83
- NEAR_STATION_ID – Long Integer: Corresponding STATION_ID of nearest station
- NEAR_AES_ID – Text: Atmospheric Environmental Service climate station identifer of nearest station.
- NearName – Text: AES name of nearest station with data fill in.
- Month – Integer: Numeric month of the year (1 = Jan, 2 = Feb, etc)
- yyyyA – Double: Maximum temperature for the month of year for the reference station.
- yyyyB – Double: Maximum temperature for the month of year for the nearest station to the reference station.

tbl_TempMin_NearestStations

- STATION_ID – Long Integer: Internal database unique station identifer. Relates to STATION_ID in l_Stations.
- AES_ID – Text: Atmospheric Environmental Service climate station identifer.
- STATION_NAME – Text: AES station name for stations with data fill in
- LONG – Double: Longitude in decimal degrees
- LAT - Double: Latitude in decimal degrees
- EASTING_LCC – Double: Easting coordinate value, Lambert Conformal Conic NAD 83
- NORTHING_LCC – Double: Northing coordinate value, Lambert Conformal Conic NAD 83
- NEAR_STATION_ID – Long Integer: Corresponding STATION_ID of nearest station
- NEAR_AES_ID – Text: Atmospheric Environmental Service climate station identifer of nearest station.
- NearName – Text: AES name of nearest station with data fill in.
- Month – Integer: Numeric month of the year (1 = Jan, 2 = Feb, etc)

- yyyyA – Double: Minimum temperature for the month of year for the reference station.
- yyyyB – Double: Minimum temperature for the month of year for the nearest station to the reference station.

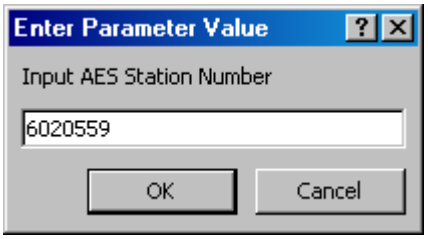
tbl_DataFillIndicator

- AES_ID – Text: Atmospheric Environmental Service climate station identifer.
- STATION_NAME – Text: AES station name for stations with data fill in
- yyyy – Double: Total precipitation for year yyyy.
- yyyyF – Text: Data fill indicator for year yyyy, Yes = prescence of fill in data; No = no fill in data present in that year.

Daily Climate Database Query

The daily climate database contains a query titled Select Daily Climate Data for Station which allows the database user to enter an AES Station ID to return all records for that station. To use this query:

1. Double click on the Select Daily Climate Data for Station query name.
2. An input dialog box will appear. Enter a valid AES Station ID number.



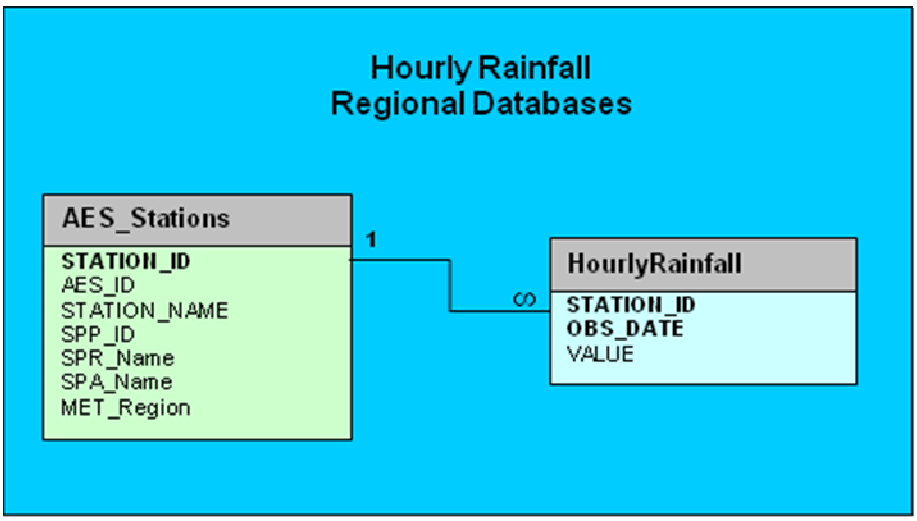
3. Press OK. The query will run for a few seconds and create a results table ordered by time.

Hourly Rainfall Database Structure

Specifications for the hourly rainfall databases are as follows:

Database Names - Ontario_Hourly_Region_1_North.mdb
Ontario_Hourly_Region_2_NearNorth.mdb
Ontario_Hourly_Region_3_East.mdb
Ontario_Hourly_Region_4_Central.mdb
Ontario_Hourly_Region_5_SouthCentral.mdb
Ontario_Hourly_Region_6_South.mdb
Ontario_Hourly_Region_7_West.mdb

Database Format – MS Access 2000



Tables

HourlyRainfall – Hourly rainfall records for stations from 1950 to 2005

AES_Stations – lookup table with AES station data

Fields

The database fields corresponding to each of the tables discussed above are described below.

