

A HISTORY OF AQC

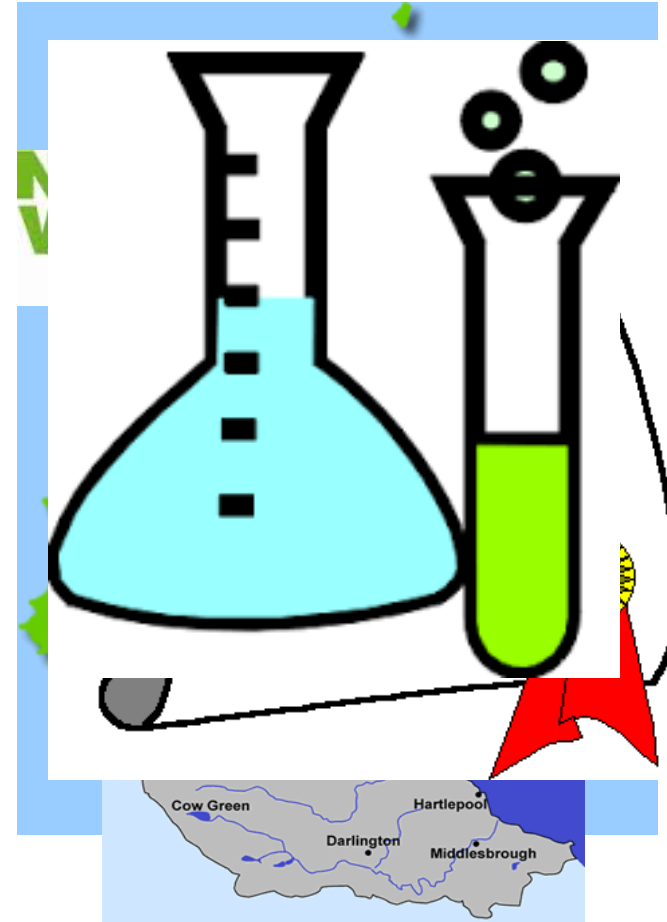
CONTENTS

- 1 Background
- 2 What is AQC?
- 3 The Evolution of AQC
- 4 Where we are now
- 5 What's on the horizon

NORTHUMBRIAN WATER BACKGROUND INFORMATION

- Northumbrian Water Group supplies 3.5 million people with drinking water and sewage services across two areas – North East England and Essex and Suffolk
- Scientific Services operate 5 laboratories across the UK – Newcastle, Horsley, Chelmsford, Cork & Levenmouth
- Accreditation for drinking water, effluents, and sampling and analysis
- Around 1.5 million tests each year

ESSEX & SUFFOLK
WATER *living water*



WHAT IS AQC?

WHAT IS AQC? INTRODUCTION

Analytical quality control (AQC), sometimes known as internal quality assurance (IQA)

WHAT IS AQC?

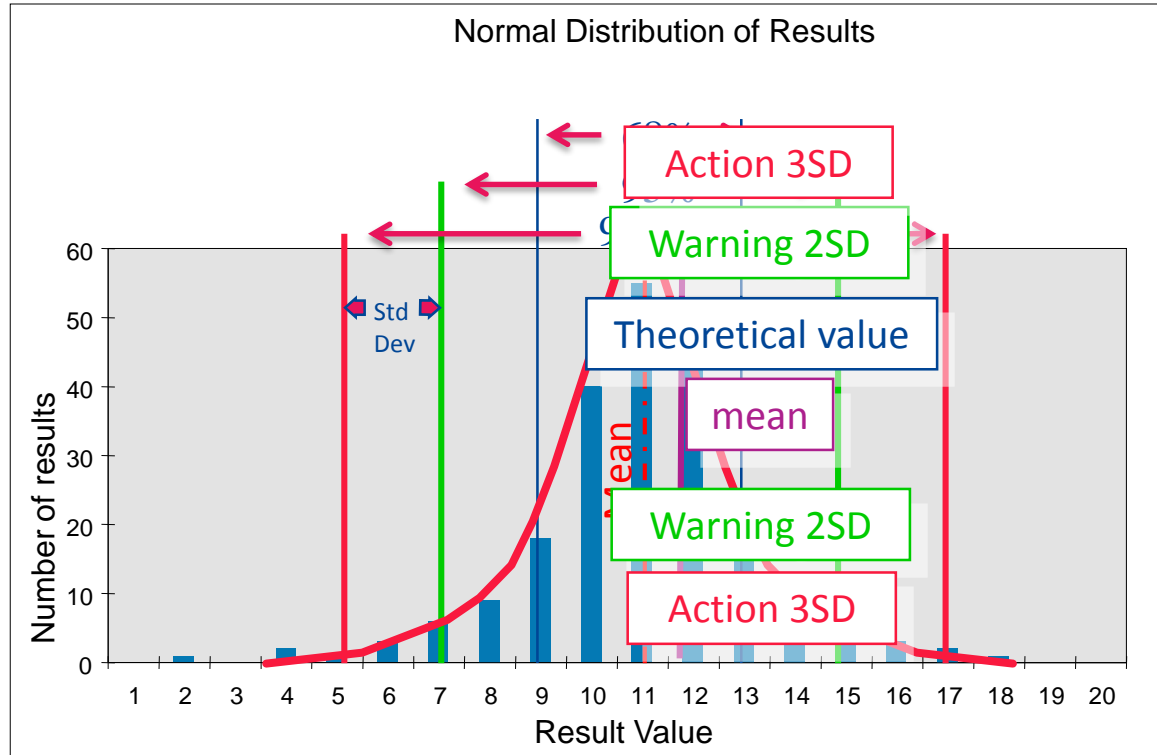
WHAT DO WE DO WITH THE DATA?

