Market Code Schedule 16

Code Subsidiary Document No. 0203

Meter Read Submission: Validation

Version: ~~3.10~~4.0

Date: ~~2019-10-24~~2020-03-26

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Change History

Version Number	Date of Issue	Reason For Change	Change Control Reference	Sections Affected
1.0	14/05/2007			
1.1	31/08/2007			
1.2	08/03/2009	Enhanced usage threshold validation	MCCP020	
1.3	17/08/2009	Re-assessed Charges	MCCP035-CC	Section 2.1
1.4	29/03/2010	Changes to RF Calculation	MCCP046-CC	
1.5	27/09/2010	Validation on I Read	MCCP063	Section 2.1.5
1.6	25/03/2011	New Meter Read Type R Enduring Rollover Solution	MCCP073 MCCP053	Section 2.1.4 Section 2
2.0	2015-03-31	Estimated T Reads	MCCP141	Section 2
3.0	2019-10-24	Renaming Transactions	MCCP242	Various
3.1 4.0	2020-03-26	Addition of T015.2	MCCP185	Section 2

Table of Contents

1.   Purpose and Scope

This document sets out the validation process performed by the CMA on receipt of Meter Reads, to ensure that the Meter Reads are fit for use in the Settlement Process. Where a Meter Read does not meet these validation requirements, the CMA will notify the Trading Party as appropriate that further investigation is required.

2. Meter Read Submission Validation Description

This process will be run by the CMA on the receipt of Meter Read Submissions in the form of Data Transactions T005.0 (Submit Meter Read (SW)), T005.1 (Submit Meter Read (LP)) , T015.2 (Submit Back-dated SPID Status) and T017.0 (Submit Meter Swap) in accordance with CSD 0202 (Meter Read Submission: Process). All Meter Reads submitted must contain the Data Items set out against the relevant Data Transaction in the Data Transaction Catalogue.

Meter Read Types are set out in CSD 0202.

Under Section 5.10 of the Market Code, validation requires to be carried out in respect of:

- registration and content validation;
- treatment of duplicate data;
- rollover detection and validation;
- volume validation.

2.1 Registration and Content Validation

The purpose of this validation is to ensure that the combination of Licensed Provider, SPID and Meter ID is a valid Registration combination. If the provider of the Meter Read is Scottish Water, then only the SPID and Meter ID combination needs to be validated against SPID Data except in the case of Non-Market Meters where only the Meter ID needs to be validated.

The validation also checks that the Data Transaction content is valid (e.g. the Meter Read value is populated) and that the Meter Read date is not a date which is later than the date of submission of the Meter Read or earlier than the date of a previous Meter Read. except in the case of a T015.2.   Appendix 1 sets these out in detail.

2.1.1 Treatment of meters created since the market opening

For meters created since market opening using the notify meter details processes (Data Transactions T004.0, T004.2 T004.3) no read (other than an Opening Read) will be accepted without the presence of an I read. Meter Reads sent using Data transaction T005.0 (Submit Meter Read (SW)) to such meters where no I Read is present will be rejected by the CMA. The CMA will send a Data Transaction T009.0 (Notify Error/Acceptance (LP)) with the Error Code DF 'Effective from date predates previous change'.

For any T17 Meter Chain, no read can be submitted prior to an I read and for any meter, no read can be submitted prior to an I read or an O read. If a Data Transaction T005.0, T005.1, or T015.2 is submitted that is not in accordance with these requirements, the CMA will reject the Data Transaction and issue a T009.0 or T009.1 with a suitable Error Code.

2.1.2 Treatment of duplicate I and F Meter Reads

If more than one I or F Meter Read is provided for the same Meter ID, the CMA will check whether the later Meter Read Submission is an exact duplicate of the earlier Meter Read. Any difference will be reported on Data Transaction T009.1 (Notify Error/Acceptance (SW)) using the Error Code AT. Where Scottish Water wishes to replace the earlier Meter Read, it should follow CSD0105 (Error Rectification & Retrospective Amendments).

2.1.3 Treatment of duplicate date Meter Reads

If more than one Meter Read is provided for any single read date for the same Meter ID, the CMA will check the later Meter Read Submission for duplication of data with the previously validated Meter Read Submission. Any difference will be reported on Data Transaction T009.0 (Notify Error/Acceptance (LP)) or T009.1 (Notify Error/Acceptance (SW)) by the CMA for the later Meter Read Submission and the earlier Meter Read will be used in the Settlement process. Where a Trading Party wishes to replace the earlier Meter Read, it should follow CSD0105 (Error Rectification & Retrospective Amendments).

Error Notification is provided as set out in the table below.

