



North West London

London Ambulance Service
NHS Trust

***CAPACITY
MODELLING REVIEW***

Final Report

ORH

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EXECUTIVE SUMMARY

1. This Capacity Modelling Review, undertaken by ORH Limited for the LAS and its Commissioners, has set out to identify the control and operational requirements for meeting prescribed national and local targets over the next few years. A base model reflecting the 2012/13 activity and resourcing profile was established, and then future years were modelled incorporating agreed activity and efficiency assumptions.
2. The 2012/13 profile is characterised by increasing telephone call and Category A incident demand, although overall demand for 'responded to' incidents is broadly flat compared to the last two years, partly due to increasing control triage levels. Ambulance utilisation rates are very high, resulting in a low take-up of meal breaks and a relatively poor standard of service for Green incidents. Although annual Category A targets are met, there is significant variation on a monthly basis.
3. Incident and call volumes for 2013/14 to 2017/18 were projected, reflecting historical trends but assuming a decreasing rate of increase. An additional 40,000 incidents were projected for 2013/14 due to diverted 111 demand (50% Red, 50% Green), but then for this to remain flat for future years.
4. The review identified the capacity requirements for the three Control functions – call-taking, clinical hub and clinical triage – based on an efficient use of resources whilst maximising triage (124 resolved Green 3 and 4 calls per day by 2017/18) and meeting 999 call-answer targets (95% within 5 seconds). The overall establishment across the three functions is projected to rise by about 35 WTEs by 2015/16 (exact number subject to rostering constraints).
5. A set of operational efficiency measures was modelled and agreement reached between the LAS and Commissioners on implementation phasing. These included: reducing from three operational tiers (DCA, FRV and AESU) to two (DCA and FRV) with an associated reduction in the multiple attendance rate; increased use of enhanced AAC points; and a complete re-rostering of deployments. Alongside these it was also assumed that conveyance rates would gradually reduce (78% in 2013/14 to 74% in 2017/18), as would time at hospital (2 minutes less on average in 2013/14, and 5 minutes less by 2017/18, compared to 2012/13).
6. The combined effect of these efficiencies is equivalent to 400 WTEs in 2013/14, rising cumulatively to 520 in 2015/16. Additional investment is required beyond these efficiency measures to ensure that the nationally prescribed Red response targets and locally determined Green response targets are met in a sustainable manner. This is equivalent to an additional 229 WTEs in 2013/14, rising cumulatively to about 300 WTEs in 2015/16 (exact number subject to rostering practicalities).
7. These efficiency measures and investments will allow standards of response to all categories of call to be met within target over the next few years in a sustainable manner. At least 80% of operational staff will be able to take their meal breaks, and utilisation levels will be maintained at more acceptable levels.
8. Sensitivity modelling has shown that the capacity conclusions are highly sensitive to the assumptions agreed, therefore a follow-up review in the latter half of 2013/14 will be required, in particular to update the projected demand assumptions.

1 INTRODUCTION

Background

- 1.1 Operational Research in Health Limited (ORH) has undertaken this Capacity Modelling Review for the London Ambulance Service NHS Trust (the LAS) and its Commissioners. The review's objective is to project resource requirements to 2015/16, with sensitivity modelling to 2017/18.
- 1.2 The LAS has delivered Category A performance to the Department of Health targets for over nine consecutive years. However the Service is not currently commissioned, nor does it have the capacity, to be able to deliver to these targets on a monthly basis resulting in varied performance throughout the year.
- 1.3 Calls and Category A demand continue to rise across the country and in London this increase is even more pronounced; however, overall incident demand is broadly flat, as illustrated in Table 1 below (see also Appendix **A1**).

Annualised levels	2010/11	2011/12	2012/13 (6 months)
Calls Percentage increase/previous year	1,502,776 -	1,608,313 7%	1,705,065 6%
Red Incidents Percentage increase/previous year	347,659 -	390,247 12.2%	423,394 8.5%
Green Incidents Percentage increase/previous year	710,430 -	651,581 -8.3%	641,702 -1.5%
Total Incidents Percentage increase/previous year	1,062,889 -	1,045,915 -1.6%	1,066,089 1.9%

Table 1: Demand Changes 2010/11 to 2012/13

- 1.4 The LAS has made several changes in recent years, with commissioner support, to manage this demand more cost-effectively. Commissioners have also invested additional monies to increase the staffing for delivering targets and increased demand (59% increases in contract value from 2004/05 to 2012/13); this has included MPET investment to increase the professionalisation of the workforce.
- 1.5 It is recognised that the LAS has the highest utilisation rates in the country and, with the current operational model and workforce constraints, this does not allow for significant surge capacity to meet unexpected demands. One result is a regular use of the Demand Management Plan, by reducing the level of ambulance provision during peaks in demand, to ensure that crews are available to be sent to the highest priority calls, which understandably carries considerable clinical risk.
- 1.6 As part of the contract negotiations for 2012/13 the LAS agreed with lead Commissioners that independent modelling would be undertaken to understand the impact of the demand on the Service and how capacity could be created to meet this. It was recognised that this may include additional funding from Commissioners.

- 1.7 The NHS commissioning system is undergoing transition during 2012/13, with the creation of Clinical Commissioning Groups, Commissioning Support Services and the National Commissioning Board. These new structures will be responsible for seeing the implementation of the 2013/14 contracting round. The LAS Strategic Commissioning Board want to ensure there is formal support for the Capacity Modelling work by the CCGs, as they will need to understand the recommendations and support its implementation
- 1.8 The LAS continues to work towards Foundation Trust status, and the outcome of this modelling will form a critical part of the assumptions for the IBP, SFM and LTFM. In addition, ambulance services nationally are currently working towards shadowing Payment by Results in 2012/13 for planned implementation in 2013/14 using local tariffs. The outcome of this capacity modelling therefore will become a key feature of this work.

Capacity Modelling Review

- 1.9 This ORH review was jointly commissioned by the LAS and Commissioners. It covers the three years, 2013/14 to 2015/16, with sensitivity modelling for the years 2016/17 and 2017/18.
- 1.10 ORH is a management consultancy based in Reading that specialises in modelling to support resource planning for the emergency services. Since 1986 ORH has undertaken over 300 such studies for Ambulance Services across the world.
- 1.11 The terms of reference for this Capacity Modelling Review are far-reaching and extensive, requiring a fresh 'greenfield' approach for projecting how the LAS will operate in the next few years.
- 1.12 The review has involved a joint approach between the LAS and its Commissioners, facilitated by ORH, to agree service targets and a wide range of assumptions relating to future year demand and specific service factors across Operations and Control. Modelling was conducted on an iterative basis, sharing emerging results with the Steering Group through a series of Progress Reports. This informed discussion of the setting of assumptions to feed into the projection modelling.
- 1.13 The review was linked to a previous study undertaken by ORH in which a large part of the data analysis and model preparation had been completed. The detailed profile of current service provision developed in that study has not been reproduced in this report.
- 1.14 The terms of reference for the review are set out in Section 2, and the approach taken is described in Section 3. The operational and control modelling results for 2013/14 are then reported in Sections 4 and 5 respectively, with a range of 2013/14 sensitivity modelling results in Section 6. All future year modelling results are then presented in Section 7, before drawing together conclusions in Section 8.
- 1.15 A glossary is provided at the back of the report in Appendix G.
- 1.16 Although this Final Report is dated April 2013, the review was completed in January 2013. The key assumptions relating to future projections were made around September 2012 with data available at that date.

2 **TERMS OF REFERENCE**

Objectives

2.1 The broad objectives of the modelling are as follows:

- a) To gain a detailed understanding of the current LAS operational model and its capacity to meet the demand and to provide a clinically safe service over the next three to five years.
- b) To identify an optimum model of operation in line with the Trust strategy of ensuring that a safe and high quality service is provided to every patient. This will include taking in to account the revision to clock start times, removal of the Category B target, utilisation, efficiencies identified within the National Audit Office¹ review, time to attend non-critically ill patients and the increased professionalisation of the workforce and therefore the increase in patient assessment and clinical skills.
- c) To compare the current model against an identified optimum model in terms of change of commissioner performance and any additional resources required over the next three years (2013/14 to 2015/16) and to test this optimum model against projected demand in 2016/17 and 2017/18.
- d) To create a detailed plan moving from the current operational model to a new model of operation and agreeing any additional resource requirements with Commissioners, the underpinning workforce plan and embedding these within the LAS Long Term Financial Model (LTFM) and Integrated Business Plan (IBP).
- e) To understand any potential additional resource requirements, in the context of the overall NHS Operating Framework (including efficiency requirements) and delivery of QIPP.

2.2 This will require system support for recommendations, through proactive engagement with the Strategic Commissioning Board, Associate Commissioners, Clinical Quality Group and the Clinical Commissioning Groups.