- 
- AQC results are plotted on Shewhart charts

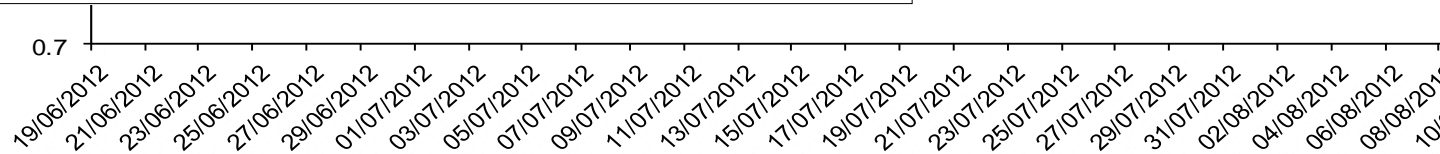
WHAT IS AQC?

WHAT ARE SHEWART CHARTS?

Control Chart



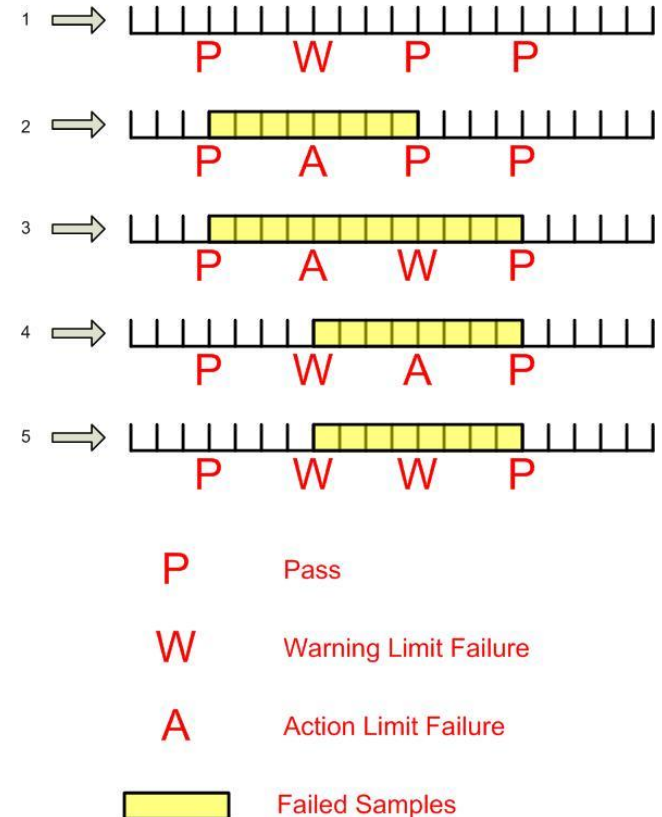
std value



WHAT IS AQC?

WHEN DO WE ACCEPT A RESULT?