HourlyRainfall

- STATION_ID – Long Integer: unique station identifier internal to database.Relates to STATION_ID in the AES_Stations table.
- OBS_DATE – DateTime: Observation date including hour of sampling.
- VALUE – Real: Observed rainfall, depth in millimetres.

AES_Stations

- STATION_ID – Long Integer: unique station identifier internal to database.
- AES_ID – Text: Atmospheric Environmental Service climate station identifer. Derived from raw data files.
- STATION_NAME – Text: Atmospheric Environmental Service climate station name. Derived from raw data files.
- SPP_ID – Long Integer: Source Protection polygon ID.
- SPR_Name – Text: Source Protection Region name.
- SPA_Name – Text: Source Protection Area name.

- MET_Region – Integer: Meteorologic regions, boundaries defined by SPP and equal data partitioning.

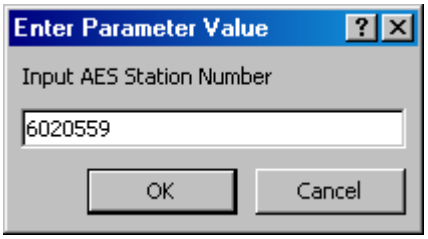
Hourly Rainfall Database Queries

Each hourly rainfall database contains 2 queries. The first query called Hourly Rainfall Statistics provides a simple summary of the minimum and maximum hourly rainfall amounts (in mm) for each of the stations in the database over the observation period of 1950 – 2005.

The second query, titled Select Hourly Rainfall for Station allows the database user to enter an AES Station ID to return all records for that station. To use this query:

4. Double click on the Select Hourly Rainfall for Station query name.

5. An input dialog box will appear. Enter a valid AES Station ID number.



6. Press OK. The query will run for a few seconds and create a results table ordered by time.

Table 1. Regional Distribution of AES Stations in Hourly Rainfall Databases

AES Number	Station Name	Hourly Rainfall Database
6040325	ARMSTRONG (AUT)	Ontario_Hourly_Region_1_North.mdb
6020LPQ	ATIKOKAN (AUT)	Ontario_Hourly_Region_1_North.mdb
6020384	ATIKOKAN MARMION	Ontario_Hourly_Region_1_North.mdb
6020559	BARWICK	Ontario_Hourly_Region_1_North.mdb
6070QK6	BONNER LAKE	Ontario_Hourly_Region_1_North.mdb
6041110	CAMERON FALLS (AUT)	Ontario_Hourly_Region_1_North.mdb
6061361	CHAPLEAU A	Ontario_Hourly_Region_1_North.mdb
6071712	COCHRANE	Ontario_Hourly_Region_1_North.mdb
6071855	CONNAUGHT	Ontario_Hourly_Region_1_North.mdb
6032120	DRYDEN 'A' (AUT)	Ontario_Hourly_Region_1_North.mdb
6012199	EAR FALLS (AUT)	Ontario_Hourly_Region_1_North.mdb
6072224	EARLTON AWOS	Ontario_Hourly_Region_1_North.mdb
602K300	EMO RADBOURNE	Ontario_Hourly_Region_1_North.mdb
6072325	ENGLEHART	Ontario_Hourly_Region_1_North.mdb
6042MJ7	FLINT	Ontario_Hourly_Region_1_North.mdb
6062425	FOLEYET	Ontario_Hourly_Region_1_North.mdb
6022476	FORT FRANCES A	Ontario_Hourly_Region_1_North.mdb
6042716	GERALDTON A	Ontario_Hourly_Region_1_North.mdb
6033697	IGNACE TCPL 58	Ontario_Hourly_Region_1_North.mdb
6073810	IROQUOIS FALLS	Ontario_Hourly_Region_1_North.mdb
6073840	ISLAND FALLS	Ontario_Hourly_Region_1_North.mdb
6073975	KAPUSKASING A	Ontario_Hourly_Region_1_North.mdb
6073980	KAPUSKASING CDA ON	Ontario_Hourly_Region_1_North.mdb
6034075	KENORA A	Ontario_Hourly_Region_1_North.mdb
6074211	KIRKLAND LAKE CS	Ontario_Hourly_Region_1_North.mdb
6014353	LANSDOWNE HOUSE (AUT)	Ontario_Hourly_Region_1_North.mdb
6044903	MANITOUWADGE	Ontario_Hourly_Region_1_North.mdb
6044961	MARATHON A	Ontario_Hourly_Region_1_North.mdb
6075024	MATTICE TCPL	Ontario_Hourly_Region_1_North.mdb
6025203	MINE CENTRE	Ontario_Hourly_Region_1_North.mdb
6075425	MOOSONEE UA	Ontario_Hourly_Region_1_North.mdb
6016525	PICKLE LAKE (AUT)	Ontario_Hourly_Region_1_North.mdb
6076572	PORCUPINE ONT HYDRO	Ontario_Hourly_Region_1_North.mdb
6046767	PUKASKWA (AUT)	Ontario_Hourly_Region_1_North.mdb
6026852	RAINY RIVER	Ontario_Hourly_Region_1_North.mdb
6036904	RAWSON LAKE	Ontario_Hourly_Region_1_North.mdb
6016975	RED LAKE A	Ontario_Hourly_Region_1_North.mdb
6037775	SIOUX LOOKOUT A	Ontario_Hourly_Region_1_North.mdb
6077845	SMOKY FALLS	Ontario_Hourly_Region_1_North.mdb
6028128	STRATTON ROMYN	Ontario_Hourly_Region_1_North.mdb
6048235	TERRACE BAY(AUT)	Ontario_Hourly_Region_1_North.mdb
6048264	THUNDER BAY AWOS	Ontario_Hourly_Region_1_North.mdb
6078285	TIMMINS A	Ontario_Hourly_Region_1_North.mdb
6048864	TRANQUILLO RIDGE	Ontario_Hourly_Region_1_North.mdb
6049095	UPSALA (AUT)	Ontario_Hourly_Region_1_North.mdb
6059408	WAWA (AUT)	Ontario_Hourly_Region_1_North.mdb
6059D09	WAWA A	Ontario_Hourly_Region_1_North.mdb

