**Guidance Document: Commercial**

Project - Automated Tracking Sheet





1. **Overview**

#### 1.1 The Commercial team’s Tracking Sheet contains details regarding samples for external stakeholders, full details of which can be found at this [link](https://affinitywaterltd.sharepoint.com/:w:/t/CommercialTeamOfficeroles/EZ_LfsdTwkJBi_azyIVhFnIB7Z429ey2I0wZXar9YylEDw).

#### 1.2 This spreadsheet is filled on an hourly basis using Business Objects, Power Automate, and Excel Online, where this document aims to outline how this system operates and manages the risks associated with data entry errors.

#### 1.3 This project uses 7 flows to extract data from LIMS for new sample details, exceedances, non-conformances, authorised customer information, subcon receival, and cancellations.

#### 1.4 The flows work by monitoring David.Golacis’ inbox for keywords in the email’s title, sent from the Enquiries.Commercial address.

Once the conditions have been met, the XLSX attachment from the report is saved on OneDrive for processing, beginning by converting the cell range into a table, extracting the data as JSON objects, and merging changes with the Tracking Sheet.

#### 1.5 Process map for the order of operations:

#### 1.6 Queries are received throughout the day to reduce conflict caused by multiple cells being edited in parallel. The schedule of queries goes as follows:

A clock with arrows and numbers

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|  |  |
| --- | --- |
| Time of Day (24-hrs) | Process |
| 07:00 | Sort table |
| 13:00 | Authorised samples |
| 14:00 | Exceptions |
| 15:00 | Non-conformances |
| 19:00 | New records |
| 20:00 | Cancellations |
| 21:00 | Received subcon results |

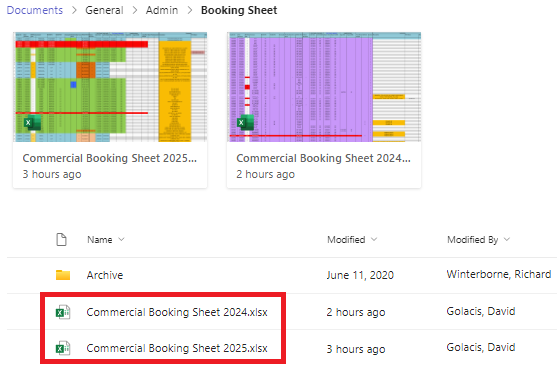
#### 1.7 Each query contains the last 10 days of data meeting the specified conditions. This helps manage risk by providing redundancy for the system. By allowing a flow to process the same data multiple times, the effect of errors which result in incomplete actions was reduced.

# 2.0 Maintenance

#### 2.1 At the end of the calendar year, only the main sheets require adjustments to continue operation. This is because the year within the document’s title defines which entries are allowed to be entered.

By storing the current and previous year’s sheets together in a folder, both sheets can be processed in parallel and keep only relevant records from being written, enabling redundancy of data within the query and bypassing the requirement of filtering out mismatched years data from the initial query.

**Teams: Commercial Team/ Documents/ General/ Admin/ Booking Sheet**



#### 2.2 In December 2025, create a fresh copy of the Booking Sheet, 2026, for the following year. Later in February, archive the 2025 year’s sheet once all samples have been reported and invoiced.

#### 2.3 Flows require no amending due to the dynamic variables used to calculate what the ending year of the current and previous year’s sheets should be relative to current UTC time.

A screenshot of a computer

Description automatically generated Previous year variable:

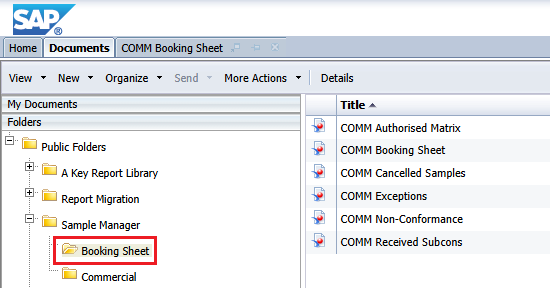
A screenshot of a computer

Description automatically generated Current year variable:

# 3.0 Data Governance

#### 3.1 All Business Objects files (SQL reports) are stored online at [Affinity's BO Portal](https://boe.grpdom.vwuk.corp/BOE/BI) within this location:

**Public Folders/ Sample Manager/ Booking Sheet**



#### 3.2 Queries, flows and Excel scripts are provided in the [appendix](#_5.0_Appendix).

# 4.0 Detailed Design

## 4.1 Design of reports

#### 4.1.1 Business Objects was used to both generate and deliver scheduled queries from an Oracle database.

#### 4.1.2 These queries shared safety features which were used to restrict which data was pulled from the cloud, reducing the memory usage of the server and improving processing speed.

Techniques used to hone searches were:

* Limiting the date range used:

WHERE

sample.recd\_date >= TRUNC ( sysdate ) - 7

* Fetching samples with an associated customer ID:

WHERE

LENGTH ( TRIM ( sample.customer\_id ) ) > 0

* Specifying which sample and/ or result status was required:

WHERE

result.status IN ( 'A' )

AND sample.status NOT IN ( 'X', 'U' )

* Utilizing parameter names:

WHERE

test.analysis IN ( 'MATRIX' )

* Using CTEs to left-join additional information:

WITH subcon\_tests AS (

SELECT

DISTINCT test.sample

FROM test

INNER JOIN sample

ON sample.id\_numeric = test.sample

WHERE

test.laboratory\_id = 'SUB\_CON'

AND sample.recd\_date >= TRUNC ( sysdate ) - 7

AND LENGTH ( TRIM ( sample.customer\_id ) ) > 0

)

LEFT JOIN subcon\_tests

ON subcon\_tests.sample = sample.id\_numeric

#### 4.1.3 The selection followed a pattern of searching for an ID, a parameter of interest, and a date of when this change had occurred. All samples compliant with the filtering conditions were be delivered to the next step.

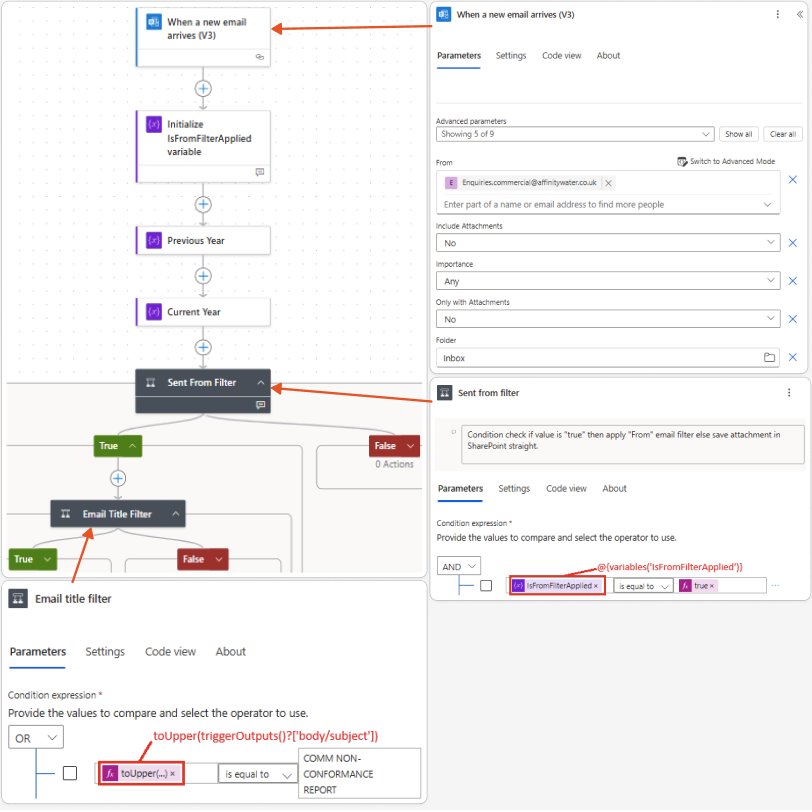
|  |  |  |
| --- | --- | --- |
| Sample No | Entered On | Parameter |
| 2688527 | 14 Jan 2025 | LEGIONELLA |
| 2688527 | 14 Jan 2025 | LEGIONELLA |
| 2688528 | 14 Jan 2025 | LEGIONELLA |

