

Demand and capacity models

Core model technical guidance

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Contents

1. Introduction	2
1.1 What is the core model?.....	2
1.2 How to use this guide	3
2. Before you start.....	4
3. Workbook structure.....	5
3.1 Setup	6
3.2 Demand.....	8
3.3 Demand background (hidden).....	9
3.4 SPC	12
3.5 SPC background (hidden)	14
3.6 Planned	16
3.7 Planned SPC.....	18
3.8 Planned background.....	20
3.9 Capacity.....	21
3.10 Critical resources	24
3.11 Capacity setup	25
3.12 Capacity summary	27
3.13 Critical resources (hidden)	29
3.14 Capacity calculation (hidden)	31
3.15 Parameters	33
3.16 Pathway.....	35
3.17 Summary	37
3.18 Summary calculations (hidden).....	40
3.19 WL PI Backing (hidden).....	43
3.20 Planning	44
3.21 Planning (hidden).....	46
Appendix A: List of macros.....	47
Appendix B: List of named ranges	62

1. Introduction

1.1 What is the core model?

The core model is an Excel tool to help you assess the demand and capacity needs of your service.

It is a development of NHS Improvement's suite of demand and capacity tools for elective care, using similar methodology; so if you have used the earlier tools, you will be familiar with the sheets in the core tool.

This model can be used across all sectors of elective care – acute, community and mental health – provided the service being modelled has the following characteristics:

- there is a request for access to an elective care service (eg via a referral)
- the patients are booked to see a clinician – the wait to be seen is typically at least one day but may be a number of weeks
- the clinical contact is completed on the day of the appointment
- once the patient has had clinical contact, they move to the next stage of the treatment pathway or are discharged from the service.

Examples of applicable services are:

- outpatient clinics for new patients
- elective daycase surgeries
- two-week wait services (eg cancer).

1.2 How to use this guide

This guide is intended for analytics / developer users who may need to customise the capabilities of the Core model, or use the calculations within the model in local data processes to facilitate automation of demand and capacity modelling.

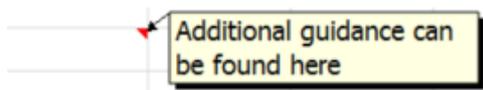
This guide will walk users through the general calculations contained within the model on a sheet by sheet basis, as well as the VBA macros that are used to drive the model.

Please note that both the worksheets and the macro scripts within the Core model have been laid out and commented to help users understand how the model works.

This guide will not explain basic principles of programming or Excel functions, and assumes that users have an advanced understanding of these skills, or will be able to learn the relevant syntax of the functions that are described.

Guidance is also available within the model, and can be accessed in one of two ways:

- If you see the following icon  , you can click on it to bring up an information window. Click on the icon again to hide it.
- If you see a cell with a small red triangle in the upper right corner, hovering your mouse cursor over the cell will make an information window appear.



2. Before you start

This guide assumes that users have the following skills:

- Advanced Excel skills – in particular, familiarity with the following functions:
 - VLOOKUP
 - OFFSET
 - Use of validated data dropdowns
- VBA programming skills:
 - Basic loops (eg. For / While)
 - Conditional statements (If Then... Else If)
 - Creating and using Sub () and Function (), including use of parameters
 - Use of Cell() and Range() functions to dynamically describe areas within worksheets
 - A good understanding of debugging functions in the VBA editor, including the use of the debug step-through function, and setting breakpoints.

Please note that editing the workbook without a good understanding of the above will risk unexpected results being returned.

3. Workbook structure

The core model is divided into the following sections:

- Setup
 - General principles
 - Sheet specific macros
 - Related sheets
 - (1) Control (hidden sheet)
 - (2) List (hidden sheet)
- Demand
 - General principles
 - Sheet specific macros
 - Related sheets
 - (1) Demand background (hidden sheet)
 - (2) Planned background (hidden sheet)
 - (3) Planned
- SPC analysis
 - General principles
 - Sheet specific macros
 - Related sheets
 - (1) SPC background (hidden sheet)
 - (2) Planned SPC
 - (3) Planned background (hidden sheet)
- Capacity
 - General principles
 - Sheet specific macros
 - Related sheets
 - Capacity calculation (hidden sheet)
 - Critical resources (variable visibility)
 - Capacity setup (variable visibility)
 - Critical resources [hide] (hidden sheet)

- Capacity summary
- Parameters
- Pathway length
- Summary
- Planning

3.1 Setup

General principles

The Setup worksheet is where the initial conditions for modelling are entered. The layout is straightforward in terms of data entry:

NHS Demand and Capacity Programme: Core model
Version: 1.04

Provider Name: 

Service Name:

Setup

Number of modalities / subspecialties required:

Does **planned** activity constitute a significant portion of your workload?

Is there a significant amount of **same day** (eg. emergency) activity?

Unit of work:

Lower bound for percentile calculation:

Urgencies:

1	2	3
2	Urgent	
3	Routine	

		Current waiting list size (Patients)
Modality 1 Name:	Test name 1	30
Modality 2 Name:	Test name 2	30
Modality 3 Name:	Another modality	20

The 'Import data from old files' button allows the user to transfer data from a populated, previous version of the model, to the latest version. The button runs the Import_Module VBA macro – see appendix for further details on this.

Related sheets

As the Setup page is fundamental to the worksheet, all worksheets involving any calculations will have some level of dependency to this. Direct dependencies include:

Demand

Planned

Capacity

Summary

Planning

3.2 Demand

General principles

The Demand worksheet is a data entry sheet that allows the user to enter up to 260 weeks' worth of demand data. If available, a week starting date can be entered, which will automatically populate the calendar year and week in the respective columns. If left blank, the model will revert to the arbitrary year 1, week 1.

The available data entry area depends on the number of modalities / subspecialties specified in the setup sheet. If the unit of work on the setup sheet is set to anything other than patients, the worksheet allows the user to enter the units of work for each modality.

If the user specifies that there is a significant amount of same day activity in the Setup tab, an 'Emergency' column becomes visible. The data entered here is used to calculate how much capacity needs to be 'carved out' for same day activity

Please enter your demand information (per week) below
 Note that you can enter up to 5 years (260 rows) of data - the sheet will extend itself if more than 52 weeks of data are entered.

Week Starting

Year	Week	Date	Test name 1				Test name 2				Total (Patients)	Total (Minutes)	Exclude data point?
			Minutes: 20	Urgent	Routine	Emergency	Total	Minutes: 20	Urgent	Routine			
2014	14	01/04/2014	1	0	0	1	2	7	0	9	10	200	
	15	08/04/2014	5	2	0	7	3	7	0	10	17	340	
	16	15/04/2014	0	2	0	2	3	5	0	8	10	200	
	17	22/04/2014	1	8	0	9	3	9	0	12	21	420	
	18	29/04/2014	1	2	0	3	3	7	0	10	13	260	
	19	06/05/2014	0	4	0	4	2	5	0	7	11	220	
	20	13/05/2014	1	4	0	5	2	9	0	11	16	320	
	21	20/05/2014	0	3	0	3	2	7	0	9	12	240	
	22	27/05/2014	2	0	0	2	0	5	0	5	7	140	
	23	03/06/2014	4	4	0	8	1	8	0	9	17	340	
	24	10/06/2014	2	2	0	4	0	14	0	14	18	360	
	25	17/06/2014	2	3	0	5	2	3	0	5	10	200	
	26	24/06/2014	2	2	0	4	0	7	0	7	11	220	
	27	01/07/2014	1	4	0	5	3	10	0	13	18	360	
	28	08/07/2014	2	1	0	3	2	9	0	11	14	280	
	29	15/07/2014	2	3	0	5	2	7	0	9	14	280	
	30	22/07/2014	2	6	0	8	2	7	0	9	17	340	
	31	29/07/2014	2	2	0	4	1	9	0	10	14	280	
	32	05/08/2014	1	7	0	8	1	8	0	9	17	340	
	33	12/08/2014	1	4	0	5	3	11	0	14	19	380	
	34	19/08/2014	3	6	0	9	3	7	0	10	19	380	
	35	26/08/2014	2	10	0	12	1	5	0	6	18	360	

Related sheets

Data entered into the Demand sheet goes directly into the Demand background (hidden) worksheet.

As demand data feeds the rest of the worksheet, most of the rest of the workbook is dependent on the data entered here to some degree.

3.3 Demand background (hidden)

General principles

The Demand background is a hidden worksheet which is fed from the Demand sheet. This sheet feeds the SPC background (hidden) sheet, ultimately feeding the SPC sheet.

There are 9 sets of tables. These are described below:

[Totals test]

Unit translation (non-emergency and emergency)

These tables are populated from the Demand worksheet. Their purposes are to convert weekly demand into units of work, if this is changed to anything other than patients in the Setup worksheet.

The emergency table is only populated if the user has specified in the Setup worksheet that their service has a significant amount same day / emergency activity.

These tables contain the following items:

Name	Description
Modifier	Unit of work - from setup tab
(Modality name)	Modality - from demand tab
(Value)	(Demand * unit of work)

Unit translation (for final output and calculations)

This table sums the weekly non-emergency and emergency (if applicable) demand across all modalities from the unit translation tables above.

This table contains the following items:

Name	Description
Calculation data series	Weekly non-emergency demand – all modalities
Emergency	Weekly emergency demand – all modalities
Exclusion flags	Indicates whether the user has excluded this point – this is derived from the SPC tab

Date axis labels

This table is derived from the demand tab. It provides the calendar year and week values for the SPC chart. If 'week starting' is left blank in the demand worksheet, it starts at the arbitrary value year 1, week 1.

The table contains the following items:

Name	Description
Year	Calendar year (if week starting is populated)
Date 2 nd level	Calendar week (if week starting is populated)

Moving range

This column calculates the moving range of the non-emergency demand data described in the 'Unit translation (for final output and calculations)' section above.