6059475	WHITE RIVER	Ontario_Hourly_Region_1_North.mdb
6049466	WHITEFISH LAKE	Ontario_Hourly_Region_1_North.mdb
6100345	ARNPRIOR GRANDON	Ontario_Hourly_Region_2_NearNorth.mdb
616I001	BANCROFT AUTO	Ontario_Hourly_Region_2_NearNorth.mdb
6100521	BARRETT CHUTE	Ontario_Hourly_Region_2_NearNorth.mdb
6100558	BARRY'S BAY	Ontario_Hourly_Region_2_NearNorth.mdb
6110606	BEATRICE 2	Ontario_Hourly_Region_2_NearNorth.mdb
6060773	BISCOTASING	Ontario_Hourly_Region_2_NearNorth.mdb
6111045	BURKS FALLS	Ontario_Hourly_Region_2_NearNorth.mdb
6101335	CHALK RIVER AECL	Ontario_Hourly_Region_2_NearNorth.mdb
6101440	CHATS FALLS	Ontario_Hourly_Region_2_NearNorth.mdb
6101494	CHENAUX	Ontario_Hourly_Region_2_NearNorth.mdb
6101555	CLAYBANK	Ontario_Hourly_Region_2_NearNorth.mdb
6101820	COMBERMERE	Ontario_Hourly_Region_2_NearNorth.mdb
6061850	CONISTON STP	Ontario_Hourly_Region_2_NearNorth.mdb
6081930	CRYSTAL FALLS	Ontario_Hourly_Region_2_NearNorth.mdb
6102009	DES JOACHIMS	Ontario_Hourly_Region_2_NearNorth.mdb
6112072	DORSET MOE	Ontario_Hourly_Region_2_NearNorth.mdb
6112133	DUNCHURCH	Ontario_Hourly_Region_2_NearNorth.mdb
6082178	DWIGHT	Ontario_Hourly_Region_2_NearNorth.mdb
6052259	ELLIOT LAKE A	Ontario_Hourly_Region_2_NearNorth.mdb
6102531	FOYMOUNT	Ontario_Hourly_Region_2_NearNorth.mdb
6082612	FRENCH R CHAUDIERE DAM	Ontario_Hourly_Region_2_NearNorth.mdb
611S002	GRAVENHURST BEAVER CREEK	Ontario_Hourly_Region_2_NearNorth.mdb
6113663	HUNTSVILLE WPCP	Ontario_Hourly_Region_2_NearNorth.mdb
6114006	KATRINE DOE LAKE	Ontario_Hourly_Region_2_NearNorth.mdb
6064460	LIVELY	Ontario_Hourly_Region_2_NearNorth.mdb
6084770	MADAWASKA	Ontario_Hourly_Region_2_NearNorth.mdb
6065006	MASSEY	Ontario_Hourly_Region_2_NearNorth.mdb
6055210	MISSISSAGI ONT HYDRO	Ontario_Hourly_Region_2_NearNorth.mdb
6065250	MONETVILLE	Ontario_Hourly_Region_2_NearNorth.mdb
6055378	MONTREAL RIVER (AUT)	Ontario_Hourly_Region_2_NearNorth.mdb
6115525	MUSKOKA A	Ontario_Hourly_Region_2_NearNorth.mdb
6085682	NORTH BAY	Ontario_Hourly_Region_2_NearNorth.mdb
6085700	NORTH BAY A	Ontario_Hourly_Region_2_NearNorth.mdb
6116262	PARRY SOUND HARBOUR	Ontario_Hourly_Region_2_NearNorth.mdb
6106369	PEMBROKE SE	Ontario_Hourly_Region_2_NearNorth.mdb
6106398	PETAWAWA A	Ontario_Hourly_Region_2_NearNorth.mdb
610FC98	PETAWAWA HOFFMAN	Ontario_Hourly_Region_2_NearNorth.mdb
6106779	PURDY	Ontario_Hourly_Region_2_NearNorth.mdb
6116843	RAGGED RAPIDS	Ontario_Hourly_Region_2_NearNorth.mdb
6066875	RAMSEY	Ontario_Hourly_Region_2_NearNorth.mdb
6107002	RENFREW	Ontario_Hourly_Region_2_NearNorth.mdb
6097426	SANDFIELD	Ontario_Hourly_Region_2_NearNorth.mdb
6057590	SAULT STE MARIE 2	Ontario_Hourly_Region_2_NearNorth.mdb
6057592	SAULT STE MARIE A	Ontario_Hourly_Region_2_NearNorth.mdb
6117957	SOUTH RIVER	Ontario_Hourly_Region_2_NearNorth.mdb
6108027	STEWARTVILLE	Ontario_Hourly_Region_2_NearNorth.mdb
6068148	SUDBURY	Ontario_Hourly_Region_2_NearNorth.mdb
6068150	SUDBURY A	Ontario_Hourly_Region_2_NearNorth.mdb
6068980	TURBINE	Ontario_Hourly_Region_2_NearNorth.mdb
6100285	APPLETON	Ontario_Hourly_Region_3_East.mdb

