Revision History

Ver#	Date	Initials	Description/Rationale of Changes
1	July 7, 2010	DCS	List of approved and available SHEF codes to be used by Water Survey of Canada operations and procedure for selecting or defining a SHEF code.

1.0 Introduction

This document identifies SHEF codes to be used for GOES data transmissions for the Water Survey of Canada of Environment Canada. NOAA approved and recognized SHEF are contained in the National Weather Service Manual 10-944 dated January 2, 2008, entitled "STANDARD HYDROMETEOROLOGICAL EXCHANGE FORMAT (SHEF) MANUAL". This manual is downloadable from U.S. government NOAA and is referred to in this document as the SHEF Manual.

This document recognizes that some codes used within the Water Survey are not officially recognized by NOAA and that there is a process to obtain official recognition of these codes. As a result there are three categories of codes that are in use within the Water Survey: NOAA officially recognized and approved codes, WSC approved codes drawn from the NOAA list, and WSC approved codes that have been submitted but not yet approved by NOAA. The full suite of NOAA officially recognized codes as of June 2010 are contained in Table 2. Table 1 summarizes the WSC approved SHEF codes, as drawn from the NOAA approved list plus codes not yet approved by NOAA and contained in the SHEF Manual. NOAA approval of these codes is being sought.

It is recognized that the codes presented in the table below are necessary for the operations of the Water Survey program.

The local procedure for selecting or defining a SHEF code for use is as follows:

- Refer to the table below for the code to match the appropriate data value to be transmitted and decoded.
- If a suitable code is not present in the table, refer to the NOAA approved list in Table 2 (or the (should be proper document name) contained in the Water Survey library). This is a comprehensive list of all officially recognized codes.
- If a suitable code cannot be found in these lists, consult with your local Data Control representative to determine a code.
- The Data Control representative is responsible to initiate the process to seek new codes (through the designated individual at the National Office).
- Revisions to this document will follow new code acceptance and posting will be done by the designated individual at the National Office).

TABLE 1
Water Survey Approved List of SHEF Codes For Use in Operations

	SHEF CODE	CODE EXPLANATION	UNITS
✓		Checkmark indicates WSC use of a NOAA approved code	
		Blank indicates a WSC code not yet approved by NOAA	
	H HEIGHT		
✓	HG	Height, River stage, elevation of the water surface at a specified station above some arbitrary zero datum	(FT, M)
	HG#	Height, River stage, additional HG reading(s) at the specified station (# = value, i.e. '2', '3', '4', etc.)	(FT, M)
✓	HD	Height, head – elevation of water surface above a sensor. *(hydroacoustic)*	(FT, M)
✓	HK	Height, lake above a specified datum	(FT, M)
✓	HN	Height, river stage - minimum elevation of the water surface at a specified station above some arbitrary zero datum for the day	(FT, M)
✓	HX	Height, Maximum River Stage - maximum elevation of the water surface at a specified station above some arbitrary zero datum for the day	(FT, M)
	P PRESSURE AND PRECIPITATION		
✓	PC	Precipitation, accumulator - summation of precipitation collected beginning at a specified date.	IN, MM
✓	PP	Precipitation (Includes liquid amount of new snowfall), actual increment - discrete increase in precipitation amount over a specified duration.	IN, MM
	Q DISCHARGE		
✓	QF	Discharge velocity - flow measured at points along a stream.	(MPH, KPH)
✓	QR	Discharge, river - flow measured at points along a stream.	(KCFS, CMS)
	T TEMPERATURE DATA		
✓	TA	Temperature, air, wet bulb	(DF,DC)
✓	TN	Temperature, minimum air temperature observed over a duration of 24 hours	(DF,DC)
✓	TW	Temperature, temperature of water at a specified depth.	(DF,DC)
	TW#	Temperature, additional TW reading(s) at the specified station (# = value, i.e. '2', '3', '4', etc.)	(DF,DC)
	V GENERATION AND GENERATOR DATA		
✓	VB	Voltage - battery (volt)	
	W WATER QUALITY		
	WA	Water, dissolved nitrogen & argon (To be used for argon only by WQB and WSC)	(PPM, MG/L)
	WB	Blue-Green Algae	(RFU)
✓	WC	Water, conductance	(uMHOS/CM)
	WE	Phosphorous	(PPM, MG/L)
	WEA	Orthophosphate	(PPM, MG/L)
	WN	Water, dissolved nitrogen (N2)	(PPM, MG/L)