Read Type	Read Value	Rollover Indicator	*Outcome*
Identical	Identical	Identical	*Ignore the second read as it is identical*
Identical	Differ	Identical	*Error notification sent with Error Code = BF*
Differ	Identical	Identical	*Error notification sent with Error Code = BF*
Differ	Differ	Identical	*Error notification sent with Error Code = BF*
Identical	Identical	Differ	*Error notification sent with Error Code = EH*
Identical	Differ	Differ	*Error notification sent with Error Code = EH*

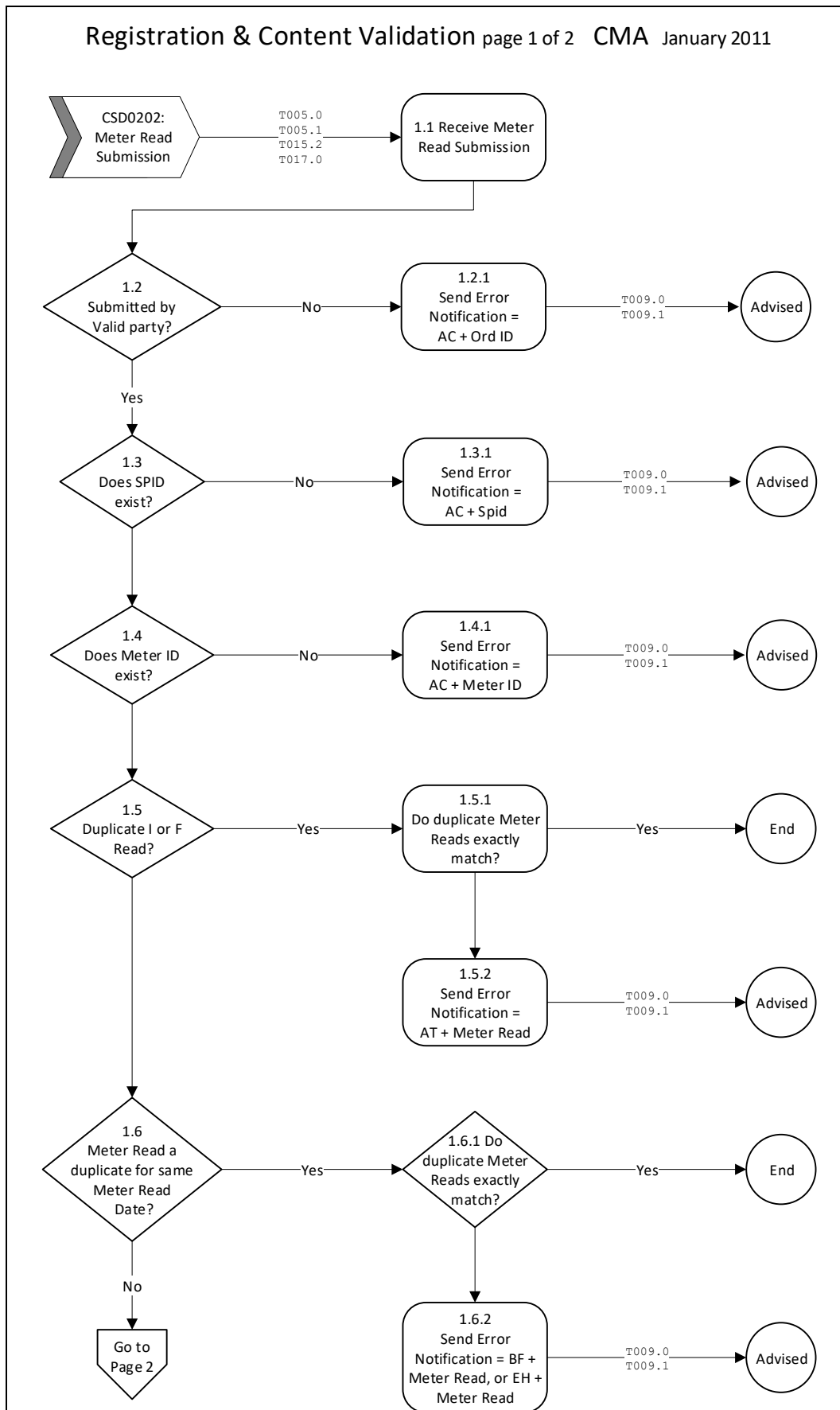| Differ	Identical	Differ	*Error notification sent with Error Code = EH*
Differ	Differ	Differ	*Error notification sent with Error Code = EH*

2.1.4 Pseudo Meters

For a Pseudo Meter, Registration validation will include verification that only permitted Meter Read Types are submitted. Only the Read Types Initial and Final are applicable and all other Read Types will not be accepted.

Meter Read Types that are not permitted will be rejected as follows:

i.   A Data Transaction T005.1 (Submit Meter Read (LP)) submitted by the Licensed Provider will be rejected using Error Code DI 'Transaction Not permitted'. For the avoidance of doubt, a T005.1 containing any of the following Meter Read Types will be rejected:

> C: Regular Cyclic Read;
>
> U: Customer Read;
>
> R: AMR Read;
>
> T: Transfer Read and
>
> S: Estimated Transfer Read

ii.   A Data Transaction T005.0 (Submit Meter Read (SW))submitted by Scottish Water containing any of the following Meter Read Types will be rejected using Error Code 'AT' (Meter Read Rejected: Read Type inappropriate):

> X: (Temporary Disconnection Read); and
>
> Y: (Reconnection Read).

iii. A Data Transaction T017.0 (Submit Meter Swap), that is Meter Read Types E (End Read) and O (Opening Read) submitted by Scottish Water will be rejected using Error Code 'DI' (Transaction not permitted).