6100398	AVONMORE	Ontario_Hourly_Region_3_East.mdb
6150689	BELLEVILLE	Ontario_Hourly_Region_3_East.mdb
6100720	BELLROCK	Ontario_Hourly_Region_3_East.mdb
6150816	BLOOMFIELD WEST	Ontario_Hourly_Region_3_East.mdb
6100971	BROCKVILLE PCC	Ontario_Hourly_Region_3_East.mdb
6101260	CARP	Ontario_Hourly_Region_3_East.mdb
6101265	CATARAQUI TS	Ontario_Hourly_Region_3_East.mdb
6151309	CENTREVILLE	Ontario_Hourly_Region_3_East.mdb
6101502	CHESTERVILLE 2	Ontario_Hourly_Region_3_East.mdb
6161662	CLOYNE ONT HYDRO	Ontario_Hourly_Region_3_East.mdb
6101874	CORNWALL	Ontario_Hourly_Region_3_East.mdb
6101901	CORNWALL ONT HYDRO	Ontario_Hourly_Region_3_East.mdb
61519JM	CRESSY	Ontario_Hourly_Region_3_East.mdb
6101920	CROW LAKE	Ontario_Hourly_Region_3_East.mdb
6101958	DALHOUSIE MILLS	Ontario_Hourly_Region_3_East.mdb
6101962	DALKEITH PYM	Ontario_Hourly_Region_3_East.mdb
6101986	DELTA	Ontario_Hourly_Region_3_East.mdb
6102J13	DRUMMOND CENTRE	Ontario_Hourly_Region_3_East.mdb
6102832	GLEN GORDON	Ontario_Hourly_Region_3_East.mdb
6102808	GLENBURNIE	Ontario_Hourly_Region_3_East.mdb
6102840	GLOUCESTER KETTLES	Ontario_Hourly_Region_3_East.mdb
6102857	GODFREY	Ontario_Hourly_Region_3_East.mdb
6103367	HARTINGTON IHD	Ontario_Hourly_Region_3_East.mdb
6103390	HAWKESBURY	Ontario_Hourly_Region_3_East.mdb
6103470	HINCHINBROOKE	Ontario_Hourly_Region_3_East.mdb
6153935	KALADAR	Ontario_Hourly_Region_3_East.mdb
6104027	KEMPTVILLE CS	Ontario_Hourly_Region_3_East.mdb
6104146	KINGSTON A	Ontario_Hourly_Region_3_East.mdb
6104175	KINGSTON PUMPING STATION	Ontario_Hourly_Region_3_East.mdb
6104725	LYNDHURST SHAWMERE	Ontario_Hourly_Region_3_East.mdb
6154779	MADOC	Ontario_Hourly_Region_3_East.mdb
6154820	MAIN DUCK ISLAND	Ontario_Hourly_Region_3_East.mdb
6104882	MALLORYTOWN LANDING	Ontario_Hourly_Region_3_East.mdb
6155148	MILFORD	Ontario_Hourly_Region_3_East.mdb
6105460	MORRISBURG	Ontario_Hourly_Region_3_East.mdb
615EMR7	MOUNTAINVIEW	Ontario_Hourly_Region_3_East.mdb
615NNPL	NAPANEE	Ontario_Hourly_Region_3_East.mdb
6105576	NAVAN	Ontario_Hourly_Region_3_East.mdb
6105976	OTTAWA CDA	Ontario_Hourly_Region_3_East.mdb
6106000	OTTAWA MACDONALD-CARTIER INT'L	Ontario_Hourly_Region_3_East.mdb
6106090	OTTAWA NRC	Ontario_Hourly_Region_3_East.mdb
6156533	PICTON	Ontario_Hourly_Region_3_East.mdb
6107133	RIDEAU FERRY	Ontario_Hourly_Region_3_East.mdb
6107247	RUSSELL	Ontario_Hourly_Region_3_East.mdb
6107836	SMITHS FALLS TS	Ontario_Hourly_Region_3_East.mdb
6107955	SOUTH MOUNTAIN	Ontario_Hourly_Region_3_East.mdb
6107276	ST. ALBERT	Ontario_Hourly_Region_3_East.mdb
6158051	STIRLING	Ontario_Hourly_Region_3_East.mdb
6109558	WOLFE ISLAND	Ontario_Hourly_Region_3_East.mdb
6110218	ALLISTON NELSON	Ontario_Hourly_Region_4_Central.mdb
6110275	ANGUS CAMPHILL	Ontario_Hourly_Region_4_Central.mdb
6150398	AURORA NE	Ontario_Hourly_Region_4_Central.mdb

