# TAMPing the Streets of Stockport
# Collecting Street Furniture

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## Introduction

The collection of information on highway assets in an authority area presents a formidable task in both time and cost. In terms of value and importance, the highway carriageway has undoubtedly the most significance, but the remaining "street furniture" also has a major impact on maintenance budgets and thus has a need to be considered in any asset plan. This paper describes the successful and cost effective approach taken at Stockport Metropolitan Borough Council (SMBC) to identify their highway and street furniture assets to populate inventories in support of the development of their Transport Asset Management Plan. Following a tender exercise, SMBC awarded a contract to Contract Data Research Ltd (CDR Group) to carry out surveys of carefully selected areas with the aim of gathering representative data.

## Background

The concept of highway asset management is becoming increasingly important for those responsible for attaining best value for managing highway networks. Asset management is not a new concept and most highway authorities are practising elements of asset management already. However, the service wide application of asset management is a relatively new concept.

Some key elements of asset management that need to be defined for each asset are:

- specification and location
- performance, condition and criticality
- planned maintenance

Information on these elements is required to develop and refine financial and risk models, as well as contributing to the asset valuation process.

More recently, with geo-referenced data being available within GIS systems, the concept of associative spatial maintenance has become a reality. This concept aims to identify, for any location where an asset requires maintenance, any adjacent assets in close proximity that do not necessarily require immediate attention, but where the maintenance can be simultaneously carried out within a budget efficient time frame.

The County Surveyors Society (CSS), together with the Local Authority Technical Advisors Group (TAG) have produced the document 'Highways Assets Management Framework' to facilitate the meaningful exchange of knowledge and experience on the subject.

Stockport MBC is one of the ten constituent Councils in Greater Manchester with a transportation planning authority, and together with Greater Manchester Passenger Transport Authority (GMPTA), they all subscribe to the Greater Manchester Local Transport Plan (GMLTP) – http://www.gmltp.co.uk. The first of these plans, LTP1, covered the period from 2001 – 2006, the second LTP2 is for the continuing 5 year period 2006 – 2011. These documents set out the five year programme for investment and planning in local transport in order to deliver their long term strategy for Greater Manchester.

SMBC spans from the borders of the Peak District National Park to cosmopolitan Manchester and covers an area of 126sqkm with a population in excess of 290,000. The borough contains 988km of road, comprising 12km motorway, 84km of 'A' road, 38km of 'B' road, 43km of other classification and 823km of unclassified road.


**(Fig.1) Greater Manchester relative to UK**


**(Fig. 2) Greater Manchester Authorities**

**(Fig. 3) Representative Survey areas in SMBC © OS Crown Copyright 2007. All rights reserved. Licence number LA100019571**

## Survey Specification

The option of carrying out a detailed survey of the Authority's entire highway network was rejected not only on grounds of cost, but more importantly because of the need to quickly generate data to assist in the formulation of the TAMP. Instead, SMBC adopted the principle of requisitioning detailed surveys of carefully selected representative sample areas and then

extrapolating the results to the Authority's area in total. 45 sample areas were chosen that provided examples not only of different road classifications, but also of different epochs of housing developments, and different land uses (industrial / commercial / residential). The areas included everything from fast dual carriageways and congested 'A' roads, to quiet modern suburban streets, older terraced housing, pedestrianised shopping precincts and local and district centres with higher quality 'aesthetic' street furniture.

SMBC identified eleven main categories of highway asset that needed to be recorded:

- Highways
- Footways
- Kerbs
- Drains
- Barriers
- Traffic Management items
- Signs
- Road Markings
- Car Parks
- Vegetation
- Other Street Furniture

The survey did not include illuminated street furniture as SMBC already maintain a detailed inventory of highway lighting and lit signs.

Each of these main categories was further sub-divided into individual categories of asset within the main category. For example, Other Street Furniture included benches and seats, litter bins, fixed and non-fixed planters, 4 types of bollard, cycle racks, and raised bus boarders. In total 86 different categories of asset were to be recorded.

The precise location of the highway is already defined in the Ordnance Survey's large-scale digital map data OS MasterMap™. Each highway, footway, footpath and verge is represented by one or more polygon areas, with each area having a unique Topographical Identifier (TOID). Kerbs are represented by one or more polylines, each with a TOID. Although some speed restriction bumps are depicted in the OS MasterMap™ data, these are by no means complete, and all the remaining street furniture has to be located and identified relative to the highway network.