## 4.2 Design of flows

#### 4.2.1 Once an email containing the report had been received, a Power Automate flow attempts to match the title of the email to keywords. If a match was found, a series of steps take place to save the attached XLSX file for processing.

To assure reliability, conditional filters were used to eliminate problems which could occur during an action. Considerations included were:

* Confirmation of email requirements:



* Check for attachment(s):

A screenshot of a computer

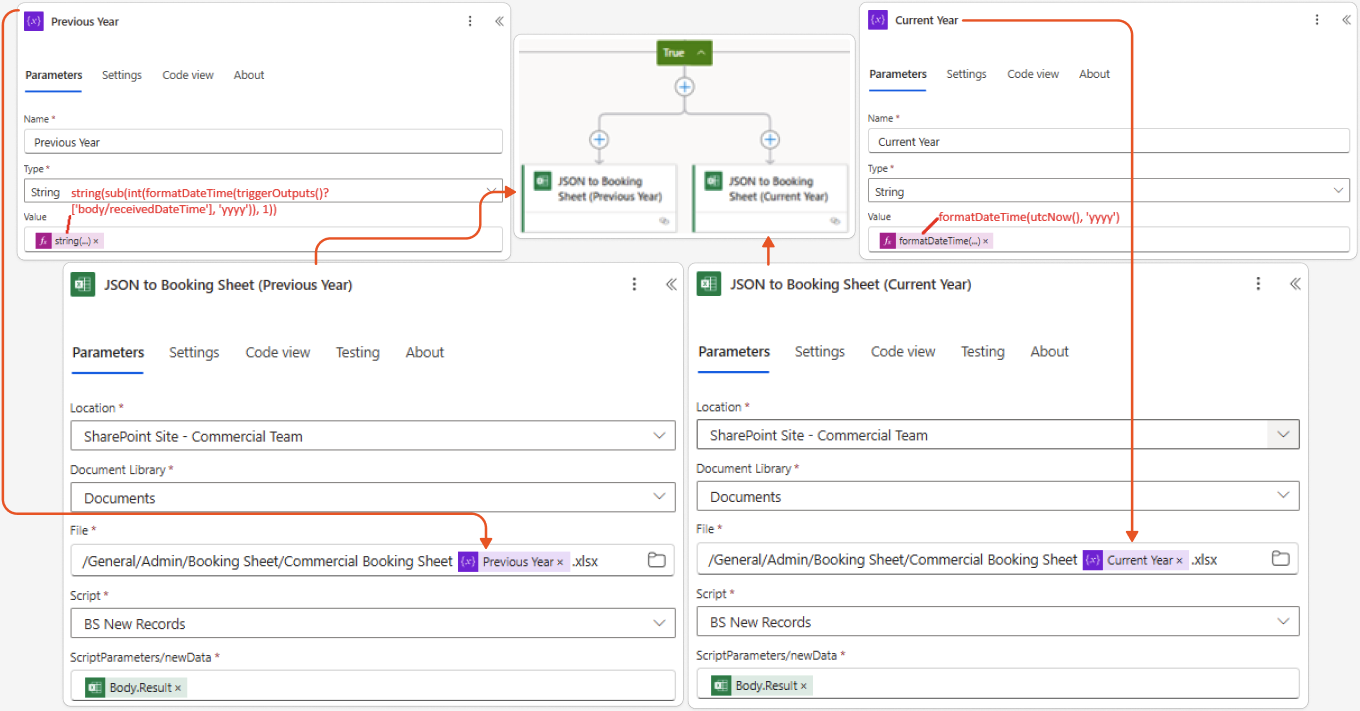
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* Validation of outgoing data:

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To improve on efficiency, both yearly spreadsheets were acted on using the data from one query in parallel:



## 4.3 Design of scripts

#### 4.3.1 Power Automate allows access to Excel Online for the use of Office Script, which enabled functions to be written and act on queries. Effort was directed at reducing the number of Excel API calls to improve performance.

#### 4.3.2 All flows shared one script to extract data from its initial report, which can be found in [section 5.3.1](#_5.3.1_Table_to). This function was designed to interact with Excel API once and pass on the contents as a string of JSON objects.

Objects were chosen for their key-value pairs, enabling future table amendments of the Tracking Sheet.

A check for data was placed at the end of the script to terminate impractical flows:

This data was then fed to a purpose-built program to execute a singular function on the spreadsheet.

#### 4.3.3 Beginning with the [new records script](#_5.3.2_New_Records), data from the Tracking Sheet was extracted in 1 API call and the year of the document in another. Then, records of the incorrect year were removed from the query, and further filtered by positive matches of binary search, leaving a query of exclusively new IDs. These items were then added to the end of the table in 1 API call, giving a total of 3 server requests for the entire report.

New records report:

|  |  |  |
| --- | --- | --- |
| Sample No | Entered Date | Text |
| 2683778 | 03/01/2025 | Giardia not complete due to external processing error |
| 2683787 | 20/12/2024 | Taste test removed. |
| 2684296 | 20/12/2024 | Could not test for Taste and Odour due to missing test bottle |

#### 4.3.4 Next, the [exceptions](#_5.3.3_Exceptions_script:) and [non-conformance](#_5.3.4_Non-Conformance_script:) scripts were both written to read the Tracking Sheet table in 1 API call, concatenating the new parameter/ text to any previous texts within the appropriate cell, repeating for the next sample number in the report, and replacing the affected record line in 2 API calls once all of the new, unique data had been strung together, for a total of 3 server requests, per unique record number in the report.