Statistical calculations

A number of statistical calculations are carried out here for non-emergency data. These values feed through to the SPC background (hidden) worksheet and are used for the SPC chart.

Up to four sets of calculations are carried out, depending on how many seasons the user has configured the SPC chart to display. The baseline selection season start and end weeks, configured by the user in the SPC worksheet, determine which weeks' data are used for these calculations.

The data items are summarised below:

Name	Description
Mean (season)	Mean calculated for the relevant rows from the Unit translation (for final output and calculations) table as described above
MRA (season)	Moving range, calculated for the relevant rows from the Moving range section, described above
Sigma (season)	The sigma value, derived from the moving range
Lower B	This calculates the weekly demand for this season at the lower bound percentile selected by the user in the setup tab
Upper B	This calculates the weekly demand for this season at the 85 th percentile

Checking urgency splits

This table will calculate the urgency split based on summed demand by urgency, adjusted for units (eg. minutes, points), and modality. This table is of particular importance if multiple modalities are entered, where clinical slot length differs between modalities.

Parsing by modality and urgency

This table summarises the non-emergency demand (as number of patients) for all modalities and urgencies on a weekly basis. This data is pulled through from the demand worksheet.

Emergency activity analysis

This table summarises emergency demand for all modalities (as the unit of work the user has selected on the setup worksheet) on a weekly basis. This data is pulled through from the demand worksheet.

Sample period as set in SPC section (across all seasonalities)

This table calculates the mean and upper and lower bound percentiles for the emergency demand data. These figures are used when displaying emergency data in the SPC chart. There are four means and percentile calculations, depending on how many seasons the user has configured the SPC chart to display.

Related sheets

The Demand background sheet feeds the SPC background (hidden) sheet, which in turn feeds the SPC sheet, the Summary sheet, and the Planning sheet.

3.4 SPC

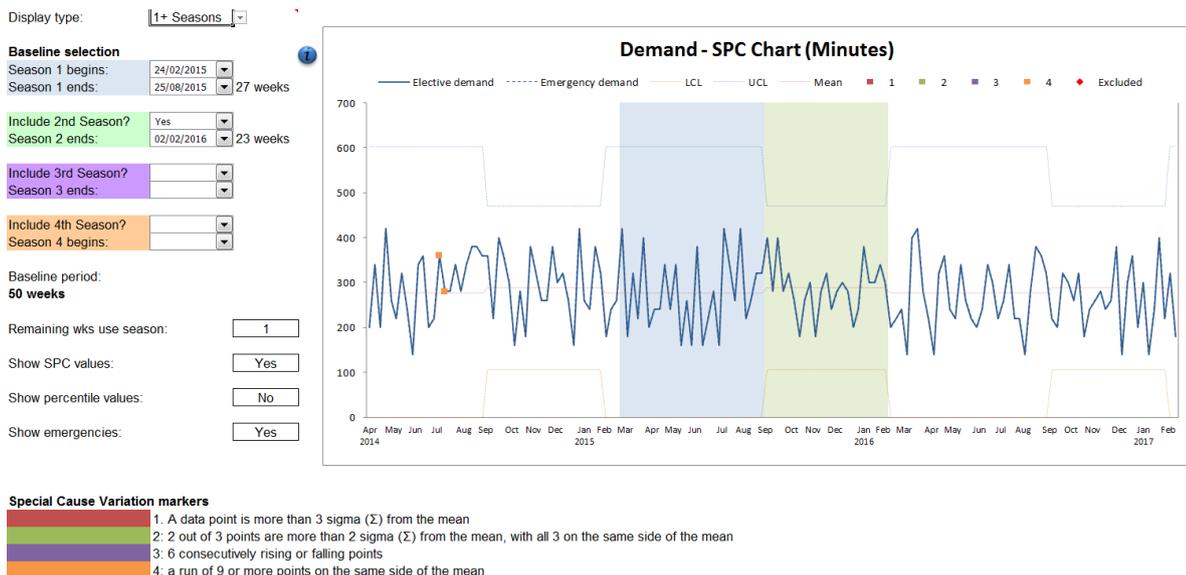
General principles

The SPC worksheet displays elective demand data, translated to units of work, as a time series. It is possible to display the demand data as a simple time series, or as an SPC chart, by using the 'Show SPC values' dropdown.

The mean and SPC upper and lower control limits are calculated and special cause variation rules are applied and flagged on the chart. These calculations are covered in the SPC background sheet. For demand data which is seasonal, it is possible to 'split' the SPC chart by up to four seasons – this calculates the mean, control limits and applies SPC rules for each season.

The upper and lower bound percentiles can be displayed or hidden using the 'Show percentile values' dropdown. These values are calculated in the Demand background worksheet, and then passed through to the SPC background sheet.

Same day / emergency demand can be overlapped on this chart using the 'Show emergencies' dropdown.



Seasonality can be enabled by changing the 'Display type' option to '1+ Seasons'. All dropdowns for season selection are dropdown objects, as opposed to data validated cells – this allows more control over the options users can see – see the 'SPC background (hide)' section for more details.

Related sheets

The key purpose of the SPC chart from a functional point of view, is to set the baseline period to calculate required capacity. Visible worksheet dependencies are:

Summary

Planning

Non-visible worksheet dependencies are:

Summary calculation (hide)

Planning (hide)

3.5 SPC background (hidden)

General principles

Contains the controls for the interactive elements of the SPC Chart tab, seasonal lookups, and the calculations for SPC values, including exception rules.

SPC Chart controls

Control the appropriate start and end points for selection boxes for seasons on the SPC Chart tab. Maximum selectable range is 52 weeks, and there must be a minimum of 10 data points before additional seasons are made available to the user.

Season lookup values (Cols AG – AT)

Uses values picked up from the SPC Chart control table to generate a lookup table that links week number (based on standard ISOWeek definition) to seasonal mean and sigma values, as well as percentile values.

Note that if a full 52 week span has not been selected, an interim 'Season 5' is set, which can be aligned with any of the existing seasons. This also applies to years where a 53rd week occurs.

SPC calculations

Displays the overall demand with calculated SPC values, based on user selection of seasonal baseline values.

Basic rules:

- Week number is compared against season lookup table and mean and sigma values are extracted.
- 4 sets of SPC rules are applied to check for special cause variation. 2 sets of columns are used in each instance: one is used to assess data points (eg. is

the data point more than 2 sigma from the mean, and in which direction?), and the other is used to keep track of the status of multiple points of data, and generate a data point at the appropriate position (ie. replicate the original data point).

Related sheets

Data from this sheet will be used in the Summary and Planning sheets, to assist with lookups for required capacity, based on percentile and season settings.

3.6 Planned

General principles

The planned worksheet is a data entry sheet that allows the user to enter up to 52 weeks' worth of planned demand data. This sheet is visible if the user has specified, in the setup worksheet, that planned activity is significant portion of their service's workload. The planned worksheet is similar to the demand worksheet in terms of operation.

The available data entry area depends on the option selected in the 'Enter data by' dropdown – this gives the user to enter planned demand as an aggregate, or by modality.

As per the demand worksheet, a week starting date can be entered, which will automatically populate the calendar year and week in the respective columns. If left blank, the model will revert to the arbitrary year 1, week 1.

Please enter your planned demand information (per week) below
Note that you can enter up to 52 weeks of data only here



Enter data by:

Week starting:

Year	Week	Date	Overall (Manual entry) Minutes: 20	Total (Patients)	Total (Minutes)	Exclude data point?
2014	14	01/04/2014	8	8	160	
	15	08/04/2014	0	0	0	
	16	15/04/2014	6	6	120	
	17	22/04/2014	7	7	140	
	18	29/04/2014	6	6	120	
	19	06/05/2014	4	4	80	
	20	13/05/2014	6	6	120	
	21	20/05/2014	8	8	160	
	22	27/05/2014	9	9	180	
	23	03/06/2014	6	6	120	
	24	10/06/2014	0	0	0	
	25	17/06/2014	5	5	100	

Related sheets

Planned SPC

Summary

Planning

Non-visible worksheet dependencies are:

Planned background (hide)

Summary calculation (hide)

Planning (hide)

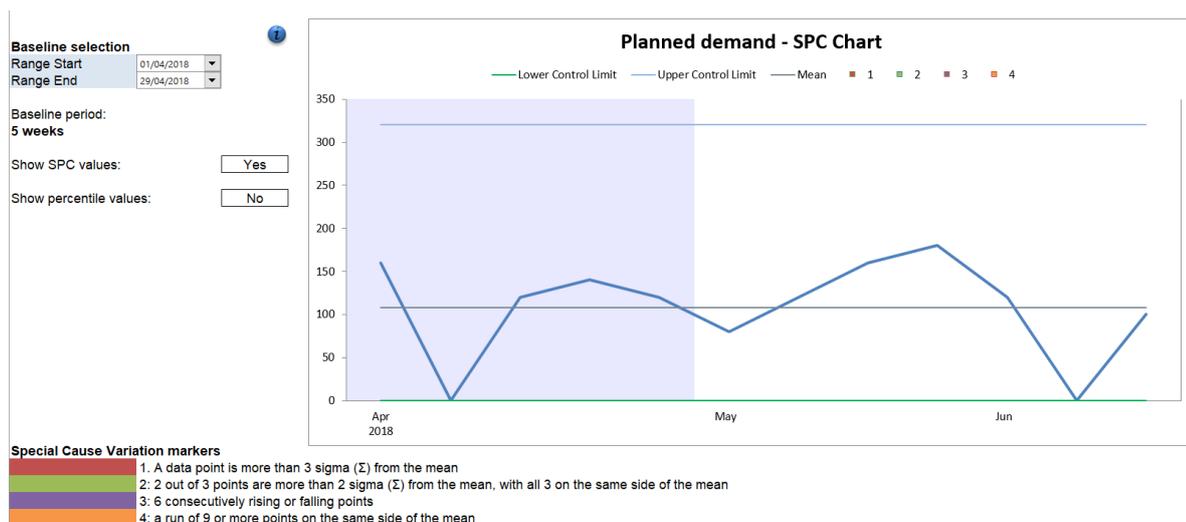
3.7 Planned SPC

The Planned SPC worksheet works on the same principles as the SPC worksheet. If the user has populated the Planned worksheet in the model, this data is translated to units of work, as a time series. It is possible to display the demand data as a simple time series, or as an SPC chart, by using the 'Show SPC values' dropdown.