SMBC's specification called for the survey data to be presented in the format of MapInfo Professional tables (MapInfo being the GIS of choice of both SMBC and CDR Group). The specification also called for each asset to be accurately positioned and to be attributed with text details recording items such as asset type and condition. Furthermore Highways, Footways, Kerbs and Vegetation were to be attributed with the relevant underlying OS MasterMap™ TOID.

## Methodology

In order to design the most appropriate survey methodology, CDR first videoed a sample of the survey areas using a camera mounted on a vehicle driven at normal road speeds. This video was then analysed in detail to make an initial assessment of the complexity of the survey with respect to number of assets to be collected; visibility; accessibility etc.

A number of methods of conducting the survey were considered. These included:

- Analysis of georeferenced aerial photography data
- Analysis of spatially referenced images collected by vehicle mounted video cameras
- Analysis of spatially referenced data collected by vehicle mounted 3d laser
- Collection of data by surveyors working on foot

It was imperative that the method chosen yield accurate results, as these values would then be extrapolated for the whole region. Any errors in the sample data would thus be magnified by the extrapolation.

Aerial photography was discounted because too many areas are obscured by shadows, parked cars, overhangs, vegetation etc to obtain a complete asset inventory, the imagery is not necessarily up-to-date, and individual categories cannot be distinguished (e.g. differentiating between a regulatory sign and a warning sign). Both of the vehicle-mounted techniques would involve a two-stage process: driving the survey and then analysing the captured data back in the office. This adds cost to the project. Again data is often obscured by parked vehicles (e.g. drainage gullies) or by moving vehicles on congested highways. Thus there is no guarantee that all of the assets are "visible". Also certain categories of asset cannot be distinguished (e.g. cast-iron bollards and polypropylene bollards of the same design). Furthermore vehicle-based technology is not appropriate for pedestrian precincts.

CDR Group therefore recommended adopting the trusted "foot soldier" approach carried out by experienced surveyors using modern mobile computing technology. This recommendation was endorsed by SMBC. When surveying in an urban environment CDR does not normally utilise a GPS feed as the position obtained are not sufficiently accurate. Instead CDR's surveyors position the assets being surveyed by reference to the detailed OS MasterMap™ data.

CDR Group designed an appropriate target MapInfo table incorporating a total of 46 data fields used to record details of the 86 categories of data to be surveyed.

**Equipment**

CDR Group already had considerable experience of using hand held computers in performing a variety of site survey work including manholes, streetlighting, bus stops etc. The disadvantages of "tablet" like PC systems include weight, short battery life, field robustness and cost issues. CDR find that the current range of Personal Digital Assistants (PDA) offers a far better solution. PDAs are light, the battery life is good, they are robust and relatively cheap and offer excellent storage capabilities. The disadvantage of PDAs are that their screen size is fairly small (3.5 sq in) and that they are not fully ruggedised for extreme weather conditions.

CDR decided to retire their ageing stock of Compaq iPAQs, mainly due to the batteries having deteriorated over the course of many hours work, and replace them with a set of ACER N35 PDAs. These offered a lighter (165g) and more compact solution with a better battery life and had the added bonus of an integrated 12 channel GPS system. The units are equipped with Samsung 266MHz processors with 64MB SDRAM and 32MB ROM and an SD card slot. The operating system is Microsoft Windows Mobile for Pocket PC 2003 Premium operating system, onto which CDR loaded the Maps4Site Pro GIS software from By Design.

CDR's use of the Maps4Site Pro software was governed by a number of factors:

- The application occupies only 2MB of storage space
- The application integrates well with the MapInfo Professional software that is the GIS of choice for both SMBC and CDR
- The application integrates with the on-board GPS signal

CDR's experience is that the Maps4Site Pro software affords both rapid and accurate data-entry in the field. Search facilities allow the operator to rapidly find the relevant location. All the normal GIS facilities (pan, zoom, king's move etc) are easily accessed. Text data-entry is via a fully-customisable entry form that CDR configured to incorporate separate sections for each main asset category. Additionally CDR structured the target table used for data-collection so as to maximise the use of Yes/No fields and drop-down picklists. These not only allow rapid data entry, but also eliminate errors caused by mis-spelt data entries. Data is written directly to an SD card as it is being collected thereby providing a high level of data security against failure of the PDA operating system.

The detailed mapping for SMBC's total area was converted from Ordnance Survey's OS MasterMap™ gz files into several MapInfo layers and loaded onto 512MB SD cards along with blank target tables.