Exceptions report:

|  |  |  |
| --- | --- | --- |
| Sample No | Parameter | Result |
| 2689477 | Legionella species | 100 |
| 2689736 | Legionella species | 2400 |
| 2692260 | Bromate as BrO3 | 461.2 |

Non-conformance report:

|  |  |  |
| --- | --- | --- |
| Sample No | Entered Date | Text |
| 2683778 | 03/01/2025 | Giardia not complete due to external processing error |
| 2683787 | 20/12/2024 | Taste test removed. |
| 2684296 | 20/12/2024 | Could not test for Taste and Odour due to missing test bottle |

#### 4.3.4 Finally, the [cancellations](#_5.3.6_Cancellations_script:), [subcon receival](#_5.3.7_Subcon_Receival), and [authorisations](#_5.3.5_Authorisations_script:) scripts were written to draw the Tracking Sheet data in 1 API call, match records using binary search and enter data if required. The affected rows were replaced in the table in 2 API calls, for a total of 3 server requests, per individual item in the report.

Cancellations report:

|  |  |
| --- | --- |
| Sample No | Date Authorised |
| 2665640 | 3 Jan 2025 |
| 2684715 | 6 Jan 2025 |
| 2688538 | 6 Jan 2025 |

Subcon Receival report:

|  |  |  |
| --- | --- | --- |
| Sample No | Entered On | Parameter |
| 2688527 | 14 Jan 2025 | LEGIONELLA |
| 2688527 | 14 Jan 2025 | LEGIONELLA |
| 2688528 | 14 Jan 2025 | LEGIONELLA |

Authorisations report:

|  |  |  |
| --- | --- | --- |
| Sample No | Auth Date | Auth Initials |
| 2691776 | 14 Jan 2025 | GOLACISD |
| 2691777 | 14 Jan 2025 | GOLACISD |
| 2691778 | 14 Jan 2025 | GOLACISD |

# 5.0 Appendix

## 5.1 Business Objects material

#### 5.1.1 New Records

SQL query:

WITH subcon\_tests AS (

**SELECT**

DISTINCT test.sample

**FROM** test

INNER JOIN sample

ON sample.id\_numeric = test.sample

**WHERE**

test.laboratory\_id = 'SUB\_CON'

AND sample.recd\_date >= TRUNC ( sysdate ) - 10

AND LENGTH ( TRIM ( sample.customer\_id ) ) > 0

)

**SELECT**

TRIM ( sample.id\_numeric ) AS sample\_no,

TRUNC ( sample.recd\_date ) AS date\_received,

sample.customer\_id,

sample.login\_by,

sample.template\_id,

CASE WHEN

INSTR ( UPPER ( sample.collected\_from ), 'RESAMPLE' ) > 0

THEN 'Y'

ELSE ''

END AS resample,

CASE WHEN

TO\_CHAR ( sample.recd\_date, 'Dy' ) = 'Sat'

THEN 'Y'

WHEN

TO\_CHAR ( sample.recd\_date, 'Dy' ) = 'Sun'

THEN 'Y'

ELSE ''

END AS weekend\_work,

CASE WHEN

subcon\_tests.sample > 0

THEN 'Y'

ELSE ''

END AS subcon,

CASE WHEN

sample.status = 'X'

THEN 'Y'

ELSE ''

END AS cancelled,

sample.collected\_from

**FROM** sample

LEFT JOIN subcon\_tests

ON subcon\_tests.sample = sample.id\_numeric

**WHERE**

sample.recd\_date >= TRUNC ( sysdate ) - 10

AND LENGTH ( TRIM ( sample.customer\_id ) ) > 0

Report:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Sample No | Date Received | Customer | Booked By | Resample | Weekend Work | Sub-Con | Analysis Description | Cancelled Sample | Description |
| 2692090 | 14 Jan 2025 | ASCOT\_ | GEALL |  |  | Y | RE\_ASCOT1 |  | 580832, GRANDSTAND, CORE D, LAWN LEVEL, CLEANERS CUPBOARD, CWS |
| 2692091 | 14 Jan 2025 | ASCOT\_ | GEALL |  |  | Y | RE\_ASCOT1 |  | 580830, GRANDSTAND, CORE C, LAWN LEVEL, CLEANERS CUPBOARD, CWS |
| 2692092 | 14 Jan 2025 | ASCOT\_ | GEALL |  |  | Y | RE\_ASCOT1 |  | 584032, GRANDSTAND, CORE C, LEVEL 1, CLEANERS CUPBOARD, CWS |

#### 5.1.2 Exceptions

SQL query:

**SELECT**

TRIM ( sample.id\_numeric ),

result.name,

result.text

**FROM** sample

INNER JOIN test

ON test.sample = sample.id\_numeric

INNER JOIN result

ON result.test\_number = test.test\_number

**WHERE**

result.status NOT IN ( 'U', 'X' )

AND result.result\_type IN ( 'N', 'K' )

AND result.out\_of\_range = 'T'

AND LENGTH ( TRIM ( sample.customer\_id ) ) > 0

AND result.entered\_on >= TRUNC ( sysdate ) - 10

Report:

|  |  |  |
| --- | --- | --- |
| Sample No | Parameter | Result |
| 2689477 | Legionella species | 100 |
| 2689736 | Legionella species | 2400 |
| 2692260 | Bromate as BrO3 | 461.2 |

#### 5.1.3 Authorisations

SQL query:

**SELECT**

TRIM ( sample.id\_numeric ) AS sample\_no,

TRUNC ( result.date\_authorised ) AS authorisation\_date,

TRIM ( result.authoriser ) AS authoriser

**FROM**

result

INNER JOIN test

ON test.test\_number = result.test\_number

INNER JOIN sample

ON sample.id\_numeric = test.sample

**WHERE**

result.status IN ( 'A' )

AND test.analysis IN ( 'MATRIX' )

AND test.date\_authorised >= ( TRUNC ( sysdate ) - 10 )

AND LENGTH ( TRIM ( sample.customer\_id ) ) > 0

AND sample.status NOT IN ( 'X', 'U' )

Report:

|  |  |  |
| --- | --- | --- |
| Sample No | Auth Date | Auth Initials |
| 2691776 | 14 Jan 2025 | GOLACISD |
| 2691777 | 14 Jan 2025 | GOLACISD |
| 2691778 | 14 Jan 2025 | GOLACISD |

#### 5.1.4 Non-conformance

SQL query:

SELECT

TRIM ( sample.id\_numeric ) AS sample\_no,

TRUNC ( result.entered\_on ),

result.text

FROM sample

INNER JOIN test

ON test.sample = sample.id\_numeric

INNER JOIN result

ON result.test\_number = test.test\_number

WHERE

LENGTH ( TRIM ( sample.customer\_id ) ) > 0

AND result.entered\_on >= TRUNC ( sysdate ) - 10

AND test.analysis = 'NON\_CONF\_S'

AND result.name IN ( 'Text comment 1', 'Text comment 2' )

AND result.status IN ( 'A', 'C' )

Report:

|  |  |  |
| --- | --- | --- |
| Sample No | Entered Date | Text |
| 2683778 | 03/01/2025 | Giardia not complete due to external processing error |
| 2683787 | 20/12/2024 | Taste test removed. |
| 2684296 | 20/12/2024 | Could not test for Taste and Odour due to missing test bottle |

#### 5.1.5 Cancellations

SQL query:

**SELECT**

TRIM ( sample.id\_numeric ) AS sample\_no,

TRUNC ( sample.date\_authorised ) AS cancelled\_date

**FROM**

test

INNER JOIN sample

ON sample.id\_numeric = test.sample

**WHERE**

sample.status IN ( 'X' )