Benefits

2.3 The expected benefits from achieving these objectives are as follows:

- | | |
|---|--|
| i. Improved Patient experience | vii. Improved staff satisfaction |
| ii. Capacity matching demand | viii. More equitable performance across London |
| iii. Improved resilience | ix. Reduced activity at A&E |
| iv. Improved efficiency | x. Increased ACP usage |
| v. Reduced utilisation rates in line with other urban ambulance norms | xi. Support for the LAS FT application |
| vi. Improved performance | |

¹ NAO review 'Transforming NHS Ambulance Services'
http://www.nao.org.uk/publications/1012/nhs_ambulance_services.aspx

Scope of the Modelling

- 2.4 The modelling will be undertaken based on 2011/12 data including contracted growth for 2012/13, and will cover the period to 2017/18.
- 2.5 The following variables will be considered within the scope of this project:
- | | |
|---|--|
| a. Multiple Attendance Ratios | l. Control staffing to support optimum model |
| b. Cancellation Rates | m. Commissioned targets ie, R1 and 2 only |
| c. Workforce | n. Alignment of capacity & demand |
| a. Staff establishment & flexibility | o. Different operational models (and associated skill mix) |
| b. Staff abstraction rates (including impact of rest breaks/annual leave) | p. A&E Conveyance rates and Levels of ACP usage |
| d. Optimal vehicle mix | q. Levels of Hear & Treat |
| e. Job Cycle Times | r. Activity/Demand – including by hour/day/season at a PCT level |
| f. Hospital Turnaround (both elements) | s. Mobilisation/activation times (including impact of active area cover) |
| g. Utilisation rates | t. Known hospital reconfigurations |
| h. Vehicle Off Road | u. Known station location changes. |
| i. Patient Flow | |
| j. Increased See & Treat | |
| k. Impact of 111/NHSD | |

Deliverables following Review of Modelling

- 2.6 The key deliverables of the project include the following:
- a) Agreed demand profile for future years (to 2017/18).
 - b) Agreed operational model to meet that demand (and impact of other options).
 - c) Agreed workforce plan, including levels/rostering to match demand to capacity including relief levels.
 - d) Quantify the impact on LAS of key efficiency factors, eg, Hospital Turnaround.
 - e) Agreed implementation plan, with clear milestones for the period modelled 2012/13 to 2015/16.
 - f) Identify any changes in commissioning resource requirements in the context of:
 - LAS Cost Improvement Plan, including:
 - Operational efficiencies
 - Management costs and overheads
 - Estate strategy savings
 - Impact of known reconfigurations
 - g) Agree on how the outcome of the modelling will be supported by Commissioners.

Principles

2.7 The principles are as follows:

- Joint ownership and oversight of the capacity modelling by both the LAS and its Commissioners.
- Equality of input and review, with openness and transparency, eg, joint sharing of first drafts, development of assumptions, sensitivity analysis.
- Shared responsibility for briefing to the wider system on findings, recognising importance of effective communication and explanation, particularly for those stakeholders with a lower understanding of detail of ambulance operations.
- The modelling by ORH will identify key findings and recommendations. The recommendations will not be binding, but will be used to inform a negotiated jointly agreed implementation plan.
- The results of the modelling shall be open to external challenge and advice, by those agreed by the Steering Group, including by the Emergency Care Intensive Support Team, to ensure that best practice (eg, national ECIST lessons learnt) is incorporated.

Constraints

2.8 The key constraints recognised are as follows:

- The review ideally needs to be completed before the commencement of the 2013/14 contracting round.
- The input of senior management over the period of the Olympic and Paralympic Games.
- Transition from current to new commissioning structures in London, with potentially significant changes in responsibilities. The outcome of the capacity modelling will require support from the Clinical Commissioning Groups.

Stakeholders

2.9 The following stakeholders will need to be involved/informed:

- London Ambulance Service – Senior Management Group
- LAS Strategic Commissioning Board
- Clinical Quality Group
- Clinical Commissioning Groups
- Associate Commissioners (current PCT cluster representatives)
- Finance – LAS and Commissioners

- LAS Commissioning Team
- NHS London/NCB London office
- Metropolitan Police and TfL (as significant referrers to LAS)
- Patients and public

Interfaces

2.10 This capacity modelling study interfaces with the following:

- PbR shadowing;
- 2013/14 LAS Contract settlement;
- LAS Foundation Trust application – IBP & LTFM;
- reconfigurations/Service changes to Emergency & Urgent Care system.

Governance

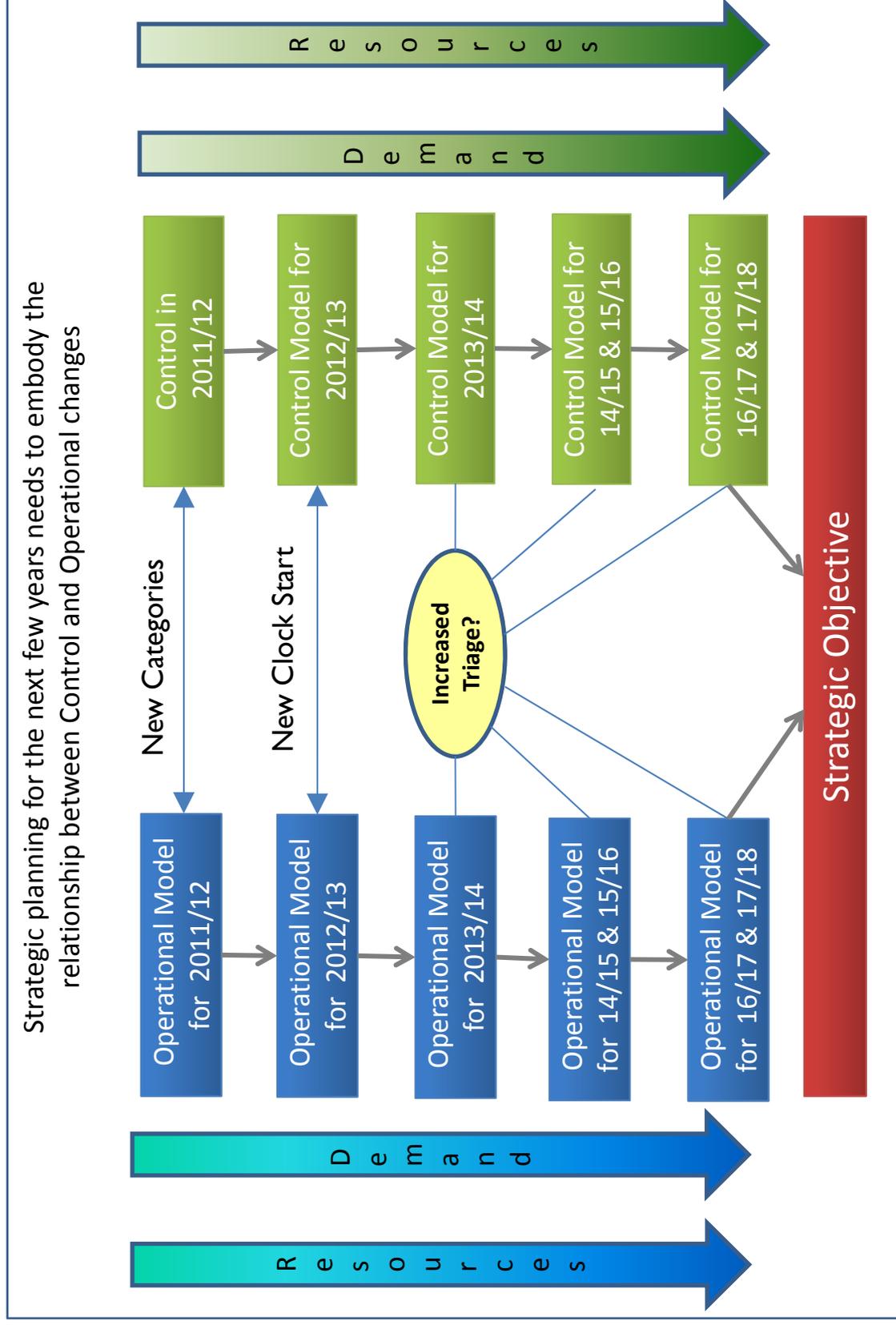
2.11 A Steering Group will be established for the project. The Steering Group will report to the LAS Strategic Commissioning Board, and will be responsible for:

- clear plan and milestones;
- regular communication and engagement with stakeholders;
- ensuring deliverables are achieved during December 2012; and
- developing TOR for external reference group, including ECIST

2.12 The Steering Group membership shall be:

- Chair – Martin Flaherty, Chief Operating Officer, LAS;
- Deputy Chair – Neil Kennett-Brown, Director of LAS Commissioning, NHS NWL;
- LAS – Clinical support as required from Medical Directorate;
- LAS – Jason Killens, Deputy Director, Operations;
- Clinical Quality Group Chair - Dr Andrew Steeden, Clinical Director, NHS NWL;
- Deane Kennett, Contract and Performance Manager, LAS Commissioning Team, NHS NWL.

Figure 1 Modelling Operations and Control



3 REVIEW METHODOLOGY

Introduction

- 3.1 Figure 1 opposite illustrates the overall study approach undertaken in this review. Both the operational and control work streams were progressed in parallel; the results from control feed directly into the operational demand for operations.
- 3.2 The study started from the position inherited from a partially completed initial study. This gave a validated base operational model for 2011/12 and some quantitative understanding of the relationship between demand, resources and performance in 2012/13.
- 3.3 Section 2 gives a full description of the study specified and includes context for processing the results of the study. In essence, the study aim is to project resource requirements for an efficient operational regime that meets agreed performance standards over the main projection period, 2013/14 to 2015/16. Outputs will include recommendations for roster change in 2013/14 that embrace movement towards an optimum balance of resource types.
- 3.4 The study approach allowed for regular Steering Group input supported by targeted Progress Reports.
- 3.5 A model of Control call-taking and triaging was prepared and validated and then used as required to model different incoming 999 call levels and triaged call levels, which were then used to feed into the operational modelling for the future years.
- 3.6 The data analysis required for preparing a model validated against the 2011/12 operational regime was completed as part of the initial study. Some examples of benchmarking analysis that were undertaken and shared with the Trust at this time are given in Appendix **A2**.
- 3.7 Further data were collected to allow for analysis of the following:
- Control call-taker and triage modelling.
 - Demand projections to the year 2017/18.
 - Abstraction rates to inform the setting of an appropriate relief rate.
- 3.8 The current control call-taking profile was quantified in terms of: incoming 999 demand by call type, hour, etc; resource levels by hour planned and actually deployed; and call-answering performance by hour. A more recent sample period than was used for the operational modelling was taken (18th June to 15th July 2012) to assist the control modelling.
- 3.9 Paragraph 2.5 lists twenty variables for consideration in the modelling for future years. One of the key inputs from both the LAS and Commissioners has been to identify how these variables will change in 2013/14 and beyond from their current base position. The decisions made are discussed in the results sections for both Control and Operations.

