SEVERN TRENT

SEVERN TRENT SERVICES OPERATIONS UK LTD

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Supplier(s)	b	Where this document or any documents referenced in this document refer to a Supplier or Suppliers, this means the party providing the services or works to STS.

Contents

1.0 Introduction

This document contains the Severn Trent Services Telemetry Signal List.

This is the definitive list of authorised signals that a site can have and additional signals cannot be added to a site if not included in this list.

The STS Telemetry System has been configured and set up with defined standards for the asset types.

In conjunction with the signal provision, configuration and alarm response standards the telemetry systems are an integral part of the asset management tool set.

1.1 Use of this Document

This document defines the range of signals for each process, to ensure adequate and consistent remote monitoring is achieved.

This document must be used each time

- A site has telemetry installed for the first time
- A site undergoes alterations, which affects the range of processes monitored or the volume of equipment monitored.

To obtain the required set of signals for a site

1. Separate out the individual processes for the site
2. Consult the relevant sections within this document to obtain the signals for each process
    - Alarms and levels are set based on RAMP, if available, for the process stream
    - In all cases alarms and set points must be approved by the Regional Manager

1.2 Document Key

Throughout this document, the following key is used to indicate the category of the signal

- A = signals for remote alarm reporting
- M = signals required for remotes asset management

1.3 Assumptions used in this Standard

The following assumptions were made in the development of this standard.

1.3.1 General

1. Exit procedures for sites will ensure all drives are left in “Auto” or “Off”. This negates the need to monitor the status of the drive, “Hand”, “Off”, “Auto”, etc.
2. No monitoring of the Emergency Water Supplies (EWS) is required.

1.3.2 Water Treatment and Distribution

1. Delivery pressure on boosters is not required to be reported on telemetry.
2. Chlorine dosing failures are recorded at individual dosing plants.
3. Chlorine residual will be measured to ensure “wholesome” water is being delivered.
4. A strategic flow or pressure monitoring point is a predetermined point of measurement. A collection of processes may have multiple strategic flow or pressure monitoring points.

1.3.3 Sewage Treatment

1. It is not required to monitor dissolved oxygen by telemetry. It is assumed that if the aeration plant is running, the consent is being met.

2.0 Compatibility

2.1 Master Station

STS's telemetry system is a Scope-X system using Xtraview 3 as a browser-based client.

2.2 Out Stations

The system is set up to use CSE Servelec / Seprol out stations (typically S250 or S500). Other out stations are not compatible with the system and are not accepted.

Most of the out stations use GSM modems, although where multiple out stations are in close proximity to each other, a master out station with a GSM modem (to communicate with the top end system) and a low power radio (to communicate with the other out stations nearby) can be installed.

Landlines are acceptable where GSM signals are weak or not available or are likely to be disrupted by external interference, such as RADAR, etc.

The telemetry system out stations are set up to dial in by exception (i.e. to report an alarm). In addition the top end system calls each out station three times per day to ensure the out station is functioning correctly and to download archive information.

3.0 Power Supplies

Telemetry systems and instrumentation must be powered by a mains electricity supply.

In circumstances where a mains power supply is not available, solar powered and wind powered systems are acceptable if the following conditions can be met

- It must be demonstrated that a mains power supply is not available within 50m of the out station
- The power systems and energy storage systems are designed to power the telemetry out station, modem and instrumentation for the duration of one week without sunlight or wind and without falling below 50% storage capacity all year round, taking into consideration seasonal variations in daily sunlight.
- It is permitted for the modem to enter the sleep mode but it must wake up when contacted by the STS master station. The STS master station will contact the out station three times per day.
- It is permitted for the instrumentation to power down for 15 minutes, then power on again for 15 minutes continuous to manage energy consumption, but the instrumentation must maintain continuous power in the event of an alarm condition occurring.
- The power systems and energy storage systems must be guaranteed for a period of three years from the handover to STS.

4.0 Development Projects

Where MoD development projects are taking place, additional telemetry required should be provided by the development project in accordance with this specification.

Out stations that are directly compatible with the STS master station should be supplied. New out stations should not require additional telephone lines, software or other hardware to be installed on the STS telemetry system.

STS will supply a suitable SIM card for any GSM out station installed once commissioning and handover of the assets is complete.