AND (

( sample.date\_authorised >= ( TRUNC ( sysdate ) - 10 ) )

AND

( sample.date\_authorised < TRUNC ( sysdate ) )

)

AND LENGTH ( TRIM ( sample.customer\_id ) ) > 0

Report:

|  |  |
| --- | --- |
| Sample No | Date Authorised |
| 2665640 | 3 Jan 2025 |
| 2684715 | 6 Jan 2025 |
| 2688538 | 6 Jan 2025 |

#### 5.1.6 Subcon Receival

SQL query:

**SELECT**

TRIM ( sample.id\_numeric ) AS sample\_no,

result.entered\_on,

test.analysis

**FROM** sample

INNER JOIN test

ON test.sample = sample.id\_numeric

INNER JOIN result

ON result.test\_number = test.test\_number

**WHERE**

result.entered\_on >= TRUNC ( sysdate ) - 10

AND LENGTH ( TRIM ( sample.customer\_id ) ) > 0

AND test.laboratory\_id = 'SUB\_CON'

AND TRIM ( result.text ) IS NOT NULL

Report:

|  |  |  |
| --- | --- | --- |
| Sample No | Entered On | Parameter |
| 2688527 | 14 Jan 2025 | LEGIONELLA |
| 2688527 | 14 Jan 2025 | LEGIONELLA |
| 2688528 | 14 Jan 2025 | LEGIONELLA |

## 5.2 Power Automate flow:

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## 5.3 Office Script material

#### 5.3.1 Table to Objects script:

// Function to extract data and output nested objects

function main(workbook: ExcelScript.Workbook): string {

// Select 1st sheet in workbook

const selectedSheet = workbook.getWorksheets()[0];

// Get the working range as string

const usedRange = selectedSheet.getUsedRange();

let rangeText = usedRange.getTexts();

//console.log(rangeText);

// Cleaning string

let length = rangeText.length;

while (length--) {

// Remove blank rows

if (rangeText[length][1] === '') {

rangeText.splice(length, 1);

continue;

};

// Remove blank columns

if (rangeText[length][-1] === '') {

rangeText[length].splice(-1, 1);

continue;

};

};

// If there's data, turn range into nested objects

if (rangeText.length > 1) {

const outputData = stringToObjects(rangeText);

//console.log(JSON.stringify(outputData));

return JSON.stringify(outputData);

}

// Otherwise, return an empty array to stop flow

else {

return '';

};

};

// Function to convert a 2D array string to nested objects

function stringToObjects(tableString: string[][]): string[][] {

// Key: Value pairs

var objectKeys: string[] = [];

// Result

var outputArray: string[][] = [];

// for each element in array...

for (var index = 0; index < tableString.length; index++) {

// Use the 1st element of array as keys

if (index === 0) {

objectKeys = tableString[index];

continue;

};

// Empty object to store key and values

var tempObject: Object = {};

// For the length of an array within nest...

for (var element = 0; element < tableString[index].length; element++) {

//console.log(objectKeys[element]);

// Set the value of newObject with objectKeys at position (element);

// Using values of tableString at position (index) at key (element)

tempObject[objectKeys[element]] = tableString[index][element];

};

// Push object into output array

outputArray.push(tempObject);

continue;

};

return outputArray;

};

#### 5.3.2 New Records script:

// Function to add new records to Commercial's tracking sheet

function main(workbook: ExcelScript.Workbook, newData: string): void {

// Convert newData string to JSON objects

const inputData: string[][] = JSON.parse(newData);

// Find output table, turn it to string

const table = workbook.getWorksheets()[0].getTables()[0];

// Convert table to string

const tableString = table.getRange().getTexts();

// Convert table string to nested objects

let tableObjects = stringToObjects(tableString);

//console.log(tableObjects);

// Removes objects from inputData which are already in tableObjects, or of incorrect year

const outputData = cleaner(workbook, tableObjects, inputData);

//console.log(outputData);

// Add new records to end of table

const newObjects = addObjects(tableObjects, outputData);

//console.log(newObjects);

// Pasting final JSON block into end of the table

table.addRows(-1, newObjects);

// Sort table (for records which were received later than when they were created)

return sort(table);

};

// Function to create objects with matching keys to output table and convert to nested array

function addObjects(outputObjects: string[][], inputObjects: string[][]): string[][] {

// Get keys from nested arrays of outputObjects

const keys = Object.keys(outputObjects[0]);

//console.log(keys);

// Loop start value

var a = 0;

// Loop end value

const b = inputObjects.length;

// Result in nested array for Excel

var outputArray: string[][] = [];

while (a < b) {

// Creating temp object to store all keys from outputObjects

var tempObject: Object = {};

for (var key of keys) {

// Pasting Excel formulae in place, otherwise blank

if (key === 'Working Days') {

tempObject[key] = `=IF(ISBLANK([@[Cancelled Sample]]),IF(ISBLANK([@[Date Received]]),"",IF(ISBLANK([@[Report Date]]),NETWORKDAYS([@[Date Received]],TODAY())-1,NETWORKDAYS([@[Date Received]],[@[Report Date]])-1)),"")`;

} else if (key === 'Total Days') {

tempObject[key] = `=IF(ISBLANK([@[Cancelled Sample]]), IF(ISBLANK([@[Date Received]]), "", IF(ISBLANK([@[Report Date]]), DAYS(TODAY(),[@[Date Received]]), DAYS([@[Report Date]],[@[Date Received]]))),"")`;

} else {

tempObject[key] = '';

}

};

//console.log(tempObject);

// Add values from current inputObjects' item to tempObject, matched by key

tempObject = {...tempObject, ...inputObjects[a]};

//console.log(tempObject);

// Temp array to store values

var outputRow: string[] = [];

// Extracting values from each key

for (var key of keys) {

//console.log(tempObject[key]);

outputRow.push(tempObject[key]);

};

//console.log(outputRow);

// Nesting array

outputArray.push(outputRow);

// Queue the next object in inputObjects

a++;

};

//console.log(outputArray);

return outputArray;

};

// Function to clean input nested objects of irrelevant year's records and of duplicate records of output table

function cleaner(workbook: ExcelScript.Workbook, outputObjects: string[][], inputObjects: string[][]): string[][] {

// Required year found in filename

const documentTitle = workbook.getName();

//console.log(documentTitle);

// Extract year from filename

const documentYear = documentTitle.replace(/\D+/, '').replace('.', '').replace(/\D+/, '');

//console.log(documentYear);

// Length of loop

let length = inputObjects.length;

// For all elements of inputObjects...

while (length--) {

// Identify date of record

var itemDate: string = inputObjects[length]['Date Received'];

//console.log(itemDate);

// Extract year from record

var itemYear = itemDate.split(' ');

//console.log(itemYear[2]);

// Remove unmatched years

if (itemYear[2] !== documentYear) {

inputObjects.splice(length, 1);

continue;

};

// Position of current record of inputObjects in outputObjects

var position = binarySearch(outputObjects, 'Sample No', inputObjects[length]['Sample No']);