2.1.5 Process Diagrams

Registration & Content Validation page 1 of 2   CMA   January 2011

CSD0202:
Meter Read
Submission

T005.0
T005.1
T015.2
T017.0

1.1 Receive Meter Read Submission

1.2 Submitted by Valid party?
— No →
1.2.1 Send Error Notification = AC + Ord ID
— T009.0 / T009.1 →
Advised

Yes ↓

1.3 Does SPID exist?
— No →
1.3.1 Send Error Notification = AC + Spid
— T009.0 / T009.1 →
Advised

↓

1.4 Does Meter ID exist?
— No →
1.4.1 Send Error Notification = AC + Meter ID
— T009.0 / T009.1 →
Advised

↓

1.5 Duplicate I or F Read?
— Yes →
1.5.1 Do duplicate Meter Reads exactly match?
— Yes →
End

↓

1.5.2 Send Error Notification = AT + Meter Read
— T009.0 / T009.1 →
Advised

↓

1.6 Meter Read a duplicate for same Meter Read Date?
— Yes →
1.6.1 Do duplicate Meter Reads exactly match?
— Yes →
End

No ↓

Go to Page 2

1.6.2 Send Error Notification = BF + Meter Read, or EH + Meter Read
— T009.0 / T009.1 →
Advised

From Page 1

1.7
Meter read submitted by SW?

—No→

1.7.1
SPID registered to LP submitting Meter Read?

—No→

1.7.2
If SS, is the Meter Read from WS LP at the same premises?

—No→

Yes ↓

Yes →

Yes →

No →

1.8
Is the Meter ID associated with the SPID?

—No→

1.8.1
Send notification of validation failure = BC + Meter ID

T009.0
T009.1

→ Advised

Yes ↓

1.7.3
Send notification of validation failure = BG + SPID/Org ID

1.9
Meter Read Data Item unpopulated?

—Yes→

1.9.1
Send notification of validation failure = AB + Meter Read

T009.0
T009.1

→ Advised

No ↓

T009.0
T009.1

1.10
Meter Read Date either in future or prior to previous read?

—Yes→

1.10.1
Send notification of validation failure = AC + Meter Read Date

T009.0
T009.1

→ Advised

Advised

No ↓

1.11
Meter Read where no I read is present

—Yes→

1.11
Send notification of validation failure = DF

T009.0
T009.1

→ Advised

No ↓

CSD0204:
Actual Daily Usage Calculation

2.1.6 Interface and Timetable Requirements

Step Ref:	When	Action/Decision	From	To	Data Transaction
1.1	Ad hoc	Receive Meter Read Submission	CMA	LP/SW	Meter Read Submission (T005.0, T005.1, T015.2, T017.0)
1.2		Does the submitter of the Meter Read have a recognised Organisation ID (Org ID)?	CMA		
1.2.1		If the submitter of the Meter Read is not a known Org ID, send Error Notification. Go to Validation Failure Reporting.	CMA	LP/SW	Error Transaction T009.0, T009.1
1.3		Is the SPID an existing SPID?	CMA		
1.3.1		If the SPID is not a known SPID send Error Notification. Go to Validation Failure Reporting.	CMA	LP/SW	Error Transaction T009.0, T009.1
1.4		Is the Meter ID an existing Meter ID?	CMA		
1.4.1	Daily	If the Meter ID is not a known Meter ID send Error Notification. Go to Validation Failure Reporting.	CMA	LP/SW	Error Transaction T009.0, T009.1
1.5		If a validated I or F Meter Read has been submitted for this Meter ID with the same Meter Read Date go to 1.5.1 otherwise go to 1.6	CMA		
1.5.1		Do all the Meter Read Data Items for the previous and current Meter Read exactly match, if so the process ends, otherwise go to 1.5.2	CMA		
1.5.2		If all the Meter Read Data Item values do not match, send error. Go to Validation Failure Reporting	CMA	LP/SW	Error Transaction T009.0, T009.1
1.6		If a validated Meter Read has been submitted for this Meter ID with the same Meter Read Date go to 1.6.1 otherwise go to 1.7	CMA		
1.6.1		Do all the Meter Reads for the previous and current Meter Read exactly match, if so the process ends, otherwise go to 1.6.2	CMA		
1.6.2		If all the Meter Read Data Item values do not match send error, go to Validation Failure Reporting.	CMA	LP/SW	Error Transaction T009.0, T009.1
1.7		If the Meter Read Provider is Scottish Water go to 1.8, otherwise go to 1.7.1.	CMA		

