

National Climatic Data Center

DATA DOCUMENTATION

FOR

DATA SET 9767B (DSI-9767B)

Master Station History Report

June 30, 2011

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1. Abstract: The Master Station History Report (MSHR) data set contains information about the present and historical names, identifiers, and locations of more than 50,000 stations documented in the NCDC Station History Database. These stations are located on all continents, but most are US sites. This station information, a kind of metadata (data about other data), is used in the plotting, interpretation and analysis of climate data.

The MSHR data set, for the first time, contains information for all NCDC stations, including those having only non-digital data archived at the NCDC.

Past NCDC station history products were limited to specific networks (NWS Cooperative network) or station identifier numbering schemes (WBAN-numbered stations). These products provided links between the station identifiers in data sets of climate data and the metadata. These kinds of products (Coop and WBAN station number master lists) are now a part of the new MSHR data set product and can be easily extracted.

The MSHR data set is updated monthly by the NCDC Product Development Branch.

2. Element Names and Definitions: The first record of this report product data set contains the date the report was created from the Station History database. This report is scheduled to be updated monthly.

Beginning with the second record, the element names and definitions are as follows:

a. **Station Id Number.** An 8-digit integer that uniquely identifies individual stations in the NCDC Station History database - the source of this data set product.

Discussion. A 'station' is the organizational unit of the Station History database, and is defined as a geographical site recording one or more environmental data parameters according to practices governed by one or more observational programs. Further discussion of station definition is found in **Known Uncorrected Station Problems**.

NCDC's Station History database integrates station information from different observational programs, each having rules of station definition and identity. For this and other database management reasons, the Station Id Number was created for NCDC to internally track and organize the histories of stations.

Station Id Number is the primary sort key, and Begin Date is the secondary sort key. This grouping of stations (Station Id Number) and their histories (Begin Date) indicates how data are organized in the NCDC Station History database. Users of this data set product should never incorporate the NCDC Station Id Number as part of their information systems except as an indicator of station uniqueness. NCDC can and will change these numbers to meet internal needs. Data users more familiar with certain observation programs that use their own station id numbering system, such as the NWS Cooperative Network, may find it useful to sort this data set product on an alternate station number system, or even on a geographical basis (country, state, station name).

b. **Record Type Number.** A 2-character field indicating the type of station information contained in a report record. Currently all records are of type

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01 indicating the record type of Summary Information. This is left in place to support legacy format.

c. **Coop Station Identifier.** A 6-digit number identifying a station in the NWS Cooperative Network. The first two digits designate a USA state or territory in the table below (FIPS refers to the Federal Information Processing System standard). The last four digits are assigned to stations within a state in general accordance with the alphabetic order of the station name.

NWS State		FIPS State	
Number	Abbreviation	Number	State Name
01	AL	01	ALABAMA
02	AZ	04	ARIZONA
03	AR	05	ARKANSAS
04	CA	06	CALIFORNIA
05	CO	08	COLORADO
06	CT	09	CONNECTICUT
07	DE	10	DELAWARE
08	FL	12	FLORIDA
09	GA	13	GEORGIA
10	ID	16	IDAHO
11	IL	17	ILLINOIS
12	IN	18	INDIANA
13	IA	19	IOWA
14	KS	20	KANSAS
15	KY	21	KENTUCKY
16	LA	22	LOUISIANA
17	ME	23	MAINE
18	MD	24	MARYLAND
18	DC	11	DISTRICT OF COLUMBIA*
19	MA	25	MASSACHUSETTS
20	MI	26	MICHIGAN
21	MN	27	MINNESOTA
22	MS	28	MISSISSIPPI
23	MO	29	MISSOURI
24	MT	30	MONTANA
25	NE	31	NEBRASKA
26	NV	32	NEVADA
27	NH	33	NEW HAMPSHIRE
28	NJ	34	NEW JERSEY
29	NM	35	NEW MEXICO
30	NY	36	NEW YORK
31	NC	37	NORTH CAROLINA
32	ND	38	NORTH DAKOTA
33	OH	39	OHIO
34	OK	40	OKLAHOMA
35	OR	41	OREGON
36	PA	42	PENNSYLVANIA
37	RI	44	RHODE ISLAND
38	SC	45	SOUTH CAROLINA
39	SD	46	SOUTH DAKOTA
40	TN	47	TENNESSEE
41	TX	48	TEXAS
42	UT	49	UTAH
43	VT	50	VERMONT

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44	VA	51	VIRGINIA
45	WA	53	WASHINGTON
46	WV	54	WEST VIRGINIA
47	WI	55	WISCONSIN
48	WY	56	WYOMING
50	AK	02	ALASKA
51	HI	15	HAWAII
66	PR	72	PUERTO RICO
67	VI	78	US VIRGIN ISLANDS
91	--	--	US PACIFIC ISLANDS**

* NOTE: All District of Columbia stations are classified with Maryland.