	WNA	Water, dissolved nitrite (NO2-)	(PPM, MG/L)
	WNB	Water, dissolved nitrate (NO3-)	(PPM, MG/L)
	WNC	Water, Ammonia	(PPM, MG/L)
	WND	Water, Ammonium	(PPM, MG/L)
✓	WO	Water, dissolved oxygen - amount of oxygen dissolved in water.	(PPM, MG/L)
	WS	Water, salinity	(PPT)
✓	WV	Water, velocity - velocity of a particle(s) of water in a stream.	(FT/SEC, M/SEC, CM/SEC)
	WV#	Water, velocity – velocity of a particle(s) of water in a stream, at a specific location a channel. This is usually associated with a specific "bin" in an acoustic transect. Numbers of 0 through 9 can be used.	
	WVX	Water, velocity - velocity of particle(s) of water in the x vector component. *(hydroacoustic)*	(FT/SEC, M/SEC, CM/SEC)
	WVY	Water, velocity - velocity of particle(s) of water in the y vector component. *(hydroacoustic)*	(FT/SEC, M/SEC, CM/SEC)
	WX	Water, Oxygen Saturation	(%)
	WY	Water, Chlorophyll	(ppb, ug/L)
	Y RESERVED FOR UNIQUE, STATION SPECIFIC TYPE CODES		
		YA->YZ Assigned on an individual basis for unique data, except as noted below	
	YB	Distance, cell Beginning	(m)
	YDU	Usage rate i.e. Compressor motor etc.	
	YE	Distance, Cell End	(m)
✓	YF	Forward power, a measurement of the DCP, antenna, and coaxial cable	(watts)
	YI	Internal Equipment Temperature	(C)
	YK	Data Storage remaining	(kb, mb)
	YL	Logger Diagnostic Value	(#)
	YP	Tank Pressure	(kPa, psi)
✓	YR	Reflected power, a measurement of the DCP, antenna, and coaxial cable	(watts)
	YSN	Mean signal to noise ratio	(s.s)
	YSN#	Mean signal to noise ratio - additional measurements of the acoustic signal quality at specific locations in a channel cross section. This is usually associated with a specific "bin" in an acoustic transect. Numbers of 0 through 9 can be used	(s.s)

TABLE 2
NOAA Approved List of SHEF Codes

	SHEF CODE	CODE EXPLANATION	UNITS
✓		Checkmark indicates a NOAA approved code	
	E EVAPORATION		
✓	EA	Evapotranspiration potential - amount of moisture which would be removed from a fully vegetated land surface by evapotranspiration if there were always an adequate water supply available	(IN, MM)
✓	ED	Evaporation, pan depth - depth of water in an evaporation pan usually obtained with the aid of a hook gage set in a still well	(IN, MM)
✓	EM	Evapotranspiration amount	(IN, MM)
✓	EP	Evaporation, pan increment	(IN, MM)
✓	ER	Evaporation rate - amount of liquid or solid transformed through physical process into the gaseous state over a specified time.	(IN/day, MM/day)
✓	ET	Evapotranspiration total - evaporation from all water, soil, snow, ice, vegetative, and other surfaces plus transpiration	(IN, MM)
✓	EV	Evaporation, lake computed	(IN, MM)
	G GROUND FROST AND GROUND STATE		
✓	GD	Frost depth, depth of frost penetration - depth of non-permafrost penetration as measured by instrumentation (frost meter, probe, auger).	(IN, CM)
✓	GR	Frost report, structure - structure of surface frost	
✓	GS	Ground state	
✓	GT	Frost, depth of surface frost thawed - depth of surface frost thawed as obtained by instrumentation (frost meter, probe, auger).	(IN, CM)
	H HEIGHT		
✓	HA	Height of reading, vertical or perpendicular elevation of an observation above a given datum	(FT, M)
✓	HB	Depth of reading - vertical or perpendicular elevation of an observation below a given datum.	(FT, M)
✓	HD	Height, head – elevation of water surface above a sensor. *(hydroacoustic)*	(FT, M)
✓	HE	Height, regulating gate - height of a regulating gate opening.	(FT, M)
✓	HF	Elevation, project powerhouse forebay	(FT, M)
✓	HG	Height, River stage, elevation of the water surface at a specified station above some arbitrary zero datum	(FT, M)
✓	HH	Height of reading, elevation in MSL	(FT, M)
✓	HI	Stage trend indicator (coded, see Table 19)	(FT, M)
✓	HJ	Height, spillway gate	(FT, M)
✓	HK	Height, lake above a specified datum	(FT, M)
✓	HL	Elevation, natural lake	(FT, M)
✓	HM	Height of tide, MLLW	(FT, M)
✓	HN	Height, river stage - minimum elevation of the water surface at a specified station above some arbitrary zero datum for the day	(FT, M)
✓	HO	Height, flood stage	(FT, M)