Step Ref:	When	Action/Decision	From	To	Data Transaction
1.7.1		Is the SPID registered to the Meter Read providing Market Participant, or corresponding SS SPID if RWSM if so go to 1.7 otherwise go to 1.6.2	CMA		
1.7.2		If the SPID is not registered to the Org ID of the Meter Read Provider send Error Notification. Go to Validation Failure Reporting.	CMA	LP/SW	Error Transaction T009.0, T009.1
1.8		Is the Meter ID associated with the SPID, if so go to 1.9, otherwise go to step 1.8.1	CMA		
1.8.1		If the Meter ID is not associated with the SPID send Error Notification. Go to Validation Failure Reporting.	CMA	LP/SW	Error Transaction T009.0, T009.1
1.9		If the Meter Read is unpopulated go to 1.9.1, otherwise go to 1.10	CMA		
1.9.1		If the Meter Read is unpopulated send Error Notification. Go to Validation Failure Reporting.	CMA	LP/SW	Error Transaction T009.0, T009.1
1.10		Is the Meter Read date prior to previous Meter Read or after the submission date, if not go to 1.10.1, otherwise go to 2.	CMA		
1.10.1		If the Meter Read date is in the future send Error Notification. Go to Validation Failure Reporting, otherwise go to 1.10	CMA	LP/SW	Error Transaction T009.0, T009.1
1.11		If the Meter Read is submitted for a meter notified since the market opening Date where no I Read is present, go to Validation Failure Reporting.	CMA	LP/SW	Error Transaction T009.0, T009.1

2.2 Rollover Detection and Validation

2.2.1 Rollover Detection

Following the submission of any meter read which passes registration and content validation the CMA will use the Rollover Detection Algorithm (RDA) (Appendix 2) to determine whether a meter rollover has occurred. The algorithm will return (internally to the Central System) one of three states:

- Not a rollover
- Rollover
- Indeterminate

2.2.2 Rollover Validation

The CMA will then compare the results of the Rollover Detection Algorithm with the Rollover Indicator optionally submitted with the meter read.

	Rollover_Indicator: True	Rollover_Indicator: False	Rollover_Indicator Not set
RDA: Rollover	AGREE Rollover Flag TRUE	DISAGREE	AGREE Rollover Flag TRUE
RDA: Not Rollover	DISAGREE	AGREE Rollover Flag FALSE	AGREE Rollover Flag FALSE
RDA: Indeterminate	AGREE Rollover Flag TRUE	AGREE Rollover Flag FALSE	QUERY

Where the result of the comparison process is either

- DISAGREE;or
- QUERY

the CMA will reject the meter read and return either a T009.0 (Notify Error/Acceptance (LP)) in the case of an LP read, or a T009.1 (Notify Error/Acceptance (SW) in the case of an SW read containing the error codes

- EE:Central Systems disagree with the Rollover Indicator provided; or
- EF:Unable to determine the Rollover Status. Please supply Rollover Indicator

respectively.

For the avoidance of doubt, where the CMA rejects a meter read as a result of either DISAGREE or QUERY, the CMA will not retain a copy of the meter read. Subsequent submissions of the same meter read would therefore not be considered in respect for either duplicate checking or as a potential re-read.

Where the results of the comparison process is

- AGREE

the CMA will set the Rollover Flag based upon the table above, record that the candidate meter read has been submitted (to allow potential future meter re-reads),and proceed to volume validation.

2.3 Volume Validation

The CMA will calculate the Candidate Daily Volume supplied to a meter in relation to a Supply Point as:

$$CDV = \frac{(R_1 - R_0) + flag * 10^n}{(D_1 - D_0)}$$

where

R_1 is the value shown in the submitted Meter Read;

*Flag*has the value 1 if the Rollover Flag determined in accordance with Section 2.2 is True; and*flag* has the value 0 if the Rollover Flag is False;

R_0 is the value shown in the previous Meter Read;

D_1 is the date of the submitted Meter Read; and

D_0 is the date of the previous Meter Read.

and will validate the Meter Read submitted to it in respect of that meter. The CMA will not carry out such validation in respect of Type I, Type O and Type Y Meter Reads, because there will no relevant Candidate Daily Volume associated to these.

2.3.1 Threshold Validation

The CMA will check the value of the Candidate Daily Volume calculated for a meter relating to a Supply Point using the formulae below. The read submission will either be accepted with an OK response or rejected with an error code as per the following table.

Where:
CDV is the Candidate Daily Volume in m^3 computed using the new candidate meter read; and PEDV is the latest Prior Estimated Daily Volume in m^3 for the same period computed using the previously accepted meter reads.

Note that in calculating the CDV and PEDV values in respect of volume validation, no account is taken of either temporary disconnection or vacancy.

PEDV Value	CDV Value	Acceptance (OK) or Error Return Code as per D4004
PEDV <=0	CDV = 0; SPID Vacant = True	*OK*
	CDV = 0; SPID Vacant = False	*BZ*
	-3 < CDV <0	*BN*
	CDV <= -3	*BV*
	0 < CDV	*BH*
0 < PEDV	CDV = 0; SPID Vacant = True	*OK*
	CDV = 0; SPID Vacant = False	*BZ*
	-3 < CDV < 0	*BN*
	CDV <= -3	*BV*
	CDV < 0.2 * PEDV	*BL*
	2 * PEDV < CDV	*BH*
	0.2 * PEDV <= CDV <= 2 * PEDV	*OK*

Section 2.8 of CSD0202 Meter Read Submission Process describes the use of Re-reads.