5.0 Signal Operation

5.1 Correct Installation and Operation for each Signal is Key

The correct installation and operation for each signal is key to the detection of failed states.

Below are the requirements for each type of signal

- Digital Inputs: digital inputs must be defined in the scope by STS and must be connected to the STS nominated input on the telemetry I/O to match the RTU configuration that will be provided by STS prior to End-2-End testing and must be installed such that a closed contact represents a healthy state. If the contact is fed from a relay, this relay must be energised when the equipment is healthy. This configuration ensures that if the circuit becomes disconnected, the alarm will be generated (i.e. fail safe).

- Analogue Signals: analogue signals will be calibrated and commissioned such that 4mA represents a zero measurement and 20mA represents full-scale measurement, this configuration ensures that fault conditions such as a circuit disconnection can be distinguished from a zero measurement.

- Analogue Inputs: for all analogue inputs, alarm points to be derived from the analogue inputs must be defined in the scope by STS, to match the RTU configuration that is provided by STS prior to End-2-End testing.

- Alarm Signals: a maintenance override push button is provided to override all alarms on site when undertaking routine operations and maintenance. This uses the 60 minute count down internal function of the RTU and an alarm is presented remotely to indicate the function has been initiated. The timer auto resets to enable the alarms, to avoid accidental long term inhibit of the alarms from site. The 60 minute count down interval maybe extended by a person on site to a maximum of another 60 minutes.

- RTU / SCOPE Configuration: the RTU / SCOPE configuration must be proved and tested off line prior to live End-2-End testing on site.

- Nuisance Alarms: the timed RTU bits are configured as a standard to facilitate the option to apply timed delays to manage nuisance alarm volumes risk assessed and approved.

5.2 Common Signals Between Processes

Some alarms are contained within more than one process. Where this occurs the out station will have one common signal which represents all the individual process states.

For example; the alarm *"Source Shutdown"* appears within a number of processes. However the out station has one alarm, which indicates that one or more of the processes has caused the source to shut down. The on site annunciation systems need to present the actual cause of the failure.

6.0 Signals

All signals are mapped to the timed BIT in the RTU configuration, with the option to apply a timed delay by the Operational Manager to reduce nuisance alarms.

All delay times are applied once risk assessed and approved by the Regional Manager.

Analogue alarm points are derived from the 4-20mA source and configured in the RTU to provide flexibility and reduction in site wiring and cost. Fail safes are hard wired based on risk and are identified in the scope of works based consequence of failure and approved by the Regional Manager.

Analogue derived alarm outputs may be inhibited for a timed period and / or derived from associated assets where process loop times / responses generate nuisance alarms for the period of the process loop time and / or if the associated asset (for example a disinfection dosing pump running / stopped) time delay. Derived alarms must be risk assessed and approved by the Regional Manager.

6.1 Standard Signals for all Plant Types

Signal Title	**Type**	**Comments**	**Category**	**Contact State**	
				0	**1**
Power failure	Digital	Power Failure will be measured by loss of power to the outstation – outstation on battery signal	A	Low	Normal
Intruder Alarm	Digital	Indicates that unauthorised entry to the site has been made	A	Alarm	Normal

6.2 Optional Signals

Where additional items of equipment have been installed due to site specific needs, the following signals should supplement the standard ones.

Signal Title	Type	Comments	Category	Contact State 0 | 1	
Fuel Level	Digital	Indicates the generator requires a fuel refill	A	Low	Normal
Fire Booster Running	Digital		A	Running	Stopped
Fire Alarm	Digital	Indicates that the fire alarm has been activated – where installed	A	Alarm	Normal

7.0 Water Treatment and Distribution Processes

7.1 Water Pumping Station – Borehole / Abstraction / Springs

For sites that have river abstraction, borehole or spring pumping stations the following signals must be monitored

Signal Title	Type	Comments	Category	Contact State 0 | 1	
Pump Running	Digital	Per pump Running / Standing	M	Standing	Running
Pump Failed	Digital	Per pump Failed / Healthy	A	Failed	Healthy
Pump Hand	Digital	Per pump Auto / Hand	A	Hand	Auto

7.2 Booster Station (Treated Water)

For sites that have on site booster stations the following signals must be monitored

Signal Title	Type	Comments	Category	Contact State 0 | 1	
Pump Running	Digital	Per pump Running / Standing	A/M	Standing	Running
Pump Failed	Digital	Per pump Failed / Healthy	A	Failed	Healthy
Pump Hand	Digital	Per pump Auto / Hand	A	Hand	Auto