//console.log(inputObjects[length]['Sample No']);

//console.log(position);

// If value from inputObjects is present in outputObjects, remove the element from inputObjects

if (position !== -1) {

//console.log(inputObjects[length]);

inputObjects.splice(length, 1);

continue;

} else {

continue;

};

};

//console.log(inputObjects);

return inputObjects;

};

// Function to find the index of the ID within nested objects

function binarySearch(nestedObjects: string[][], key: string, value: string): number {

// Range of array

var start = 0;

var end = nestedObjects.length - 1;

// How many iterations did it take to find the index

//let turns = 0;

// Iterate while start has not met end

while (start <= end) {

//turns++;

// Find the mid index, rounding down

var mid = Math.floor(start + ((end - start) / 2));

// If element is present at mid index, return index value

if (nestedObjects[mid][key] === value) {

return mid;

}

// Else, re-find mid in the left or right half of the array

else if (nestedObjects[mid][key] < value) {

start = mid + 1;

} else {

end = mid - 1;

};

};

// If not found, break and return -1

return -1;

};

// Function to convert a 2D array string to nested objects

function stringToObjects(tableString: string[][]): string[][] {

// Key: Value pairs

var objectKeys: string[] = [];

// Result

var outputArray: string[][] = [];

// for each element in array...

for (var index = 0; index < tableString.length; index++) {

// Use the 1st element of array as keys

if (index === 0) {

objectKeys = tableString[index];

continue;

};

// Empty object to store key and values

var tempObject: Object = {};

// For the length of an array within nest...

for (var element = 0; element < objectKeys.length; element++) {

//console.log(objectKeys[element]);

// Pasting Excel formulae in place, otherwise blank

if (objectKeys[element] === 'Working Days') {

tempObject[objectKeys[element]] = `=IF(ISBLANK([@[Cancelled Sample]]),IF(ISBLANK([@[Date Received]]),"",IF(ISBLANK([@[Report Date]]),NETWORKDAYS([@[Date Received]],TODAY())-1,NETWORKDAYS([@[Date Received]],[@[Report Date]])-1)),"")`;

} else if (objectKeys[element] === 'Total Days') {

tempObject[objectKeys[element]] = `=IF(ISBLANK([@[Cancelled Sample]]), IF(ISBLANK([@[Date Received]]), "", IF(ISBLANK([@[Report Date]]), DAYS(TODAY(),[@[Date Received]]), DAYS([@[Report Date]],[@[Date Received]]))),"")`;

} else {

tempObject[objectKeys[element]] = tableString[index][element];

};

};

// Push object into output array

outputArray.push(tempObject);

continue;

};

return outputArray;

};

// Function to sort table before binary search

function sort(table: ExcelScript.Table) {

// Sort table by Sample No. column

table.getSort().apply([{ key: 0, ascending: true }]);

// Copy table with new positions and paste in place

const workingRange = table.getRangeBetweenHeaderAndTotal();

return workingRange.copyFrom(workingRange, ExcelScript.RangeCopyType.all, false, false);

};

#### 5.3.3 Exceptions script:

// Function to add exceptions data to Commercial's tracking sheet

function main(workbook: ExcelScript.Workbook, newData: string): void {

// Convert newData string to JSON objects

const inputData: string[][] = JSON.parse(newData);

// Find output table, turn it to string

const table = workbook.getWorksheets()[0].getTables()[0];

const tableString = table.getRange().getTexts();

// Convert table string to nested objects

let tableObjects = stringToObjects(tableString);

//console.log(tableObjects);

// Find unique ID's from inputData

const uniqueIDs = separateIDs(inputData);

//console.log(uniqueIDs);

// For each unique ID...

for (let targetID of uniqueIDs) {

// Find the position of targetID in tableObjects

const position = binarySearch(tableObjects, 'Sample No', targetID);

//console.log(position);

// If sample isn't present, go to the next entry

if (position === -1) {

continue;

};

// Placeholder for result

let failureString = '';

// If record's PCV Failure was blank

if (tableObjects[position]['PCV Failure'] === '') {

// Loop through inputData

for (let a = 0; a < inputData.length; a++) {

// If IDs of targetID and current item match

if (inputData[a]['Sample No'] === targetID) {

// If 1st failure, no comma

if (failureString === '') {

failureString = inputData[a]['Parameter'];

}

// Otherwise, add comma

else {

failureString = failureString.concat(`, ${inputData[a]['Parameter']}`);

}

};

};

};

//console.log(failureString);

// If record's PCV Failure was not blank

if (tableObjects[position]['PCV Failure'] !== '') {

// Split the PCV Failure

const splitString = String(tableObjects[position]['PCV Failure']).split(', ');

//console.log(splitString);

// Loop through splitString

for (let index = 0; index < splitString.length; index++) {

// If 1st failure, no comma

if (failureString === '') {

failureString = splitString[index];

}

// Otherwise, add comma

else {

failureString = failureString.concat(`, ${splitString[index]}`);

};

};

// Loop through inputData

for (let index = 0; index < inputData.length; index++) {

// If IDs of targetID and current item match

if (inputData[index]['Sample No'] === targetID) {

// Append new parameters

failureString = failureString.concat(`, ${inputData[index]['Parameter']}`);

};

};

// Split the failureString

const splitFailures = String(tableObjects[position]['PCV Failure']).split(', ');

//console.log(splitFailures);

failureString = deDuplicate(splitFailures);

};

//console.log(failureString);

//console.log(tableObjects[position]['PCV Failure']);

// Check if existing string and new string are the same, skip if they are

if (tableObjects[position]['PCV Failure'] === failureString) {

continue;

}

// Otherwise, amend table

else {

// Set PCV Failure as the failureString

tableObjects[position]['PCV Failure'] = failureString;

// Convert to array of values

const updateArray: string[] = Object.values(tableObjects[position]);

//console.log(updateArray);

// Delete previous item at index

table.deleteRowsAt(position, 1);

// Replace with updated string

table.addRow(position, updateArray);

continue;

};

};

return;

};

// Function to add unique record dates to array

function deDuplicate(inputObjects: string[]): string {

// Finding unique dates's from inputObjects

const uniqueObjs: string[] = inputObjects.reduce((newArr, element) => {

// Before element: x-1, and empty array

//console.log(newArr);

// Current element: x

//console.log(element);

// If the the current object's year is not in newArr, add it

if (!newArr.some(item => item === element)) {

// Add missing object to array

newArr.push(element);

//console.log(element);

};

// Return nested objects

return newArr;

}, []);

//console.log(uniqueObjs);

// Extracting the parameter values into array

let uniqueIDs = '';

for (let index = 0; index < uniqueObjs.length; index++) {

//console.log(uniqueObjs[index]);

// If uniqueIDs is blank, no comma

if (uniqueIDs === '') {

uniqueIDs = String(uniqueObjs[index]);

}

// Otherwise, add comma

else {

uniqueIDs = uniqueIDs.concat(`, ${String(uniqueObjs[index])}`);

};

};

//console.log(uniqueIDs);

return uniqueIDs;

};

// Function to find the index of the ID within nested objects

function binarySearch(nestedObjects: string[][], key: string, value: string): number {