** includes stations in AMERICAN SAMOA (AS/60), GUAM (GU/66), NORTHERN MARIANA ISLANDS (MP/69), PALUA (PW/70), U.S. MINOR OUTLYING ISLANDS (UM/74), FEDERATED STATES OF MICRONESIA (FM/64), and MARSHALL ISLANDS (MH/68)

Discussion. A station in this network, as designated by a single **Coop Station Identifier**, can be one site or a series of sites whose locations fall within 2 miles horizontal or 100 feet vertical difference. There are exceptions to this rule, with 'climatic compatibility', as determined by the NWS field manager, being the overriding factor.

d. **Climate Division.** A two-character field that usually contains a 2-digit number ranging from 01 to 10. Indicates the climate division (in US stations).

Discussion. Climate divisions are standardized regions within each state designating areas of similar climate regime. The number of climate divisions in a state varies from one (Rhode Island) to a maximum of ten (many states).

The present climate divisions were defined in late 1950's. Prior to that, a different system of climate divisions existed, with a lesser number of divisions in each state (often just 3). Prior to the late 1950's, alphabetic characters could appear in the climate division field such as 'N', 'W' and 'F'. The 'N' indicated a non-published station prior to the 1980's, for which climate divisions were not required. Other letters indicated observing networks existing prior to the 1950's. NCDC has converted all of these to climate division numbers. Climate division number changes occurring during the 1950's, in otherwise unchanged station locations, are most likely due to the re-invention of the climate divisions.

NCDC's Product Development Branch is responsible for assigning climate division numbers to new stations using master divisional reference maps. These maps appear in the NCDC **Climatological Data** publications.

e. **WBAN Station Identifier.** A five-digit station identifier used at NCDC for digital data storage and general station identification purposes. (Many WBAN numbers begin with a leading zero (e.g. 03010) which should be counted as one of the five digits; computer software should consider this to be an alpha-numeric field that contains 5 numbers.)

Discussion. WBAN is an acronym, invented in the 1950's, which stands for Weather-Bureau-Army-Navy. WBAN station numbers were first used as

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identifiers for stations reporting meteorological observations on the then-standard WBAN series of forms (e.g. WBAN 10A, 10B, and 10C).

WBAN numbers were the first major attempt at a coordinated station numbering scheme among several weather reporting authorities. Original participants in the WBAN number plans were the United States Weather Bureau, Air Force, Navy, and Army; the Canadian Department of Transportation, and certain German and Korean stations in close cooperation with the US Weather Services.

The assignment and management of WBAN numbers is done by NCDC's Product Development Branch. The philosophy and goals of WBAN number management since the early 1980's has been to assign one WBAN number for each geographical observing site through time. This means that a 'place' such as an airport, will retain the same WBAN number throughout its history (even if closures and re-openings occurred) and among its different data collection networks (such as surface airways, upper air, RADAR, etc.).

These goals have not been perfectly achieved through time; therefore WBAN number usage should be limited to the creation of simple associations between a site's data collection and its metadata description. The dates associated with a WBAN number's existence do not necessarily correspond to the dates of data availability, digital or otherwise.

See Known Uncorrected Problems for an additional discussion of **WBAN Station Identifiers**.

f. **WMO Station Identifier**. A five-digit station identifier assigned by the World Meteorological Organization (WMO), used for international weather data exchange and station documentation.

Discussion. The authoritative documentation of the WMO Station Identifier is the publication:

Volume A, Observing Stations, WMO - No. 9, World Meteorological Organization, Geneva Switzerland (issued periodically)

The USA liaison for WMO Volume A information is the US National Weather Service (contact: Al Mongeon W/OS0242).

Limitations. Some, but not all, WMO station identifiers are contained in this data set report. Dates associated with the WMO station identifier are unreliable. Information from the WMO Volume A publication has not been routinely incorporated into the NCDC Station History database.

g. **FAA Location Identifier**. An alpha-numeric identifier of up to 4-characters managed by the USDT Federal Aviation Administration (FAA), used for site identification of airports, weather stations and other sites vital to navigation.

Discussion. This identifier is also commonly referred to as 'Call Sign' or 'Call Letters'. (See also item h. **NWS Location Identifier**.) A three-letter identifier (e.g. ATL) implies a higher-level aviation facility than one containing numbers or one with 4-number/letters (e.g. 1N5, EN3C).

The authoritative documentation of the FAA Location Identifier is the publication:

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7350.8N - Location Identifiers, U.S. Department of Transportation, Federal Aviation Administration (issued several times annually)

Limitations. Some, but not all, FAA station identifiers are contained in this data set report. In general, dates associated with the FAA station identifier are unreliable; no known definitive history of FAA location identifier assignments exists. The FAA location identifiers should be used for simple associations between data collected/stored under this identifier and the station metadata.

h. NWS Location Identifier. (NWSLI) A 3- to 5-character alpha-numeric identifier assigned by the US NWS, used for site identification in the NWS communications systems (e.g. AFOS, ROSA, SHEF, etc.). NWS real-time data transmissions, forecasts and other products are referenced by this identifier.