7.3 Disinfection Dosing (Liquid)

For sites which use Chlorine, Sulphur or Ammonia based liquids within the disinfection process the following signals must be monitored

Signal Title	Type	Comments	Category	Contact State 0 | 1	
Disinfection Shutdown	Digital	Duty & standby dosing system failed Duty & standby dilution tank Low-Low Duty & standby catch pot high High Bund alarm High-High or Low-Low failsafe alarm 'timeout' from residual analyser (ME13A.10.4.3)	A	Alarm	Normal
Disinfection Equipment Malfunction	Digital	Duty & standby transfer system failed	A	Alarm	Normal
Duty System Failed	Digital	Duty dosing system failed Duty transfer system failed Duty dilution tank low-low Duty catch pot high	A	Failed	Healthy
Chemical/Gas Reorder	Digital	Stock tank low	A	Alarm	Normal

7.4 Disinfection Monitoring

For sites that use disinfection (gas or liquid) the following signals must be monitored for each stage of the process (Chlorination / de-chlorination)

Signal Title	Type	Comments	Category	Contact State 0 | 1
Chlorine Residual	Analogue	(4-20mA) Signal from monitor	A/M	Displays on site value.

7.5 Service reservoir (Including Towers and Tanks)

For sites that have reservoirs, towers or tanks the following signals must be monitored

Signal Title	Type	Comments	Category	Contact State 0 | 1	
Level/ Overflow	Digital	Low-Low or High-High Switch	A	Alarm	Normal
Level	Analogue	(4-20mA) Signal. Includes Software generated alarms, Low, Low-Low, High and High-High etc.	A/M	Displays on site value and derive HI HIHI and Lo LOLO alarms points from analogue outputs and set alarms remote at CCT	

7.6 Strategic Flow and Pressure Monitoring Points

For flow or pressure monitoring the following signals must be monitored

Signal Title	Type	Comments	Category	Contact State 0 | 1
Flow	Analogue	Includes Software generated alarms, Low, Low-Low, High and High-High etc.	A/M	Displays on site value
Integrated Flow	Pulse	Where suitable instrument exists	M	Displays on site value
Pressure	Analogue	Includes Software generated alarms, Low, Low-Low, High and High-High etc.	A/M	Displays on site value

7.7 Fire Boosters

For sites that have fire booster stations the following signals must be monitored

Signal Title	Type	Comments	Category	Contact State 0	Contact State 1
Jockey Pump Running	Digital	Per pump Running / Standing	M	Standing	Running
Jockey Pump Failed	Digital	Per pump Failed / Healthy	A	Failed	Healthy
Fire Pump Running	Digital	Per pump Running / Standing – For diesel pumps provide diesel pump running site visit required to reset remote alarm where auto stop facility is not installed to prevent pump damage	M	Standing	Running
Fire Pump Failed	Digital	Per pump Failed / Healthy	A	Failed	Healthy
Flow	Analogue	Includes Software generated alarms, Low, Low-Low, High and High-High etc.	A/M	Displays on site value	
Pressure	Analogue	Includes Software generated alarms, Low, Low-Low, High and High-High etc.	A/M	Displays on site value	

8.0 Sewage Treatment

8.1 Pumping Stations

Depending on the type of equipment installed, each pumping station must monitor the following signals

Signal Title	Type	Comments	Category	Contact State 0 | 1	
Pump Running	Digital	Per pump - Running / Standing	M	Standing	Running
Pump Failed	Digital	Per Pump - To include all failure modes, overload, low oil, over temp. etc.	A	Failed	Healthy
Wet Well Hi Level	Digital	Excessive level in well via separate Float Switch	A	High	Normal
Wet Well Level	Analogue	(4-20mA) Signal. Includes Software generated alarms, Low, Low-Low, High and High-High etc.	A/M	Displays on site value	
Ejector Running	Digital	Per Ejector - Running / Standing.	M	Standing	Running
Ejector Failed	Digital	Per Ejector - To include all failure modes, overload, low oil, over temp.	A	Failed	Healthy
Compressor Running	Digital	Per Compressor - Running / Standing	A	Failed	Healthy
Compressor Failed	Digital	Per Compressor - To include all failure modes, overload, low oil, over temp.	A	Failed	Healthy