✓	HP	Elevation, pool	(FT, M)
✓	HQ	Distance from a ground reference point to the river level - Used to estimate stage.	(FT, M)
✓	HR	Elevation, lake or reservoir rule curve	(FT, M)
✓	HS	Elevation, spillway forebay	(FT, M)
✓	HT	Elevation, project tail water stage	(FT, M)
✓	HU	Height, cautionary stage	(FT, M)
✓	HW	Height, spillway tail water	(FT, M)
✓	HX	Height, Maximum River Stage - maximum elevation of the water surface at a specified station above some arbitrary zero datum for the day	(FT, M)
	I ICE CODES		
✓	IC	Ice cover, river - percentage of ice covering a given surface area of the river.	(%)
✓	IE	Extent of ice from reporting area, extent of river ice upstream "+", downstream -	(MI,KM)
✓	IO	Extent of open water from reporting area, extent of openupstream "+",downstream -	(MI,KM)
✓	IR	Ice report type, structure, and cover	
✓	IT	Ice thickness - measured thickness of ice in the river.	(IN, CM)
	L LAKE DATA		
✓	LA	Lake surface area	(KAC,KM2)
✓	LC	Lake storage volume change	(KAF,MCM)
✓	LS	Lake storage volume	(KAF,MCM)
	P PRESSURE AND PRECIPITATION		
✓	PA	Pressure, atmospheric	IN-HG, KPA, PSI
✓	PC	Precipitation, accumulator - summation of precipitation collected beginning at a specified date.	IN, MM
✓	PD	Pressure, atmospheric net change during past 3 hours	IN-HG, KPA,PSI
✓	PE	Pressure, characteristic, NWS handbook #7, table 10.7)	
✓	PL	Pressure, sea level	IN-HG, KPA,PSI
✓	PM	Probability of measurable precipitation (dimensionless)(coded, see table 22)	
✓	PN	Precipitation Normal	IN,MM
✓	PP	Precipitation (Includes liquid amount of new snowfall), actual increment - discrete increase in precipitation amount over a specified duration.	IN, MM
✓	PR	Precipitation Rate - average precipitation rate (per day).	IN/day, MM/day
✓	PT	Precipitation, Type (coded, see table 17)	
	Q DISCHARGE		
✓	QD	Discharge, canal diversion - flow diverted to a canal or auxiliary channel.	(KCFS, CMS)
✓	QF	Discharge velocity - flow measured at points along a stream.	(MPH, KPH)
✓	QG	Discharge from power generation - flow passing through turbines generating power.	(KCFS, CMS)
✓	QI	Discharge, inflow - flow into a specified impoundment.	(KCFS, CMS)
✓	QL	Discharge, rule curve	(KCFS, CMS)
✓	QN	Discharge, minimum flow over a duration of 24 hours.	(KCFS, CMS)
✓	QR	Discharge, river - flow measured at points along a stream.	(KCFS, CMS)
✓	QS	Discharge, spillway - flow measured at a structure which bypasses the streamflow at the dam after the reservoir has been filled to capacity.	(KCFS, CMS)
✓	QU	Discharge, controlled by regulating outlet - flow measured through regulating outlet(s).	(KCFS, CMS)
✓	QX	Discharge, maximum flow over a duration of 24 hours.	(KCFS, CMS)
	R RADIATION		