Discussion. NWS location identifiers are assigned and managed by the NWS/OSO Configuration Management Branch with the NWSLI database (contact Thomas Raffa, NWSLI Program Manager, W/OS0113). Prior to the database era, these were known as 'Handbook 5' identifiers. The NWSLIs are the same as the NWS Cooperative network 'Site Ids' (SIDs), as shown on WS Form B-44.

Relationship between FAA and NWS Location Identifiers. There is a long history of NWS forecast/observational support at FAA facilities; thus, the NWS has long used FAA location identifiers (LIs) as shortcut names (call signs) for airport stations and their transmitted reports and forecasts. When NWS data transmission interests grew to include non-aviation networks, such as the Cooperative Program network, the FAA had no desire to manage thousands of additional LIs. The FAA delegated to NWS the authority to assign 5-character LIs to non-aviation NWS sites. The collection of NWS LIs, then, includes some 1000-2000 FAA LIs for aviation/weather sites and an additional 10,000-12,000 NWS-assigned LIs.

It would seem from this discussion that the NWSLI collection is simply an extension of the FAA LI collection; but from a data management perspective this is not entirely true, because the NWS identifies stations by operational function and NCDC manages stations as geographical entities. At major airports, the FAA LI is the same as the NWSLI (e.g. Atlanta is ATL in both LI lists); but at some minor airports, separate LIs exist for the aviation function and the Cooperative network function (e.g. Tuscaloosa Municipal AP has an FAA LI of 'TCL' and a NWS LI of 'TUSA1'). For this reason NCDC maintains the FAA LIs and NWS LIs as separate lists.

NWS LIs and Cooperative Network Site Ids (SIDS). Even though the NWS Cooperative network stations have been identified by 6-digit numbers (see item 3. **Coop Station Identifiers**) for many decades, present NWS transmission systems use the NWS LI assigned to these stations. The NWS LI is called the "SID" on the NWS station history report, WS Form B-44.

The format of the 5-character alpha-numeric identifiers is as follows:

char. 1-3 - 3 letters suggestive of the town or locality name, e.g. 'AVL' for Asheville

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char. 4-5 - first letter of the station's state and alphabetical order number of that state among all other states with same beginning letter, e.g. Kansas = 'K1' and Kentucky = 'K2'.

A station in Smithville Alabama might then be, 'SMVA1'.

i. **ICAO Location Indicator.** A 4-letter indicator for geographical locations throughout the world, managed by the International Civil Aviation Organization (ICAO).

The authoritative documentation of the ICAO Station Indicator is the publication:

Location Indicators, Doc 7910/85, International Civil Aviation Organization, Montreal (85th Edition, June, 1997) (issued periodically)

The USA representative to the ICAO is the Federal Aviation Administration (FAA). The FAA assigns all Location Indicators that appear in the publication, and also assigns Location Indicators that are not part of the ICAO Aeronautical fixed stations network, and do not appear in the publication.

Discussion. The FAA assigns all Location Indicators for the US and its possessions with a couple of exceptions. The major exceptions are those Indicators beginning with 'KN', which are the property of the US Navy. Other exceptions are those beginning with 'KK' or 'KW', which belong to the Federal Communications Commission (FCC).

The first letter of the ICAO Indicator denotes an Aeronautical Fixed Service (AFS) routing area (a first level division of the globe). In the USA, most places are in AFS area 'K' (e.g. KATL). Alaskan stations begin with 'A', Caribbean stations (Puerto Rico and US Virgin Islands) begin with 'T', and Hawaiian and other USA possessions in the Pacific begin with 'P'.

The second letter is supposed to depict a state or territory within the AFS routing area. This convention is used in the outlying areas of the USA (e.g. all Alaskan sites begin with 'AA', all Hawaiian sites begin with 'PH'), but is not used for the conterminous USA. Most of these USA sites use 'K' plus the FAA three-letter Location Identifier (e.g. KATL for Atlanta) (but there are exceptions!).

In the 1990's modernization of the NWS, many new stations were added to international data transmissions, most notably the ASOS and NEXRAD networks. ICAO indicators are assigned to all of these stations, but most will not appear in the official publication.

As with the FAA and NWS Location Identifiers (see Section h. *Discussion*), there is long history of interdependence between aviation and weather interests. These shortcut names for airports are used in international transmissions of weather reports and forecasts.

Limitations. ICAO Indicators were first digitized into the report product during FY98 and consist of ICAO Indicators for USA stations, including the NWS and Department of Defense (DOD) NEXRAD sites, and NWS and FAA ASOS network sites.

j. **Country.** Country name.

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k. **State/Province.** The two-letter FIPS standard abbreviation for the USA states and possessions, and a similar, coordinated two-letter abbreviation for the Canadian provinces, as listed below:

Abbreviation	Canadian Province/Territory Name
AB	ALBERTA
BC	BRITISH COLUMBIA
MB	MANITOBA
NB	NEW BRUNSWICK
NF	NEWFOUNDLAND
NS	NOVA SCOTIA
NW	NORTHWEST TERRITORIES
ON	ONTARIO
PE	PRINCE EDWARD ISLAND
PQ	QUEBEC
SK	SASKATCHEWAN
YK	YUKON TERRITORY

l. **County.** The county or county-equivalent name for USA stations.