// Range of array

var start = 0;

var end = nestedObjects.length - 1;

// How many iterations did it take to find the index

//let turns = 0;

// Iterate while start has not met end

while (start <= end) {

//turns++;

// Find the mid index, rounding down

var mid = Math.floor(start + ((end - start) / 2));

// If element is present at mid index, return index value

if (nestedObjects[mid][key] === value) {

return mid;

}

// Else, re-find mid in the left or right half of the array

else if (nestedObjects[mid][key] < value) {

start = mid + 1;

} else {

end = mid - 1;

};

};

// If not found, break and return -1

return -1;

};

// Function to add unique record dates to array

function separateIDs(inputObjects: string[][]) {

// Finding unique dates's from inputObjects

const uniqueObjs = inputObjects.reduce((newArr, element) => {

// Before element: x-1, and empty array

//console.log(newArr);

// Current element: x

//console.log(element);

// If the the current object's year is not in newArr, add it

if (!newArr.some(item => item['Sample No'] === element['Sample No'])) {

// Add missing object to array

newArr.push(element);

//console.log(element);

};

// Return nested objects

return newArr;

}, []);

//console.log(uniqueObjs);

// Extracting the ID values into array

let uniqueIDs: string[] = [];

for (let index = 0; index < uniqueObjs.length; index++) {

//console.log(uniqueObjs[index]['Sample No']);

uniqueIDs.push(uniqueObjs[index]['Sample No']);

};

//console.log(uniqueIDs);

return uniqueIDs;

};

// Function to convert a 2D array string to nested objects

function stringToObjects(tableString: string[][]): string[][] {

// Key: Value pairs

var objectKeys: string[] = [];

// Result

var outputArray: string[][] = [];

// for each element in array...

for (var index = 0; index < tableString.length; index++) {

// Use the 1st element of array as keys

if (index === 0) {

objectKeys = tableString[index];

continue;

};

// Empty object to store key and values

var tempObject: Object = {};

// For the length of an array within nest...

for (var element = 0; element < objectKeys.length; element++) {

//console.log(objectKeys[element]);

// Pasting Excel formulae in place, otherwise blank

if (objectKeys[element] === 'Working Days') {

tempObject[objectKeys[element]] = `=IF(ISBLANK([@[Cancelled Sample]]),IF(ISBLANK([@[Date Received]]),"",IF(ISBLANK([@[Report Date]]),NETWORKDAYS([@[Date Received]],TODAY())-1,NETWORKDAYS([@[Date Received]],[@[Report Date]])-1)),"")`;

} else if (objectKeys[element] === 'Total Days') {

tempObject[objectKeys[element]] = `=IF(ISBLANK([@[Cancelled Sample]]), IF(ISBLANK([@[Date Received]]), "", IF(ISBLANK([@[Report Date]]), DAYS(TODAY(),[@[Date Received]]), DAYS([@[Report Date]],[@[Date Received]]))),"")`;

} else {

tempObject[objectKeys[element]] = tableString[index][element];

};

};

// Push object into output array

outputArray.push(tempObject);

continue;

};

return outputArray;

};

#### 5.3.4 Non-Conformance script:

// Function to add non-conformance data to Commercial's tracking sheet

function main(workbook: ExcelScript.Workbook, newData: string): void {

// Convert newData string to JSON objects

const inputData: string[][] = JSON.parse(newData);

// Find output table, turn it to string

const table = workbook.getWorksheets()[0].getTables()[0];

const tableString = table.getRange().getTexts();

// Convert table string to nested objects

let tableObjects = stringToObjects(tableString);

//console.log(tableObjects[310]);

// Find unique ID's from inputData

const uniqueIDs = separateIDs(inputData);

//console.log(uniqueIDs);

// For each unique ID...

for (let targetID of uniqueIDs) {

// Find the position of targetID in tableObjects

const position = binarySearch(tableObjects, 'Sample No', targetID);

//console.log(position);

// If sample isn't present, go to the next entry

if (position === -1) {

continue;

};

// Placeholder for result

let failureString = '';

// If record's PCV Failure was blank

if (tableObjects[position]['Non-conformance'] === '') {

// Loop through inputData

for (let a = 0; a < inputData.length; a++) {

// If IDs of targetID and current item match

if (inputData[a]['Sample No'] === targetID) {

// If 1st failure, no comma

if (failureString === '') {

failureString = inputData[a]['Text'];

}

// Otherwise, add comma

else {

failureString = failureString.concat(`; ${inputData[a]['Text']}`);

};

};

};

};

//console.log(failureString);

// If record's Non-conformance was not blank

if (tableObjects[position]['Non-conformance'] !== '') {

// Split the Non-conformance

const splitString = String(tableObjects[position]['Non-conformance']).split('; ');

//console.log(splitString);

// Loop through splitString

for (let index = 0; index < splitString.length; index++) {

// If 1st failure, no comma

if (failureString === '') {

failureString = splitString[index];

}

// Otherwise, add comma

else {

failureString = failureString.concat(`; ${splitString[index]}`);

};

};

// Loop through inputData

for (let index = 0; index < inputData.length; index++) {

// If IDs of targetID and current item match

if (inputData[index]['Sample No'] === targetID) {

// Append new parameters

failureString = failureString.concat(`; ${inputData[index]['Text']}`);

};

};

// Split the failureString

const splitFailures = String(tableObjects[position]['Non-conformance']).split('; ');

//console.log(splitFailures);

failureString = deDuplicate(splitFailures);

};

//console.log(failureString);

//console.log(tableObjects[position]['Non-conformance']);

// Check if existing string and new string are the same, skip if they are

if (tableObjects[position]['Non-conformance'] === failureString) {

continue;

}

// Otherwise, amend table

else {

// Setting Non-conformance as failureString

tableObjects[position]['Non-conformance'] = failureString;

// Array of values

const updateArray: string[] = Object.values(tableObjects[position]);

// Deleting last column due to an error

updateArray.pop();

//console.log(updateArray);

// Delete previous item at index

table.deleteRowsAt(position, 1);

// Replace with updated string

table.addRow(position, updateArray);

continue;

};

};

return;

};

// Function to add unique record dates to array

function deDuplicate(inputObjects: string[]): string {

// Finding unique dates's from inputObjects

const uniqueObjs: string[] = inputObjects.reduce((newArr, element) => {

// Before element: x-1, and empty array

//console.log(newArr);

// Current element: x

//console.log(element);

// If the the current object's year is not in newArr, add it

if (!newArr.some(item => item === element)) {

// Add missing object to array

newArr.push(element);

//console.log(element);

};

// Return nested objects

return newArr;

}, []);

//console.log(uniqueObjs);

// Extracting the parameter values into array

let uniqueIDs = '';

for (let index = 0; index < uniqueObjs.length; index++) {

//console.log(uniqueObjs[index]);

// If uniqueIDs is blank, no comma

if (uniqueIDs === '') {

uniqueIDs = String(uniqueObjs[index]);

}

// Otherwise, add comma

else {

uniqueIDs = uniqueIDs.concat(`, ${String(uniqueObjs[index])}`);