The baseline selection start and end dropdown allows the user to specify a particular period of historic data that the model will use to predict how future planned demand will behave, and carve this out from future capacity.

The mean and SPC upper and lower control limits are calculated and special cause variation rules are applied and flagged on the chart.

The upper and lower bound percentiles can be displayed or hidden using the 'Show percentiles values' dropdown.



Related sheets

The key purpose of the Planned SPC chart from a functional point of view, is to set the baseline period to calculate required capacity available for carve out. Visible worksheet dependencies are:

Summary
Planning

Non-visible worksheet dependencies are:

Planned background (hide)

Summary calculation (hide)

3.8 Planned background

General principles

This sheet works much like a combination of the Demand background (hide) and SPC background (hide) sheets, and carry out the same function, albeit on the more limited dataset that can be entered for the Planned tab.

Note that due to the simplification of the data entry, seasonal calculations are not included for Planned data.

Related sheets

Data from this worksheet will inform the carve-out from available capacity. Visible worksheet dependencies include:

Summary

Non-visible worksheet dependencies include:

Summary calculation

3.9 Capacity

General principles

The capacity worksheet is where the user specifies the service's available capacity for the next 52 weeks.

A start date may be entered, to contextualise capacity over the period the user wishes to plan for. This affects the visualisations in the capacity summary worksheet. If a start date is not entered, the model assumes a start date of today.

Basic / Planning calculator

The Basic capacity mode makes an initial assumption that capacity is evenly distributed over 52 weeks.

The Planning Calculator mode lets users link clinics to key resources which can then be restricted. Enabling the planning calculator will reveal two additional sheets – Critical resources, and Capacity setup.

Note: The 'radio buttons' that allow you to switch modes is linked to the sheet-specific *Worksheet_change()* VBA macro (further details in the appendix).

Unit selection

The drop-down options for the unit selection will change dynamically, depending on what users select in the Setup sheet. If any data has already been entered in the core or ad hoc capacity tables, the units will be automatically translated, based on the overall minute or point ratio to patient as entered on the Demand sheet.

Any changes to units on this sheet will be mirrored on the Summary and Planning sheets.

Capacity tables

For the most part, the core capacity and ad-hoc capacity tables work identically. These feed through to distinct tables in the capacity calculation (hidden) worksheet.

The columns are described below.

Name	Description
Session name	Free text data entry field, used throughout later worksheets to identify a particular resource including clinics, lists and sessions
Session description (1 & 2)	Free text field allowing the user to add further context to the session name, such as the day it runs, clinician's name or anything else that may be useful
Weeks per year	The number of weeks the resource is available per calendar year, to aggregate figures up annually
(units of work) per clinic	The number of units of work that can be treated by a particular resource in any given week
Total (units)	The total capacity of the resource per calendar year (weeks per year x units of work per clinic)
Average per week	The total units per year divided by 52, hence, the average capacity of the resource per week
WL clearance (ad-hoc capacity)	This is a drop down field that is only found in the ad-hoc capacity table. This is to specify if an ad-hoc resource is specifically dedicated to clearing a waiting list backlog

Capacity

Start date: 01/05/2018
End date: 30/04/2019

Basic Planning calculator

Units: Minutes On aggregate, 1 patient = 20. Minutes

Capacity calculator

Core capacity

Session name	Session description [1]	Session description [2]	Weeks Per Year	Minutes Per Clinic	Total (Minutes)	Average Per Week (52 Weeks)
					18,000	346
MRI (Gastro) Mon	Mon		39	180	7,020	135
CT (Colonoscopy) Mon	Mon		39	180	7,020	135
CT (Colonoscopy) Tue	Tue		21	120	2,520	48
CT (Colonoscopy) Thu	Thu		12	120	1,440	28

Ad-Hoc capacity

Session name	Session description [1]	Session description [2]	Weeks Per Year	Minutes Per Clinic	Total (Minutes)	Average Per Week (52 Weeks)	WL Clearance
					Totals 5,040	97	
ad hoc 1			42	60	2,520	48	
ad hoc 2			42	60	2,520	48	

Related sheets

Visible worksheet dependencies include the following:

- Critical resources
- Capacity setup
- Capacity summary
- Summary

Planning

Non-visible worksheet dependencies include:

Capacity calculation (hide)

3.10 Critical resources

General principles

The critical resources worksheet allows the user to specify resources that are necessary for the service to run. Resources, in this context could refer to the availability of clinicians, medical equipment, clinic space or anything else, without which the service (or a portion thereof) could not run.

The start and end dates are pulled through from the Capacity worksheet and are not user adjustable.

The worksheet allows the user to input a maximum of 100 critical resources. Up to five periods of unavailability over a 52-week period can be entered for each resource. The layout is straightforward in terms of data entry:

Critical resources

Start date	01/04/2019
End date	31/03/2020

Please enter up to 5 periods when your critical resources are unavailable

Critical Resource	Period 1		Period 2		Period 3		Period 4		Period 5	
	Start	End	Start	End	Start	End	Start	End	Start	End
Consultant: Mr Smith	01/04/2019	14/04/2019	13/05/2019	26/05/2019	16/09/2019	29/09/2019	10/02/2020	16/02/2020	09/03/2020	
Consultant: Ms Taylor	16/12/2019	05/01/2020								
CT Scanner 1	05/08/2019	25/08/2019								
CT Scanner 2										
CT Scanner 3										

Resources are then assigned to specific cohorts of the service's capacity in the Capacity setup worksheet.

Related sheets

This sheet is only active if the 'Planning calculator' option is enabled.

Visible worksheet dependencies include the following worksheets:

- Capacity setup
- Capacity summary
- Summary
- Planning

Non-visible dependencies include:

- Capacity calculation (hide)
- Summary calculation (hide)

3.11 Capacity setup

General principles

The Capacity setup worksheet is where critical resources are aligned with cohorts of the service's capacity, specific clinics, for example. This can be done for either or both core and ad-hoc capacity, depending on the selection in the 'Show:' dropdown list.

Up to three critical resources can be assigned per clinic, using the dropdown under 'Key resource (1 – 3)'.

The columns are described below:

Name	Description
Clinic name	Refers to particular resources, such as clinics, lists and sessions. Automatically populated from the information in the Capacity worksheet
Key resource (1 - 3)	Dropdown list populated from the information entered in the Critical resources worksheet
Frequency from calculator	The number of weeks the clinic is available per calendar year. Populated from capacity worksheet
Adjusted for critical resources	The number of weeks the clinic is available per calendar year once critical resources are taken into consideration
Stated capacity	The total capacity of the resource per calendar year (weeks per year x units of work per clinic) that the resource is intended to run – taken from capacity worksheet
Adjusted (maximum) capacity	The maximum capacity available over the planning period, once critical resources are considered, ie if the clinics ran at full tilt for the number of weeks the clinics are available (adjusted weeks per years x units of capacity)
Capacity match?	This indicates whether the impact of critical resources affects the overall number of patients that can be seen over the 52-week planning period. 'Under' highlights you may underdeliver capacity for a given resource

Capacity - Link your sessions to your key resources here

Show:

Core

Core capacity

Clinic Name	Key resource 1	Key resource 2	Key resource 3	Frequency from calculator	Adjusted for critical resources	Stated capacity	Adjusted (maximum) capacity	Capacity match?
MRI (Gastro) Mon	1. Consultant: Mr Smith			39	28	7,020	5,040	Under
CT (Colonoscopy) Mon	1. Consultant: Mr Smith	2. Consultant: Ms Taylor		39	42	7,020	7,020	Over
CT (Colonoscopy) Tue	2. Consultant: Ms Taylor	3. CT Scanner 1		21	20	2,520	2,400	Under
CT (Colonoscopy) Thu	3. CT Scanner 1			12	11	1,440	1,320	Under

Related sheets

Dependencies include (visible):

Capacity summary

Summary

Planning

Non-visible dependencies:

Capacity calculation (hide)

3.12 Capacity summary

General principles

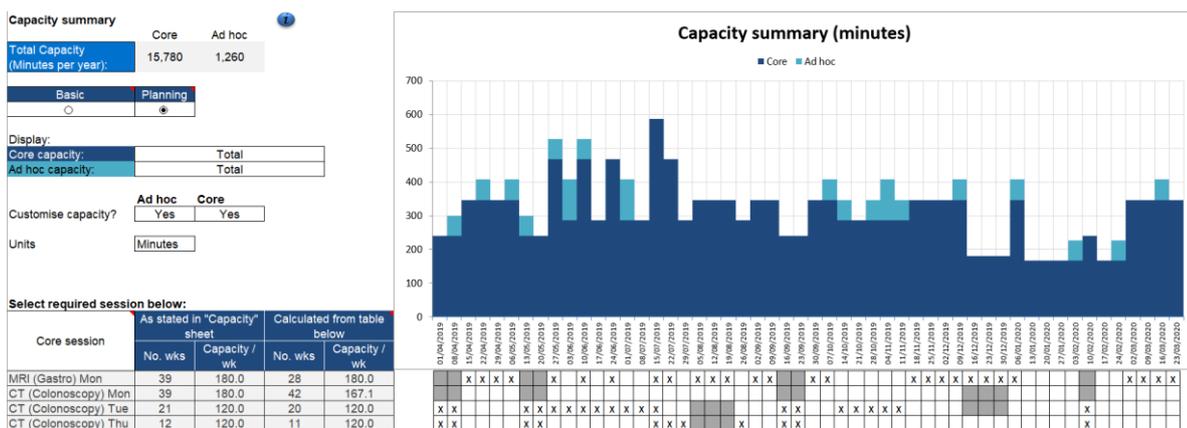
The capacity summary worksheet summarises the service’s available capacity for the 52-week planning period. The services, or particular cohorts thereof, can be further customised in this worksheet.