All county names are spelled as found in the Federal Information Processing Standards (FIPS) Publication 6-4, except that the standard uses upper and lower case letters, and NCDC's report uses all upper case. Note that periods ('.') are retained for abbreviations, as shown in the standards (e.g. FIPS county 01115 is 'St. Clair' in the FIPS standard and 'ST. CLAIR' in the NCDC report). The NCDC source database retains both the county name and its FIPS county code, and will not allow non-standard entries.

Limitations. Although all counties in this report product are consistent with FIPS standards, not all USA stations have entries for the county. The source for county information was generally the NWS Cooperative network station history forms (B-44). Stations not found in that network (e.g. minor airports, coastal stations), have had their counties sourced from the NationalAtlas.gov US Time Zone layer. Also, Alaskan stations have poor county documentation, because the Cooperative network chose to depict the climate division in lieu of FIPS county for many decades. Most USA Pacific island possession stations were upgraded to FIPS county standards, where it was easily determined; others have no county assignment pending better base map information.

m. **Time Zone.** Depicted as the number of hours added to local time to get Greenwich Mean Time. For example, USA Eastern Standard Time zone stations show +5.

n. **Coop Station Name.** The Cooperative station name is the name maintained by the NWS Cooperative network on WS Form B-44. The name is normally in the format of town name + qualifier, where the qualifier differentiates locations among stations or sites having the same town name (e.g. GREENVILLE 1 SW, GREENVILLE 2 NE). Exceptions to the town name convention include some military sites (e.g. LANGLEY AFB), and certain natural features or private holdings in remote areas (e.g. STAMPEDE PASS, JOHNSON RANCH).

Network Integrity. It is intended that this element document the history of the station name used in the NWS Cooperative network, for the time in

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which the station was part of the Cooperative network. If a user of this report product extracts only those stations having a **Coop Station Identifier**, the complete history of the names associated with those stations should be contained in this element. Because of known errors in a previous database, some historical Cooperative station name information has been lost. When this happens, the element **Coop Station Name** contains the current or latest station name. (See also, *Element Logic*, below.)

Element Logic. Each station in this report (as shown by an NCDC **Station Id Number**) has one or more records delineated by unique begin-end date pairs. For each record, the **Coop Station Name** element is filled from the source database with the Cooperative network name. If a Cooperative network name does not exist for a record's time period, the element is filled with the latest, best station name.

What results is a complete population of the **Coop Station Name** element in this report with Cooperative network historical names for the times a station shows a **Coop Station Identifier**; and the latest, best station name for the times a station does not show a **Coop Station Identifier**.

Relation Between Principal and Coop Station Names. The NWS Cooperative network established its own station naming conventions apart from other NWS observational programs. When a geographical site, as indicated by the NCDC **Station Id Number**, takes observations for both the Cooperative network and another network, the station names may be different; thus both names are presented here. Normally, the differences are confined to the qualifier of the town name, such as 'ATLANTA WSO AP' vs. 'ATLANTA HARTSFIELD INTL AP'. Other times, the change is significant, such as 'ATLANTA WFO' (NEXRAD observations) vs. 'PEACHTREE CITY' (Cooperative observations).

o. **Principal Station Name.** The station name in the format of town name + qualifier, where qualifier differentiates among stations with the same town name (e.g. SMITHVILLE POWER PLANT vs. SMITHVILLE MUNICIPAL AP). Exceptions to the town name convention include some military sites (e.g. LANGLEY AFB), and certain natural features or private holdings in remote areas (e.g. STAMPEDE PASS, JOHNSON RANCH).

Historical Integrity. It is intended that this element document the history of the non-Cooperative network station names used at a site. (See discussion below on *Relation Between Principal and Coop Station Names*.) If a user of this report product extracts only those stations having a **WBAN Station Identifier**, the complete history of the names associated with those stations should be contained in this element. Because of known errors in a previous database, some historical station name information has been lost. When this happens, the element **Principal Station Name** contains the current or latest station name. (See also, *Element Logic*, below.)

Element Logic. Each station in this report (as shown by an NCDC **Station Id Number**) has one or more records delineated by unique begin-end date pairs. For each record, the **Principal Station Name** element is filled from the source database with the Principal station name. If a Principal station name does not exist for a record's time period, the element is filled with the latest, best station name.

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What results is a complete population of the **Principal Station Name** element in this report with historical names, when available, or the latest, best station name, when not.

If a report station belongs solely to the Cooperative network, the **Principal Station Name** contains only the latest, best (Coop) station name in each record.