8.2 Sewage Treatment Inlet Works

For sites that have inlet works the following signals must be monitored

Signal Title	Type	Comments	Category	Contact State 0 | 1	
Macerator Pump Running	Digital	Per pump Running / Standing Only where failure causes disruption to total works flow & or inlet flooding	M	Standing	Running
Macerator Pump Failed	Digital	Per pump Failed / Healthy Only where failure causes disruption to total works flow & or inlet flooding	A	Failed	Healthy
Screen Running	Digital	Per Screen Running signal for each mechanical screen.	A	Standing	Running
Screen Failed	Digital	Per Screen Failed signal for each mechanical screen.	A	Failed	Healthy
Screening/Grit Removal	Digital	Combined signal to give single alarm indicating the failure of any automated item of Screenings and / or Grit Removal Plant	A	Alarm	Normal

8.3 Flow Measurement

For sites that have MCERTS flow meters the following signals must be monitored

Signal Title	Type	Comments	Category	Contact State 0 | 1	
Flow	Analogue	Flow measurement required for ALL sites. Note in the event that the Inlet Flow is defined as the point of measurement in respect of UWWTD for any particular site then the Signal Title shall be 'UWWTD Inlet Flow (l/s)' (Where flow >50m3/D)	M	Displays on site value. Monitors the flow recorded by the MCERTS flowmeter at 15min intervals. Needs to use a serial cable from the MCERTS Instrumentation system to ensure the outstation records exactly the same value as the MCERTS datalogger, at the same time interval.	
Flow	Pulse	Only provided for sites where the Inlet Flow is defined as the point of measurement in respect of UWWTD.	M	Displays Totalised Flow	
Flow Meter Failed	Digital	Signal picked up from the measurement unit	A	Failed	Healthy

8.4 Storm / Flow Control Tanks

If storm / flow tanks require monitoring, the following signals must be monitored

Signal Title	Type	Comments	Category	Contact State 0 | 1
Overflow to Water Course	Analogue / Digital	Includes Software generated alarms, Low, Low-Low, High and High-High etc.	A/M	Displays on site value

8.5 Primary Sedimentation Tanks

Where rotating scraper bridges are installed, the following signals must be monitored

Signal Title	Type	Comments	Category	Contact State 0	1
Scraper Bridge Running	Digital	Per scraper bridge - Running / Standing	M	Standing	Running
Scraper Bridge Failed	Digital	Per scraper bridge - To include all failure modes, overload, low oil, over temp. etc.	A	Failed	Healthy

8.6 Aeration

For sites that have aeration plants the following signals must be monitored

Signal Title	Type	Comments	Category	Contact State 0 | 1	
Aerator Running	Digital	Per Aerator Motor	M	Standing	Running
Aerator Drive Failed	Digital	Per Aerator Motor	A	Failed	Healthy
Blower Running	Digital	Per Blower Motor	M	Standing	Running
Blower Motor Failed	Digital	Per Blower Motor Failed / Healthy	A	Failed	Healthy
Anoxic Zone Mixer Running	Digital	Per Anoxic Mixer	A	Standing	Running
Anoxic Zone Mixer Failed	Digital	Per Anoxic Mixer	A	Failed	Healthy
SAS Thickening Plant Common Alarm	Digital	To indicate the following failure modes within the Surplus Activated Sludge Plant: SAS Thickener Fail Thickened SAS Pump Fail Polymer Plant Fail	A	Alarm	Normal

8.7 Sludge Tanks – Thickening and Storage

Where on site digestion of sludge exists the following signals must be monitored

Signal Title	Type	Comments	Category	Contact State 0 | 1	
Tank High Level	Digital	Per Tank, where auto de-sludging is installed, to indicate the tank level is high, types of tank as follows: Continuous Picket Fence Thickener Primary Sludge Batch Thickening Tank Thickening Sludge Holding Tank	A	High	Normal

8.8 Humus Tanks / Final Settlement Tanks

Signal Title	Type	Comments	Category	Contact State 0 | 1	
FST Sludge Blanket High Level	Digital	Per Final Tank Where auto desludging is installed	A	Alarm	Normal
Scraper Bridge Running	Digital	Per scraper bridge - Running / Standing	M	Standing	Running
Scraper Bridge Failed	Digital	Per scraper bridge - To include all failure modes, overload, low oil, over temp. etc.	A	Failed	Healthy