The total capacity for the planning period is summarised in units of work in the top left of the sheet. This is split by ad-hoc and core capacity.

The basic and planning radio buttons are carried through from the Capacity worksheet – the selection, basic or planning calculator can be made in either the Capacity or Capacity summary worksheet. This selection affects both sheets.

The chart provides a graphical representation of the service’s available capacity based on the information populated in the model. Cohorts of capacity (such as specific clinics) can be viewed individually on the chart using the dropdown menus for core and ad-hoc capacity under the ‘Display’ heading.

The user can further customise their services ad-hoc and core capacity by changing the selection in the respective dropdown field underneath the ‘customise capacity’ heading. This allows the user to specify when particular clinics run by selecting / entering ‘x’ in the box below the corresponding week in the chart. If critical resources have been assigned, boxes are greyed out when that capacity is unavailable.



Related sheets

The main dependency is related to the week on week adjustments for core and ad hoc capacity – this is only applicable if the option to customise capacity is set to 'Yes'.

Dependencies include (visible):

Summary

Planning

Non-visible dependencies:

Capacity calculation (hide)

3.13 Critical resources (hidden)

General principles

The Critical resources (hide) worksheet is where the background calculations for critical resource availability are performed. Any unavailability is then passed through to the Capacity calculation (hidden) worksheet, where the net capacity is adjusted to take critical resources into account. The tables in this worksheet are described below:

Resource availability

This section is split into two tables. The first table is used to derive date items: week start and end date, calendar year, calendar month and calendar week. The headings are self-explanatory. These data items are used later on in this worksheet to calculate the availability of resources on a week by week basis.

The second table calculates the periods of unavailability of critical resources by week indices. The table contains the following items:

Name	Description
Critical resource	The name of the critical resources as entered by the user in the Critical resources worksheet. This is prefixed (concatenated) with a serial number
Start (periods 1 – 5)	These columns convert the start date for each period of unavailability, as selected in the Critical resources worksheet, into week indices
End (periods 1 – 5)	These columns convert the end date for each period of unavailability, as selected in the Critical resources worksheet, into week indices

Check if resource is active within a given week

This table summarises the availability of each critical resource on a week by week basis. This table contains the following items:

Name	Description
Critical resource	The name of the critical resources as entered by the user in the Critical resources

	worksheet. This is prefixed (concatenated) with a serial number
Wk index (1 – 52)	The headings refer to the week indices. A '1' indicates the resource is unavailable. A '0' indicates the resource is available

Related sheets

This sheet will only have an effect if the Planning calculator option is selected.

Dependencies include (visible):

Capacity setup
Capacity summary
Summary
Planning

Non-visible dependencies include:

Capacity calculation

3.14 Capacity calculation (hidden)

General principles

The Capacity calculation (hide) worksheet is where the capacity figures are calculated. The effect of critical resource unavailability is taken into consideration to derive the 'net' capacity. The tables in this worksheet are split into core (top half of the worksheet) and ad hoc capacity (bottom half of the worksheet). These tables are described below:

Core (or ad-hoc) clinic list

This table summarises capacity and the critical resources that have been linked to them. This information is derived from the 'Capacity setup' worksheet.

This table contains the following items:

Name	Description
Clinic index name	The name of the clinical resource (such as a clinic name), derived from the Capacity setup worksheet
Resource link (1 – 3)	These columns refer to any critical resources assigned to a clinic index, as specified by the user in the Capacity setup sheet. '0' is displayed if a critical resource has not been assigned
End (periods 1 – 5)	These columns convert the end date for each period of unavailability, as selected in the Critical resources worksheet, into week indices

Capacity summary (units of work) – time based

This table summarises whether capacity can run on any given week, considering the availability of critical resources and contains the following items:

Name	Description
Clinic index name	The name of the clinical resource (such as a clinic name), derived from the Capacity setup worksheet
1 – 52 (week indices)	The headings refer to the week indices. A '1' indicates the clinic index can run. A '0'

	<p>indicates the clinic index cannot run, due to the unavailability of a critical resource.</p> <p>If the model has been set up to use the 'basic' capacity calculator (rather than the planning calculator), all cells are populated with '1'</p>
Total weeks active	This indicates the total number of weeks a clinic index can run, based upon the availability of critical resources
Capacity / clinic (adjusted)	<p>This is the units of work required to be delivered each week by the clinic index to deliver the planned capacity over 52 weeks. This is after the availability of critical resources is taken into account.</p> <p>This is only affected if it is theoretically possible to deliver planned capacity.</p>

Capacity (time based) – adjusted

This table summarises the capacity (in units of work) adjusted for clinical resources and contains the following items:

Name	Description
Clinic index name	The name of the clinical resource (such as a clinic name), derived from the Capacity setup worksheet
1 – 52 (week indices)	<p>The headings refer to the week indices.</p> <p>The highlighted row below the week is the calendar week the week index corresponds to.</p> <p>The row below this is the total units of work across all resources per week (see below).</p> <p>The cell values refer to the units of work available by clinic index by week, taking critical resources into consideration</p>
Total capacity (adjusted)	The total units of work available by clinic index, accounting for the availability of critical resources.
Total capacity (basic)	The total units of work available by clinic index, before critical resources are taken into consideration

3.15 Parameters

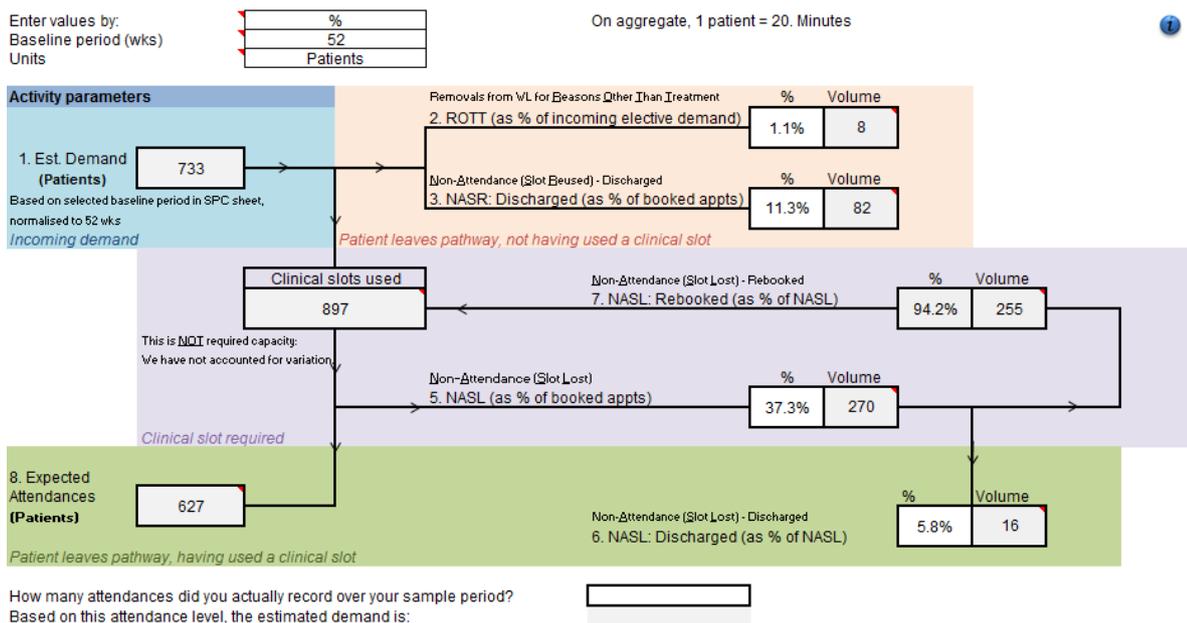
General principles

The Parameters worksheet allows the user to set up the model to reflect how their service behaves.

The 'Enter values by:' selection is used to toggle between entering service behaviour information as a % value or as a volume. Changing this selection triggers the worksheet_change macro

The Baseline period (wks) selection allows the user to normalise demand values to a given number of weeks to help with percentage calculations. For example, if the user was entering data by volume, but only had 40 weeks of data, setting the baseline period to 40 weeks would ensure that any calculated percentage rates for ROTT etc would be adjusted properly.

The 'Units' selection allows the user to enter parameter volumes by either patients, minutes or points, depending on the unit of work selected in the Setup worksheet.



Related sheets

Data entered into this sheet will affect required capacity calculations. This will be visible in the following sheets:

Summary, Planning

Non-visible worksheet dependencies include:

3.16 Pathway

General principles

The pathway worksheet is where the user enters details about the desired waiting times for their service.

The model allows the user to enter these details by urgency. 'Start' refers to the earliest a patient can be seen, 'seen by' refers to the *latest* a patient can be seen, taking into consideration whether it would be clinically appropriate for them to do so. The rebooking period refers to the maximum time it would take for a rebooking to be seen – this is on top of the *normal* waiting time for that urgency. In essence, by cancelling and rebooking their appointment, patients are, in effect, choosing to wait longer for their treatment.