Figure 2 **Triage Targets for G3 and G4**

- **Green 3:**
 - 95% in 30 minutes from Call Complete and
 - 99% in 45 minutes from Call Complete

- **Green 4:**
 - 95% in 60 minutes from Call Complete and
 - 99% in 90 minutes from Call Complete

If not triaged within 45 and 90 minutes respectively, calls are then returned to EOC for a response

Figure 3 **Operational Response Targets**

- **Red 1:** 75% in 8 minutes (from Call Connect)
- **Red 2:** 75% in 8 minutes (from Clock Start)
- **CCG Red performance:** 72% in 8 minutes over rolling 3 months
- **Green 1: 90% in 20 minutes:** 99% in 45 minutes (from Clock Start)
- **Green 2: 90% in 30 minutes:** 99% in 60 minutes (from Clock Start)
- **Green 3: 90% in 60 minutes:** 99% in 90 minutes (from Call Connect + 60 seconds), for those requiring a response
- **Green 4: 90% in 60 minutes:** 99% in 120 minutes (from time it is identified that transport is required)

Control Modelling for 2013/14

- 3.10 ORH has a simulation model that is used for control call-taking and triage. The model can assess the relationship between incoming 999 call demand and the processing of that demand.
- 3.11 The model was validated against current call rates and triage levels by call type (ie, Reds and Greens by sub-category).
- 3.12 The model was then used to output the required number of call-takers to meet the 95% within the 5 seconds national call answering target for projected levels of incoming 999 calls by hour of the day and day of the week.
- 3.13 Figure 2 opposite shows the triage targets that were used by category of call within the modelling of both the Clinical Hub (CHUB) for Green 3 calls and by Clinical Telephone Advice (CTA) for Green 4 calls. These were agreed as appropriate local targets by clinicians on the Steering Group.
- 3.14 These modelling runs were further used to inform the setting of future year operational demand rates by call category.
- 3.15 This modelling was then linked to assumptions to be made about the future 111/NHSD arrangements, and also to the potential introduction of NHS Pathways (or an equivalent system).

Operational Modelling for 2013/14

- 3.16 The assumptions for this year in terms of demand profiles/levels and in terms of the factors listed at paragraph 2.5 were established and are discussed in Section 5.
- 3.17 Simulation runs were undertaken to identify, given the 2013/14 parameters, the most efficient balance of resources by type, day and hour to meet response targets by category as detailed in Figure 3 opposite. Different operational models were tested and the most efficient identified.
- 3.18 The main output is a detailed set of deployments by station, hour and day for each different resource type that allow commissioned Red targets, and identified Green targets, to be met efficiently. An appropriate relief factor was calculated to allow these deployments to be translated into required establishment levels. The outputs were designed to directly inform a review of current rosters.
- 3.19 A series of sensitivity modelling runs were undertaken in order to investigate the impact of changes in various assumptions on performance.
- 3.20 The optimum position found for 2013/14, using agreed demand projections and assumptions, was then used as the basis for future year modelling.

Clinical Rationale

- 3.21 The Steering Group received clinical guidance in setting assumptions for 2013/14 and future years. These are set out in Appendix E.

Future Year Modelling

- 3.22 The projection of all the key input assumptions was then discussed in the Steering Group. The results of this process are set out at the start of Section 7.
- 3.23 In projecting demand forward, account was taken of the underlying trend in call and incident demand, and of the fact that Red calls and incidents are increasing at a higher rate than that for all demand. The impact of the move from NHSD to 111 had to be factored in, and assumptions were made covering projected levels of MPS and HCP demand.
- 3.24 Realistic assumptions were projected for further improvements in operational efficiency factors (eg, time at hospital, VoR), and on future conveyance rates by incident category. Clinical input from the Steering Group was required to project achievable triage rates in future years.

Figure 4 Control Functions – 2012/13

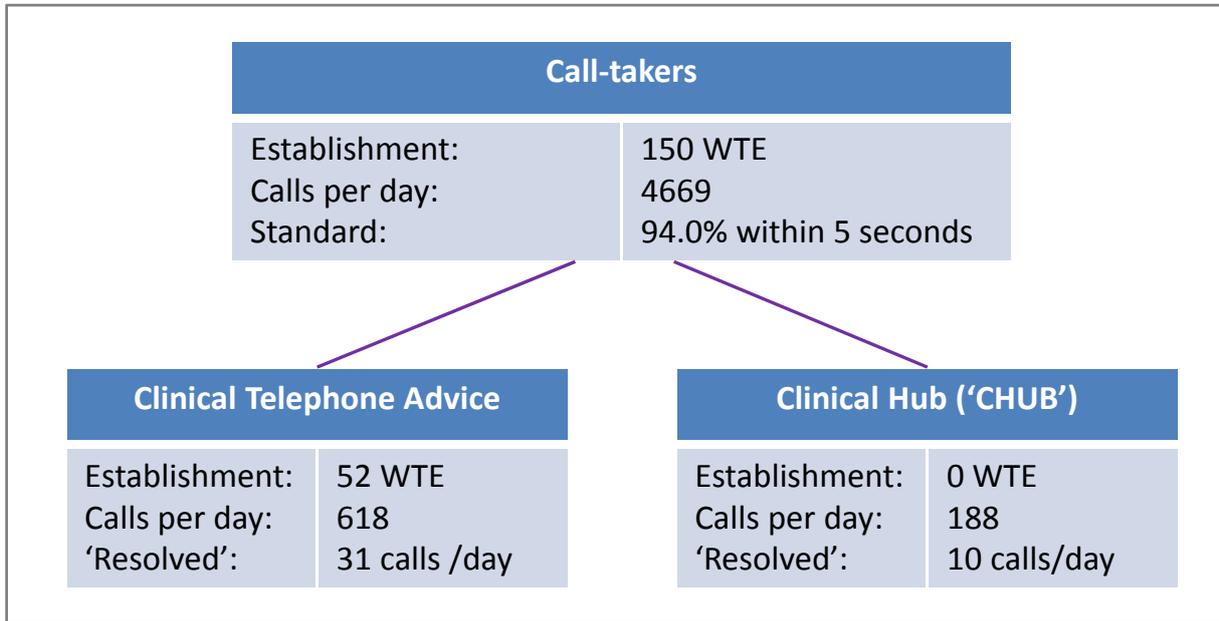
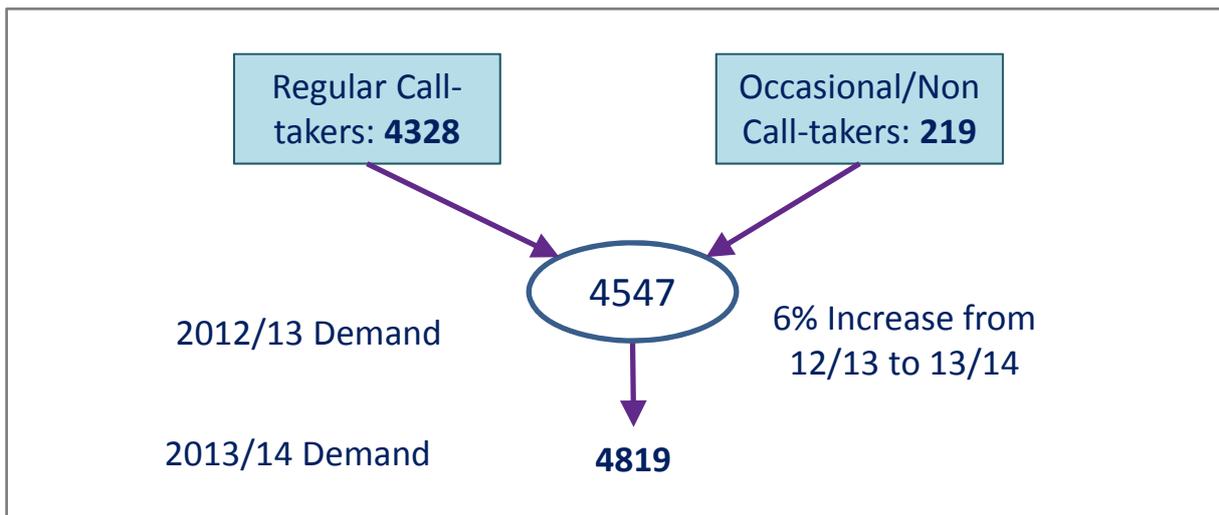


Figure 5 Call-taker Modelling – Incoming 999 Phone Calls per Day



4 CONTROL MODELLING 2013/14

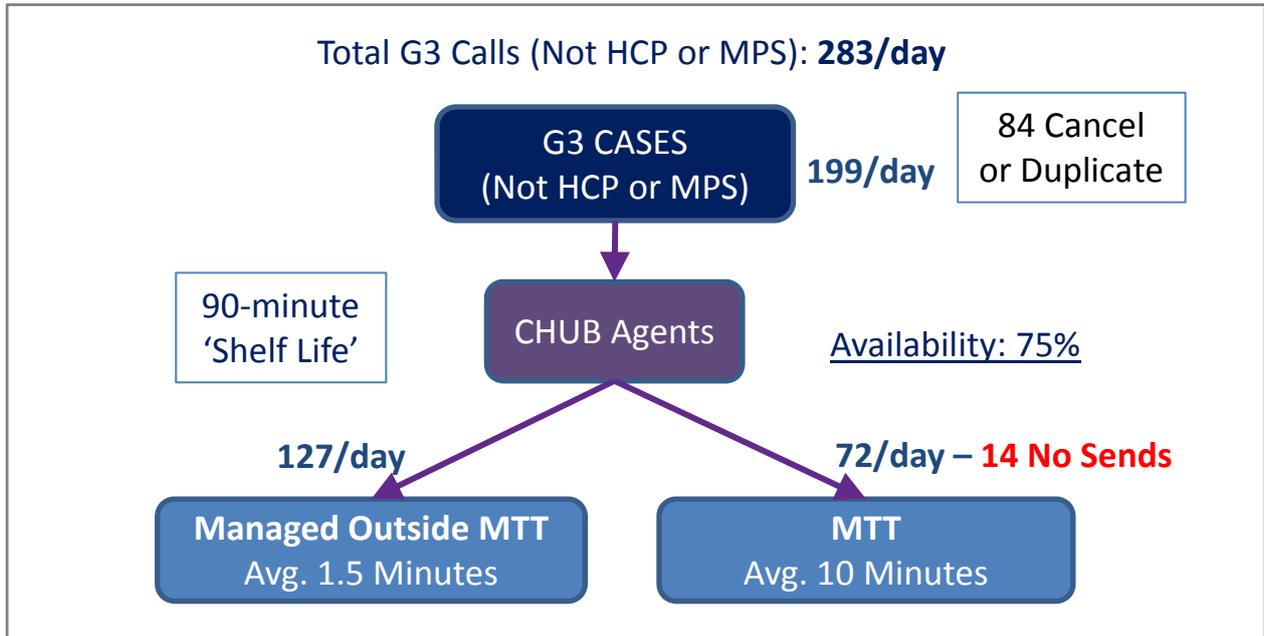
Introduction

- 4.1 This section presents the results for modelling resource requirements for 999 call-taking, the Clinical Hub and Clinical Telephone Advice for the financial year 2013/14.
- 4.2 Figure 4 opposite summarises how these three resource groups are linked together, and showing the current (2012/13) establishment associated with each and current call volumes being met. The Clinical Hub does not have a current establishment, although in 2012/13, 30 A&E support staff were disestablished during the year to create CHUB-based paramedic posts so as to form an initial capability.