- The AQC result(s) need to lie between the 2 SD limits for results to be reported
- One AQC result may be outside 2 SD, but two consecutive will lead to the analysis being repeated
- One AQC result outside the 3 SD limits means that results will not be reported
- Any AQC results outside 4 SD are considered an outlier and not included in chart limit production



THE EVOLUTION OF AQC WITHIN NORTHUMBRIAN WATER

THE EVOLUTION OF AQC A TIMELINE OF IMPROVEMENTS

Hand drawn
charts on graph
paper

Deterioration logs
& annotations
in

software
(tools)
integrated

Charts printed after
manual entry into Excel
and plotted by hand

1992

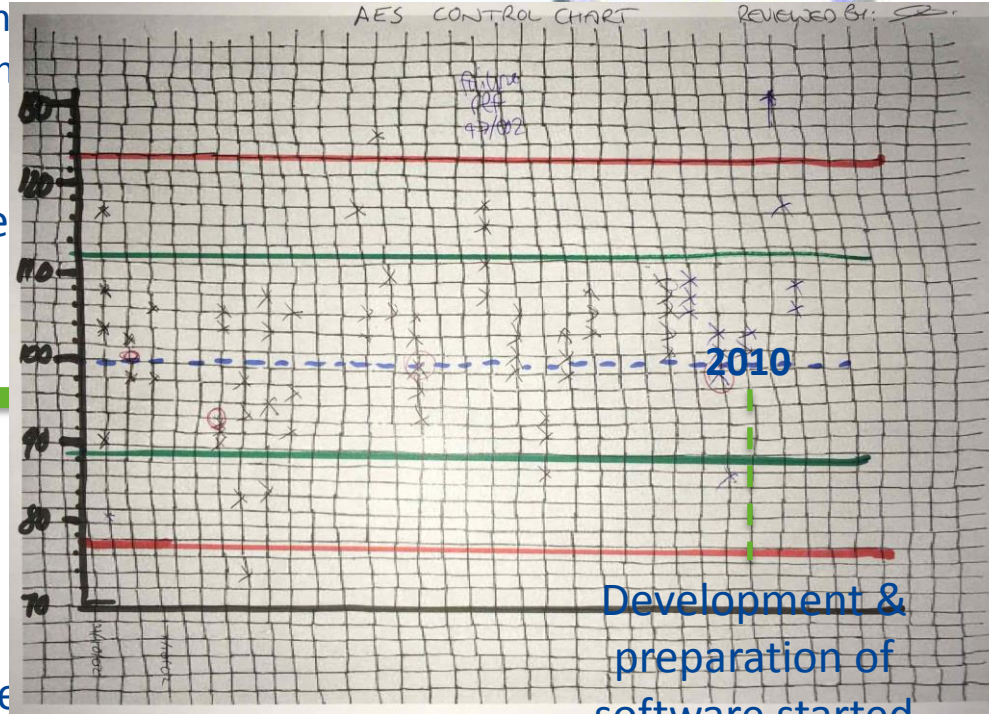
1997

1990

1995

UKAS
accreditation
granted

Data extracted
Lab database (LIMS)
for chart production



Development &
preparation of
software started

2014

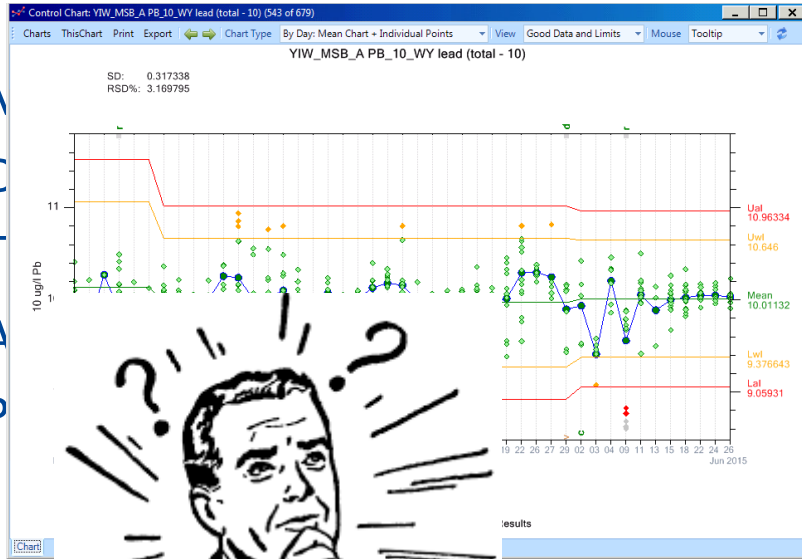
WHERE ARE WE NOW?

WHERE ARE WE NOW? BESPOKE SOFTWARE

All
determinands
use L4L which
in turn plots
data onto
electronic
charts

WHERE ARE WE NOW?