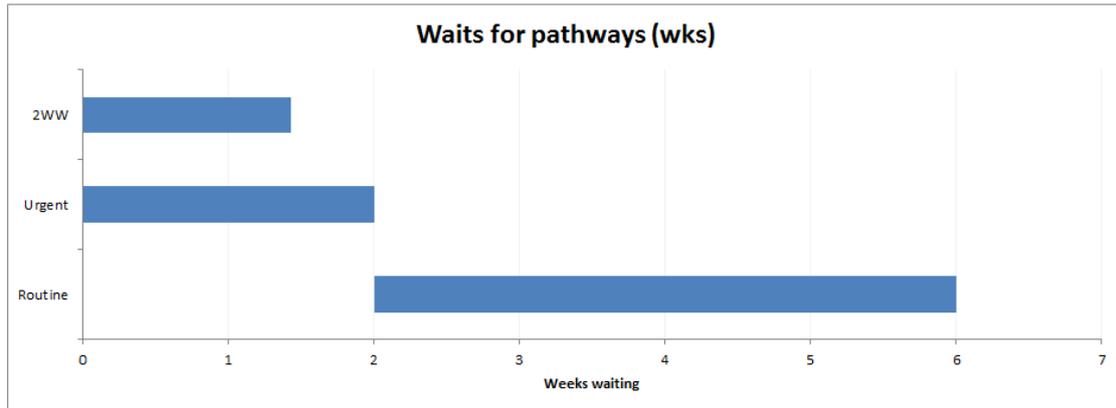
The start and seen by times can be specified in either days or weeks. The pathways for the urgencies are visually represented in the chart.

These figures are used to calculate the sustainable waiting list size in the summary worksheet. By default, the model automatically works out the split between different urgencies based on the historic data that has been entered in the demand worksheet. If it is known that this split is likely to change for the period being planned, or the user wishes to test a scenario involving a different split of urgencies, the demand split can be overridden by selecting 'override' from the 'Demand split' dropdown box and manually entering the split. This can be reverted by changing the dropdown back to 'use calculated values'.

Pathway parameters

Urgency	Start	Seen by	Rebookings seen in:	Units
2WW	0	10		Days
Urgent	0	2		Weeks
Routine	2	6		Weeks

Demand split	Use calculated figures
0%	
20%	
80%	



Related sheets

The data from this sheet will be used to calculate the sustainable waiting list size.
Direct dependencies for visible worksheets include:

Summary

Non-visible worksheet dependencies include:

Parameters calculator (hide)

3.17 Summary

General principles

The summary worksheet displays the outputs of the model.

The top half of the worksheet displays the current state of the service, comparing the service's required capacity with its available capacity. It is possible to view this as an aggregate figure or broken down by time, using the 'breakdown' selection. If a unit of work other than patients has been selected in the setup worksheet, it is possible to view required capacity and available capacity either by patients or by the unit of work, using the units selection.

The user can enter a start date for the chart to run from. If left blank, it defaults to the start date entered in the capacity worksheet.

Capacity carved out for planned and same day demand can be displayed or hidden on the chart depending on the selection in the 'show reserved capacity' dropdown.

The 'show details' dropdown toggles whether rows 27 – 35 are visible or not. These rows detail the required capacity at the 85th percentile of weekly demand and at the lower bound percentile as selected by the user on the setup worksheet. It also shows the capacity required to meet the average weekly demand.

Also included here is the available core and ad-hoc capacity per week and per year. Reserved capacity is displayed if the user has selected this in the dropdown selection on the worksheet.

If there is a shortfall in available capacity, this is quantified in warning messages for both the lower and upper bound percentiles.

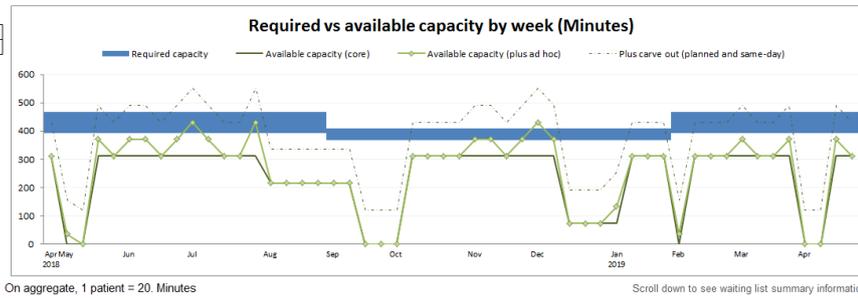
Required capacity vs available capacity (weekly)

Show by:
Breakdown:
Units:

Select a start date:

Show reserved capacity?

Show details



Required capacity	Per week	Year
Based on 85th percentile	442	-
Based on 65th percentile	381	-
Average	345	18,277
Available capacity		
Core	231	12,218
Ad hoc	23	1,211
Reserved capacity		
Reserved for non-elective	120	6,360

You need an additional 189 minutes to meet the 85th percentile of demand. It may be advisable to review your capacity if you have an urgent, or very variable service.
You need an additional 128 minutes to meet the 65th percentile of demand. Your waiting list size is likely to increase over time.

The bottom half of the worksheet displays information about the waiting list size. There are two options which can be selected via the dropdown menu¹:

- Current waiting list size against the maximum sustainable waiting list size.
- Estimated waiting list trajectory

Note that units for both sections are controlled by the units selection at the top of the sheet.

The waiting list trajectory tool includes 2 additional parameters: absence (ie. sickness) rate, and estimated effect on capacity – these are used as part of the trajectory modelling.

Clicking on the 'Run WL Sim' button will run the WL_Prediction_Interval macro (further details in appendix).

Current waiting list vs Estimated sustainable waiting list (Minutes)

Breakdown:
Capacity Adjustment Rate (%):
Capacity Impact (%):

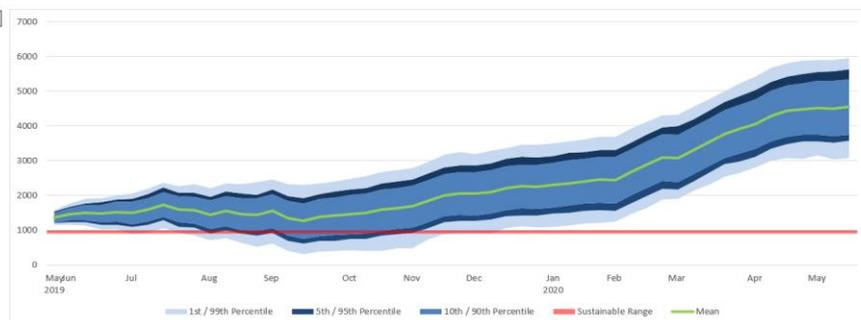
Current: 1,220
Sustainable: 907 - 1,003

Clearance: 0 - 313

Clearance calculator:

I would like to clear the backlog in Weeks

This will require capacity for an additional:
-- minutes per week to clear in the time specified



¹ Waiting list trajectory is only available from version 2.0 onwards only.

Related sheets

Parameters for the Waiting List trajectory tool are passed to the WL PI Backing (hide) sheet.

3.18 Summary calculations (hidden)

General principles

The summary calculations (hide) worksheet contains the backing data for the outputs on the summary tab. This worksheet consists of a number of tables which are outlined as follows below.

Season start / end

This table is on the top left of the worksheet and derives the start and end periods for seasons, if the user has chosen to view the outputs seasonally. This table contains the following items:

Name	Description
Season (1 – 4)	These refer to the four seasons that can be shown in the summary, derived from the selection chosen by the user in the SPC chart worksheet
Wk index start	This refers to the week index the start of the season (as chosen by the user in the SPC chart worksheet) corresponds to in the planning period
Wk index end	This refers to the week index the end of the season (as chosen by the user in the SPC chart worksheet) corresponds to in the planning period

Parameters

This table is to the right of the season start / end table, at the top of the worksheet. It contains the values entered by the user in the parameters worksheet along with any corresponding values that have been entered in the Planning worksheet, to test 'what if' scenarios. The contains the following items:

Name	Description
Adjustments	These refer to the respective parameters. Values pulled from Parameters calculator (hidden) worksheet
(values)	The values entered for each item by the user in the Parameters worksheet

Override	Values entered in the Planning worksheet against these headings will appear here. If blank, these revert to the values entered in the Parameters worksheet
----------	--

Individual cells:

Override adjustment: Refers to the 'multiplier' that is applied to demand to derive capacity at the appropriate percentile, once parameters are taken into consideration.

Overall pt-unit adjustment: Conversion to translate capacity in non-patient units (ie. minutes or points) back into patients. This value is set to 1 if selected units in the Setup tab are 'Patients'.

Starting point: Refers to the start date used for the chart in the summary worksheet, specified by the user. If left blank, it reverts to the value entered by the user in the capacity worksheet (which in turn reverts to the start of the current week if left blank in the capacity worksheet).

Date table

Contains the following items:

Name	Description
Reference week	These are the dates used to derive the x-axis for the chart in the summary sheet
Year	Calendar year of the respective reference week
Month	Calendar month of the respective reference week
Wk index	Calendar week of the respective reference week

These date items apply to the rest of the tables in this worksheet, which are outlined below.

Demand table

Contains the following items:

Name	Description
Lower	Lower bound percentile of weekly (seasonal) elective demand
Upper	Upper bound percentile of weekly (seasonal) elective demand
Emergency carve out	Mean weekly emergency demand
Planned carve out	Mean weekly planned demand

Capacity

There are two tables – the first table feeds the second table, which feeds the chart and calculates other values for the summary worksheet. The majority of items are the same in both tables, and are thus collectively listed below:

Contains the following items:

Name	Description
Available capacity (core and ad-hoc)	Elective capacity available on a per week basis, taking into account critical resources and periods of unavailability
Adjusted available capacity (core and ad-hoc)	Available capacity minus any carve out (emergency or planned)
Required capacity (lower and upper)	Lower bound (user set) and upper bound (85 th) percentiles of weekly demand as per historical demand data. Note that in the chart table, upper is displayed as the figure that needs to be added to the lower bound percentile.
Carve out	Total carve out for planned and emergency demand

3.19 WL PI Backing (hidden)

General principles

Holds reference tables and final outputs for the Waiting List trajectory tool (accessible on the Summary sheet). Tables are as follows:

Summary values (Cols A-B)

Summary values for the service, based on data from the Parameters page.