999 Call-taking

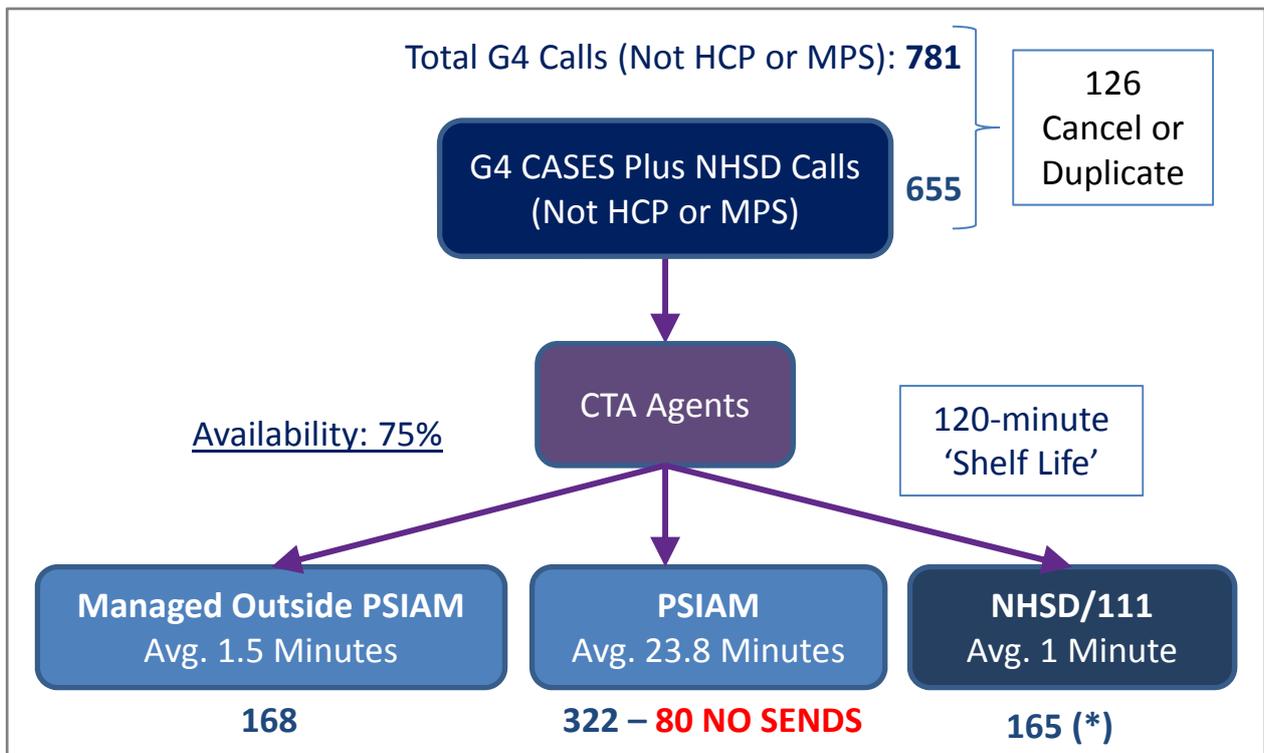
- 4.3 Currently in LAS Control the majority (4,328 per day) of incoming 999 phone calls are answered by regular rostered call-takers. A further 219 per day are answered by other staff members within Control during times of high call volume. These figures are based on a sample period of 18th June to 15th July 2012.
- 4.4 ORH's call-taking model was first calibrated against the rostered call-taker level and the calls answered by this group per day, and then updated to reflect a position where rostered call-takers are answering all phone calls. The resulting volumes are shown in Figure 5 opposite and detailed by hour of week in Appendix B1. The current number of call-taker hours available across the week is 4,295.
- 4.5 The volume of 999 phone calls being received within the EOC is up 9% to the end of November in 2012/13 compared to 2011/12. The number of estimated time of arrival calls (ETAs) has increased above this level. It has been agreed that if the operational capacity is increased, leading to a reduction in long wait times for patients, this 9% rise will not be realised again in 2013/14. Taking a longer term trend of call volumes suggests an increase of 6%, which has been agreed for modelling purposes. As shown in Figure 5, this would mean an average daily phone call volume of 4,819 in 2013/14.
- 4.6 Modelling was then undertaken to achieve an overall (average weekly) 95% call answering performance against this increased volume. Appendix B2 sets out the final call-taker results in terms of numbers of agents required by hour and by day, including an allowance for meal breaks. This therefore provides the roster key for the LAS to set new rosters for these staff. The total number of staff hours required per week is 4,209; it can be seen that there is a shift in the number of hours currently deployed from the night to the day, and this results in a significant efficiency being realised.
- 4.7 The requirement for 2013/14 is for 147 WTE compared to 150 WTE currently established. However, the 147 does not take account of roster feasibility considerations. The conclusion drawn is that the current establishment of 150 WTE, once reconfigured in new rosters and shifts, will be able to meet the required call answering targets in 2013/14 given the assumptions made.

Figure 6 Clinical Hub Modelling – 2013/14



MTT – Manchester Triage Tool

Figure 7 CTA Model 2013/14



(*) Very few returned for an operational response

Clinical Hub

- 4.8 The June to July sample period volumes were uplifted to 2013/14 levels and this resulted in 283 calls being categorised as Green 3 per day; this number excludes Health Care Professional (HCP) and Metropolitan Police Service (MPS) calls. Of these, 84 were cancelled or duplicates, leaving 199 true Green 3 cases per day, as summarised in Figure 6 opposite.
- 4.9 Detailed discussions, which have included medical representatives from the Trust, determined how these calls should be dealt with within a Clinical Hub (CHUB) that sits within the EOC. It has been determined that 36% of these calls would be suitable for a detailed (10-minute) assessment on the phone using the Manchester Triage Tool and, of those assessed, 20% could be stopped without a response from an LAS vehicle, thus reducing 14 responses per day. The remainder can be determined as not suitable for triage with a quick (1.5-minute) assessment without calling the patient back.
- 4.10 A simulation model was set up to model the required level of staff within the CHUB to deal with this volume of calls by hour of day. Appendix B3a shows the number of Green 3 calls incoming by hour and Appendix B3b shows the required level of rostered CHUB staff by hour of week; this has an allowance for meal breaks. A total of 385 staff hours per week are required within the CHUB to undertake the Green 3 triage described above.
- 4.11 This modelling of CHUB excludes any additional role for reviewing Red calls. There is some limited capacity to review a few Red calls per day. Although 385 hours per week equates to 13.5 staff, it is expected that an establishment of 16 WTE will be required to allow realistic rosters to be drawn up.

Clinical Telephone Advice

- 4.12 Currently Clinical Telephone Advice is given to Green 4 patients, using the PSIAM tool. In 2013/14 there will be a projected total of 781 non-HCP or MPS Green 4 calls a day, of which 126 are cancelled or are duplicates.
- 4.13 A similar exercise to that undertaken for the Green 3 calls was undertaken with medical staff, the outcomes of which are shown in Figure 7 opposite. The CTA can decide within a 1-minute assessment that 165 calls per day are suitable to be transferred to NHS direct (which have been assumed will continue to be transferred to 111). There are 168 calls per day that are managed outside of PSIAM and result in a response, and the remaining 49% of calls can be triaged within the PSIAM software with an average call duration of 23.8 minutes. Of those managed within PSIAM, 25% will result in a resource not being sent to the scene, a reduction of 80 responses per day.
- 4.14 Appendix B4a shows the Green 4 calls volumes per hour being passed through the CTA, and B4b shows the required staffing to respond to those calls within the set triage times. In total, 1,750 hours per week are required, including an allowance for meal breaks.

Resource Establishments for 2013/14

- 4.15 Appendix **B5** shows a calculated relief rate for call-takers, taking account of actual numbers of days leave, training and sickness. The calculated relief rate here is 30.8%. The 4,209 hours per week shown at **B2** is equivalent to 147 staff when a 37.5-hour week and a 30.8% relief rate are applied. This level is a calculation based on hours required and will rise once rosters are developed, but should be achievable within the current establishment of 150 WTE.
- 4.16 CHUB and CTA staff have the same relief rate as operational staff (33% – see Appendix **C6**). Undertaking the same staffing calculation based on the CHUB and CTA modelling results in a staffing requirement of 13.6 staff in the CHUB and 62.1 staff in the CTA. It is expected that, once feasible rosters are established, these levels will rise to around 16 WTE and 64 WTE respectively.