6110557	BARRIE WPCC	Ontario_Hourly_Region_4_Central.mdb
6110617	BEAUSOLEIL	Ontario_Hourly_Region_4_Central.mdb
6110663	BEETON GRAHAM	Ontario_Hourly_Region_4_Central.mdb
6110731	BIG CHUTE	Ontario_Hourly_Region_4_Central.mdb
6160822	BOBCAYGEON	Ontario_Hourly_Region_4_Central.mdb
6150863	BRADFORD MUCK RESEARCH	Ontario_Hourly_Region_4_Central.mdb
6161050	BURLEIGH FALLS	Ontario_Hourly_Region_4_Central.mdb
6151090	CAMBORNE	Ontario_Hourly_Region_4_Central.mdb
6151137	CAMPBELLFORD	Ontario_Hourly_Region_4_Central.mdb
6151689	COBOURG STP	Ontario_Hourly_Region_4_Central.mdb
6111769	COLDWATER WARMINSTER	Ontario_Hourly_Region_4_Central.mdb
6111792	COLLINGWOOD	Ontario_Hourly_Region_4_Central.mdb
6111859	COOKSTOWN	Ontario_Hourly_Region_4_Central.mdb
6112340	ESSA ONT HYDRO	Ontario_Hourly_Region_4_Central.mdb
6162376	FENELON FALLS	Ontario_Hourly_Region_4_Central.mdb
6152555	FRANKFORD MOE	Ontario_Hourly_Region_4_Central.mdb
6162883	GOODERHAM	Ontario_Hourly_Region_4_Central.mdb
6152951	GORES LANDING	Ontario_Hourly_Region_4_Central.mdb
6163171	HALIBURTON 3	Ontario_Hourly_Region_4_Central.mdb
6153853	JANETVILLE	Ontario_Hourly_Region_4_Central.mdb
6154142	KING SMOKE TREE	Ontario_Hourly_Region_4_Central.mdb
6164433	LINDSAY FROST	Ontario_Hourly_Region_4_Central.mdb
6115099	MIDHURST	Ontario_Hourly_Region_4_Central.mdb
6115130	MIDLAND HURONIA A	Ontario_Hourly_Region_4_Central.mdb
6115127	MIDLAND WATER POLLUTION CONTROL	Ontario_Hourly_Region_4_Central.mdb
6165195	MINDEN	Ontario_Hourly_Region_4_Central.mdb
6155616	NEWMARKET	Ontario_Hourly_Region_4_Central.mdb
6165716	NORWOOD	Ontario_Hourly_Region_4_Central.mdb
6155722	OAK RIDGES	Ontario_Hourly_Region_4_Central.mdb
6115811	ORILLIA BRAIN	Ontario_Hourly_Region_4_Central.mdb
6155854	ORONO	Ontario_Hourly_Region_4_Central.mdb
6166420	PETERBOROUGH AWOS	Ontario_Hourly_Region_4_Central.mdb
6166452	PETERBOROUGH TORRANCE	Ontario_Hourly_Region_4_Central.mdb
6166455	PETERBOROUGH TRENT U	Ontario_Hourly_Region_4_Central.mdb
6156670	PORT HOPE	Ontario_Hourly_Region_4_Central.mdb
6116902	RAVENSHOE	Ontario_Hourly_Region_4_Central.mdb
6147229	RUSKVIEW	Ontario_Hourly_Region_4_Central.mdb
6157685	SHARON	Ontario_Hourly_Region_4_Central.mdb
6157832	SMITHFIELD CDA AUTOMATIC CLIMAT	Ontario_Hourly_Region_4_Central.mdb
6158875	TRENTON A	Ontario_Hourly_Region_4_Central.mdb
6119055	UDORA	Ontario_Hourly_Region_4_Central.mdb
6159122	UXBRIDGE	Ontario_Hourly_Region_4_Central.mdb
616RKR0	WARSAW	Ontario_Hourly_Region_4_Central.mdb
6169453	WEST GUILFORD	Ontario_Hourly_Region_4_Central.mdb
6169647	WOODVILLE	Ontario_Hourly_Region_4_Central.mdb
6159651	WOOLER	Ontario_Hourly_Region_4_Central.mdb
6150103	ALBION FIELD CENTRE	Ontario_Hourly_Region_5_SouthCentral.mdb
6150135	ALDERSHOT	Ontario_Hourly_Region_5_SouthCentral.mdb
615S004	BOLTON NORTH	Ontario_Hourly_Region_5_SouthCentral.mdb
6150830	BOWMANVILLE MOSTERT	Ontario_Hourly_Region_5_SouthCentral.mdb
6150916	BRAMPTON MOE	Ontario_Hourly_Region_5_SouthCentral.mdb
6151042	BURKETON MCLAUGHLIN	Ontario_Hourly_Region_5_SouthCentral.mdb