Reference values (Cols H – N)

Uses seasonal values from original baseline set on the SPC Chart sheet, and applies this to the 52 week period set on the Summary sheet.

Modelling outputs (Cols R – AC)

Sets data series that will be used in the Waiting List trajectory chart, including ranges for prediction intervals as well as sustainable waiting list range. Note that no calculations take place on this table – this is all handled via VBA macro (see appendix for further information).

Related sheets

Outputs are used on the Summary sheet – no other dependencies.

3.20 Planning

General principles

The planning worksheet allows the user to test different scenarios, based on changes to capacity, and some of the parameter information. The current situation and the impact of the user's adjustments are represented visually in the chart.

If the user has selected a unit of work other than patients in the setup page, the unit can be changed on the chart using the 'units' selection – this will be reflected on the Capacity and Summary worksheets.

The 'start date' box allows the user to enter a date from which they would like to plan from. If left blank, the chart defaults to start of the following week.

'What if' tool

Changing the 'What if' planning selection to 'Yes' allows the user to test how changes in demand or the behaviour of their service impacts its demand and capacity balance.

Note that any changes made here will not be reflected in the rest of the workbook.

Capacity tool

If the 'change capacity' selection is set to yes, it unhides rows 22 – 45, displaying a table. This table has 21 rows available for planning purposes, which allow the user to test the impact of different scenarios - either and increase or decrease in capacity.

The table is summarised below:

Name	Description
Session name	Free text data entry field to allow the user to annotate the change in capacity
No. wks	Derived from the number of weeks the session runs (Denoted by 'X's under the chart – described later)
Capacity / wk	Numerical field – allows the user to specify weekly additional capacity, or a reduction in capacity using if the value is preceded by a negative (-) sign.

3.21 Planning (hidden)

General principles

The planning (hide) worksheet contains the backing data for the outputs in the Planning worksheet. It contains the following items:

Name	Description
Week commencing	Start of the week for planning purposes
Weeknum	Calendar week
Required lower	Required capacity at the lower bound percentile
Required upper	Additional capacity required on top of required lower to hit 85 th percentile
Available (core and ad hoc)	Elective core and ad hoc capacity available on a per week basis, taking into account critical resources, periods of unavailability and capacity carved out for planned and emergency demand
Total	Total core and ad hoc capacity per week
Adjusted	Capacity following adjustments made by the user based on the 'change capacity' section (see below)
Set to zero	The zeros override the available capacity for that week, if selected by the user
(Session name)	Headers refer to the session names added by the user to change their capacity. Cell values refer to the change in capacity – if the user has indicated that this session will run in any given week. These values are added to the 'Total' value to derive the 'Adjusted' value in this table

Related sheets

Outputs relate directly to the Planning worksheet.

Appendix A: List of macros

Macros will be listed by module (in order of appearance in the VBA script), and then by sheet, in workbook order.

Note that Functions can be used directly as a method in VBA script, but Subs will need to be called via the *Call* command.

This section assumes a high level of proficiency with VBA programming – the code within the worksheets is also commented to assist developers, but is not designed as a tutorial.

Module: Capacity_Radio_Buttons

Sub Advanced_Calculator_Click()

Description

Allows access to advanced capacity calculator functions (eg. setting critical resources, linking to clinics, and specific week functions on the *Capacity Summary* sheet). Following sheets are unhidden:

- Critical resources
- Capacity setup

Capacity planner functions will be enabled if this is enabled – this is carried out by Excel functions in the backing sheets.

Sub Simplified_Calculator_Click()

Description

Hides the *Critical resources* and *Capacity setup* sheets. Excel functions in the backing sheet will also disable advanced capacity planning calculations.

Module: standard_macros

Function GenAddressX(XStepSize, XStepRep, StartPoint)

Description

Generates a list of cell references which are returned as a string. This version steps across columns, jumping *XStepSize* columns, repeated *XStepRep* times. The *GenAddressY* function performs the same operation, but on a vertical (ie. row) basis rather than horizontal (ie. column).

Arguments

XStepSize	Size of column step (<i>integer</i>)
XStepRep	Number of step iterations that will be returned (<i>integer</i>)
StartPoint	Starting location – needs to be a specific cell address, including worksheet (<i>range</i>)

Function GenAddressY(YStepSize, YStepRep, StartPoint)

Description

Generates a list of cell references which are returned as a string. This version steps across rows, jumping *YStepSize* rows, repeated *YStepRep* times. The *GenAddressX* function performs the same operation, but on a horizontal (ie. column) basis rather than vertical (ie. row).

Arguments

YStepSize	Size of row step (<i>integer</i>)
YStepRep	Number of step iterations that will be returned (<i>integer</i>)

StartPoint Starting location – needs to be a specific cell address, including worksheet (*range*)

Example

```
TestString = GenAddressY(4, 5, Worksheets("Demand").Range("A3"))
```

Will result in *TestString* becoming a String with the following value:

```
'Demand!A3, 'Demand!A7, 'Demand!A11, 'Demand!A15, 'Demand!A19
```

Sub RowVisible(TargetSheet, StartRow, Height, Flag)

Description

Hides or unhides a defined set of rows in a worksheet.

Arguments

TargetSheet Name of the worksheet in which the target rows are located (*string*)

StartRow Starting row which will be affected by the function (*integer*)

Height Number of rows that will be affected (*integer*)

Flag True/False flag which sets whether specified rows will be visible (value = *True*) or hidden (value = *False*) [*Boolean*]

Sub ColVisible(TargetSheet, StartCol, Width, Flag)

Description

Hides or unhides a defined set of columns in a worksheet.

Arguments

TargetSheet	Name of the worksheet in which the target rows are located (<i>string</i>)
StartCol	Starting column which will be affected by the function (<i>integer</i>)
Height	Number of rows that will be affected (<i>integer</i>)
Flag	True/False flag which sets whether the specified rows will be visible (value = <i>True</i>) or hidden (value = <i>False</i>) [<i>Boolean</i>]

Example

Call ColVisible("Demand", 3, 5, False)

Will result in columns C – E on the sheet "Demand" becoming hidden.

Sub ProtectSheet(ws, changeflag)

Description

Sets the protection status of an individual worksheet.

Arguments

ws	Target worksheet to be protected/unprotected (<i>worksheet</i>)
changeflag	True/False flag which sets whether the sheet will be protected (value = <i>True</i>) or unprotected (value = <i>False</i>) [<i>Boolean</i>]

Example

Call ProtectSheet("Demand", False)

Will unprotect the worksheet "*Demand*".

Sub protectall()

Description

Protects all visible worksheets in the workbook. Visible worksheets are considered as any sheet that does not have the suffix '*(hide)*', or whose name is '*List*'.

Note

If you are editing the worksheets as a developer, commenting out the contents of this macro will prevent the workbook from being automatically protected every time a worksheet value is changed.

Sub Customise_List()

Description

The Trust / Specialty list sheet ("*List*") is made visible, and activated. The '*Edit lists*' button on the '*Setup*' sheet is linked to this macro.

Sub List_Set()

Description

Hides the Trust / Specialty list sheet ("*List*"), and moves the user back to the "*Setup*" sheet. The '*Go back*' button on the '*List*' sheet is linked to this macro.

Module: Format_Changes

Sub ModalityAdjust(Modalities)

Description

Updates the workbook to reflect user selection of modalities in all related interfaces through the workbook (eg. allow modality specific demand to be entered). This is called by a worksheet linked macro on the *Setup* sheet, and will affect the following worksheets:

- Setup
- Demand
- SPC Chart
- Planned (if used)
- Parameters calculator (if used)

Arguments

modalities Integer value that is picked up from a user-selected dropdown cell on the '*Setup*' sheet. Ranges between 1 and 20.

Module: Import_Module

Sub Import_Button()

Description

Links to 'Import data from old files' button on 'Setup' page. Controls data import by calling required tests and sub routines in order, and returns success or error message to user.

Arguments

None

Function Import_Process(wbTarget, wbSource)

Description

Imports data from user-selected file into active document. Relevant arguments are generated within the *Import_Button()* sub routine.

Data import is carried out by opening user defined source file. All data is copied over directly from the source worksheet.

Arguments

wbTarget Target sheet to copy data into. This is the active document.

wbSource Worksheet that we are copying data from (ie. selected by user).

Function minset(Value1)

Description

Checks row counts in sheets and returns a minimum value of 1 if argument = 0 to ensure import process works correctly (copying an array with row value of 0 will result in an error).

Arguments

Value1 Value being tested. Returns 1 if *Value1* = 0, otherwise returns *Value1*.

Module: SPC_Ranges

Sub OptionButton17_Click()

Obsolete macro – no longer in use

Sub OptionButton18_Click()

Obsolete macro – no longer in use

Sub PlannedRangeStart_Change()

Description

Checks that the Planned SPC background data remain valid whenever the dropdown range is changed by the user. Links to the '*Range Start*' dropdown option on the '*Planned SPC*' sheet. If the starting point shifts forward, and the end point is shifted beyond the dataset size, the end point is adjusted to the maximum possible value, with warning note displayed to user.

Sub SPC_Range_Reset()

Description

Data check for main SPC range – works in the same fashion as *PlannedRangeStart_Change()*: If end points for data ranges are invalid (ie. beyond existing limits), reset to max possible value.