2.3.2 Capacity Limit Validation

The CMA will check the Candidate Daily Volume calculated for a meter related to a Supply Point, by comparing its value to the value of the maximum Volume that the CMA considers could have been supplied to the meter related to the Supply Point. The CMA will derive the value of that maximum Volume from the physical meter size, as notified by Scottish Water for each Supply Point. The CMA will consider the value of the Candidate Daily Volume to be validated if it is less than the value of the maximum Volume that could have been supplied to that meter, divided by the number of days in the relevant Year, as shown by the following formula:
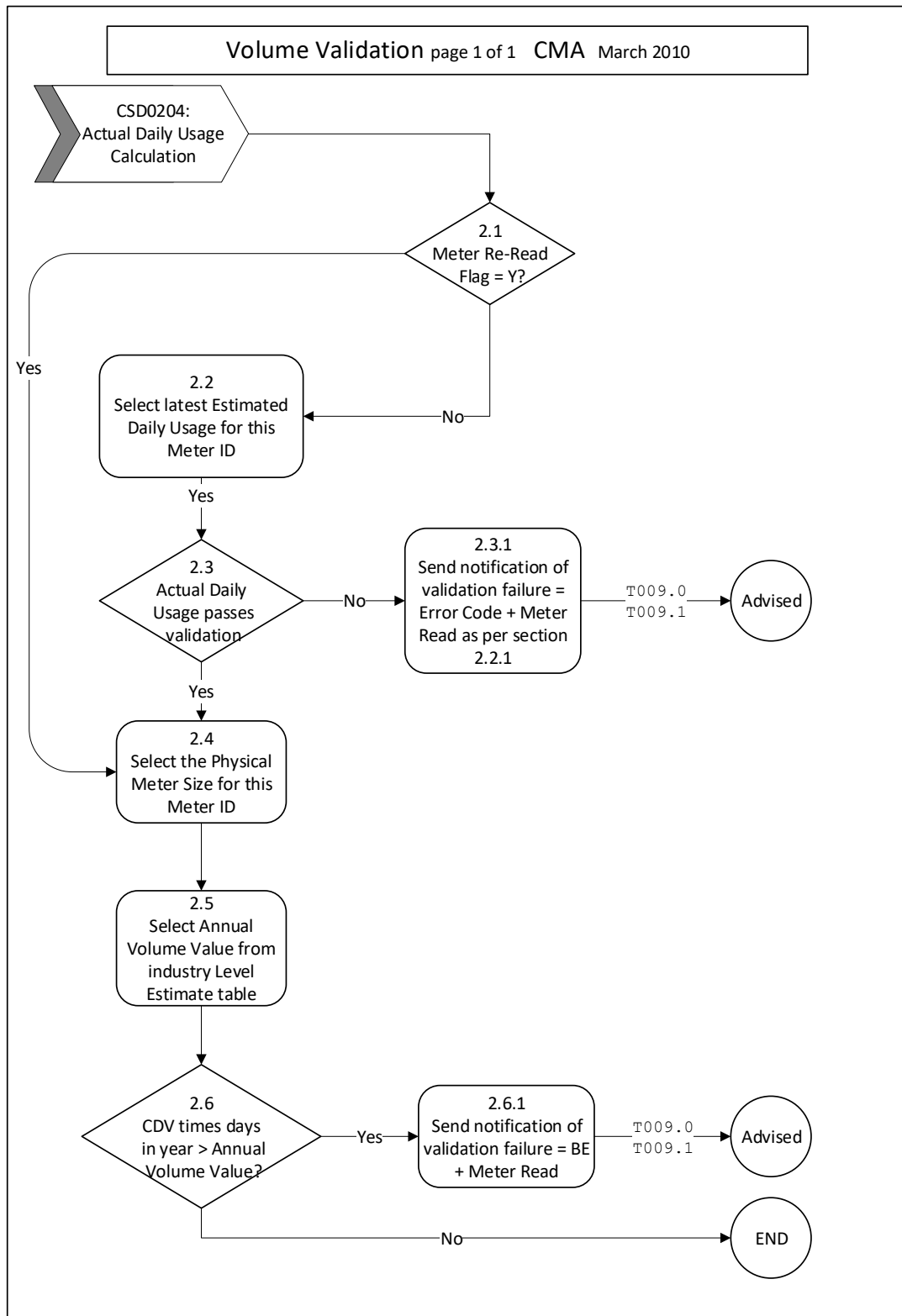

$$\text{If } CDV < (MAC_i / DIY)$$

Where:

CDV is the value of the Candidate Daily Volume that the CMA calculated for the meter;

MAC_K is the value of the maximum Volume that could have been supplied to the meter K (as derived from the relevant physical meter size); and

DIY is the number of days in the Year.

