BRITISH TRANSPORT POLICE

REPORT TO:	**BTPA**
DATE:	**26 October 2011**
SUBJECT:	**ICT Disaster Recovery Centre**
SPONSOR:	**Director of Corporate Resources**
AUTHORS:	**Paul Day / Leigh Stringer**

1. PURPOSE OF PAPER

1.1 To seek approval to proceed with the provision of a full Disaster Recovery (DR) Capability at Birmingham Axis.

2. BACKGROUND

2.1 BTP currently has its data centre at FHQ, Camden Road, and it is there that all of the Force's 160 plus applications are hosted, and all of the data is stored. The two most important systems for operational policing, Command & Control (CnC) and Airwave radio have some DR capability. CnC has duplicate servers in Birmingham Axis; these were installed earlier in the year as a 'quick fix' for BTP's most operationally vital system, pending the creation of a comprehensive DR capability. Airwave radio has an external system provider with their own arrangements, and may be considered reasonably robust. The CnC DR capability is quite limited, however. If CnC DR were invoked because FHQ was out of operation, the key systems that CnC interfaces to – Crime, Intelligence, PNC etc. would not be available, since they are all hosted at FHQ. In the event of the loss of FHQ, all of the Force's other applications and data would be inaccessible, including email, intranet, internet, PNC, Crime, Intelligence, mobile data, management information, and all the other 160 plus applications, making normal operation of the Force impossible.

2.2 The likely causes of data centre loss are, from research:

- Fire
- Flood (typically plumbing problems within a building)
- Gas/chemical leaks
- Malware (viruses etc)
- Theft
- Civil disturbance
- Bomb threat
- To these can be added direct terrorist action against BTP, area denial after a radiological bomb, epidemics, and a range of other lower probability causes.

2.3 To put things into perspective, each year there are 1000 – 1200 "large loss" fires in commercial premises in the UK, with average claims over £0.5m[1]. Statistics reveal that around half of these are of malicious origin. If FHQ were to be affected by a major fire, it is likely that the data centre would be a total loss (with a combination of fire, smoke and water damage), and would need to be totally replaced, probably in a new building. This would

[1] Examination of Large Loss Fires in Commercial Buildings. Greenstreet Berman Ltd, Dept for Communities and Local Government, March 2010.

take a minimum of 6 months, and during that time the Force would be unable to function in any other than the most rudimentary fashion, having lost email, intranet & internet, the G: and H: drives, all its 160 plus applications, all its management information systems, and so forth. Thus apart from basic DR as described above, plus any local PC based systems and data held on individual PCs, the Force would be back to paper and pencil, since although the PCs on most sites would still run, and the WAN and telephony would still operate, the servers vital to the Force's applications, and the disks holding all the Force's data, would no longer exist. If the disaster occurred during the 2012 Olympic Games, or during any extended period of critical policing (e.g. London riots), the damage to the organisation's reputation could be terminal. Even in non-critical times, the force's daily operations could only survive in Business Continuity mode for a relatively short time without the FHQ data centre.

2.4 Police forces have long been aware of the critical nature of ICT in operational policing, and their ability to run as properly managed businesses. A straw poll of UK police forces taken by the author revealed that of the 29 who responded, 28 have DR and one does not. So clearly the provision of a DR capability is standard practice in the police world. In the private sector, it is reported that of commercial organisations that have experienced a major ICT disaster, 43% never reopened for business, 51% closed within two years, and only 6% survived long term[2].

2.5 The risks associated with BTP having no DR centre have been on the Corporate Risk Register for some time, and in a recent review the BTPA Audit Committee urged the resolution of the issue before the 2012 Olympic Games.

2.6 The proposed approach to DR is to duplicate the FHQ data centre at another BTP site, and Birmingham Axis is the preferred location (see Appendix A for an evaluation of the other major options, and the reason why Birmingham is the preferred option). A fringe benefit would be that the DR centre could double up as a system test facility, when not needed for DR purposes, allowing system changes to be tested before release into the production environment. This is not possible at present.