6151053	BURLINGTON	Ontario_Hourly_Region_5_SouthCentral.mdb
6151057	BURLINGTON ELIZABETH GDN	Ontario_Hourly_Region_5_SouthCentral.mdb
6151064	BURLINGTON TS	Ontario_Hourly_Region_5_SouthCentral.mdb
6151512	CHRISTIE CONSERVATION	Ontario_Hourly_Region_5_SouthCentral.mdb
6151545	CLAREMONT	Ontario_Hourly_Region_5_SouthCentral.mdb
6152605	FRENCHMANS BAY	Ontario_Hourly_Region_5_SouthCentral.mdb
6152695	GEORGETOWN WWTP	Ontario_Hourly_Region_5_SouthCentral.mdb
6152833	GLEN HAFFY MONO MILLS	Ontario_Hourly_Region_5_SouthCentral.mdb
6152953	GORMLEY ARDENLEE	Ontario_Hourly_Region_5_SouthCentral.mdb
6153290	HAMILTON MUNICIPAL LAB	Ontario_Hourly_Region_5_SouthCentral.mdb
6153301	HAMILTON RBG CS	Ontario_Hourly_Region_5_SouthCentral.mdb
6153410	HEART LAKE	Ontario_Hourly_Region_5_SouthCentral.mdb
6153552	HORNBY TRAFALGAR TS	Ontario_Hourly_Region_5_SouthCentral.mdb
6154135	KING CREEK	Ontario_Hourly_Region_5_SouthCentral.mdb
6154310	LAKEVIEW MOE	Ontario_Hourly_Region_5_SouthCentral.mdb
6154950	MAPLE	Ontario_Hourly_Region_5_SouthCentral.mdb
6154992	MARKHAM MOE	Ontario_Hourly_Region_5_SouthCentral.mdb
6155183	MILLGROVE	Ontario_Hourly_Region_5_SouthCentral.mdb
6155187	MILTON KELSO	Ontario_Hourly_Region_5_SouthCentral.mdb
6155BA0	MISSISSAUGA	Ontario_Hourly_Region_5_SouthCentral.mdb
6155PD4	OAKVILLE GERARD	Ontario_Hourly_Region_5_SouthCentral.mdb
6155790	ORANGEVILLE MOE	Ontario_Hourly_Region_5_SouthCentral.mdb
6155878	OSHAWA WPCP	Ontario_Hourly_Region_5_SouthCentral.mdb
6156227	PALGRAVE	Ontario_Hourly_Region_5_SouthCentral.mdb
6156516	PICKERING DUNBARTON	Ontario_Hourly_Region_5_SouthCentral.mdb
6156545	PINE GROVE	Ontario_Hourly_Region_5_SouthCentral.mdb
6156634	PORT DARLINGTON WPCP	Ontario_Hourly_Region_5_SouthCentral.mdb
6157012	RICHMOND HILL	Ontario_Hourly_Region_5_SouthCentral.mdb
6157194	ROUGE PARK	Ontario_Hourly_Region_5_SouthCentral.mdb
6158084	STOUFFVILLE WPCP	Ontario_Hourly_Region_5_SouthCentral.mdb
61587P6	TOR SCARBOROUGH COLLEGE	Ontario_Hourly_Region_5_SouthCentral.mdb
6158350	TORONTO	Ontario_Hourly_Region_5_SouthCentral.mdb
6158370	TORONTO ASHBRIDGES BAY	Ontario_Hourly_Region_5_SouthCentral.mdb
6158406	TORONTO BOOTH	Ontario_Hourly_Region_5_SouthCentral.mdb
6158411	TORONTO BURNHAMTHORPE	Ontario_Hourly_Region_5_SouthCentral.mdb
615HMAK	TORONTO BUTTONVILLE A	Ontario_Hourly_Region_5_SouthCentral.mdb
6158443	TORONTO DOWNSVIEW A	Ontario_Hourly_Region_5_SouthCentral.mdb
6158520	TORONTO ELLESMERE	Ontario_Hourly_Region_5_SouthCentral.mdb
6158647	TORONTO HUMBER SUMMIT	Ontario_Hourly_Region_5_SouthCentral.mdb
6158665	TORONTO ISLAND A	Ontario_Hourly_Region_5_SouthCentral.mdb
6158691	TORONTO ISLINGTON	Ontario_Hourly_Region_5_SouthCentral.mdb
6158733	TORONTO LESTER B. PEARSON INT'L	Ontario_Hourly_Region_5_SouthCentral.mdb
6158776	TORONTO SCARBOROUGH	Ontario_Hourly_Region_5_SouthCentral.mdb
6158779	TORONTO SUNNYBROOK	Ontario_Hourly_Region_5_SouthCentral.mdb
6158846	TORONTO WILSON HEIGHTS	Ontario_Hourly_Region_5_SouthCentral.mdb
6159048	TYRONE	Ontario_Hourly_Region_5_SouthCentral.mdb
6159127	VALENS	Ontario_Hourly_Region_5_SouthCentral.mdb
6159575	WOODBRIDGE	Ontario_Hourly_Region_5_SouthCentral.mdb
6130411	AYLMER	Ontario_Hourly_Region_6_South.mdb
6140954	BRANTFORD MOE	Ontario_Hourly_Region_6_South.mdb
6141095	CAMBRIDGE GALT MOE	Ontario_Hourly_Region_6_South.mdb
6151866	COPETOWN	Ontario_Hourly_Region_6_South.mdb