};

};

//console.log(uniqueIDs);

return uniqueIDs;

};

// Function to find the index of the ID within nested objects

function binarySearch(nestedObjects: string[][], key: string, value: string): number {

// Range of array

var start = 0;

var end = nestedObjects.length - 1;

// How many iterations did it take to find the index

//let turns = 0;

// Iterate while start has not met end

while (start <= end) {

//turns++;

// Find the mid index, rounding down

var mid = Math.floor(start + ((end - start) / 2));

// If element is present at mid index, return index value

if (nestedObjects[mid][key] === value) {

return mid;

}

// Else, re-find mid in the left or right half of the array

else if (nestedObjects[mid][key] < value) {

start = mid + 1;

} else {

end = mid - 1;

};

};

// If not found, break and return -1

return -1;

};

// Function to add unique record dates to array

function separateIDs(inputObjects: string[][]) {

// Finding unique dates's from inputObjects

const uniqueObjs = inputObjects.reduce((newArr, element) => {

// Before element: x-1, and empty array

//console.log(newArr);

// Current element: x

//console.log(element);

// If the the current object's year is not in newArr, add it

if (!newArr.some(item => item['Sample No'] === element['Sample No'])) {

// Add missing object to array

newArr.push(element);

//console.log(element);

};

// Return nested objects

return newArr;

}, []);

//console.log(uniqueObjs);

// Extracting the ID values into array

let uniqueIDs: string[] = [];

for (let index = 0; index < uniqueObjs.length; index++) {

//console.log(uniqueObjs[index]['Sample No']);

uniqueIDs.push(uniqueObjs[index]['Sample No']);

};

//console.log(uniqueIDs);

return uniqueIDs;

};

// Function to convert a 2D array string to nested objects

function stringToObjects(tableString: string[][]): string[][] {

// Key: Value pairs

var objectKeys: string[] = [];

// Result

var outputArray: string[][] = [];

// for each element in array...

for (var index = 0; index < tableString.length; index++) {

// Use the 1st element of array as keys

if (index === 0) {

objectKeys = tableString[index];

continue;

};

// Empty object to store key and values

var tempObject: Object = {};

// For the length of an array within nest...

for (var element = 0; element < objectKeys.length; element++) {

//console.log(objectKeys[element]);

// Pasting Excel formulae in place, otherwise blank

if (objectKeys[element] === 'Working Days') {

tempObject[objectKeys[element]] = `=IF(ISBLANK([@[Cancelled Sample]]),IF(ISBLANK([@[Date Received]]),"",IF(ISBLANK([@[Report Date]]),NETWORKDAYS([@[Date Received]],TODAY())-1,NETWORKDAYS([@[Date Received]],[@[Report Date]])-1)),"")`;

} else if (objectKeys[element] === 'Total Days') {

tempObject[objectKeys[element]] = `=IF(ISBLANK([@[Cancelled Sample]]), IF(ISBLANK([@[Date Received]]), "", IF(ISBLANK([@[Report Date]]), DAYS(TODAY(),[@[Date Received]]), DAYS([@[Report Date]],[@[Date Received]]))),"")`;

} else {

tempObject[objectKeys[element]] = tableString[index][element];

};

};

// Push object into output array

outputArray.push(tempObject);

continue;

};

return outputArray;

};

#### 5.3.5 Authorisations script:

// Function to add authorisation data to Commercial's trackinging sheet

function main(workbook: ExcelScript.Workbook, newData: string): void {

// Convert newData string to JSON objects

const inputData: string[][] = JSON.parse(newData);

// Find output table, turn it to string

const table = workbook.getWorksheets()[0].getTables()[0];

const tableString = table.getRange().getTexts();

// Convert table string to nested objects

let tableObjects = stringToObjects(tableString);

//console.log(tableObjects);

// For each entry of update table...

for (let entry = 0; entry < inputData.length; entry++) {

// Matching ID

const targetID: string = inputData[entry]['Sample No'];

// Parameter 1

const date: string = inputData[entry]['Auth Date'];

// Parameter 2

const initials: string = inputData[entry]['Auth Initials'];

//console.log(targetID);

// Find the position of target ID in tableObjects

const position = binarySearch(tableObjects, 'Sample No', targetID);

//console.log(position);

if (position === -1) {

// If sample isn't present already, go to the next entry

continue;

};

// Update the failure key of tableObjects with the new string

if (tableObjects[position]['Auth Date'] === '') {

tableObjects[position]['Auth Date'] = date;

tableObjects[position]['Auth Initials'] = initials;

} else {

// If date is already present, go to the next entry

continue;

};

// Array of values

const updateArray: string[] = Object.values(tableObjects[position]);

// Delete previous item at index

table.deleteRowsAt(position, 1);

// Replace with updated string

table.addRow(position, updateArray);

continue;

};

return;

};

// Function to find the index of the ID within nested objects

function binarySearch(nestedObjects: string[][], key: string, value: string): number {

// Range of array

var start = 0;

var end = nestedObjects.length - 1;

// How many iterations did it take to find the index

//let turns = 0;

// Iterate while start has not met end

while (start <= end) {

//turns++;

// Find the mid index, rounding down

var mid = Math.floor(start + ((end - start) / 2));

// If element is present at mid index, return index value

if (nestedObjects[mid][key] === value) {

return mid;

}

// Else, re-find mid in the left or right half of the array

else if (nestedObjects[mid][key] < value) {

start = mid + 1;

} else {

end = mid - 1;

};

};

// If not found, break and return -1

return -1;

};

// Function to convert a 2D array string to nested objects

function stringToObjects(tableString: string[][]): string[][] {

// Key: Value pairs

var objectKeys: string[] = [];

// Result

var outputArray: string[][] = [];

// for each element in array...

for (var index = 0; index < tableString.length; index++) {

// Use the 1st element of array as keys

if (index === 0) {

objectKeys = tableString[index];

continue;

};

// Empty object to store key and values

var tempObject: Object = {};

// For the length of an array within nest...

for (var element = 0; element < objectKeys.length; element++) {

//console.log(objectKeys[element]);

// Pasting Excel formulae in place, otherwise blank

if (objectKeys[element] === 'Working Days') {

tempObject[objectKeys[element]] = `=IF(ISBLANK([@[Cancelled Sample]]),IF(ISBLANK([@[Date Received]]),"",IF(ISBLANK([@[Report Date]]),NETWORKDAYS([@[Date Received]],TODAY())-1,NETWORKDAYS([@[Date Received]],[@[Report Date]])-1)),"")`;

} else if (objectKeys[element] === 'Total Days') {

tempObject[objectKeys[element]] = `=IF(ISBLANK([@[Cancelled Sample]]), IF(ISBLANK([@[Date Received]]), "", IF(ISBLANK([@[Report Date]]), DAYS(TODAY(),[@[Date Received]]), DAYS([@[Report Date]],[@[Date Received]]))),"")`;

} else {

tempObject[objectKeys[element]] = tableString[index][element];

};

};

// Push object into output array

outputArray.push(tempObject);

continue;

};

return outputArray;

};