Additional function – for seasons that are disabled due to range constraints, start values are reset to 1.

Module: WL_Prediction_Interval

Sub WaitingListPrediction()

Description

Generates a prediction interval cone for expected waiting list size by running a Monte Carlo simulation of the waiting list.

Parameters are based on summary statistics of demand and parameter values (eg. mean + standard deviation on a per-season basis, adjusted by non-attendance and rebooking %), capacity information is based on user entered data, on a per-week basis.

Output is saved on the worksheet '*WL PI Backing (hide)*' – note that the calculations are carried out internally before the results are copied directly to sheet.

Sheet specific macros

Sheet specific macros are generally designed to be linked to events that are expected to occur within a given sheet – eg. user selection of drop-down options.

Most of the macro actions will be related to user interface adjustments. Anything that changes the structure or values in the worksheets will temporarily disable worksheet protections.

All visible sheets will also include information points: . These are buttons which links to sheet specific macros ('[Sheet]_Help_Click'), which toggle the visibility of a window containing help text.

Any worksheets which require an evaluation of cells that have been changed will use the *Worksheet_Change(TargetCell)* macro, which will run any time an item on the worksheet has changed.

TargetCell is an automatic variable returned by the *worksheet_change()* macro, which will specify any worksheet cell that has been changed.

Setup

Sub worksheet_change(TargetCell)

Description

Tests for changes in dropdown cell values [number of modalities, inclusion of planned demand, inclusion of emergency/same day demand, definition of units], and formats the Excel workbook accordingly. Formatting and interface changes are as follows:

Modality:

Waiting list and modality name options on the *Setup* worksheet will be adjusted to the user selection. The *Demand* sheet will be similarly modified, as will the *Planning* worksheet if enabled.

Planned:

Allows user to access *Planned* and *Planned SPC* sheet, and will carve out capacity required for planned demand from the overall available capacity.

Emergency:

Unlocks 'Emergency' columns in the *Demand* sheet, and will carve out capacity required for emergency demand from the overall available capacity. Options to view emergency demand will be available in the *SPC* sheet.

Units:

Dropdown boxes for unit selection in the rest of the workbook (*Capacity*, *Parameters*, *Summary* and *Planning* sheets) will be adjusted to allow users to choose between patients and any other selected units.

Demand

Sub worksheet_change(TargetCell)

Description

Checks the starting date (entered in cell C6). If a valid date has been entered, the date column is formatted in dd/mm/yyyy format, otherwise it is adjusted to 'General' format.

Note: This is done to ensure that the x-axis on the SPC chart is formatted to correctly show dates or numbers, depending on what the user has entered.

Arguments

SPC Chart

Sub worksheet_change(TargetCell)

Description

[Show/hide choices made by user on the SPC chart. Following choices will affect the display:

Single / multi season dropdown

Show SPC values

Show Percentile values

Show emergency appointments

Note: Macro operates by hiding/showing data items – this technique is used for similar 'switches' in other dropdown options in the rest of the workbook]

Capacity

Sub worksheet_change(TargetCell)

Description

If the user changes the units dropdown option (eg. patients, minutes, points), any numeric values entered regarding clinical session capacity will be translated automatically to the relevant unit.

This also tests for settings on related capacity sheets (*Summary*, *Capacity summary* and *Planning*) to ensure that units are consistently applied across all sheets.

Capacity summary

Sub worksheet_change(TargetCell)

Description

Checks for 2 inputs:

- Unit adjustment, where all units shown on capacity tables will match user selection from the dropdown option.
- Show/hide rows for adhoc and core capacity sessions based on user selection.

Parameters

Sub worksheet_change(TargetCell)

Description

Checks user selection of dropdowns for:

- Method of data entry
- Change of unit type

Note: Baseline period is handled within the worksheet using Excel formula.

Once the type of change from the user has been detected, further sheet-specific macros are called to enact desired worksheet behaviour.

Sub ParamCalculatorFormat(ws, wshidden, Units, Mode)

Description

If the worksheet is configured with the following settings, additional options are provided to the user:

- Model has multiple modalities
- Parameter data is entered as a volume, not %
- Data is entered in patients

The user will then be presented with the option to use a more complex 'Parameter calculator' which will calculate overall % values based on the behaviour of individual modalities.

Sub CellProtection(ws, wshidden, ModeSelect, UnitSelect, unitchange)

Description

Carries out formatting based on user selection by locking/unlocking and formatting cells for data entry.

Sub Param_Cells_Formula(wshidden, ws, TypeFlag, VolCellChange, PerCellChange, Parameter_Calc_Flag, unitchange)

Description

Adjusts the formula used in the display of the Parameters data: Any cells that are not being used for data entry will reference calculated values in the hidden backing sheet.

Sub Param_Calculator_Yes_click()

Description

Enables the more advanced parameters calculator.

Sub Param_Calculator_No_click()

Description

Disables the parameters calculator, and unlocks the main parameters sheet.

Summary

Sub worksheet_change(TargetCell)

Description

Shows/hides visual displays based on user input. This includes the following:

Required vs available capacity

- Chart type: Select between single value and time-based breakdown.
- Units: based on user selections in the Setup sheet.
- Show/hide reserved capacity as an additional data item on the chart.
- Show/hide table of results

Current waiting list vs. Estimated sustainable waiting list

- Chart type: Select between summary position of current waiting list and waiting list trajectory.

Planning

Sub worksheet_change(TargetCell)

Description

Checks for the following user actions:

- Change of units
- Selection of 'What if' scenario planner – shows or hides parameter options for change, and locks/unlocks input cells accordingly.
- Shows/hides capacity planner cells, based on user selection, and locks/unlocks accordingly.

Note that if the 'What if' planner is enabled, the required capacity will be shown based on the original parameter settings, as well as the new settings. The data are split on primary and secondary axes so that the values can be shown simultaneously, so the code will equalise the y-axis scales if any parameter values are changed.

Appendix B: List of named ranges

Name	Formula	Notes
Cap_Chart_A dhoc_Range	=OFFSET('Capacity calculation (hide)'!\$BK\$111,MATCH(Planning!\$C\$6,'Capacity calculation (hide)'!\$C\$111:\$C\$211,0)-1,0,1,52)	Chart range for ad hoc capacity used in the planning chart. Only active in the Planning sheet.
Cap_Chart_A dhoc_Range	=OFFSET('Capacity calculation (hide)'!\$BK\$111,MATCH('Capacity summary'!\$C\$11,'Capacity calculation (hide)'!\$C\$111:\$C\$211,0)-1,0,1,52)	Chart range for ad hoc capacity used in the capacity summary chart.
Cap_Chart_C ore_Range	=OFFSET('Capacity calculation (hide)'!\$BK\$4,MATCH(Planning!\$C\$5,'Capacity calculation (hide)'!\$C\$4:\$C\$104,0)-1,0,1,52)	Chart range for core capacity used in the planning chart. Only active in the Planning sheet.
Cap_Chart_C ore_Range	=OFFSET('Capacity calculation (hide)'!\$BK\$4,MATCH('Capacity summary'!\$C\$10,'Capacity calculation (hide)'!\$C\$4:\$C\$104,0)-1,0,1,52)	Chart range: Defines the range for core capacity used in the capacity summary chart.
Cap_Chart_X axis	=('Critical resources (hide)'!\$B\$6:\$B\$57	Chart range: Defines the x axis for the capacity summary chart
Capacity_Res ource	=IF('Critical resources'!\$A\$11=0,'Critical resources'!\$A\$1,OFFSET('Critical resources (hide)'!\$G\$6,0,0,'Critical resources'!\$A\$11,1))	Dynamic range for all critical resources: used to generate dropdown options in Capacity setup sheet.
ChartRange_ Data	=OFFSET('SPC background (hide)'!\$C\$16,0,0,MaxRows,1)	Chart range for demand data to be shown in SPC chart
ChartRange_ E1	=OFFSET('SPC background (hide)'!\$Q\$16,0,0,MaxRows,1)	Chart range for special cause (exception type 1) to be shown in SPC chart
ChartRange_ E2	=OFFSET('SPC background (hide)'!\$S\$16,0,0,MaxRows,1)	Chart range for special cause (exception type 2) to

		be shown in SPC chart
ChartRange_E3	=OFFSET('SPC background (hide)!\$Y\$16,0,0,MaxRows,1)	Chart range for special cause (exception type 3) to be shown in SPC chart
ChartRange_E4	=OFFSET('SPC background (hide)!\$W\$16,0,0,MaxRows,1)	Chart range for special cause (exception type 4) to be shown in SPC chart
ChartRange_Emergencies	=OFFSET('SPC background (hide)!\$AA\$16,0,0,MaxRows,1)	Chart range for emergency/same day demand to be shown in SPC chart
ChartRange_Exclusion	=OFFSET('SPC background (hide)!\$H\$16,0,0,MaxRows,1)	Chart range: highlights user defined exclusions from the main dataset on the SPC chart.
ChartRange_LCL	=OFFSET('SPC background (hide)!\$J\$16,0,0,MaxRows,1)	Chart range for lower control limit to be shown in SPC chart.
ChartRange_Mean	=OFFSET('SPC background (hide)!\$M\$16,0,0,MaxRows,1)	Chart range for mean to be shown in SPC chart.
ChartRange_PercLower	=OFFSET('SPC background (hide)!\$AC\$16,0,0,MaxRows,1)	Chart range for user defined lower percentile bound to be shown in SPC chart.
ChartRange_PercUpper	=OFFSET('SPC background (hide)!\$AD\$16,0,0,MaxRows,1)	Chart range for upper percentile bound (85th) to be shown in SPC chart.
ChartRange_S1	=OFFSET('SPC background (hide)!\$D\$16,0,0,MaxRows,1)	Chart range: Highlights position of user defined season 1.
ChartRange_S2	=OFFSET('SPC background (hide)!\$E\$16,0,0,MaxRows,1)	Chart range: Highlights position of user defined season 2
ChartRange_S3	=OFFSET('SPC background (hide)!\$F\$16,0,0,MaxRows,1)	Chart range: Highlights position of user defined season 3