6141933	CULLODEN EASEY	Ontario_Hourly_Region_6_South.mdb
6131983	DELHI CS	Ontario_Hourly_Region_6_South.mdb
6132148	DUNNVILLE PUMPING STN	Ontario_Hourly_Region_6_South.mdb
6142275	ELMIRA	Ontario_Hourly_Region_6_South.mdb
6142286	ELORA RCS	Ontario_Hourly_Region_6_South.mdb
6142402	FERGUS MOE	Ontario_Hourly_Region_6_South.mdb
6142400	FERGUS SHAND DAM	Ontario_Hourly_Region_6_South.mdb
6132470	FORT ERIE	Ontario_Hourly_Region_6_South.mdb
6142803	GLEN ALLAN	Ontario_Hourly_Region_6_South.mdb
6142991	GRAND VALLEY WPCP	Ontario_Hourly_Region_6_South.mdb
6143090	GUELPH TURFGRASS CS	Ontario_Hourly_Region_6_South.mdb
6133120	HAGERSVILLE	Ontario_Hourly_Region_6_South.mdb
6153194	HAMILTON A	Ontario_Hourly_Region_6_South.mdb
6155097	MIDDLEPORT TS	Ontario_Hourly_Region_6_South.mdb
6145267	MONTICELLO	Ontario_Hourly_Region_6_South.mdb
6135657	NIAGARA FALLS NPCSH	Ontario_Hourly_Region_6_South.mdb
6135FF4	NIAGARA ON THE LAKE	Ontario_Hourly_Region_6_South.mdb
6136606	PORT COLBORNE	Ontario_Hourly_Region_6_South.mdb
6136626	PORT DALHOUSIE	Ontario_Hourly_Region_6_South.mdb
6136643	PORT DOVER	Ontario_Hourly_Region_6_South.mdb
6136694	PORT STANLEY	Ontario_Hourly_Region_6_South.mdb
6146711	PRESTON	Ontario_Hourly_Region_6_South.mdb
6137161	RIDGEVILLE	Ontario_Hourly_Region_6_South.mdb
6147188	ROSEVILLE	Ontario_Hourly_Region_6_South.mdb
6147664	SCOTLAND	Ontario_Hourly_Region_6_South.mdb
6137730	SIMCOE	Ontario_Hourly_Region_6_South.mdb
6137287	ST CATHARINES A	Ontario_Hourly_Region_6_South.mdb
6137306	ST CATHARINES POWER GLEN	Ontario_Hourly_Region_6_South.mdb
6137362	ST THOMAS WPCP	Ontario_Hourly_Region_6_South.mdb
6137401	ST WILLIAMS AUTOMATIC CLIMATE S	Ontario_Hourly_Region_6_South.mdb
6138270	TILLSONBURG MOE	Ontario_Hourly_Region_6_South.mdb
6139141	VINELAND	Ontario_Hourly_Region_6_South.mdb
6139143	VINELAND RITTENHOUSE	Ontario_Hourly_Region_6_South.mdb
6139148	VINELAND STATION RCS	Ontario_Hourly_Region_6_South.mdb
6139356	WATERFORD	Ontario_Hourly_Region_6_South.mdb
6149389	WATERLOO WELLINGTON 2	Ontario_Hourly_Region_6_South.mdb
6139445	WELLAND	Ontario_Hourly_Region_6_South.mdb
6130257	AMHERSTBURG	Ontario_Hourly_Region_7_West.mdb
6120819	BLYTH	Ontario_Hourly_Region_7_West.mdb
6121025	BRUCEFIELD	Ontario_Hourly_Region_7_West.mdb
6131415	CHATHAM WPCP	Ontario_Hourly_Region_7_West.mdb
6111467	CHATSWORTH	Ontario_Hourly_Region_7_West.mdb
6141919	CROMARTY	Ontario_Hourly_Region_7_West.mdb
6121940	CYPRUS LAKE CS	Ontario_Hourly_Region_7_West.mdb
6121969	DASHWOOD	Ontario_Hourly_Region_7_West.mdb
6142066	DORCHESTER	Ontario_Hourly_Region_7_West.mdb
6132090	DRESDEN	Ontario_Hourly_Region_7_West.mdb
6112171	DURHAM	Ontario_Hourly_Region_7_West.mdb
6122370	EXETER	Ontario_Hourly_Region_7_West.mdb
6142420	FOLDENS	Ontario_Hourly_Region_7_West.mdb
6122450	FOREST	Ontario_Hourly_Region_7_West.mdb
6122847	GODERICH	Ontario_Hourly_Region_7_West.mdb