Relation Between Principal and Coop Station Names. The NWS Cooperative network established its own station naming conventions apart from other NWS observational programs. When a geographical site, as indicated by the NCDC **Station Id Number**, takes observations for both the Cooperative network and another network, the station names may be different; thus both names are presented here. Normally, the differences are confined to the qualifier of the town name, such as "ATLANTA WSO AP" vs. "ATLANTA HARTSFIELD INTL AP". Other times, the change is significant, such as "ATLANTA WFO" (NEXRAD observations) vs. "PEACHTREE CITY" (Cooperative observations).

p. **Beginning Date of Record.** Begin date in format YYYYMMDD. ('00000101' indicates an unknown begin date.)

q. **Ending Date of Record.** End date in format YYYYMMDD. ('99991231' indicates station currently open.)

r. **Latitude Direction.** Blank (' ') indicates north latitude; negative sign ('-') indicates south latitude.

s. **Latitude Degrees.** Contains values from '00' through '90', with leading zeros present.

t. **Latitude Minutes.** Contains values from '00' through '59', with leading zeros present.

u. **Latitude Seconds.** Contains values from '00' through '59', with leading zeros present. (See **Latitude/Longitude Precision Code**.)

v. **Longitude Direction.** Blank (' ') indicates east longitude; negative sign ('-') indicates west longitude.

w. **Longitude Degrees.** Contains values from '00' through '180', with leading zeros present.

x. **Longitude Minutes.** Contains values from '00' through '59', with leading zeros present.

y. **Longitude Seconds.** Contains values from '00' through '59', with leading zeros present. (See **Latitude/Longitude Precision Code**.)

z. **Latitude/Longitude Precision Code.** An integer indicating the precision of the source latitude and longitude values before they were converted to degrees, minutes and seconds. Codes found in this report:

Precision Code	Original Precision
54	Degrees, Whole Minutes
55	Degrees, Whole Minutes, Whole Seconds

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57	Decimal Degrees, to Hundredths
58	Decimal Degrees, to Thousandths
59	Decimal Degrees, to Ten Thousandths
60	Decimal Degrees, to Hundred Thousandths
62	Degrees, Decimal Minutes to Tenths
63	Degrees, Decimal Minutes to Hundredths
64	Degrees, Decimal Minutes to Thousandths
66	Degrees, Minutes, Decimal Seconds to Tenths
67	Degrees, Minutes, Decimal Seconds to Hundredths

Latitude/Longitude Discussion. Up until the past decade, nearly all latitude and longitude values were reported in Degrees, Whole Minutes, and most uses for latitude and longitude information required no higher resolution. In recent years, the availability of Global Positioning System (GPS) technology and the demand for more precise location information has changed the way latitude and longitude information are reported. The precision code tracks these changes and informs report users when the latitude and longitude seconds information is useful (i.e. a seconds value of '00' with a precision code of '54' indicates that seconds information is meaningless).

Another inference can be made using the precision code. As sites are resurveyed with GPS equipment, as generally indicated with a change in the precision code, the resulting latitude and longitude values can give validity or suspicion to past coordinates, as illustrated in these (contrived) examples:

stn_id_num	latitude	longitude	precision_code	begin	end
10800101	32 45 00	-080 10 00	54	1960	1990
10800101	32 45 09	-080 09 56	55	1990	9999
10800102	37 36 00	-112 14 00	54	1986	1994
10800102	37 35 23	-112 12 10	55	1994	9999

Station 10800101 shows an upgrade in the coordinate values. A rounding of the new seconds values shows agreement with the previous coordinate values. This suggests confidence in the historical coordinate values.

Station 10800102 likewise shows an upgrade in the coordinate values, but the new values are significantly different than the old values, even when seconds are rounded. If the station shows no supportive relocation information, this coordinate upgrade suggests an error in either the old or new coordinates.

aa. **Ground Elevation.** The elevation of the station at ground level, in feet, expressed as a signed integer. A value of '-99999' means the ground elevation is missing. A value of '0' is legitimate (sea level), as are negative values.

From NWS guidelines ground elevation is generally taken from temperature sensor location at airport sites, and from the rain gage location at other observing sites.

Quality issues.

(A) Elevations at NWS Cooperative network station during the years prior to 1984 are suspect. The degree of inaccuracy is less than 10 feet, but pretty consistently in error from archive station history records. Two past data management practices contributed to the problem:

1) A source file used to create the present station history database stored these elevation values in units of tens of feet (i.e. an elevation of 552 feet was '55' in the source file). This gave an implicit error of +/- 5 feet.

2) The initial load of the Station History database (System 2000) used at NCDC beginning in 1983 had an error in the elevation load program that converted elevations from feet to the database storage units of tenths of meters. Elevations reconverted from tenths of meters back to feet were found to be off by 2-4 feet.

(B) Some elevations at NWS Cooperative network station from 1983 to 1995 are also suspect. The degree of inaccuracy is less than 3 feet for stations with elevations greater than 1000 feet. Although the conversion error to tenths of meters mentioned above was corrected, application programs that displayed and manipulated elevations in feet contained 'back and forth' conversion inaccuracies that caused elevation values to 'drift' over time, most notably in places with elevations over 1000 feet. For example, a station elevation of 4,590 feet that was accessed several times in 1980's and 1990's may appear in this report product as:

<u>elevation</u>	<u>begin date</u>	<u>end date</u>
4590	19750101	19860701
4589	19860701	19920422
4588	19920422	99991231

This pattern of incremental downward drift, with no relocation indicated in element **Station Relocation**, can well be interpreted as an era of no elevation change, earliest value correct (4,590 feet).