Once it has validated a Meter Read, the CMA will make the data from that Meter Read available to Trading Parties in accordance with CSD0202 (Meter Read Submission Process).

2.3.3 Process Diagrams

Volume Validation page 1 of 1   CMA   March 2010

```
CSD0204:
Actual Daily Usage
Calculation
        │
        ▼
     ┌─────────┐
     │   2.1   │
     │ Meter Re-Read │
     │ Flag = Y?│
     └─────────┘
      │No      │Yes
      ▼        │
┌──────────────┐ │
│     2.2      │ │
│ Select latest │ │
│ Estimated    │ │
│ Daily Usage for this │ │
│ Meter ID     │ │
└──────────────┘ │
      │Yes       │
      ▼          │
   ┌────────┐    │        ┌──────────────┐          ┌─────────┐
   │  2.3   │ No │        │    2.3.1     │ T009.0   │ Advised │
   │ Actual Daily │───────▶│ Send notification of │ T009.1  └─────────┘
   │ Usage passes │        │ validation failure = │
   │ validation   │        │ Error Code + Meter   │
   └────────┘    │        │ Read as per section  │
      │Yes       │        │      2.2.1           │
      ▼          │        └──────────────┘
┌──────────────┐ │
│     2.4      │◀┘
│ Select the Physical │
│ Meter Size for this │
│ Meter ID     │
└──────────────┘
      │
      ▼
┌──────────────┐
│     2.5      │
│ Select Annual │
│ Volume Value from │
│ industry Level │
│ Estimate table │
└──────────────┘
      │
      ▼
   ┌────────┐    Yes      ┌──────────────┐          ┌─────────┐
   │  2.6   │────────────▶│    2.6.1     │ T009.0   │ Advised │
   │ CDV times days │     │ Send notification of │ T009.1  └─────────┘
   │ in year > Annual │   │ validation failure = BE │
   │ Volume Value? │     │ + Meter Read │
   └────────┘            └──────────────┘
      │No
      ▼                                              ┌─────────┐
      ──────────────── No ──────────────────────────▶│   END   │
                                                      └─────────┘
```

2.3.4 Interface and Timetable Requirements

Step Ref:	When	Action/Decision	From	To	Information/Transaction
2.1		Is the Meter Re-Read Flag = 'Y', if so go to 2.4.	CMA		Meter Re-Read Flag
2.2		Select the latest Estimate Daily Volume for this Meter ID	CMA		Estimate Daily Volume, Meter ID
2.3		Does the Candidate Daily Volume fail the validation steps described in section 2.2.1? If so go to 2.3.1, if not go to 2.4	CMA		SPID, Meter ID, SPID Vacant Flag, Candidate Daily Volume, Estimated Daily Volume
2.3.1		If the Candidate Daily Volume fails the threshold validation described in section 2.2.1, send appropriate Error Message	CMA		Error Transaction T009.0, T009.1
2.4		Select the Actual Meter Size from the Registration Details for this Meter ID	CMA		SPID, Meter ID, Actual Meter Size
2.5		Using the Actual Meter Size and the Industry Level Estimate Table (Part of Standing Data), select the Annual Volume	CMA		Actual Meter Size, Industry Level Estimate Table, Annual Volume
2.6		If the Candidate Daily Volume * Number of days in the year (to annualise) is more than the Annual Volume go to 2.6.1. Otherwise End	CMA		Candidate Daily Volume, Annual Volume
2.6.1		If the Annualised Candidate Daily Volume is more than the Annual Volume send Error Notification, Validation Failure Reporting	CMA		Error Transaction T009.0, T009.1

2.4 Validation Failure - Error Transactions

In the event that a Meter Read fails validation, the CMA will notify the Party who submitted the Meter Read, using Data Transaction T009.0 (Notify Error/Acceptance (LP)) or T009.1 (Notify Error/Acceptance (SW)).

Meter Reads that fail rollover detection and validation will not be recorded in the Meter Read history. However, Meter Reads that fail threshold validation will be recorded in the Meter Read history, although they will not be used in any subsequent Volumetric Charge Calculations.

The Data Transaction for each failed Meter Read Submission will contain the Data Items set out against the relevant Data Transaction in the Data Transaction Catalogue.

The Error Codes are fully defined in the Data Transaction Catalogue.

On receipt of a T009.0 or T009.1 the Trading Party will need to investigate the error.

Rollover Detection and Validation Failure.
Where the Error Code is an "EF", the Trading Party should submit a new Meter Read with the Rollover Indicator appropriately set. The Meter Read should not be resubmitted as a Re-Read. Where the Error Code is an "EE", then there is a disagreement between the CMA and the User. The Trading Party should update the information and submit a new Meter Read. Where the Trading Party believes that the Meter Read and Rollover Indicator to be correct they should contact the CMA to make appropriate amendments to the Meter Read history using CSD 0105 Error Rectification and Retrospective Amendment to ensure that the failure does not re-occur, before submitting a new Meter Read with the same Data values.