2.7 Gaining financial approval for the DR centre has taken some time to progress through BTP. In the early part of 2011, detailed discussions with specialist suppliers revealed that the budgetary sum put aside for the refurbishment of the Birmingham site was inadequate. SCT asked for an exploration of the alternatives, in the hope of finding a more affordable solution, and a paper giving that information was presented to SCT on 15 April 2011. A request was made for further information on costs and timescales, before a decision to proceed to the next phase (inviting tenders for the refurbishment of Birmingham) could be made. The information was presented to SCT in May 2011, and approval was given to go to tender for the refit works. A paper was presented to SCT on 15 September 2011 outlining the tendered costs, and seeking approval to proceed. The matter was referred to the new Director of Corporate Resources, to consider the robustness of the estimates and the level of contingences that should be included. This paper now presents the final estimates of the costs, plus contingencies, along with the implementation timescales.

3. DISASTER RECOVERY BASICS

[2] Backing Up Business: Industry Trend or Event, Health Management Technology, January 2011.

3.1 A Disaster Recovery Centre needs:

- Secure, resilient, high capacity data network links, so that it can serve as the new central node for the BTP network following the disaster, and up until that time can be constantly updated with data from the primary data centre;
- To be located sufficiently far away from the primary centre, so that it is less likely to be affected by the same disaster;
- To be on a different part of the National Grid;
- To be sufficiently large to hold all the equipment;
- To have good physical security;
- To have an adequate mains power supply (i.e. local substation of sufficient size);
- To have continuity of power, if the mains power fails – this is achieved with UPS ("Uninterruptible Power Supply", i.e. local battery backup) plus a generator;
- To have air cooling, to prevent equipment overheating;
- To have fire suppression, to prevent or contain an electrical fire without destroying all the equipment;
- To have received planning permission from the local authority, plus landlord approval, if the building has to be modified.

3.2 Birmingham Axis is the most suitable site. It has dual, high bandwidth data links, which have been upgraded as part of the WAN project. It is sufficiently far away from FHQ to be unaffected by local incidents or a whole-London event. Space has been found in the building of sufficient size for the data centre, although that will involve relocating some staff within the building (the costs for the relocation exercise, including fitting out office space elsewhere in the building, are built into the budget). There is sufficient power capacity in the local substation, the local authority has given planning permission, and landlord approval has been obtained.

4. RECOMMENDED WAY AHEAD

4.1 Way Ahead: The recommended way ahead is to proceed with the construction of the DR data centre at Birmingham. This would ensure that in the event of disaster at FHQ, the Force could continue to work with all its IT applications, and interruption to business would be limited to redeploying FHQ staff to other sites.

4.2 Timescales: The timescales for the work are outlined in Appendix C. The fit out work will take 4 months, and the commissioning and testing of the IT equipment 2 months, giving an overall timescale of 6 months. Note that the preparatory IT work would take place while the fit out work was under way. If work were to start in November 2010, the DR centre would be completed, tested and operational by May 2012.

4.3 Cost, Risks and Issues:

- Fit-Out Contingency: Estates Department have reviewed industry standard practice for contingency levels for refurbishment projects, and they typically range from 5% to 10% (a broad-ranging academic study published by the Royal Institute of Chartered

Surveyors[3] supports this conclusion). As the project is of a relatively hi-tech nature (including the fit-out of cooling, fire suppression, UPS etc), the upper end of the contingency figure is felt appropriate. The issue has been discussed with two independent consultancies used by Estates Department, DTZ and RLB, and they concur with the conclusion that a contingency of 10% on the refurbishment costs would be appropriate. Thus the cost of the facility fit-out was £710k without contingency, and would be **£781k including contingency.**