Figure 8 2013/14 Assumptions

<ul style="list-style-type: none"> • 999 call growth of 6%
<ul style="list-style-type: none"> • Cat A growth of 12% over the 2012/13 agreed position
<ul style="list-style-type: none"> • Overall incident growth of 3.2% over 2012/13
<ul style="list-style-type: none"> • Green 3 triage: All calls passed through CHUB with times on call as agreed. 36% are suitable for full assessment in the CHUB with a no-send rate of 20%
<ul style="list-style-type: none"> • Green 4 triage: All calls passed through CTA with times on call as agreed. 49% are suitable for full assessment in the CTA with a no-send rate of 25%
<ul style="list-style-type: none"> • Additional 40k incidents from 111 with a 50/50 A and C split
<ul style="list-style-type: none"> • 2 minutes off Time at Hospital (1 minute reduced for LAS and 1 minute for the hospital)
<ul style="list-style-type: none"> • New AAC points being used from 6am to midnight
<ul style="list-style-type: none"> • VOR at 5.1% (down 0.5 percentage points from the 2012/13 position)
<ul style="list-style-type: none"> • C1 to C4 response targets as agreed once it is determined that transport is required
<ul style="list-style-type: none"> • New Response Model as described below
<ul style="list-style-type: none"> • 80% of staff getting a rest break within the middle 2 quarters of each shift

New Response Model

R1: DCA and FRU
R2: closest vehicle, if DCA is closest responds solo and if FRV is closest then automatically backed up by DCA
C1 and C2: DCA if can respond within target time (regardless of which type of vehicle is closest). If DCA cannot meet target time, FRV responds and is only backed up by a DCA if transport is required
C3 and C4: all going through CHUB or CTA assessment prior to DCA send when indicated - No FRU ever responds

Note: See Appendices **E1** and **E2** for 'clinical rationale'.

Figure 9 Modelled 2013/14 Daily Demand

Category of Incident	Average Daily Incidents
R1	48.7
R2	1303.7
G1	151.5
G2	711.9
G3	330.7
G4	525.8
ALL	3072.2

5 OPERATIONAL MODELLING 2013/14

- 5.1 Figure 8 opposite gives the agreed final set of 2013/14 assumptions.
- 5.2 Base incident demand is projected to rise by 3.2% above the funded 2012/13 levels. Within this 3.2% there is a 12% increase in Category A incidents and a small decrease in Green incidents.
- 5.3 From this level the number of incidents modelled as being triaged and resulting in no response due to the CHUB and CTA are removed, as discussed in Section 4.
- 5.4 Above this level is an additional expectation of 40,000 111 incidents per year. This has been extrapolated from current pilot sites and assumed to be split 50:50 between Red and Green demand.
- 5.5 The impact of the reconfiguration at Chase Farm Hospital has also been added in, assuming that the demand levels increase in line with recent hospital reconfigurations. This incorporates an allowance for additional Healthcare Professional referrals from the Chase Farm site and surrounding areas, as well as the expected change in patient flows to surrounding Emergency Departments.
- 5.6 The resultant average daily number of incidents modelled in 2013/14 is given in Figure 9 opposite.
- 5.7 Additional efficiencies were then input into the model:
- I. a reduction in overall time at hospital of 2 minutes;
 - II. the introduction of 70 new Active Area Cover (AAC) points as shown in Appendix C1;
 - III. increase in hours that AAC points can be used, now assumed to be 06.00 to midnight 7 days a week;
 - IV. Vehicle off Road set at 5.1% (down 0.5% from 2012/13 current).
- 5.8 ORH's simulation models were then used to find the most efficient method of operation and resource balance to meet the response targets shown in Figure 3. This involved testing multiple modes of operation and vehicle mixes.
- 5.9 The most efficient method of operation was found to be that described in Figure 8 opposite ('New Response Model') and explained further below:
- All Red 1 calls need two vehicles on scene for clinical reasons, and therefore this is assumed to continue.
 - If an ambulance is the closest vehicle to a Red 2 incident it is sent on its own; currently the LAS attempts to send an FRV and an ambulance to every Red 2 incident. If an FRV is closest to a Red 2 incident, it is sent and automatically backed up by an ambulance.

Figure 10 **2013/14 Modelled Response Performance**

	Performance									Utilisation	
	RED8	RED19	RED 19T	G1-20	G1-45	G2-30	G2-60	G3-60	G4-60	DCA	FRV
13/14 Base	79.9%	98.8%	97.1%	92.6%	99.9%	94.1%	100.0%	99.6%	91.9%	72.3%	49.5%

- FRVs are only sent to Green 1 and Green 2 incidents if they are the closest resource and the closest ambulance cannot attend within the target response time. When an FRV is sent to a Green1 or Green2 incident, an ambulance is only assigned once backup has been requested.
 - FRVs are not sent to Green 3 or Green 4 incidents, all of which will have been through the CHUB or CTA in the EOC, therefore only ambulances respond.
- 5.10 This method of operating has been found to be more efficient than operating a “closest goes” model, under which only the closest resource is sent to lower acuity incidents. The “closest goes” model would require significantly more FRVs to operate as the aim is to get a single person on scene to assess before transport is required. With the current conveyance rates, this would result in the majority of incidents receiving a response from an FRV and then being backed up for transport.
- 5.11 Within the chosen operational model described above various balances between resource types were tested. In the future years, as Green triage and the proportion of Red demand is increasing, the benefit of two transporting tiers (one emergency tier capable of responding two and transporting all patients and a lower acuity tier only capable of transporting lower acuity patients) decreases. In 2013/14, the most efficient vehicle mix is to operate with one tier of emergency transporting vehicles and one tier of FRVs. Apart from the reason above, some of the other benefits from this model are:
- A reduced multiple attendance ratio (from 1.43 to 1.29) – currently AESUs will respond to Red calls but are required to be backed up by an emergency ambulance, as is an FRV.
 - All transporting vehicles have the ability to refer patients at the scene and avoid a transport – currently AESUs do not have this role due to the clinical skills of the Band 3 crew, and therefore they will typically transport patients to hospital.
 - It is easier for control officers in terms of making decisions about which type of resource to send.
 - It leads to a more flexible deployment model.
- 5.12 Within this operational model and with one tier of ambulances, modelling was then undertaken to calculate the number of ambulances and FRVs required to meet response standards in 2013/14 with all agreed efficiencies in place.
- 5.13 The performance results by Area and modelling period are shown in Appendix **C2** and summarised in Figure **10** opposite. For each Area performance reaches the required target for each call category. The deployments modelled also ensure that CCG performance targets are met.
- 5.14 These results assume that all current indirect contributions to Red8 remain in place (eg, Defibs and cycle units) – see Appendix **C2d**. In summary, the indirect contribution to Red8 is 3.5% in East, 3.9% in South and 6.0% in West.

Figure 11 **2013/14 Modelled Resource Requirement**

Weekly Vehicle Hours			
Area	DCA	FRV	Total
South	14217	3959	18176
East	10861	4217	15078
West	11272	3750	15022
Total	36350	11926	48276

Weekly Staff Hours			
Area	DCA	FRV	Total
South	28434	3959	32393
East	21722	4217	25939
West	22544	3750	26294
Total	72700	11926	84626

- 5.15 The reasons that the modelled Red8 performance is as high as 79.9% against a 75% target are as follows:
- to maintain sufficient availability to give a Red 1 8-minute call connect performance of 75% 'brings with it' a naturally higher Red 2 8-minute performance, and therefore a higher overall Red8 performance than 75%;
 - withdrawing further ambulances or FRVs from the core deployment proposed resulted in one of the Green standards falling below target;
 - the 79.9% is an 'average expectation' given normal variation in demand levels, however, very high demand levels will result in a greater negative impact than the positive impact of very low demand days, and therefore a degree of resilience needs to be built in; and
 - some allowance has to be made for a small 'comfort factor' in modelling the resource requirements with uncertainty around many of the input factors.
- 5.16 In broad terms, and depending particularly on the frequency and scale of very high demand days, the estimated outturn will be in the range 77.5% to 78.5%.
- 5.17 The resulting deployments by hour and day are shown in Appendix **C3**. These include allowance for vehicle-off-road and also allow for 80% of scheduled meal breaks to be taken. The detailed deployments by day, hour and station have been supplied to the Trust to inform rostering.
- 5.18 Figure **11** opposite shows the total modelled resource levels LAS-wide. A total of 36,365 DCA vehicle hours per week and 11,926 FRV hours per week are required to meet all response standards. Combining both types of vehicle gives a total staff hours per week requirement of 84,626. This excludes cycle units and Team Leaders which will be required in addition to the total shown. This also assumes that all the required Control staff are in place and that all the triage target levels are met to ensure that operational Green demand is reduced.
- 5.19 Graphs of the resulting resources are shown against demand in Appendix **C4**. These indicate that there are significant increases in weekend resources in order to match the demand profile. It can be seen that there is a significant increase in DCA deployments (partly as a result of the move to a two-tier system) and an associated reduction in the number of FRVs required.
- 5.20 Vehicle utilisation has not been capped and is an output of the modelling. Appendix **C5** shows the mean utilisation by Complex in the day, evening and night for ambulances (DCAs) and FRVs. The maximum and minimum is also shown. For ambulances the maximum is under 80% and for FRVs it is under 60%. In broad terms, the average ambulance utilisation decreases by 10 percentage points (from about 83% to 73%) and average FRV utilisation increases by about 10 percentage points (from 40% to 50%).
- 5.21 Appendix **C6** shows the calculation for an operational staff relief rate. This calculation of relief for operational staff gives 32%. The 32% absence rate needs to be supplemented by one percentage point to allow for time in lieu for the 20% of meal breaks not taken by crews – this extra percentage has not been taken into account in the staffing projections and needs to be absorbed as an efficiency.