Volume Validation Failure
 Where the Error Code is "BH", "BL", "BZ", "BN" or "BV", and the Trading Party believes the Meter Read to be correct, they should resubmit the Meter Read as a Re-Read or otherwise they should update the information required to ensure the failure will not reoccur and submit a new Meter Read.

Appendix 1 – Validation Failure Types

A full description of each validation failure type is provided below. The DTC contains all the Error Codes and Data Items (summarised in section 1.1).

Unrecognised Organisation ID – error occurring when the Licensed Provider's Organisation ID is not recognised as being within the market. This could occur as a result of either:

- an error occurring during the production of the Data Transaction; or
- because the party is not registered with the CMA when the Meter Read is received.

Unrecognised SPID – error occurring when the CMA does not have a record of the Supply Point in its system. This anomaly could occur as a result of either:

- an error occurring during the production of the Data Transaction; or
- because the SPID is not registered with the CMA when the meter read is received.

Unrecognised Meter ID – error occurring when the CMA does not have a record of the meter in its system. This anomaly could occur as a result of either:

- an error occurring during the production of the Data Transaction; or
- because the meter has not been registered with the CMA when the Meter Read is received.

SPID not Registered to this Licensed Provider – error occurring when a mismatch exists between the Licensed Provider and SPID held CMA registration data within the Meter Read Submission. Here the SPID is not registered for that Licensed Provider for the Meter Read date being submitted. The error may occur because:

- registration data has not been updated upon a Transfer Registration;
- the SPID has incorrectly populated; or
- the SPID has transferred to a new Licensed Provider.

Meter ID not associated with this SPID – error occurring when a mismatch exists between the Meter ID and SPID within the Meter Read Submission. The meter ID is not associated with that SPID at the Meter Read date being submitted. The error may occur because:

- registration data has not been updated upon a meter change;
- the SPID has incorrectly populated; or
- the Meter ID has been incorrectly populated.

Missing Meter Read value – error occurring when the Meter Read Submission does not contain a Meter Read value for the Volume. This Data Item should be populated and the submission remade.

Meter Read Date invalid – error occurring when the Meter Read Date is in the future or before the previous Meter Read Date. The Licensed Provider should check the Meter Read Date and resubmit the Meter Read Submission with the correct Meter Read Date, if necessary.

Outside Volume threshold – error occurs when the standard threshold used to sense check Volume have been broken. This may result from:

- A large change in the Volume pattern at the site and be correct;
- A meter fault having occurred requiring resolution; or
- Incorrect population of the Meter Read field resulting in erroneous Volume.

Where the Meter Read has been certified as correct, the Meter Read can be resubmitted as a Re-Read.

Outside Volume capacity limit – error occurs when the capacity threshold has been broken. This may result from either:

- A meter fault having occurred requiring resolution; or
- Incorrect population of the Meter Read field resulting in erroneous Volume.

Duplicate Meter Read mismatch – error occurs when a Meter Read is submitted by a Licensed Provider with the same Meter Read Date, but different Meter Read Data Item values, as a Meter Read Submission previously submitted by another Licensed Provider. The mismatch should be investigated and resolved.

I and F Meter Read mismatch – error occurs when a second I or F Meter Read is submitted by Scottish Water but with different values. The mismatch should be investigated and resolved.

Appendix 2 – Rollover Detection Algorithm

Terminology

The following terminology is used:

			Previous Read	Candidate Read
Reads	R_{-2}	R_{-1}	R_0	R_1
Advances		A_{-2}	A_{-1}	A_0
Daily Rates Of Advance		DRA_{-2}	DRA_{-1}	DRA_0

The new candidate read R_1 will always exist.
The most recent previous read is R_0, and may or may not exist.
If R_0 exists, the second most previous read is R_{-1} and may or may not exist.
If R_{-1} exists, the third most previous read is R_{-2} and may or may not exist.

Similarly the advances between the reads A_{-2}, A_{-1} and A_0, may or may not exist. The advance A_0 will be calculated for the purposes of this algorithm on the assumption that a rollover has taken place between the reads is R_0 and R_{-1},

Corresponding to the advances A_{-2}, A_{-1} and A_0, the Daily Rates of Advance DRA_{-2}, DRA_{-1} and DRA_0 are calculated taking account of the number of days between the dates of the reads, but taking no account of either vacancy or temporary disconnection.

The number of dial digits on the meter is n.

Outline Algorithm

The Rollover Detection Algorithm first carries out the tests for the state:
- Not a Rollover;

Those reads which have failed the first test: "Not a Rollover", are then tested for the state
- Rollover.

Any reads which fail both the "Not a Rollover" and the "Rollover" tests are classified as
- Indeterminate

The algorithms below contain a number of configurable parameters. For the avoidance of doubt, while these parameters can be altered – they are subject to formal change control, and will be as specified within this CSD.

Not A Rollover

In order for the Rollover Detection Algorithm to return the state of "Not Rollover" the following conditions must be met.

Either:

    R_0 does not exist (ie this is a first read) ;

or

    $R_1 - R_0 > - (Q_1 + Q_2 * 10^n)$

    Where Q_1 and Q_2 are configurable parameters as specified below.