The surveyors were deployed in teams of two, and the physical survey was completed in 20 days during January/February 2007. At the end of each day's work, each surveyor returned the data they had collected to the office on a SD card so as to provide a secure data backup as well as to allow continual office processing. For asset collection the GPS was not used as it was not accurate enough and objects were placed by eye against the detailed OS MasterMap™ data.

**Equipment Performance**

Very few problems with the equipment were encountered. Thin film screen protectors were routinely used as a precaution against screen damage from the stylus. Even though each surveyor was equipped with back-up batteries, each PDA held sufficient charge for a day's work and they were adequately charged from a car's cigarette lighter socket whilst travelling to and from site (1 hour max).
Apart from one mains charger socket cracking due to rough handling, one stylus lost down the back of a car seat and occasional soft reboots of the PDA operating system being required, there were no significant problems.

**Data Collected**

The total numbers of assets surveyed in each of the main categories were as follows:

| | |
|---|---|
| • Highways | 1,984 |
| • Footways | 1,520 |
| • Kerbs | 5,456 |
| • Drains | 5,659 |
| • Barriers | 426 |
| • Traffic Management items | 1,837 |
| • Signs | 2,331 |
| • Road Markings | 2,898 |
| • Car Parks | 799 |
| • Vegetation | 317 |
| • Other Street Furniture | 2,917 |
| • Total assets | 26,144 |

**Post-processing**

Once all the field data had been captured it was collated into the desktop MapInfo Professional system. The Highways, Footways, Kerbs and Vegetation assets were associated to the relevant TOIDs using simple geographic SQL statements.

**Quality Control**

The design of the target dataset and the data-entry form incorporated a number of quality control features (see above) including the automatic recording of date, time and operator stamps on each record.

As an aid to quality control, each of the designated survey areas was "driven " using a vehicle-mounted Sony DCR SR50E digital camera synchronised to a PDA unit with the GPS tracking enabled. CDR quality control operators were thus able to view the video footage at any particular location and compare what was shown with the data recorded by the surveyor. All of the survey data was subjected to random "spot checks" in this way. In addition, incomplete or ambiguous data was cross-checked through an actual visit to site.

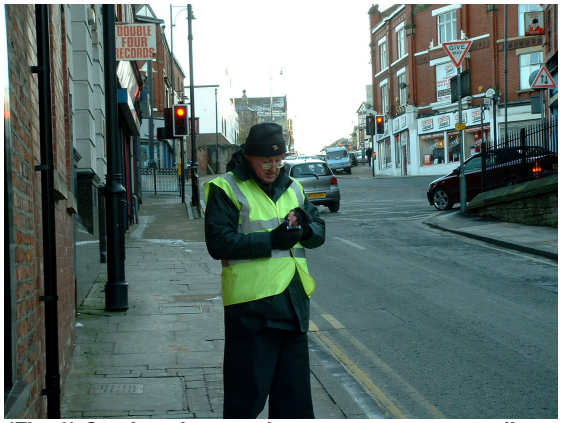
The final data was then made available to SMBC to populate their asset register.

## Conclusion

By adopting simple modest proven technologies, CDR were able to provide SMBC with a timely economic solution to aid them in developing their TAMP.


**(Fig. 4) Acer N35 in action in cold weather**

**(Fig. 5) Typical recordings: safety rail; road surface change; road markings; pavement surface change**




**(Fig. 6) One location may have many asset recordings**


**(Fig. 7) Pedestrianised street – numerous bollards**

## Glossary

SMBC – Stockport Metropolitan Borough Council
CSS – County Surveyors Society
CDR – Contract Data Research Ltd
Maps4Site – PDA GIS & data collection software
PDA – Personal Digital Assistant
MapInfo – Desktop GIS software
OS MasterMap™ – Digital large-scale mapping available from Ordnance Survey
OS – Ordnance Survey
GMPTA – Greater Manchester Passenger Transport Authority
GMLPT – Greater Manchester Local Transport Plan
LTP – Local Transport Plan
TAG - Local Authority Technical Advisors Group
TAMP – Transport Asset Management Plan

## References

CDR Group – http://www.cdrgroup.co.uk
Stockport MBC– http://www.stockport.gov.uk
Map4Site – http://www.maps4site.co.uk
Acer – http://www.acer.co.uk
Highways Asset Management Framework - http://www.ukroadsliaisongroup.org/pdfs/060202 - Highways Asset Management Framework.pdf & http://www.roadcodes.org