M
D
T
A
P



Aqc Exception for Result

Description Results and Limits Investigation Actions Shared Investigations

Checklist

- Instrument performance / Sensitivity
- Calibration
- Standard / Reagent expiry
- Standards / Reagents preparation logs
- Instrument Drift / Blockage
- Environment/Inter-logs

Investigation

Sensitivity drifted downwards after the second calibration. Reason for drift not found

Reason For Failure

Root Cause: Unknown

Effect on Samples: Re-analyse Samples

| | atory % | Aqc Expected Value | Current Limit's Mean | Current Limits Bias from Expected Value % | Current Limits RSD% | Dataset Mean | Dataset RSD% | Dataset Bias % | Dataset Bias from Expected Value % | Points in Dataset | Fail% | Warn% | Is dataset RSD% signif. greater than Target RSD%? | Is dataset Bias% signif. greater than Target Bias%? | Is dataset RSD% signif. different from current chart limits RSD%? | Is dataset Mean signif. different from current chart limit Mean? | Is dataset RSD% signif. greater than Regulatory RSD%? | Is dataset Bias% signif. greater than Regulatory Bias%? | |
|----------------------------------|---------|--------------------|----------------------|---|---------------------|--------------|--------------|----------------|------------------------------------|-------------------|-------|-------|---|---|---|--|---|---|----|
| IH SOLV_01_VV/trichloroethene | | 12.5 | 25 | 9.600 | 10.19417 | 6.19 | 3.1474038 | 10.14869 | 3.01804 | -0.44612 | 5.72 | 175 | 1.1 | 3.4 | N/A | N/A | No | No | No |
| IH SOLV_02_VV/tetrachloroethene | | 12.5 | 25 | 9.6 | 10.41731 | 8.51 | 4.5792531 | 10.16752 | 3.76543 | -2.39781 | 5.91 | 174 | 0 | 2.9 | N/A | N/A | Yes | No | No |
| IH SOLV_03_VV/tetrachloroethane | | 10 | 20 | 3.2 | 3.174275 | -0.80 | 3.8735868 | 3.14854 | 3.41225 | -0.81061 | -1.61 | 171 | 0 | 2.3 | N/A | N/A | Yes | No | No |
| IH SOLV_04_VV/benzene | | 12.5 | 25 | 0.96 | 1.015125 | 5.74 | 3.9376106 | 1.01820 | 3.35249 | 0.30315 | 6.06 | 173 | 0 | 1.7 | N/A | N/A | Yes | No | No |
| IH SOLV_05_VV/1,2-dichloroethane | | 12.5 | 25 | 3.2 | 3.218705 | 0.38 | 3.2128177 | 3.24193 | 2.61435 | 0.72172 | 1.31 | 169 | 1.2 | 1.8 | N/A | N/A | Yes | Yes | No |
| IH THM_01_VV/trichloroethane | | 12.5 | 25 | 96.0 | 99.30961 | 3.44 | 3.2384171 | 98.97366 | 2.88069 | -0.32925 | 3.10 | 220 | 0 | 2.3 | N/A | N/A | Yes | No | No |
| IH THM_02_VV/bromodichloroethane | | 12.5 | 25 | 96.0 | 101.6829 | 5.92 | 3.2660211 | 101.11466 | 2.80917 | -0.55884 | 5.33 | 211 | 0 | 2.4 | N/A | N/A | Yes | No | No |
| IH THM_03_VV/dibromochloroethane | | 12.5 | 25 | 96.0 | 97.88308 | 1.97 | 3.8448172 | 97.26588 | 3.48000 | -0.64070 | 1.32 | 211 | 0 | 2.8 | N/A | N/A | Yes | No | No |
| IH THM_04_VV/tribromomethane | | 12.5 | 25 | 96.0 | 98.16367 | 2.25 | 4.3487636 | 96.97409 | 4.44986 | -1.21183 | 1.01 | 214 | 0.9 | 4.2 | N/A | N/A | No | No | No |

ON THE HORIZON

What's in store for the future...

ON THE HORIZON

WHAT'S IN STORE FOR THE FUTURE

- Review of AQC frequency
- F & t test document – unified approach to AQC stats across the water industry
- Remote Sampler (field PDA) – Daily AQC for Chlorine
- Drinking Water regulations change – operational sampling and online monitors
- System suitability – included within AQC software?
- Microbiology?

THANK YOU

QUESTIONS?

RICHARD.KIRKPATRICK@NWL.CO.UK