Rollover

In order for the Rollover Detection Algorithm to return the state "Rollover" the following condition must be met[1]:

Rollover = { (*UseTestOriginal* and (Passes Original Rollover Algorithm)) }
    OR
  {
       [(Not *UseTest1*) or (Passes Test 1)] AND
       [(Not *UseTest2*) or (Passes Test 2)] AND
       [(Not *UseTest3*) or (Passes Test 3)] AND
       [(Not *UseTest4*) or (Passes Test 4)] AND
       [(Not *UseTest5*) or (Passes Test 5)] }

where
- *UseTestOriginal*
- *UseTest1*
- *UseTest2*
- *UseTest3*
- *UseTest4*
- *UseTest5*

are configurable parameters indicating whether the subtests:
- Original Rollover Algorithm
- Test 1
- Test 2
- Test 3
- Test 4
- Test 5

are applied or not

These sub tests are defined as follows:

Original Rollover algorithm:
- R_0 and R_1 exist;
- $R_0 >= 99 * 10^{n-2}$; and
- $R_1 < 10^{n-2}$

Test 1
- R_0 and R_1 exist;
- $R_0 >= V_0 * 10^{n-2}$
- R_0 is *Not a Rollover*
- $R_1 < V_1 * 10^{n-2}$

where V_0 and V_1 are configurable parameters (integers).

Test 2
- R_{-1}, R_0 and R_1 exist
- R_{-1} is *Not a Rollover*
- R_0 is *Not a Rollover*

---

[1] Note: This expression for Rollover assumes that at least one of the variables *UseTest1* ..*UseTest5* is set to be True. In the unlikely event that all of these variables were selected to be False (ie a move back to the original test for rollover), the expression for Rollover would have to be rewritten; as otherwise the expression as written always returns the result True.

- $P_{low} * DRA_{-1} < DRA_0 < P_{high} * DRA_{-1}$

Where Plow and Phigh are configurable proportions (specified as a decimal with up to two decimal places) – for example 0.2 and 2.0.

In calculating Test 2 it will be assumed that a rollover has taken place for the purposes of determining DRA_0. However, this assumption is specific to this Test 2, and will not affect any other setting or determination of the rollover flag associated with the meter read R_0.

Test 3

- R_0 and R_1 exist
- R_0 is *Not a Rollover*
- $10^n + R_1 - R_0 < P_1 * 10^n$

where P_1 is a configurable parameter (specified as a decimal with up to two decimal places).

Test 4

- R_{-1} and R_0 to exist
- R_{-1} is *Not a Rollover*
- R_0 is *Not a Rollover*
- $R_0 - R_{-1} < P_2 * 10^n$

where P_2 is a configurable parameter (specified as a decimal with up to two decimal places).

Test 5

- R_{-2} and R_{-1} exist
- R_{-2} is *Not a Rollover*
- R_{-1} is *Not a Rollover*
- $R_{-1} - R_{-2} < P_3 * 10^n$

where P_3 is a configurable parameter (specified as a decimal with up to two decimal places) .

Indeterminate

The Rollover Detection Algorithm will return the state "Indeterminate" if the meter reads do not fall into either of the states "Not a Rollover" or "Rollover".
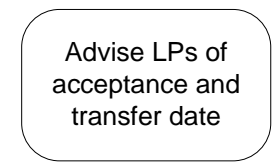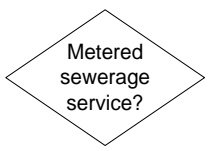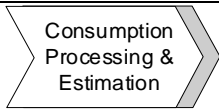
Parameters
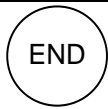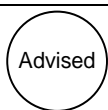
The CMA will set the Rollover Detection Algorithm parameters as follows:

Q_1	1000
Q_2	0
UseTestOriginal	FALSE
UseTest1	TRUE
UseTest2	TRUE
UseTest3	TRUE
UseTest4	TRUE
UseTest5	TRUE
V_0	90
V_1	10
Plow	0.2
Phigh	2.0

P_1	0.1
P_2	0.1
P_3	0.1

Appendix 3 – Process Diagram Symbols

As used in this document

Symbol	Name	Details
Advise LPs of acceptance and transfer date	Step	An action step. It appears in the "swimlane" of the party responsible for performing the action.
Metered sewerage service?	Decision	A decisive question rather than an action. Followed by Yes or No, or occasionally WS (Water Service) or SS (Sewerage Service) the process splits depending on the answer to the question in the decision diamond.
Consumption Processing & Estimation	To another process	A flow in, or input to, another documented process
New Supply Point	From another process	A flow in, or output from another documented process.
END	End	Used after a decision diamond, generally to mean "do nothing" as it is the end of the process.
Advised	Advised	Used after a process step to show "passive" action on the part of a data flow receiver e.g. to represent "Advised" or "Invoiced"
1.2.1	Reference	Reference within each step or decision to the numbering in the tables
T005.2	Transaction reference	Reference to the data transaction occurring as an output from the step it appears next to.