- 5.22 The total staff required to produce the recommended 84,626 staff hours per week is therefore 2,979. This is based on a calculation from deployed numbers and may need to increase slightly due to rostering.
- 5.23 The modelling has not assumed the exact skill level that will operate on the emergency double crewed ambulances. Currently the LAS aims to provide a paramedic and a technician on each vehicle. If this were to continue, there would be the requirement to phase out the current AESU staff and there would be increased staff costs, both from the increased number recommended here and the increased average unit costs due to all staff being paramedics. Some other Trusts have examined and implemented a mixed crewing of a paramedic and an AESU driver/assistant; this has the impact of reducing overall staff costs. This report is not recommending either option, but the crewing model needs to be explored by the LAS and its Commissioners.
- 5.24 It is important that the LAS moves as quickly as possible towards the two-tier model. If financial considerations prove to be a constraining factor, it then becomes more critical to consider mixed skills (paramedic and AESU) on an ambulance, supplemented by paramedics on FRVs (currently not all FRVs have paramedics).
- 5.25 A comparison of the 2013/14 input operational parameters with 'base validated' values is given for reference in Appendix **C7**.

6 SENSITIVITY MODELLING 2013/14

Introduction

- 6.1 The assumptions made for 2013/14 as set out in Figure 8 (opposite page 13) leave some uncertainty as to the actual values that will be seen in that year taken as a whole. Also, as the study progressed during 2012/13, more information on up-to-date current parameter values became available.
- 6.2 A range of sensitivity modelling runs were therefore agreed by the Steering Group to test the robustness of the 'core results' against potential changes in the assumptions made. These results are set out in this section. First a description of the modelled position for 2013/14 being tested against demand variation is given, then a series of individual changes to input factors are tested.

Demand Variation

- 6.3 Figure 9 (opposite page 13) shows the average daily number of incidents responded to by category in the 2013/14 model. An average of 1,352 Cat A incidents are expected per day; this varies from 1,292 on the average Wednesday to 1,389 on the average Saturday and Sunday. Total demand is predicted to be 3,072 incidents per day, varying from 2,959 on the average Sunday to 3,147 on the average Friday.
- 6.4 Further analyses have been undertaken on a 12-month sample from 1st December 2011 to 30th November 2012, with 1st January 2012 and 3rd October 2012 removed.
- 6.5 Appendix D1a shows the average daily demand overall and by day of week across the sample. During this period there was an average of 1,160 Category A incidents per day and 2,926 total incidents per day.
- 6.6 The maximum number of Category A incidents was 1,389 and the maximum overall demand was 3,321, and these both occurred on the same day.
- 6.7 The 99th percentile of Category A demand was 1,345, ie, on 1% of days Category A demand was at least 1,345 incidents or more. The 99th percentile of all demand was 3,207 incidents. The 95th percentile of Category A incidents was 1,292, showing that there were around 18 days in the year where Category A demand was at this level or higher.
- 6.8 The figures for the previous 12 month's variation were used to extrapolate the extremes in demand for 2013/14 – these can be found in Appendix D1b. It can be expected that on 1% of days in 2013/14 Category A demand will be 16% above that projected, and also on 1% of days overall demand will be 10% above that predicted. The model was run with these demand levels (1,569 Category A incidents, 3,367 overall incidents) along with all other 2013/14 variables. It was found that at these projected high demand days, it is most likely that few, if any, meal breaks could be taken (certainly less than 10%) and performance would fall, with Green 4 calls stacking and with a Red standard of about 70%.

Figure 12 Sensitivity Modelling Summary - Modelled Performance

ITEM	Demand	Performance										Utilisation	
		RED8	RED 19	RED 19T	G1-20	G1-45	G2-30	G2-60	G3-60	G4-60	DCA	FRV	
	Base 13/14 Modelled Performance	79.9%	98.8%	97.1%	92.6%	99.9%	94.1%	100.0%	99.6%	91.9%	72.3%	49.5%	
	Demand												
	1 111 achieves the national business case	83.0%	99.3%	98.7%	94.4%	100.0%	95.1%	100.0%	99.9%	94.4%	66.4%	48.0%	
	2 MPS activity reduced by 50% with associated conveyance case	81.0%	99.0%	97.9%	93.4%	100.0%	94.6%	100.0%	99.8%	93.4%	70.9%	48.5%	
	3 Cat A growth 6% from 12/13 to 13/14	81.6%	99.1%	98.1%	93.7%	100.0%	94.8%	100.0%	99.9%	93.8%	70.0%	47.9%	
	Triage												
	4a Triage exceeded: G3 36% suitable, 30% no send; G4 53% suitable, 35% no send	81.5%	99.2%	98.3%	93.9%	100.0%	94.8%	100.0%	99.9%	94.0%	69.4%	49.4%	
	4b Triage unchanged from validated base	77.3%	97.8%	92.6%	88.2%	99.8%	91.3%	99.9%	98.6%	76.5%	75.9%	49.7%	
	Op Model												
	5&6 a No additional front line hours, but all other efficiencies in place **	76.2%	98.6%	97.7%	93.0%	99.9%	94.3%	100.0%	99.5%	46.8%	76.1%	54.0%	
	5&6 b No additional front line hours, but all other efficiencies in place ***	69.2%	98.0%	97.2%	92.1%	99.9%	94.0%	99.9%	99.6%	91.5%	72.1%	62.5%	
	7a Minus 2 mins time at hospital from 13/14 base	81.2%	99.1%	98.1%	93.5%	100.0%	94.6%	100.0%	99.9%	93.6%	70.0%	49.6%	
	7b Plus 2 mins time at hospital from 13/14 base	77.4%	98.0%	93.3%	89.0%	99.8%	91.8%	99.9%	98.5%	80.0%	75.9%	49.7%	
	8 Minus 5 mins time at scene from 13/14 base	83.8%	99.4%	98.9%	94.7%	100.0%	95.2%	100.0%	100.0%	94.6%	65.5%	45.3%	
	Combined Factors												
	9a 6% increase in Cat A demand; Further -2 mins TaH	82.3%	99.2%	98.5%	94.4%	100.0%	94.9%	100.0%	99.9%	94.4%	68.0%	48.0%	
	9b As above, no additional front line hours **	74.7%	98.9%	98.6%	94.0%	100.0%	94.8%	100.0%	99.9%	94.3%	68.0%	61.2%	
	9c As above, no additional front line hours ***	73.5%	97.8%	95.9%	91.0%	99.9%	93.0%	99.9%	99.1%	89.9%	72.1%	53.3%	
	10a 18% increase in Cat A demand, 3.5% overall growth	78.9%	98.6%	96.4%	91.8%	99.9%	93.6%	99.9%	99.3%	89.8%	73.3%	51.0%	
	10b As above, with additional resources in order to maintain targets *	79.8%	98.9%	97.5%	93.8%	100.0%	96.1%	100.0%	99.6%	93.8%	72.5%	50.7%	

Note: 2013/14 deployed hours as recommended in all modelling except 5&6a and 5&6b
 72700 DCA deployed staff hours per week
 11926 FRV deployed staff hours per week
 Total deployed hours per week = 84626

** 72700 minus 3394 = 69306 DCA deployed staff hours per week
 11926 minus 3394 = 8532 FRV deployed staff hours per week
 Total deployed hours per week = 77838

*** 72700 DCA deployed staff hours per week
 11926 minus 6788 = 5138 FRV deployed staff hours per week
 Total deployed hours per week = 77838

* Additional 142 DCA deployed hrs/wk
 Additional 169 FRV deployed hrs/wk

- 6.9 If the demand level experienced at the 95th percentile is modelled (an 11% increase in Category A incidents and a 6% increase in all incidents), performance could be maintained at target levels but with the sacrifice of the majority of meal breaks not being taken (roughly between 25% and 30% taken).
- 6.10 So the conclusion here is that the proposed deployments will allow targets to be achieved on an annual basis for the LAS, and for the rolling 3-month period for CCG areas. There will be days, potentially weeks, where performance will fall below target, but this will not affect attainment of the specified targets.
- 6.11 Although there will be days where less than 80% of meal breaks will be taken, there will be many more days when more than 80% will be taken, and therefore it is expected that the overall level will be maintained above 80% on a monthly basis.
- 6.12 The Steering Group put forward a list of suggestions for further sensitivity modelling against the base 2013/14 results. These were separately modelled to assess their individual impact on performance. Each item was modelled individually with all the other assumptions and parameters remaining at their base values.
- 6.13 Figure **12** opposite summarises the results. Details for each item are given in Appendix **D2** and the results are discussed below. The numbering of each item follows the original Commissioner's list.

Item 1: 111 volumes

- 6.14 The national business case for 111 indicates that there should be an overall reduction of 2% in 999 activity spread proportionally across Green categories. This was modelled by removing the original 111 demand being modelled in 2013/14 (circa 61,500 calls per year in the base assumption) and then reducing incident volumes by a further 2%. This reduces incidents from 3,072 per day to 2,845 per day. The change leads to an overall Red proportion of 44.6% of all Emergencies.
- 6.15 Results in Appendix **D2a** show that Red8 performance would improve by 3.1% to 83.0%, and there would be a reduction in DCA utilisation to 66.4% as a result of the reduced workload.

Item 2: MPS volumes

- 6.16 MPS activity was reduced by 50% with an assumption that any remaining MPS incidents have the same conveyance rates as non-MPS incidents of the same category. This results in a reduction of 221 incidents per day, and the overall conveyance rate for the remaining incidents increases by 2.4 percentage points.
- 6.17 Under this option Red8 performance improves by 1.1% to 81.0% and DCA utilisation is reduced by 1.4% to 70.9% – see Appendix **D2b**.

Item 3: Red (Category A) volumes

- 6.18 Red incident growth between 2012/13 and 2013/14 was set at +6% (as opposed to the original assumption of +12%). The Green demand was left unchanged from the base position. Green demand had originally been set so as to fix overall growth at 3.2%, with 12% growth on Red. The result of this change in assumption is that overall growth becomes approximately 1%. Red demand levels decrease by about 70 incidents per day.
- 6.19 As shown in Appendix **D2c**, under this option Red8 performance improves by 1.6% and there is a 2.3% reduction in DCA utilisation to 70.0%.