8.9 Pumping Stations; Chemical Dosing – where applicable

Signal Title	Type	Comments	Category	Contact State 0 | 1	
Duty Dosing Pump Failed	Digital	Duty Pump failure – Include all failure modes	A	Failed	Healthy
Dosing Plant Shutdown	Digital	Alarm to include Main Bund High Alarm Dosing Bund High Alarm Duty & Standby Dosing System Failed PLC Failed Mixer Failed	A	Alarm	Normal
Storage Tank Reorder Level	Digital	Indicates that the dosing tank requires a refill	A	Low	Normal

8.10 Inter Stage / Process Pumps (eg Sludge Transfer, RAS, SAS, Liquor Returns, etc.)

Signal Title	Type	Comments	Category	Contact State 0 | 1	
Pump Running	Digital	Per pump Running / Standing	M	Standing	Running
Pump Failed	Digital	Per Pump - To include all failure modes, overload, low oil, no flow, over temp. etc. Macerators (where provided) should generate a common macerator / pump alarm on failure.	A	Failed	Healthy

8.11 Rotating Biological Contactor (RBC)

For sites that have RBC the following signals must be monitored

Signal Title	Type	Comments	Category	Contact State 0 | 1	
RBC Failed	Digital	Each RBC is to be monitored for Rotation Fail by a suitable rotation-monitoring device.	A	Failed	Healthy

8.12 Submerged Aerated Filters

For sites whose treatment facilities comprise a submerged aerated filter the following signals must be monitored

Signal Title	Type	Comments	Category	Contact State 0 | 1	
Aeration Failure	Digital	Indicates loss of air supply to the process (usually via a single pressure switch mounted on delivery side of blower(s))	A	Failed	Healthy

8.13 Biological Filter Beds

For sites that have rotating filter distributors the following signals must be monitored

Signal Title	Type	Comments	Category	Contact State 0 | 1	
Filter Distributor Loss of Rotation	Digital	Indicates loss of rotation of the distributor arms. For powered filters this can be derived from the drive system. For unpowered systems, the signal can be obtained by proximity switches on the filter arms. A timer is required to prevent false alarms.	A	Failed	Healthy

9.0 Sewerage

9.1 Pumping Stations

Depending on the type of equipment installed, each pumping station must monitor the following signals

Signal Title	Type	Comments	Category	Contact State 0 | 1	
Pump Running	Digital	Per pump - Running / Standing	M	Standing	Running
Pump Failed	Digital	Per Pump - To include all failure modes, overload, low oil, over temp. etc.	A	Failed	Healthy
Wet Well Hi Level	Digital	Excessive level in well via separate Float Switch	A	High	Normal
Wet Well Level	Analogue	(4-20mA) Signal. Includes Software generated alarms, Low, Low-Low, High and High-High etc.	A/M	Displays on site value	
Ejector Running	Digital	Per Ejector - Running / Standing.	M	Standing	Running
Ejector Failed	Digital	Per Ejector - To include all failure modes, overload, low oil, over temp.	A	Failed	Healthy
Compressor Running	Digital	Per Compressor - Running / Standing	A	Failed	Healthy
Compressor Failed	Digital	Per Compressor - To include all failure modes, overload, low oil, over temp.	A	Failed	Healthy

9.2 Pumping Stations; Chemical Dosing – where applicable

Signal Title	Type	Comments	Category	Contact State 0 | 1	
Duty Dosing Pump Failed	Digital	Duty Pump failure – Include all failure modes	A	Failed	Healthy
Dosing Plant Shutdown	Digital	Alarm to include Main Bund High Alarm Dosing Bund High Alarm Duty & Standby Dosing System Failed PLC Failed Mixer Failed	A	Alarm	Normal
Storage Tank Reorder Level	Digital	Indicates that the dosing tank requires a refill	A	Low	Normal

9.3 Oil Water Interceptors (OWI)

For sites where OWI are installed in the sewerage system the following signals must be monitored

Signal Title	Type	Comments	Category	Contact State 0 | 1	
Oil Level	Digital	Indicates that oil is present and requires emptying	A	Failed	Healthy
Silt alarm	Digital	Indicates that silt has settled within the OWI and requires emptying	A	Failed	Healthy

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