- Technology Contingency: Technology Department have reviewed industry experience in IT project cost overruns. The best-publicised reports in this area are the annual "Chaos" reports produced by the U.S. Standish Group, who have consistently reported average cost overruns on major IT projects of 40%, across many industry sectors. An authoritative report by the British Computer Society[4] reaches the same conclusion: a median overspend of 40% on a large sample of major projects. Note that many of the projects reported on by both studies involved software development (a big risk factor), and many were far larger than the IT work proposed for BTP's DR facility (another risk factor). In addition, much of the IT work has already been de-risked in that the server virtualisation work has already been completed, and the servers to go into Birmingham will be 'carbon copies' of the virtual servers at FHQ. With this in mind, it is felt that the contingency factor can safely be reduced to 20% on the IT work. Thus the initial IT fit-out without contingency has been budgeted at £200k, and would be **£240k including contingency.**
- It is important to consider the whole life cost of the facility. Note that its life would extend well beyond the Olympics, which is the immediate focus. The fabric of the DR centre (UPS, air cooling, fire suppression system, specialist cabling and racking etc) will last for at least 10 years, with appropriate maintenance. The IT servers and disk storage will last for 5 years, and so over a 10 year period we would expect one refresh of this equipment. Thus the whole-life cost over 10 years would be:
  - Building fit-out: £781k (including contingency)
  - IT fit-out: £240k (including contingency)
  - IT server refresh after 5 years: £200k
  - Maintenance over 10 years, at £10k pa: £100k
  - **Total cost over 10 years: £1321k**
  - Thus the annual cost of the facility, taken over 10 years**, is £132k per annum.**
- Resourcing: The bulk of the fit out work would be done by the successful bidder, E. Manton Ltd, who have the capability to start work immediately. Estates Department have sufficient capacity to oversee the work during the proposed period. The Technology Department is currently extremely busy (primarily with the WAN implementation), but its workload will have fallen considerably by the time that the IT

[3] COBRA 2004: The International Construction Research Conference of the Royal Institution of Chartered Surveyors, 7-8 September 2004, Leeds Metropolitan University. "Accuracy in Estimating Project Cost Construction Contingency – A Statistical Analysis". Baccarini, D, Dept of Construction Management, Curtin University of Technology, Perth, Western Australia.

[4] "A Study In Project Failure", McManus J & Wood-Harper, T, British Computer Society, 2005. http://www.bcs.org/content/ConWebDoc/19584

work for the DR Centre would take place, and so will have sufficient capacity to do the work.

- Interdependencies: The proposed DR project has had significant interdependencies with other force activities. The WAN project was required, to provide the secure, high bandwidth links between FHQ and Birmingham Axis, and these links are now in place and working. The server virtualisation project was required, to allow the bulk of the servers to be easily re-created on duplicate, virtualised servers within the DR centre, and this project has now been completed successfully. The telephony elements of the WAN project (which will complete within the timescale) also enable resilient telephony, so that there is no dependence on a single telephone switch within FHQ. The timing of the work now proposed ensures that Technology staff will have the capacity to undertake the DR work, following from the current peak of WAN work. Thus all interdependencies have now been resolved, which de-risks the project considerably.
- Budget: The costs for the work are within the capital budget for the current financial year, 2011/12. Delays in proceeding would cause budgetary issues, both a capital underspend in 2011/12, and possible difficulties in finding the capital allocation in 2012/13.
- Timescale: If the facility is to be completed in time for the 2012 Olympics, work must commence in the near future.

5. DECISION NOW REQUESTED

5.1 It is recommended that BTPA approve the provision of a full DR capability at Birmingham Axis. This will cover the risk that the FHQ data centre is put out of action by fire, flood or any of a range of causes, which would cripple BTP's capability to run as an effective police force. This risk is especially critical in the context of the 2012 Olympics, but the proposed DR centre would provide cover for the next 10 years. Note that if extensively damaged, rebuilding of the FHQ data centre would take at least 6 months.

5.2 It is recommended that BTPA approve expenditure for the fit out of the facility at Birmingham Axis at £781k (including VAT and contingency), and expenditure for the IT equipment procurement and installation at £240k (including VAT and contingency), **a total expenditure within this financial year of £1,021k.** Over the facility's anticipated life of 10 years, maintenance would be required at an estimated £10k per annum, and a server refresh would be required after 5 years, estimated at £200k. This brings the **whole-life cost over 10 years to £1,321k**, including contingency and VAT, which is the equivalent of £132k pa.

APPENDIX A: OPTIONS EXAMINED TO REDUCE COSTS

A1 **Do without a DR Capability:** Some organisations (although almost no police forces) have no DR capability, and take the risk that in the event of a disaster, business continuity plans can succeed using a paper-based approach, pending the eventual re-creation of an ICT capability. Total loss of an organisation's ICT capability is relatively unusual, but the consequences are very serious, and many organisations fail to survive after a disaster. For an organisation such as BTP, which is involved in matters of public safety on a 24x7 basis, the consequences of the loss of the Camden data centre would be extremely serious. **The option of doing without a DR capability is not recommended.**