Item 4: Triage

- 6.20 Modelling was requested to assess the impact if the baseline assumptions on call triage are exceeded as follows:
- Green 3 triage – 36% suitable, but 30% no send;
 - Green 4 triage – 49% suitable, but 35% no send;
 - NHSD calls referred on increase to 220 per day.
- 6.21 Results for modelling this option are shown under option 4a in Figure **12** and in Appendix **D2d**.
- 6.22 This option produces very similar performance and utilisation results to Item 3 (Category A growth), with a 1.6% improvement in Red8 and a 2.9% fall in DCA utilisation.
- 6.23 In addition, ORH modelled an alternative scenario where triage volumes remained at their current levels. This would result in an increase of 114 incidents per day over the 2013/14 base level.
- 6.24 Results for this option are shown under option 4b in Figure **12** and Appendix **D2e**.
- 6.25 This option shows a marked reduction in Red8 performance, taking it to 77.3%. Red19T (ie, the transporting resource response) falls below 95%. Although this is not a specific target, low transporting resource performance indicates that there may be issues with FRVs waiting for transport backup.

Items 5 & 6:

All Efficiencies and Activity as 2013/14 base but no resource increase

- 6.26 In this option it is assumed that no additional resources are available, although all the other efficiencies are in place and activity is at the 2013/14 projected levels. In order to model this, the difference between the total available deployed hours in the original validated model and the 2013/14 totals was calculated. The relevant numbers are shown in Table **2** overleaf. An additional 6,788 staff hours per week have been added to the 2011 base position to meet targets in 2013/14.

Area	Total deployed person hours per week		
	Base (May-June 2011)	2013/14 recommended	Difference
E	23888	25939	2051
S	29845	32393	2548
W	24105	26294	2189
LAS	77838	84626	6788

Table 2: Modelled Resource Change

- 6.27 Thus it was assumed that 6,788 person hours per week needed to be removed from the 2013/14 modelled position.
- 6.28 In the first option modelled (Appendix **D2f** and options 5 and 6a in Figure **12**), the staff hours were removed as half DCA and half FRVs, ie, 3,394 FRV hours per week and 1,697 DCA hours per week were removed from the recommended 2013/14 position. This gives a total of 77,838 deployed person hours per week.
- 6.29 In this option the lack of DCAs has a large impact on performance and, in effect, the system ceases to be able to function because insufficient resources are available to transport patients. In order for the system to operate with these staffing levels, 50% of Green 4 demand needs to be removed, ie, 263 Green 4 incidents per day do not receive a response that do so in the base 2013/14 position. The 46.8% performance shown in Figure **12** is the net impact of a 90% target being met for half of the Green 4 incidents, but the remaining half receiving no response at all. There is a corresponding fall in Red8 performance, although this is still above target. Utilisations increase for both DCAs (to over 76%) and for FRVs by a similar amount.
- 6.30 In the second option modelled (Appendix **D2g** and options 5 and 6b in Figure **12**), all the resource reduction was taken as FRVs – ie, 6,788 FRV hours per week. This also gives a total of 77,838 deployed person hours per week.
- 6.31 Under this option Red8 performance falls below target to 69.2%, although other targets are maintained. FRV utilisation increases to 62.5%.

Item 7: Hospital Turnaround Time

- 6.32 The baseline assumption for 2013/14 was that hospital turnaround time would be reduced by an average of 2 minutes to 30.3 minutes. Two sensitivity scenarios were modelled. Option 7a in Figure **12** and Appendix **D2h** models a further 2-minute improvement. Option 7b, in Figure **12** and Appendix **D2i**, models the scenario where the original 2-minute improvement is not achieved.
- 6.33 For option 7a results are quite similar to options 3 and 4a, with Red8 performance at 81.2% and DCA utilisation at 70.0%.
- 6.34 For option 7b Red8 falls to 77.4%, Red19T also falls to 93.3%, Green 4 falls below target to 80% and DCA utilisation increases to 75.9%.

Item 8: Job Cycle Time

- 6.35 In order to model a 5-minute reduction in job cycle time, 5 minutes was taken off all vehicle on scene times.
- 6.36 This option results in an increase in Red8 performance to 83.8% and a reduction in DCA utilisation to 65.5%, as shown in Appendix **D2j**.
- 6.37 It is very important to note that these sensitivity modelling results refer to each item separately. The impact of several items occurring together – for example, decreased time at scene and decreased MPS volumes – is not a simple sum of the individual impacts.
- 6.38 Modelling under Items 9 and 10 considers combinations requested by the commissioners (Item 9) and the LAS (Item 10).

Item 9: Reduced Cat A and Reduced Hospital Turnaround

- 6.39 Item 9 combines two of the previous individual items: (3) Cat A growth at 6% and (7a). A further 2-minute reduction in Hospital Turnaround.
- 6.40 This option results in an improvement in performance and a reduction in utilisation.
- 6.41 The same scenario was then run, but with no additional front line hours (c.f. Items 5&6). Where the resource adjustment is made solely with FRVs, the results show that the Red 8 target would not be met (74.7% performance). Where the adjustment is made with a 50:50 mixture of FRVs and DCAs results show that Red 8 is reduced to 73.7% and in addition the Green 4 target would not be met.
- 6.42 Details are shown in Appendix **D3a**.

Item 10: Increased Cat A and Increased Overall Growth

- 6.43 Under Item 10 an 18% increase in Cat A demand was modelled together with a 3.5% increase in overall activity.
- 6.44 Results show that the Green 4 target would not be met and Red 8 performance would fall by 1%. In order to restore performance to the original 13/14 position an additional 142 DCA hours per week and an additional 169 FRV hours per week would be required.
- 6.45 Detailed results are shown in Appendix **D3b**.

Control Sensitivity Modelling

- 6.46 The call-taker modelling described in Section 4 identifies the staff requirement to meet 95% call answer performance across an average week. There are in fact 42 hours in the week where the 95% target will not be met, given the staffing requirements developed there.
- 6.47 Further modelling was undertaken to establish the number of additional call-taker hours required to meet the 95% call answer target in each hour of the week.

- 6.48 Appendix **D4** shows the performance by hour of day and the number of call-takers required in the core modelling and with the requirement to meet 95% in each hour. An additional 281 call-taker hours a week are required above the core 4209 to meet this more stringent target. This is equivalent to an additional 9.8 staff.

Sensitivity Modelling Conclusions

- 6.49 A wide range of sensitivity modelling runs have been undertaken reflecting the uncertainty implicit in many of the forward projections. Some general conclusions can be made.
- 6.50 If incoming demand levels on the LAS are not as high as projected, or triage levels achieved are greater than projected, then response performance will improve and utilisation will decrease, thus supporting greater resilience. This would also occur if greater efficiencies (particularly quicker hospital turnarounds) are achieved than projected here.
- 6.51 The actual levels of demand/activity, successful triage and efficiencies achieved should be reviewed on a regular basis to inform future investment decisions by commissioners.

Figure 13 **Future Assumptions**

	13/14	14/15	15/16	16/17	17/18
VoR Rate	5.1%	4.6%	4.3%	4.0%	4.0%
Time at Hospital (minutes reduction)	-2	-1	-1	-0.5	-0.5
Operational Tiers	2	2	2	2	2
Phonecalls - rate of increase	6%	5%	4%	3%	3%
Incidents - rate of increase	3.2%	3.0%	2.8%	1.9%	1.9%
Red Incidents - rate of increase (Reduced HCP Increase)	12%	9.5%	7.3%	5.5%	5.5%
G3 Triage (Suitable x No Response)	36%x20%	36%x25%	36%x30%	36%x30%	36%x30%
G3 Calls 'resolved'/day	14	21	28	27	27
G4 Triage (Suitable x No Response)	49%x25%	49%x30%	49%x35%	49%x35%	49%x35%
G4 Calls 'resolved'/day	80	88	100	93	97
Time at Scene	See Box 1				
AAC Points Usage	not 00->06	24 hours	24 hours	24 hours	24 hours
Meal Breaks	flexible	flexible	flexible	flexible	flexible
Overall Conveyance Rates (see Box 2)	78%	77%	76%	75%	74%
111 Demand	See Box 3	flat	flat	flat	flat

Box 1 - Time at Scene

DCA - 28 minutes if incident conveyed, 44 if not
 FRV - 37 minutes if incident conveyed, 36 if not

These values used for all years and match current

Box 2 - Conveyance Rates - 13/14

	2013/14	2014/15	2015/16	2016/17	2017/18
R1	46.8%	46.8%	46.8%	46.8%	46.8%
R2	81.8%	80.8%	79.9%	78.9%	77.9%
G1	75.9%	75.0%	74.2%	72.4%	70.7%
G2	76.8%	75.4%	74.5%	72.7%	70.9%
G3	65.0%	64.0%	63.0%	62.5%	62.0%
G4	81.0%	80.0%	79.0%	78.0%	77.0%

Box 3 - 111 Demand giving additional incidents

40,000 more incidents in 2013/14 over 2012/13

Note: See Appendix E3 for 'clinical rationale'.

7 FUTURE YEAR MODELLING

Assumptions

- 7.1 The assumptions agreed by the Steering Group between the LAS and the Commissioners are shown in Figure **13** opposite. These represent a year-on-year improvement in most aspects of the service, in terms of efficiency and demand rate increase.
- 7.2 Vehicle off road (VoR) rates are assumed to decline over the five years as a result of more pro-active management.
- 7.3 Time at Hospital is also set to reduce from year to year. This reduction is assumed to be effected as 50% on the 'LAS' side and 50% on the 'hospital' side.
- 7.4 The move to two operational tiers will be maintained.
- 7.5 Total phone calls are set to reduce over time. Partially this is assumed to be as a result of increased use of 111. Red incident rates will show a decreasing rate of increase. This will be further enhanced by pro-active management of HCP Red call rates.
- 7.6 The total percentage of calls suitable for triage is assumed to stay the same at 36% of Green 3 incidents and 49% of Green 4 incidents. Successful triage for Green 3, where no response is required, is assumed to increase to 30% of incidents by 2015/16 and then remain constant. For Green 4 incidents there is a similar pattern of increase remaining constant at 35% from 2015/16. The total calls 'resolved' (ie, no response required) in the CTA and CHUB combined therefore rises from a current level of about 40 calls per day to 124 calls per day in 2017/18. This represents about 2.3% of all calls received in 2017/18.
- 7.7 Time at scene is not assumed to change from current levels. As Box 1 opposite indicates, the time at scene is modelled at different values for conveyed and non-conveyed patients so, as the conveyance rate decreases, the overall average time at scene will increase.
- 7.8 Active Area Cover usage will be expanded from the current limit where sites are not used between midnight and 6am to 24x7 use.
- 7.9 Meal break policy will remain the same, and the modelling in all years has assumed that at least 80% of meal breaks will be taken within the allocated window.
- 7.10 Conveyance rates are assumed to stay the same for the most serious incidents (Red 1), but to reduce for other call categories. There is a limit to the scope for reduction of Green 3 and Green 4 conveyance rates, since these are also linked to successful triage. Where a triaged incident does require a vehicle response, then the likelihood of the patient being transported is high.
- 7.11 The transfer to 111 is assumed to generate an additional 40,000 incidents in each year.