ChartRange_S4	=OFFSET('SPC background (hide)!\$G\$16,0,0,MaxRows,1)	Chart range: Highlights position of user defined season 4
ChartRange_UCL	=OFFSET('SPC background (hide)!\$P\$16,0,0,MaxRows,1)	Chart range for upper control limit to be shown in SPC chart.
Emergency1	= 'Demand background (hide)!\$AX\$3	Summary value: Mean emergency demand (season 1).
Emergency2	= 'Demand background (hide)!\$AX\$10	Summary value: Mean emergency demand (season 2).
Emergency3	= 'Demand background (hide)!\$AX\$17	Summary value: Mean emergency demand (season 3).
Emergency4	= 'Demand background (hide)!\$AX\$25	Summary value: Mean emergency demand (season 4).
MaxRows	=Demand!\$A\$6	Summary value: Number of rows in demand dataset.
Mean1	= 'Demand background (hide)!\$AW\$3	Summary value: Mean elective demand (season 1).
Mean2	= 'Demand background (hide)!\$AW\$10	Summary value: Mean elective demand (season 2).
Mean3	= 'Demand background (hide)!\$AW\$17	Summary value: Mean elective demand (season 3).
Mean4	= 'Demand background (hide)!\$AW\$25	Summary value: Mean elective demand (season 4).
Num_Modalities	=Setup!\$I\$11	Setup value: User defined number of modalities for model.
PercLower1	= 'Demand background (hide)!\$AW\$6	Summary value: User defined lower percentile bound for model (season 1).
PercLower2	= 'Demand background (hide)!\$AW\$13	Summary value: User defined lower percentile bound for model (season 2).
PercLower3	= 'Demand background (hide)!\$AW\$20	Summary value: User defined lower percentile bound for model (season 3).

PercLower4	= 'Demand background (hide)!\$AW\$28	Summary value: User defined lower percentile bound for model (season 4).
PercUpper1	= 'Demand background (hide)!\$AW\$7	Summary value: Upper percentile bound (85th) for model (season 1).
PercUpper2	= 'Demand background (hide)!\$AW\$14	Summary value: Upper percentile bound (85th) for model (season 2).
PercUpper3	= 'Demand background (hide)!\$AW\$21	Summary value: Upper percentile bound (85th) for model (season 3).
PercUpper4	= 'Demand background (hide)!\$AW\$29	Summary value: Upper percentile bound (85th) for model (season 4).
Plan_SPC_Baseline	=OFFSET('Planned background (hide)!\$AD\$3,0,0,PMaxRows,1)	Chart range: Highlights user defined baseline region for Planned SPC chart.
Plan_SPC_Date	=OFFSET('Planned background (hide)!\$BH\$3,0,0,PMaxRows,1+IF(Planned!\$C\$8<>"",1,0))	Chart range: X-axis for Planned SPC chart (dates).
Plan_SPC_Demand	=OFFSET('Planned background (hide)!\$AE\$3,0,0,PMaxRows,1)	Chart range: Demand dataset for Planned SPC chart.
Plan_SPC_LCL	=OFFSET('Planned background (hide)!\$AH\$3,0,0,PMaxRows,1)	Chart range: LCL dataset for Planned SPC chart.
Plan_SPC_Mean	=OFFSET('Planned background (hide)!\$AF\$3,0,0,PMaxRows,1)	Chart range: Mean dataset for Planned SPC chart.
Plan_SPC_Neg1Sig	=OFFSET('Planned background (hide)!\$AJ\$3,0,0,PMaxRows,1)	Chart range: -1 SD for Planned SPC chart.
Plan_SPC_Neg2Sig	=OFFSET('Planned background (hide)!\$AI\$3,0,0,PMaxRows,1)	Chart range: -2 SD for Planned SPC chart.
Plan_SPC_Pos1Sig	=OFFSET('Planned background (hide)!\$AK\$3,0,0,PMaxRows,1)	Chart range: -1 SD for Planned SPC chart.
Plan_SPC_Pos2Sig	=OFFSET('Planned background (hide)!\$AL\$3,0,0,PMaxRows,1)	Chart range: -2 SD for Planned SPC chart.
Plan_SPC_R1	=OFFSET('Planned background (hide)!\$AP\$3,0,0,PMaxRows,1)	Chart range: Special cause variation marker (exclusion

		type 1) dataset for Planned SPC chart.
Plan_SPC_R2	=OFFSET('Planned background (hide)!\$AR\$3,0,0,PMaxRows,1)	Chart range: Special cause variation marker (exclusion type 2) dataset for Planned SPC chart.
Plan_SPC_R3	=OFFSET('Planned background (hide)!\$AT\$3,0,0,PMaxRows,1)	Chart range: Special cause variation marker (exclusion type 3) dataset for Planned SPC chart.
Plan_SPC_R4	=OFFSET('Planned background (hide)!\$AV\$3,0,0,PMaxRows,1)	Chart range: Special cause variation marker (exclusion type 4) dataset for Planned SPC chart.
Plan_SPC_Sigma	=OFFSET('Planned background (hide)!\$AG\$3,0,0,PMaxRows,1)	Summary value: Week specific sigma for planned data.
Plan_SPC_UCL	=OFFSET('Planned background (hide)!\$AM\$3,0,0,PMaxRows,1)	Chart range: UCL dataset for Planned SPC chart.
Planned_RangeEnd	=OFFSET(IF(Planned!\$C\$8 = 0,'Planned background (hide)!\$F\$3,'Planned background (hide)!\$G\$3),'Planned background (hide)!\$V\$19-1,0,'Planned background (hide)!\$X\$19,1)	Internal range: Sets usable dropdown values for end of user defined baseline.
Planned_RangeStart	=OFFSET(IF(Planned!\$C\$8=0,'Planned background (hide)!\$F\$3,'Planned background (hide)!\$G\$3),0,0,'Planned background (hide)!\$X\$18+1,1)	Internal range: Sets usable dropdown values for start of user defined baseline.
PMaxRows	=Planned!\$A\$6	Summary value: Total number of rows for planned demand.
Range_Blank	='SPC background (hide)!\$A\$1	Internal range: used to return a blank value (eg. if there are no usable dropdown values).
Range_DateAxis	=OFFSET('Demand background (hide)!\$AP\$4,0,0,MaxRows,1+IF(Demand!\$C\$6<>"",1,0))	Chart range: Date (x) axis values for SPC chart.
Range_S1End	=OFFSET(IF(Demand!\$C\$6<>"",Demand!\$D\$12,'Control sheet (hide)!\$A\$2),'SPC background	Internal range: Dropdown values for end of season 1

	(hide)!\$D\$5,0,'SPC background (hide)!\$F\$5,1)	selection in SPC chart.
Range_S1Start	=OFFSET(IF(Demand!\$C\$6<>"" ,Demand! \$D\$13,'Control sheet (hide)!\$A\$3),0,0,'SPC background (hide)!\$F\$4,1)	Internal range: Dropdown values for start of season 1 selection in SPC chart.
Range_S2End	=IF('SPC background (hide)!\$C\$6=2,OFFSET(IF(Demand!\$C \$6<>"" ,Demand!\$D\$12,'Control sheet (hide)!\$A\$2),'SPC background (hide)!\$D\$7,0,'SPC background (hide)!\$F\$7,1),Range_Blank)	Internal range: Dropdown values for end of season 2 selection in SPC chart.
Range_S2Start	=IF(ISNA('SPC background (hide)!\$F\$6),Range_Blank,'Control sheet (hide)!\$C\$6:\$C\$7)	Internal range: Dropdown values for start of season 2 selection in SPC chart.
Range_S3End	=IF('SPC background (hide)!\$C\$8=2,OFFSET(IF(Demand!\$C \$6<>"" ,Demand!\$D\$12,'Control sheet (hide)!\$A\$2),'SPC background (hide)!\$D\$9,0,'SPC background (hide)!\$F\$9,1),Range_Blank)	Internal range: Dropdown values for end of season 3 selection in SPC chart.
Range_S3Start	=IF(ISNA('SPC background (hide)!\$F\$8),Range_Blank,'Control sheet (hide)!\$C\$6:\$C\$7)	Internal range: Dropdown values for start of season 3 selection in SPC chart.
Range_S4End	=IF('SPC background (hide)!\$C\$10=2,OFFSET(IF(Demand! \$C\$6<>"" ,Demand!\$D\$12,'Control sheet (hide)!\$A\$2),'SPC background (hide)!\$D\$11,0,'SPC background (hide)!\$F\$11,1),Range_Blank)	Internal range: Dropdown values for end of season 4 selection in SPC chart.
Range_S4Start	=IF(ISNA('SPC background (hide)!\$F\$10),Range_Blank,'Control sheet (hide)!\$C\$6:\$C\$7)	Internal range: Dropdown values for start of season 4 selection in SPC chart.
SampleLength	= 'SPC background (hide)!\$I\$11	Summary value: number of datapoints used in baseline - displayed in SPC sheet.
Sigma1	= 'Demand background (hide)!\$AW\$5	Calculated value of Sigma (season 1).

Sigma2	= 'Demand background (hide)!\$AW\$12	Calculated value of Sigma (season 2).
Sigma3	= 'Demand background (hide)!\$AW\$19	Calculated value of Sigma (season 3).
Sigma4	= 'Demand background (hide)!\$AW\$27	Calculated value of Sigma (season 4).
SPC_Type	= 'SPC Chart!\$B\$1	Internal range: User selected mode for SPC chart - single or multi-season.