A2 **Using a commercial DR Capability:** There are commercial organisations that offer basic DR facilities, on a retained basis and for a fee. They keep a number of servers in a DR centre, so that when an organisation under contract to them has a disaster, they inform the DR provider, who loads their software onto the servers along with the most recent data back-ups they have been given. The facility then acts as the organisation's temporary data centre, typically only for key applications. These centres offer the same service to multiple clients, and work on a 'first come, first served' basis. The risk would be that a disaster occurs that is widespread, and multiple clients need to use the DR centre at the same time. In addition, it would be necessary to provide resilient, high bandwidth links from the commercial DR centre into the BTP network, and pay for those links despite their not being used most of the time. Furthermore, this arrangement would not allow the DR centre to be used for testing purposes. Thus overall, the running costs would be fairly high, the availability uncertain, and the utility limited. **Because of these limitations, this option is not recommended.**

A3 **Shared Services**: The possibility exists for shared services. Due to the secure nature of much BTP data, this would need to be with another police force or similar organisation. Although many forces have DR facilities, it would not be possible to simply use their servers, since every force uses their own unique mix of systems, configured to suit their needs. Thus, if another force were willing and had the spare space, it would still be necessary to pay for the extra power, cooling and so forth within their DR centre, and so this approach would tend to have broadly the same upgrade costs (on a pro-rata basis) as using a BTP site. There would be extra costs in the provision of a new, resilient data links into their site, and so the total cost would be significant. In addition, the time to organise this is likely to be too great to make this a viable option before the Olympics. **Because of these limitations, this option is not recommended.**

A4 **Using a BTP site other than Birmingham:** The use of a BTP building other than Birmingham Axis is an option to be considered. There may be merit in having a non-urban location, and some organisations use anonymous buildings on remote industrial parks as data centres, for security reasons. The cost of leasing an industrial unit might be low, but there would be costs in enhancing the physical security, manning the building 24x7 for security purposes, plus all the fit-out costs for power, air conditioning etc. as outlined

above. In addition, it would be necessary to provide resilient, high bandwidth data links into the BTP network. Similarly, choosing another building in the existing BTP estate would incur fit-out costs, plus the upgrading of a data link. This option would be more expensive than using Birmingham, since Birmingham already the high capacity, resilient data links. **Because of these limitations, this option is not recommended.**

A5 The table below summarises the estimated whole life (ten year) costs of the three leading solutions, and notes whether access for DR is guaranteed, and whether the DR facility can be used for testing purposes.

Table A: Ten Year Costs of the Options

Five-Year Costs (£k)	BTP Birmingham	Commercial shared service	Police shared service
Cost of rent*	*£120*	£1,500	£60
Cost of additional communications links	£0	£1,100	£1,100
Cost of fit-out (excl contingency)	£710	£0	£355
Fit-out contingency at 10%	£71	£0	£36
Cost of servers	£200	£0	£100
IT contingency at 20%	£40	£0	£20
Server refresh after 5 years	£200	£0	£100
Maintenance	£100	£0	£50
Contribution to other force's staffing, plus extra BTP staff costs	n/a	n/a	£200
Guaranteed DR when needed?	Y	N	N
Guaranteed use for test purposes?	Y	N	N
Total Five-Year Cost	**£1,441**	**£2,600**	**£2,021**

*Note that the 'cost of rent' for a BTP facility is included for comparison purposes only, and does not represent an extra cost. Without this cost, the total for the BTP Birmingham solution, including contingency, **is £1321k over 10 years.**

A6 The 'cost of rent' is, in the case of the commercial shared services centre, the retainer paid to them to have an option to use the facility in times of disaster, and to periodically test the capability. In the case of other forces, it is a fair price to pay to them for the facility (since we could not rely on another force's charity, or expect them to forgo the economic benefit of sharing a service with BTP). A fair rental cost is included for the use of BTP's own space in

Birmingham, for comparison purposes, although this would not be an additional cost to the force, since the space already exists and is separately accounted for.

A7 The cost of additional communications links would be strongly affected by the distance between the DR centre and the nearest point of connection to BTP's WAN, plus the uncertainties of the installation costs (way leave, landlord's permission, and so forth). Depending on the distances involved, the cost of communications links could well be higher in practice than the estimates given here.