Figure 14 **Future Years Resource Summary**

CONTROL

	FTE			
	12/13 (*)	13/14	14/15	15/16
CT	150	147	153	157
CHUB	0	13.5	13.5	13.5
CTA	52	62	62	62
Total	202	222.5	228.5	232.5
Difference	-	20.5	6	4
% Uplift	-	10.10%	2.70%	1.80%

OPERATIONS

	FTE			
	12/13 (*)	13/14	14/15	15/16
Staff (**)	2750	2979	3014	3044
Difference	-	229	35	30
% Uplift	-	8.30%	1.50%	1.00%

(*) Current funded level needs verification

(**) Options for clinical skill mix on DCAs

All projected staffing levels subject to fitting feasible rosters

- 7.12 It is not possible to build in any clear assumptions about future changes in the configuration of hospital services. It will be important to model these separately as they become known so that the impacts on the LAS and its resourcing, both locally and regionally, can be established in advance of the changes occurring.

Control

- 7.13 As described in paragraph 7.5 above, the average increase in calls is assumed to decrease year-on-year from 2014/15. The projected increases are 5%, 4%, 3% and 3% for 14/15 through to 17/18. Over the 4 years, this is equal to a total phone call increase of 15.9%.
- 7.14 The call-taking model was used with these demand increases to identify the additional hours required year-on-year to meet the 95% call answer target across the week; these results are shown in Appendix **E1**.
- 7.15 As shown earlier for 2013/14, the staff requirement is for 4,209 call-taker hours per week. This increases to 4,375 in 2014/15 and then to 4,506, 4,608 and 4,735 call-taker hours per week in the years 2015/16 to 2017/18 respectively. Over the four years this is equivalent to an increase in staff hours of 12.5% from the modelled requirement in 2013/14.
- 7.16 The relatively high increase in Category A incidents compared to the rate of all incident increase that is projected forward to 2017/18, suggests that there will actually be a small decrease in the number of Green calls entering the control room year on year. This means that the level of staff projected for the CHUB and CTA in 2013/14 will be sufficient in all future years to meet the demand. As the volumes decrease, staff will have more opportunity to engage in other clinical activities within the control room.
- 7.17 These results are summarised in terms of WTE staff in Figure **14** opposite.

Operations

- 7.18 Operational modelling for the years 2014/15 to 2017/18 was undertaken based on the agreed assumptions shown in Figure **13**. As agreed, no resource changes were modelled for the final two years.
- 7.19 Results are summarised in Appendix **F1** and Figure **14**. These show that performance can be maintained for 2 years with only a small number of additional resources.
- 7.20 In terms of staff equivalents, the efficiencies modelled over the relevant years can be considered in terms of their staff equivalents. Table **3** overleaf shows this:

Efficiency	Staff Equivalent (approx)		
	13/14	14/15	15/16
Reduction in Time at Hospital	60	90	120
Additional Triage	70	80	90
Reduced MAR	120	120	120
New AAC Points and Usage	60	60	60
Change in Conveyance Rates	0	20	40
3 to 2 Tiers and re-rostering	90	90	90
TOTAL	400	460	520

Table 3: Efficiencies and Staff Equivalents

- 7.21 These results show that the modelled efficiencies translate to substantial savings in staff numbers.
- 7.22 For the final two years it was agreed that no additional resources would be modelled and performance changes would be noted. With the 2015/16 resources in place Red 8 performance in 2017/18 would be 75.8% with Green 1 performance at 88.4% and Green 4 performance at 80.9%, substantially below target and leading to very long waiting times for these patients. DCA utilisation shows an associated rise to 75.8%.

8 CONCLUSIONS

Introduction

- 8.1 This capacity modelling study for the LAS and its Commissioners has involved detailed analysis to establish a base position for 2012/13, then a wide range of operational and control modelling to assess options for the LAS to meet identified performance targets over the next few years.
- 8.2 The modelling was undertaken iteratively, sharing emerging results with the Steering Group, and agreeing assumptions for future years in terms of operational parameters and demand rates. Sensitivity modelling was undertaken around the core results.
- 8.3 The study excluded any financial appraisal; rather it focused on the deployment and staffing requirements in operations and control relative to the base deployment position.
- 8.4 Results were generated across the terms of reference items for the years 2013/14 to 2017/18.

Control

- 8.5 Modelling was undertaken across the 999 call-taking, Clinical Telephone Advice and Clinical Hub functions. The call-taking target is prescribed at 95% within 5 seconds. Timeliness targets for CTA and CHUB call-backs were set, with thresholds identified for passing to the dispatch desk for response.
- 8.6 Phone calls were projected to increase, but at a decreasing rate per year (6% initially but then 3% by 2017/18). This is based on an expected decrease in the ETA rate as the operational service improves (particularly reducing the number of long Green response times), and in the latter years on the expectation that 111 will be increasingly used as an alternative to 999.
- 8.7 In 2013/14 the current establishment of call-takers will be able to meet the projected phone call demand with significant re-rostering required. By 2015/16 another 7 WTEs will need to be established to meet demand levels projected.
- 8.8 The modelling has found that an establishment of 13.5 WTEs is required for the CHUB for all future years to give sufficient capacity to ring back Green calls; this is likely to rise to 16 WTEs to allow a feasible roster to be drawn up. The level of Green 3 calls resolved per day will rise from 14 per day in 2013/14 to 27 per day in 2017/18. There will be some available time to deal with a few Red calls each day if required, and to advise crews directly in some cases; however, no explicit allowance has been made here for the general Clinical Service Desk role.
- 8.9 For CTA an increase in establishment is required to allow the Green 4 triage rate to rise from about 30 resolved per day (52 posts established currently) to about 80 per day in 2013/14 (62 posts established). This higher establishment figure, subject to applying rostering criteria, will be sufficient for the future years modelled, with a projected 100 resolved calls per day by 2017/18.

Figure 15 Staffing Required (WTEs)

Operations

	12/13 (*)	13/14	14/15	15/16
Staff (**)	2750	2979	3014	3044
Difference	-	+229	+35	+30
% Uplift	-	+8.3%	+1.5%	+1.0%

Control

	12/13 (*)	13/14	14/15	15/16
CT	150	147	153	157
CHUB	0	13.5	13.5	13.5
CTA	52	62	62	62
Total	202	222.5	228.5	232.5
Difference	-	+20.5	+6.0	+4.0
% Uplift	-	+10.1%	+2.7%	+1.8%

(*) Current funded level needs verification

(**) Options for clinical skill mix on DCAs

All projected staffing levels subject to fitting feasible rosters

Operations

- 8.10 A number of assumptions and projections were made for future years based on informed discussion within the Steering Group. This encompassed a range of efficiency measures to be phased in by the LAS including a reduced VoR rate, increased telephone triage, improved use of the new AAC points identified as part of this work and comprehensive re-rostering. A relief rate of 32% was identified as being required to cover absences. Reductions in time at hospital were phased totalling 5 minutes over the next four years.
- 8.11 In 2013/14 it is projected that the overall incident rate will increase by 3.2% and the Red incident level will increase by 12%. The projected rate of increase for future years is gradually lower, down to 1.9% and 5.5% respectively by 2017/18. This is partly explained by assumptions regarding MPS and HCP calls being capped at near to their current rates. Green incident demand is projected to decrease, partly due to increased triage and partly because of the changing category profile. An additional 40,000 more incidents per year are assumed to result from the new 111 service (half Red, half Green).
- 8.12 The conveyance rate was projected to decrease gradually over the projection period for all categories of call other than Red incidents. Effectively this maintained a similar level of conveyed patients from 2014/15 onwards.
- 8.13 A key recommendation is to move to two tiers of provision (DCAs and FRVs) as opposed to the three tiers at present (an AESU tier as well). This will be a far more efficient and flexible system, giving a reduced MAR and allowing all crews potentially to 'see and treat' as well as 'see, treat and refer'.
- 8.14 This is a resource capacity modelling study and excludes any financial appraisal. The operational models – one for each of East, West and South – were validated against a three-month period in 2011/12 then upgraded to match 2013/14 demand levels. Response targets were set as prescribed nationally and as set locally by the Steering Group. The modelling allowed the most efficient deployments of DCAs and FRVs to be found for each of the projection years with the assumptions agreed built in.
- 8.15 It was found that an increase in deployed operational staff equivalent to 229 WTEs was required for 2013/14. An additional 35 WTEs and 30 WTEs are then required in 2014/15 and 2015/16 respectively. A new deployment profile provided to the LAS, and reflecting the higher deployment level for 2013/14 is being used to set new rosters. A summary of the staffing implications is given opposite in Figure 15.
- 8.16 The deployments recommended will decrease average DCA utilisation by about 10 percentage points (from 83% to 73%) and will increase FRV utilisation by the same margin (40% to 50%). Operational staff will be able to take their meal breaks within the allocated window on at least 80% of their shifts.
- 8.17 A series of sensitivity modelling runs were undertaken which showed that the results were very sensitive to changing the assumptions made. It will be necessary to review the demand projection assumptions before the end of 2013/14.