✓	RA	Radiation, albedo	(%)
✓	RI	Radiation, accumulated incoming solar over specified duration in langleys	(LY)
✓	RN	Radiation, net radiometers	(watts/meter squared)
✓	RP	Radiation, sunshine percent of possible	(%)
✓	RT	Radiation, sunshine hours	(HRS)
✓	RW	Radiation, total incoming solar radiation	(watts/meter squared)
	S SNOW DATA		
✓	SD	Snow, depth - actual depth of snow on the ground at any instant during a storm, or after any single snowstorm or series of storms	(IN, CM)
✓	SF	Snow, depth, new snowfall - incremental depth of snow on the ground at any instant since last snow depth (SD) observation.	(IN, CM)
✓	SM	Snow, Melt	(IN, CM)
✓	SP	Snowmelt plus rain	(IN, CM)
✓	SW	Snow, water equivalent	(IN, MM)
	T TEMPERATURE DATA		
✓	TA	Temperature, air, wet bulb	(DF,DC)
✓	TD	Temperature, dew point	(DF,DC)
✓	TN	Temperature, minimum air temperature observed over a duration of 24 hours	(DF,DC)
✓	TW	Temperature, temperature of water at a specified depth.	(DF,DC)
✓	TX	Temperature, maximum air temperature observed over a duration of 24 hours.	(DF,DC)
	U WIND DATA		
✓	UC	Wind, accumulated wind travel	(MI,KM)
✓	UD	Wind, direction most frequently observed during a given period	(whole degrees)
✓	UG	Wind, gust at observation time	(MI/HR,M/SEC)
✓	UP	Peak wind speed, peak velocity of air in motion relative to the surface of the earth	(MPH)
✓	UR	Peak wind direction associated with peak wind speed	(in tens of degrees)
✓	US	Wind, speed, velocity of air in motion relative to the surface of the earth.	(MI/HR,M/SEC)
	V GENERATION AND GENERATOR DATA		
✓	VB	Voltage - battery (volt)	
	W WATER QUALITY		
✓	WC	Water, conductance	(uMHOS/CM)
✓	WD	Water, water depth - depth of water below soil surface used in computing the pore pressure of the soil Piezometer.	(IN, CM)
✓	WG	Water, dissolved total gases, pressure	(IN-HG, MM-HG)
✓	WH	Water, dissolved hydrogen sulfide	(PPM, MG/L)
✓	WI	Chloride	(PPM, MG/L)
✓	WL	Water, suspended sediment	(PPM, MG/L)
✓	WO	Water, dissolved oxygen - amount of oxygen dissolved in water.	(PPM, MG/L)
✓	WP	Water, ph	(PH value)
✓	WR	Water, Oxidation Reducing Potential / Redox	(mV)
✓	WT	Water, turbidity (WQB recommends units NTU be used)	(NTU, JTU)
✓	WV	Water, velocity - velocity of a particle(s) of water in a stream.	(FT/SEC, M/SEC, CM/SEC)
✓	WW	Water Density	(Kg/m3)

✓	WZ	Water Velocity End of measurement	(m, cm, ft)
	X WEATHER CODES		
✓	XR	Humidity, relative - ratio of the actual vapor pressure of the air to the saturation vapor pressure expressed in percent.	(%)
✓	XU	Humidity, absolute	(grams/FT3,grams/M3)
	Y RESERVED FOR UNIQUE, STATION SPECIFIC TYPE CODES		
		YA->YZ Assigned on an individual basis for unique data, except as noted below	
✓	YF	Forward power, a measurement of the DCP, antenna, and coaxial cable	(watts)
✓	YR	Reflected power, a measurement of the DCP, antenna, and coaxial cable	(watts)