Another pattern seen is this:

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<u>elevation</u>	<u>begin date</u>	<u>end date</u>
4590	19750101	19860701
4589	19860701	19910101
4590	19910101	19920516
4589	19920516	99991231

Again, this small drift can be thought of as no change in elevation.

NCDC changed to a new database system in September 1995 that stores and manipulates elevation values in their original units, eliminating this problem. Past errors will be corrected as resources allow.

bb. **Elevation - Other.** An alternate elevation value at a station, in feet, expressed as a signed integer. A value of '-99999' indicates that no elevation values of any kind are known for that station during the time frame of the report record. A value of '0' is legitimate (sea level), as are negative values. The type of elevation is indicated by the **Elevation - Other Type Code** (see below).

Discussion. Weather observing stations traditionally report a variety of elevation values, according to national and international guidelines. The intent of this field is to assure the users of having at least one elevation value for each station record, and an indicator of the meaning of that value.

Element Logic. The rules for selecting an elevation value for any given record begin-end time period are to select the first available elevation from this priority ordering:

- 1st, elevation type 2, ivory point of the barometer or altimeter setting
- 2nd, elevation type 7, field, aerodrome, or runway
- 3rd, elevation type 12, zero datum of a river gage
- 4th, elevation type 6, ground
- 5th, elevation type 0, unknown type

If none of these are available, the value '-99999' is assigned.

cc. **Elevation - Other Type Code.** An integer indicating the type of elevation value depicted in the element **Elevation - Other**. Code values are:

<u>Code</u>	<u>Elevation Type</u>
0	Unknown elevation type
2	Ivory Point of the Barometer or Altimeter Setting
6	Ground
7	Field, Aerodrome, or Runway
12	Zero Datum of a River Gage

dd. **Station Relocation.** The distance and direction of a station relocation expressed as a distance value (1 to 4 characters), space, distance units (2-character abbreviation), space, and direction (1 to 3 character 16-point cardinal direction). Examples:

2 MI NE, 5000 FT W, 1.3 MI NNE, 100 YD XX, XXXX UN XX

The last example shows that a relocation occurred, but gives default values for unknown distance value (XXXX), unknown distance units (UN)

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and unknown direction (XX). The fourth example shows a relocation of 100 yards, direction unknown (XX).

The date of the relocation is indicated by the begin date of the record.

Availability. Relocation information has been maintained in the source database for NWS Cooperative network stations since the mid-1980's. Some relocations prior to the 1980's have been researched and included in this report product. Changes in latitude, longitude and elevation are the best indicators of relocations prior to the mid-1980s.

Partial relocations of stations occur, where part of the group of station equipment is re-sited. In the NWS Cooperative network, a station is defined as the rain gage. All relocations in the report, then, refer to the rain gage. It is possible that an accompanying temperature sensor could either remain in place, or be relocated independently of the rain gage.

ee. **Station Types.** A loose station classification scheme for non-Cooperative network stations based on NWS, Department of Defense (DOD) and NCDC past and present schemes. The intent of depicting station types is to inform the user of the general nature of a given station.

Prior to June 2011, station types were classified as follows:

For example, a station type of 'NAS' (Naval Air Station) indicates the station took observations according to practices of the US Navy at a high level station. The type 'WBAS' is past NWS station type denoting a major NWS Airport station, normally with 24-hourly observations. The type 'SAWRS' (Supplementary Airways Reporting Station) indicates non-digital, surface airways observations, less than 24 hours per day. The more a user knows about the station types and their histories, the more useful this element will be.

Station types are shown alone or in groups separated by blanks. Their association with the record begin and end dates should not be considered as exact.

Following is a list of station types and their descriptions:

Type	Description
A	Aviation and cooperative-a
AAB	Army Air Base
AAF	Army Air Field
AAFB	Auxiliary Air Force Base
AC	Cooperative Aviation (NWS)
ACW	Aircraft Control and Warning
AF	Air Force
AFB	Air Force Base
AFS	Air Force Station
AFWB	Air Force and Weather Bureau
AMOS	AutoMated Observing Station
ANG	Air National Guard
ASC	Army Signal Corps
ASOS	Automated Surface Observation System
ASOS-EXP	ASOS Expanded
ASOS-FAA	ASOS Federal Aviation Administration