#### 5.3.6 Cancellations script:

// Function to add cancellation data to Commercial's tracking sheet

function main(workbook: ExcelScript.Workbook, newData: string): void {

// Convert newData string to JSON objects

const inputData: string[][] = JSON.parse(newData);

// Find output table, turn it to string

const table = workbook.getWorksheets()[0].getTables()[0];

const tableString = table.getRange().getTexts();

// Convert table string to nested objects

let tableObjects = stringToObjects(tableString);

//console.log(tableObjects);

// For each row of update table...

for (let entry = 0; entry < inputData.length; entry++) {

// ID to look for

const targetID: string = inputData[entry]['Sample No'];

//console.log(targetID);

// Index of targetID in output table

const position: number = binarySearch(tableObjects, 'Sample No', targetID);

//console.log(position);

if (position === -1) {

// If sample isn't present already, go to the next entry

continue;

};

// Mark off at position

if (tableObjects[position]['Cancelled Sample'] === '') {

tableObjects[position]['Cancelled Sample'] = 'Y';

} else {

// If already complete, go to the next entry

continue;

};

// Array of values

const updateArray: string[] = Object.values(tableObjects[position]);

// Delete previous item at index

table.deleteRowsAt(position, 1);

// Replace with updated string

table.addRow(position, updateArray);

continue;

};

return;

};

// Function to find the index of the ID within nested objects

function binarySearch(nestedObjects: string[][], key: string, value: string): number {

// Range of array

var start = 0;

var end = nestedObjects.length - 1;

// How many iterations did it take to find the index

//let turns = 0;

// Iterate while start has not met end

while (start <= end) {

//turns++;

// Find the mid index, rounding down

var mid = Math.floor(start + ((end - start) / 2));

// If element is present at mid index, return index value

if (nestedObjects[mid][key] === value) {

return mid;

}

// Else, re-find mid in the left or right half of the array

else if (nestedObjects[mid][key] < value) {

start = mid + 1;

} else {

end = mid - 1;

};

};

// If not found, break and return -1

return -1;

};

// Function to convert a 2D array string to nested objects

function stringToObjects(tableString: string[][]): string[][] {

// Key: Value pairs

var objectKeys: string[] = [];

// Result

var outputArray: string[][] = [];

// for each element in array...

for (var index = 0; index < tableString.length; index++) {

// Use the 1st element of array as keys

if (index === 0) {

objectKeys = tableString[index];

continue;

};

// Empty object to store key and values

var tempObject: Object = {};

// For the length of an array within nest...

for (var element = 0; element < objectKeys.length; element++) {

//console.log(objectKeys[element]);

// Pasting Excel formulae in place, otherwise blank

if (objectKeys[element] === 'Working Days') {

tempObject[objectKeys[element]] = `=IF(ISBLANK([@[Cancelled Sample]]),IF(ISBLANK([@[Date Received]]),"",IF(ISBLANK([@[Report Date]]),NETWORKDAYS([@[Date Received]],TODAY())-1,NETWORKDAYS([@[Date Received]],[@[Report Date]])-1)),"")`;

} else if (objectKeys[element] === 'Total Days') {

tempObject[objectKeys[element]] = `=IF(ISBLANK([@[Cancelled Sample]]), IF(ISBLANK([@[Date Received]]), "", IF(ISBLANK([@[Report Date]]), DAYS(TODAY(),[@[Date Received]]), DAYS([@[Report Date]],[@[Date Received]]))),"")`;

} else {

tempObject[objectKeys[element]] = tableString[index][element];

};

};

// Push object into output array

outputArray.push(tempObject);

continue;

};

return outputArray;

};

#### 5.3.7 Subcon Receival script:

// Function to add subcon data to Commercial's tracking sheet

function main(workbook: ExcelScript.Workbook, newData: string): void {

// Convert newData string to JSON objects

const inputData: string[][] = JSON.parse(newData);

// Find output table, turn it to string

const table = workbook.getWorksheets()[0].getTables()[0];

const tableString = table.getRange().getTexts();

// Convert table string to nested objects

let tableObjects = stringToObjects(tableString);

//console.log(tableObjects);

// For each row of update table...

for (let entry = 0; entry < inputData.length; entry++) {

// ID to look for

const targetID: string = inputData[entry]['Sample No'];

//console.log(targetID);

// Index of targetID in output table

const position: number = binarySearch(tableObjects, 'Sample No', targetID);

//console.log(position);

if (position === -1) {

// If sample isn't present already, go to the next entry

continue;

};

// Mark off at position

if (tableObjects[position]['Subcon Received'] === '') {

tableObjects[position]['Subcon Received'] = 'Y';

} else {

// If already complete, go to the next entry

continue;

};

// Array of values

const updateArray: string[] = Object.values(tableObjects[position]);

// Delete previous item at index

table.deleteRowsAt(position, 1);

// Replace with updated string

table.addRow(position, updateArray);

continue;

};

return;

};

// Function to find the index of the ID within nested objects

function binarySearch(nestedObjects: string[][], key: string, value: string): number {

// Range of array

var start = 0;

var end = nestedObjects.length - 1;

// How many iterations did it take to find the index

//let turns = 0;

// Iterate while start has not met end

while (start <= end) {

//turns++;

// Find the mid index, rounding down

var mid = Math.floor(start + ((end - start) / 2));

// If element is present at mid index, return index value

if (nestedObjects[mid][key] === value) {

return mid;

}

// Else, re-find mid in the left or right half of the array

else if (nestedObjects[mid][key] < value) {

start = mid + 1;

} else {

end = mid - 1;

};

};

// If not found, break and return -1

return -1;

};

// Function to convert a 2D array string to nested objects

function stringToObjects(tableString: string[][]): string[][] {

// Key: Value pairs

var objectKeys: string[] = [];

// Result

var outputArray: string[][] = [];

// for each element in array...

for (var index = 0; index < tableString.length; index++) {

// Use the 1st element of array as keys

if (index === 0) {

objectKeys = tableString[index];

continue;

};

// Empty object to store key and values

var tempObject: Object = {};

// For the length of an array within nest...

for (var element = 0; element < objectKeys.length; element++) {

//console.log(objectKeys[element]);

// Pasting Excel formulae in place, otherwise blank

if (objectKeys[element] === 'Working Days') {

tempObject[objectKeys[element]] = `=IF(ISBLANK([@[Cancelled Sample]]),IF(ISBLANK([@[Date Received]]),"",IF(ISBLANK([@[Report Date]]),NETWORKDAYS([@[Date Received]],TODAY())-1,NETWORKDAYS([@[Date Received]],[@[Report Date]])-1)),"")`;

} else if (objectKeys[element] === 'Total Days') {

tempObject[objectKeys[element]] = `=IF(ISBLANK([@[Cancelled Sample]]), IF(ISBLANK([@[Date Received]]), "", IF(ISBLANK([@[Report Date]]), DAYS(TODAY(),[@[Date Received]]), DAYS([@[Report Date]],[@[Date Received]]))),"")`;

} else {

tempObject[objectKeys[element]] = tableString[index][element];

};

};

// Push object into output array

outputArray.push(tempObject);

continue;

};

return outputArray;

};