6113329	HANOVER	Ontario_Hourly_Region_7_West.mdb
6133362	HARROW CDA AUTO	Ontario_Hourly_Region_7_West.mdb
6123672	HURON PARK	Ontario_Hourly_Region_7_West.mdb
6143722	ILDERTON BEAR CREEK	Ontario_Hourly_Region_7_West.mdb
6124127	KINCARDINE	Ontario_Hourly_Region_7_West.mdb
6134190	KINGSVILLE MOE	Ontario_Hourly_Region_7_West.mdb
6144444	LISTOWEL ONT HYDRO	Ontario_Hourly_Region_7_West.mdb
6144478	LONDON CS	Ontario_Hourly_Region_7_West.mdb
6124700	LUCKNOW	Ontario_Hourly_Region_7_West.mdb
6115059	MEAFORD WILLOWMERE	Ontario_Hourly_Region_7_West.mdb
6145504	MOUNT FOREST (AUT)	Ontario_Hourly_Region_7_West.mdb
6124123	NAIRN	Ontario_Hourly_Region_7_West.mdb
6135583	NEW GLASGOW	Ontario_Hourly_Region_7_West.mdb
6116132	OWEN SOUND MOE	Ontario_Hourly_Region_7_West.mdb
6126210	PAISLEY	Ontario_Hourly_Region_7_West.mdb
6126499	PETROLIA TOWN	Ontario_Hourly_Region_7_West.mdb
6116718	PRICEVILLE	Ontario_Hourly_Region_7_West.mdb
6116750	PROTON STATION	Ontario_Hourly_Region_7_West.mdb
6137154	RIDGETOWN RCS	Ontario_Hourly_Region_7_West.mdb
6127890	SOUTHAMPTON 2	Ontario_Hourly_Region_7_West.mdb
6148105	STRATFORD MOE	Ontario_Hourly_Region_7_West.mdb
6148122	STRATHROY-MULLIFARRY	Ontario_Hourly_Region_7_West.mdb
6128206	TARA	Ontario_Hourly_Region_7_West.mdb
612HKLR	THEDFORD	Ontario_Hourly_Region_7_West.mdb
611HBEC	THORNBURY SLAMA	Ontario_Hourly_Region_7_West.mdb
6139265	WALLACEBURG	Ontario_Hourly_Region_7_West.mdb
6119500	WIARTON A	Ontario_Hourly_Region_7_West.mdb
6139525	WINDSOR A	Ontario_Hourly_Region_7_West.mdb
6139520	WINDSOR RIVERSIDE	Ontario_Hourly_Region_7_West.mdb
6139602	WOODSLEE CDA AUTOMATIC CLIMATE	Ontario_Hourly_Region_7_West.mdb
6149625	WOODSTOCK	Ontario_Hourly_Region_7_West.mdb
6129660	WROXETER	Ontario_Hourly_Region_7_West.mdb