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AUTO	(undocumented)
AUTOB	Automated meteorological observing station (AMOS, RAMOS, or AUTOB)
AWOS	Airway Weather Observation
AWOS-1	(undocumented)
AWOS-3	(undocumented)
AWS	(undocumented)
B	Basic contract
C-MAN	Coastal-Marine Automated Network
CAA	Civilian Aeronautics Administration
CG	Coast Guard
CO	carbon monoxide
CO2	carbon dioxide
COOP	COOPerative station
COOP-A	(undocumented)
CRN	Climate Reference Network
EMSU	Environmental Meteorological Support Unit
FAA	Federal Aviation Administration
FSS	Flight Service Station
FSS-AID	(undocumented)
HRLY	(undocumented)
LAWRS	Limited Aviation Weather Reporting Station
MARS	Marine Reporting Station
MCAF	Marine Corps Air Facility
MCAS	Marine Corps Air Station
NAAF	Naval Auxiliary Air Facility
NAAS	Naval Auxiliary Air Station
NAF	Naval Air Facility
NAS	Naval Air Station
NAVY	Navy
NEXRAD	NEXT generation RADar
NF	Naval Facility
NHC	National Hurricane Center
NS	Naval Station
RADIATION	(undocumented)
RAMOS	automated meteorological observing station (AMOS, RAMOS, or AUTOB)
S	Synoptic reports (NWS)
SA	Synoptic and Aviation Reports (NWS)
SAWRS	Supplementary Airways Reporting Station
SC	Cooperative Synoptic
SPL	Special
SURFRAD	(undocumented)
SWOP	Shared Weather Observation Program
SYNOPTIC	(undocumented)
SYNP	(undocumented)
U-A	Upper Air
WBAS	Weather Bureau Airport Station
WBFO	Weather Bureau Forecast Office
WBMO	Weather Bureau Meteorological Observatory
WBO	Weather Bureau Office
WBRO	Weather Bureau Regional Office
WBSF	(undocumented, probably Weather Bureau Support Facility)
WBRS	Weather Bureau Research Station
WSCMO	Weather Service Contract Meteorological Observatory
WSFO	Weather Service Forecast Office

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WSMO	Weather Service Meteorological Observatory
WSO	Weather Service Office
WSO-AG	(undocumented, probably Weather Service Office with Agricultural responsibilities)
WSSF	Weather Service Support Facility

Beginning June 2011, a simpler classification system for station types was implemented to manage the more than 150 detailed type entries that have accumulated over the years.

Type	Description
AIRWAYS	Miscellaneous Aviation and Airways
ASOS	Automated Surface Observing System
AWOS	Airway Weather Observation
AMOS	Automated Observing Station
COOP	COOPerative Station
USHCN	U.S. Historical Climatology Network
MILITARY	Military
SYNOPTIC	(Undocumented)
USCRN	U.S. Climate Reference Network
USRCRN	U.S. Regional Climate Reference Network
AL USRCRN	Alabama U.S. Regional Climate Reference Network
WXSVC	Weather Service
NEXRAD	NEXt generation RADar
RADAR	(Undocumented)
UPPERAIR	Upper Air
UNKNOWN	Unknown

3. Start Date: 18900101

NWS Cooperative network stations have digital metadata beginning in 1948, with a small group extending back to 1931. Other stations generally have digital metadata from their beginnings of record, as far back as the 1890's, when the US Weather Bureau began.

4. Stop Date: Ongoing.

5. Coverage: Global, but primarily in the US.

- a. Southernmost Latitude: 90S
- b. Northernmost Latitude: 90N
- c. Westernmost Longitude: 180W
- d. Easternmost Longitude: 180E

6. How to Order Data:

Ask NCDC's Customer Services about the cost of obtaining this data set.
 Phone: 828-271-4800
 FAX: 828-271-4876
 E-mail: NCDC.Orders@noaa.gov

7. Archiving Data Center:

National Climatic Data Center
 Federal Building
 151 Patton Avenue
 Asheville, NC 28801-5001

:
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Phone: (828) 271-4800.

8. Technical Contact:

National Climatic Data Center
Federal Building
151 Patton Avenue
Asheville, NC 28801-5001
Phone: (828) 271-4800.

9. Known Uncorrected Problems:

a. *Station definition implications.* The new NCDC Master Station History Report (MSHR) is a comprehensive list of weather observing stations that goes beyond NCDC's previous master station list products. Those products were subsets of (a) stations in the NWS Cooperative network or (b) stations having assigned **WBAN Station Identifiers**. A 'station' in the MSHR product can have a **Coop Station Identifier**, or a **WBAN Station Identifier**, both identifiers, or neither.

NCDC's **Station Id Number** is the primary relational key in the NCDC Station History database. Its intent is to define a station entity, which is based on geographical and climatological compatibility considerations. The definition of station has been managed differently through time, and NCDC Station Id Numbers can and will change as needed.

The value of the NCDC **Station Id Number** is best seen when an NCDC station (as defined by the **Station Id Number**) contains more than one type of local network station identifier (e.g. a **Coop Station Identifier**, and a **WBAN Station Identifier**) through time ('inter-network' Ids), and/or more than one id within the same network (e.g. 2 different **Coop Station Identifiers**) through time ('intra-network' Ids). When this occurs, it can be assumed that the different Id's are related; that they 'belong' to the same station; that some of their station metadata is shared.

The converse, unfortunately, is not always true: that differing **Station Id Numbers** always implies a different station. This happens because of differing station definitions for each local network, and because of inconsistent station definition management through time at NCDC. A station considered the 'same' in a local network may occur in two NCDC Station History database slots, as defined by the NCDC **Station Id Number**.