A8 The cost of fit out is shown as £710k for the BTP Birmingham DR centre, which was the price achieved after tendering. No fit out is required with the commercial option, but it is assumed that there would be costs in fitting out another force's spare data centre space. The cost of putting extra servers into another force's data centre is estimated at half that of the BTP option, on the basis that we can assume half of the server complement would be newly installed by BTP. Contingencies are pro-rata.

A9 The cost of servers follows the same logic. This is £200k for BTP, zero for the commercial option, and £100k (i.e. 50%) for fitting the half-complement of servers into another force's expanded data centre. Contingencies are pro-rata. The server refresh cost after 5 years is estimated at £200k, with half that sum for the half-complement in the police shared services option. Costs are allocated as contributions to the other forces for their overheads and staffing, plus for the additional BTP staffing associated with making use of another force's facility; this is modestly costed at £20k pa, a total of £200k over ten years.

A10 Finally, it can be seen that only the BTP Birmingham option provides both guaranteed DR access, and the use of the facility for testing purposes at all times when not used for true DR, or DR exercises.

A11 The cheapest option is the use of BTP's own facility. The commercial shared services option is considerably more expensive, and the police shared services option is 29% more expensive than the Birmingham option, viewed over the 10 year timescale, even if the nominal 'cost of rent' of the Birmingham space is included. The police shared services option also lacks absolutely guaranteed DR access (since half of the server facilities are shared), and full-time testing access, and is therefore a lesser option. In addition, the timescale required to find a suitable and willing force (with 50% server compatibility plus the expansion space to let BTP move in extra servers), to negotiate terms and agree governance, and to implement the solution (including the uncertainties over data links), now rules out this option in terms of it being achieved in time for the 2012 Olympics.

APPENDIX B: TENDER EXERCISE FOR THE BIRMINGHAM FIT-OUT

B1 The procurement route for this project was agreed with Procurement Department as a traditionally tendered route, inviting 5 contractors to price for the works in a competitive environment. BTP invited the following organisations to tender for the works, some of whom had previously carried out successful projects for BTP. The returned tender costs are shown against each respective organisation and are inclusive of VAT.

- Strategic Team Group - £839,672
- Shaylor Group - £713,358
- E Manton Ltd - £706,665
- Kendrick Special Projects – incorrect tender sum submitted so eliminated
- Buckingham Group – declined to tender

Upon the tenders being received on 16th August 2011, it was clear that the proposed costs exceeded the project budget. A value-engineering/scope reduction exercise was undertaken to reduce the costs as far as possible.

B2 The value engineering exercise examined the entire project scope to review where savings could be made, and the following items were identified, reducing the overall costs by £64,376 excl VAT (£77,251 inclusive of VAT).

ITEM	DETAIL	
1	General Contingency	5,000.00
2	P.S Signage	1,500.00
3	P.S. Fire Extinguishers	1,000.00
4	P.S. Replacing additional areas of floor screed	2,500.00
5	P.S. Removal of additional areas of asbestos materials	2,500.00
6	P.S. Replacement of existing doors	2,000.00
7	P.S. Insurance against damage to property	2,500.00
8	P.S. for Tests and Samples	500
9	P.S. For additional Authorised Overtime	1,500.00
10	Electrical Sub-Contract P.S. Work outside Contract Area	5,000.00
11	Mechanical Sub-Contract P.S. Work Outside Contract Area	5,000.00
12	Mechanical P.S. Modifications to existing infrastructure	2,000.00
13	Mechanical P.S. Additional Works in connection with Client/End User requirements.	2,000.00
14	Within the Server Room there are three Airedale Smart Cool Indoor cooling units with external compressors sized for the current and future requirements. It has been agreed that one unit can be omitted and installed in the future when the additional server numbers are to be increased. Include for omitting pipework, power supply, etc.	23,436.00
15	First Floor East Wing – Decorations to Offices 2 & 3 to be reduced; only new partition walls and infill to former door and vision panels in wall between rooms 2 & 3 to be painted.	565.00
16	First Floor East Wing – Corridor shall only have making good to decorations around new door opening, existing wallpaper finish to remain.	473.00

