Vegetation Management near Power Lines
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Simon Gee
Associate Director
AECOM
simon.gee@aecom.com
Introduction

Brockwells Forestry are contracted to UK Power Networks to keep over 10,000km of power lines in South East England clear of vegetation to avoid power network outages and minimise public risk.
Brockwells Forestry

Privately owned company operating for 20+ years:

- 14 Office Staff
  - Planning
  - Area supervisors
  - Training and safety
  - Operational support
  - Finance and admin
- 47 Cutting teams
  - 2-4 members
  - Sub contractors
- Specialist Equipment
  - 40 MEWPs
  - 12 mulching tractors
UKPN Southern Network Area

South East England
~8,500 sq. kilometres
UKPN Network Scale

33kV 1,125 km in 10,200 spans
HV 5,750 km in 61,000 spans
LV 5,500 km in 125,000 spans

2.1 Million Customers
(5.5 million popn.)

ESQC requirements
(Safety, Quality, Continuity)
Overall Requirements

At each stage of Brockwells workflow, data was being collected in a variety of systems and formats.

UKPN require each item of work to be submitted via their Ellipse work management system.

Brockwells saw an opportunity to evolve their own work planning and delivery by:

- Capturing data at source (where practicable)
- Reducing production and multiple handling of maps
- Building a repository of data for future planning
- Automating data processing
- Reducing manual reporting
- Improving turn around times for reporting
## Work Flow

<table>
<thead>
<tr>
<th>Who</th>
<th>How</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey</td>
<td>ArcGIS -&gt; Hard copy -&gt; ArcPad</td>
</tr>
<tr>
<td>3 No. Surveyors</td>
<td></td>
</tr>
<tr>
<td>Consent</td>
<td>ArcReader</td>
</tr>
<tr>
<td>47 No. Cutting Teams</td>
<td>UKPN Consent Form</td>
</tr>
<tr>
<td>Cutting</td>
<td>Template Spreadsheet</td>
</tr>
<tr>
<td>47 No. Cutting Teams</td>
<td></td>
</tr>
<tr>
<td>Auditing</td>
<td>ArcPad</td>
</tr>
<tr>
<td>2 No. Auditors</td>
<td></td>
</tr>
<tr>
<td>Reporting</td>
<td>ArcReader</td>
</tr>
<tr>
<td>2 Team Managers</td>
<td>ArcGIS / Excel / Access</td>
</tr>
<tr>
<td>1 Data Administrator</td>
<td></td>
</tr>
</tbody>
</table>
Survey

Consent

Cutting

Auditing

Reporting

Network maps -
- Produced using Map Book code/Data Driven Pages
- Show environmentally sensitive areas
  - SSSI (areas of Special Scientific Interest)
  - Tree Preservation Orders
  - Ancient Monuments

- PDF archive
- Hard copy
- ArcPad in field or office

Survey
Written consent from the land owner is required for work on private land,

- Title deed recorded by Land Registry
- Title polygons with owners data procured
- Processed into master Geodatabase
- Automatic update to field devices
- ArcPublisher -> ArcReader
- Package issued on DVD to supervisors
- Work Pack issued to Teams contains
  - Map showing work locations
  - Land Ownership report
Cutting

Survey
Consent
Cutting
Auditing
Reporting

Survey data used to create workbook for feeder:

- E-mailed to team leader
  - Completes data for consent
  - Records work done and issues
  - E-mails to office daily
- Rule copies to server and archive
- Processed into master file
- GP model generates SHP for auditors
Auditing
Auditing

Auditor docks Juno and new survey, consent and cutting data uploaded automatically; audit data copied back to server

Create audit record for each span; copies data from survey and consent layers
Incoming data from field devices, team workbooks and office data capture processed nightly to enable reporting:

- **Daily**
  - Work completed
  - Issues – refusals, delayed work

- **Weekly**
  - Feeder / Route status
  - Work in hand
  - Team performance

- **Ellipse data upload**
  - Work orders
  - Condition points
Output Creation

Survey Data
Consent Data
Cutting Data
Audit Data

Updated Daily

Data Consolidation and Cleansing

Internal Reports
- Progress
- Issues
- Volumes

Run Bi-Weekly

Ellipse Data Creation

Work Orders + Condition Points For Ellipse

ArcPad Application

The mobile application has evolved over time, and on different devices. Currently uses ArcPad 7.1 on Trimble Juno.

- Multi purpose
  - 11kV, 33kV
  - Survey, Audit
- Usability
  - Screen size
  - Performance
- Data transfer
- Updates
- Data management
Data Flow between Field and Office Processes

In from Field

Surveyor 1
Surveyor 2
Permissioner 1
Permissioner 2
Auditor 1
Auditor 2

Juno

Folder

Surveys Master File
Merge
Consents Master File

Server

Audits Master File

Out to Field

Permissioner 1
Permissioner 2
Auditor 1
Auditor 2

Back Office Processes

- Fit with existing IT platform
  - Excel, Access, Outlook, Terminal Server
- Automated as far as possible
  - Scheduled tasks for file transfer and processing
    - ActiveSync / MobSync on Juno docking; no user interaction
- Python scripts
- Separate script per process
- Produce log files
- Remote access via Terminal Server
Automated Geo-Processing

Python Scripts run nightly as scheduled task

E-mail to UKPN for upload to Ellipse

Access Database updated by macro
Learning Points

- One size doesn’t fit all
- Keep it simple
- Appropriate levels of technology
- Flexibility for rapid change and deployment
- Modular approach eases trouble shooting
- Produce log files (and archive)
- User education
In Conclusion

To meet the requirements of both Brockwells Forestry and their client, UK Power Networks, a series of bespoke integrated applications and processes have been built founded on ESRI technology:

- ArcGIS + GP models for data preparation, analysis, work planning and map production
- ArcPublisher/ArcReader for distribution of network and land ownership data
- ArcPad for mobile and office based data capture
- Python GeoProcessing Scripts for automated processing of data
In Conclusion

Brockwells Forestry is now able to:

- Produce ‘work done’ reports that are no more than 3 days later than the date of vegetation clearance, compared to one month with the previous system
- Carry out all data auditing electronically
- View the clearance programme graphically for management reporting, essential when dealing with an operational area of 8,500 sq. km
- Meet the client’s data requirements through automated data processing including data validation
Thank you for listening

Any Questions?

simon.gee@aecom.com