Most users of this report product will need information only for stations with **WBAN Station Identifiers** or **Coop Station Identifiers**. Such users should extract the subset of those stations from this report product, sort on the WBAN or Coop identifier (and begin date), and use the WBAN or Coop identifier as the primary station identity key instead of the Station Id Number.

b. *WBAN Station Identifier Problems.* WBAN station identifiers are supposed to have a one to one association with station sites. Management of the identifier assignments has been inconsistent in past decades resulting in the association of single WBAN identifiers with two different stations at the same time. A listing of over sixty of these duplicate associations is shown in the 1986 NCDC publication **WBAN Station Numbers Master List**. The problem has not been reassessed since that time, although some of the duplicate association problems have been resolved.

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c. Non-NCDC Identifier Information. Most station identifier information controlled by agencies other than the NCDC is not systematically quality controlled in the Station History database. These identifiers include the **WMO Station Identifier**, the **FAA Location Identifier**, the **NWS Location Identifier**, and the **ICAO Location Indicator**.

d. Missing County Information. (See Limitations above)

e. Time Zone Histories. The time zone information depicted throughout a station's history is generally the present time zone. Past time zone boundary changes affecting present stations are not documented.

f. Coop Station Name - Historical Date Problems. A software bug in loading the NCDC System 2000 database (a predecessor to the current database) caused a loss in certain date information for Cooperative network historical station names. Some of the damage has been identified and fixed. The past names of stations have been preserved, but there may be errors in their given begin-end date information.

g. Beginning and Ending Dates. All beginning and ending dates in this report product are shown as year, month and day information. In some cases these dates are just estimates when the only information known is the year or a year-month. The source database has a flag associated with each date documenting the known accuracy of the date.

h. High Resolution Latitude and Longitude Errors. In the mid-1990's many NWS offices began surveying Cooperative network sites with GPS instruments to obtain high resolution latitude and longitude values. The NWS requirement for Coop stations is to report the GPS coordinates in degrees, whole minutes and whole seconds. Among the thousands of stations surveyed by dozens of NWS field managers, NCDC noticed a significant number of coordinate pairs having seconds values greater than 59 (e.g. latitude 40D 10M 78S). This suggests that the sites were surveyed with the units degrees, decimal minutes to hundredths (e.g. latitude 40D 10.78M).

NCDC ingest systems are smart enough to identify this kind of out of bounds units problem, and sets the precision flag to depict degrees, decimal minutes to tenths. However, this leaves suspect the other high resolution values, whose seconds are not greater than 59 (i.e. is latitude value 41-32-56 actually 41D 32M 56S or 41D 32.56M ?). NCDC needs to develop strategies for identifying and addressing groups of these erroneously reported coordinates.

10. Quality Statement: Many station history metadata quality issues have been discussed in various parts of this document. Unlike many digitally processed data sets, the station metadata has been managed by subjective humans over the years and contains its share of expected interpretive and data entry errors. This report product and its source database could benefit from a comprehensive, systematic assessment of inconsistencies, range checks, and other quality control tests.

This, in fact, has been started in 1997 with the completion of NCDC's Station History Information Processing System (MMS). Many quality control screens were imposed during the database conversion, such as gross latitude, longitude and elevation range checks, standardization of state and county names to FIPS, standardization of country names, equipment codes, observation times, date fields, and more. NCDC's Product Development Branch has begun additional

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assessment of historical date overlap situations, and plans additional quality control work.

Despite these known problems, this report product and its source database remain the best digital, historical collection of weather station site information for US stations.

11. Essential Companion Datasets: Data set TD9767a, **Pre-1951 Cooperative Station Histories**, supplements this report product for NWS Cooperative network station histories prior to 1948. This data set provides metadata support for all NCDC data sets containing **Coop Station Identifiers** or **WBAN Station Identifiers**, including, but not limited to, DSI-3200, DSI-3210, DSI-3220, DSI-3240 and DSI-3280

12. References:

7350.6- Location Identifiers, U.S. Department of Transportation, Federal Aviation Administration, February 29, 1996

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Carroll, Thomas, **The Global Climate Perspectives System (GCPs) Database Documentation**, Version 0, Release 0, June, 1994

Climatological Data, USDOC/NOAA/NESDIS/National Climatic Data Center, Asheville, North Carolina (monthly and annual issues, by state)

Cooperative Station Service Accountability - User's Manual, USDOC/NOAA/National Weather Service, Silver Springs, MD, May 13, 1996

Counties and Equivalent Entities of the United States, It's Possessions, and Associated Areas, Federal Information Processing Standards Publication 6-4, USDOC National Institute of Standards and Technology, August 31, 1990

Location Indicators, Doc 7910/85, International Civil Aviation Organization, Montreal, 85th Edition, June, 1997

NWS WFO/RDA Site Reference Book, USDOC/NOAA/NWS National Implementation Staff/Facilities Modernization Program, February 1997

Volume A, Observing Stations, WMO - No. 9, World Meteorological Organization, Geneva Switzerland, May 1997

WBAN Station Numbers Master List, NOAA/NESDIS/National Climatic Data Center, Asheville, North Carolina, January, 1986