17	Building Specification Clause3.3.7 includes window blinds and whiteboards/notice boards, these are to be omitted. 11No. window blinds. 7No Whiteboards and 7No. Notice boards.	1,914.00
18	Building Specification Clause 3.4.2 includes specialist partitioning and general partitioning. The corridor wall of the New Office 12 shall be changed from specialist partitioning to general partitioning. i.e. from K10/205 to K10/125.	1,900.00
19	Building Specification Clause 3.4.4 – the existing floor finish in Room 12 and the Corridor at Ground Level South Wing will be retained and not replaced. Allow for making good, to match as far as possible, to the floor where doors and partitions have been removed/replaced. Other floor finishes will be replaced as specified, including latex skimming, etc.	1,715.00
20	Building Specification Clause 3.4.8 – decoration works will only be undertaken to Offices 12 & 14, Server Room and new walls to the corridor. No decorations to Rooms 3, 4 and 5.	965.00
21	Building Specification Clause 3.4.7 includes whiteboards/notice boards, these are to be omitted. 4 No. Whiteboards and 4 No. Notice boards.	408.00
	TOTAL REDUCTIONS TO SUBMITTED TENDER	**64,376.00**

Following the value engineering exercise, all three remaining contractors were asked to revise their proposed costs taking the above reductions into account. The revised contract sums are shown below, inclusive of VAT:

- Strategic Team Group - £768,252
- Shaylor Group - £638,400
- E Manton Ltd - £629,414

The value-engineered contract sum from E Manton Ltd was the most attractive figure to proceed with.

B3 Phase 1 of the proposed works to vacate the existing DR space involves the relocation of some Area staff to the floor above, whilst creating suitable accommodation for the various departments to work from. Estates currently hold a 2010/11 capital budget for the W&W AHQ refurbishment, so associated costs for Phase 1 of the works will utilise part of the AHQ refurbishment budget, which is appropriate given that elements of AHQ refurbishment will be achieved through this project. In addition a modest contribution from the Force-wide security upgrade budget will be brought forward to fund the access control and Intruder Detection System (IDS) provisions, which is work that would have been undertaken in any case, although at a different time. The various budgets are listed below:

- DR budget - £592,000
- W&W AHQ refurbishment budget contribution - £88,500
- Technology budget contribution - £15,000
- Security upgrade budget contribution - £15,000

This brings the budgetary provision to a total **of £710,500.**

B4 Expected final costs upon completion of the phased works amount **£710,414** inc VAT, which is made up from the following costs (including VAT, but excluding contingency):

- Engineered contract sum (E Manton Ltd) - £629,414
- Structured cabling - £7,500
- Access control/IDS provision - £20,000
- Consultancy costs (based on 8.5% of new contract sum) - £53,500

Thus the total costs for the DR centre fit-out match the budgetary provision. Note that if the costs for the IT equipment (£200,000) and estimated 10-year support costs (£100,000) are added, along with a server refresh after five years, the 10-year whole-life cost of the DR centre totals £1210k. To this must be added the contingencies, described in the main report, which amount to £71,000 for the fit-out and £40,000 for the IT, bringing a total of **£1321k over 10 years.**

B5 Are these costs reasonable? While the price obtained for the data centre fit-out has been achieved through competitive procurement, and must therefore be seen as the best available, it is worth looking at the costs objectively against industry norms. It is reported that in the US, the rule of thumb[5] for data centre costs is $1200/sq ft. The calculations reveal that at US rates, a data centre the size of Birmingham would cost £973k for construction and initial fit-out with servers – which contrasts with our sum of £1021k (which includes contingencies, but excludes support costs and server refresh). Thus our costs are remarkably close to the US industry norm.

B6 Landlord's consents have now been obtained, as has planning permission from Birmingham City Council, and so there are no external regulatory impediments to the project.

[5] http://www.datacenterknowledge.com/archives/2010/03/26/cloud-economics-by-the-square-foot/

APPENDIX C: TIMESCALES FOR DR CENTRE FIT-OUT

C1 The time required to fit out the data centre is 4 months. The time required to populate the DR centre with servers, and complete a full schedule of testing (including a full fail-over from FHQ to the DR centre, and back) is estimated at 2 months, bringing the total project elapsed time to 6 months. Note that preparatory IT work will be undertaken while the data centre fit-out is under way, to ensure the server installation and final testing is completed in the shortest possible time. This will involve configuring and testing the servers at FHQ prior to shipping them to Birmingham for installation. In addition the secure, high bandwidth, dual redundant data links between FHQ and Birmingham are now in place.