Value Engineering in Public Sector Traffic Signals: A Balanced Asset Management Philosophy

Executive Summary

This white paper outlines a strategic framework for value engineering in public sector traffic signal infrastructure. It emphasises performance, longevity, and community trust while balancing cost and safety. The philosophy promotes prudent budgeting, fit-for-purpose assessments, and initiative-taking innovation to optimise asset management.

Core Principles of Value Engineering

- Value Optimisation: Focus on performance and longevity over novelty. Newer is not always better—better is better.
- Prudent Budgeting & Fiscal Discipline: Spend wisely, not reactively. Avoid the trap of "budget burn" for the sake of annual cycles.
- Fit-for-Purpose Assessment: Retain what works. Replacement only when function or safety could be compromised.
- Asset Life Cycle & Obsolescence Management: Understand true obsolescence—when the support and parts are no longer viable—not just when something is "old."
- Spare Parts Management: Treat spares as strategic assets. Reuse, refurbish, and retain to extend system life.
- Initiative-taking Efficiency: Embrace innovation when it clearly improves performance, safety, or cost-efficiency—like the LED transition.

Strategic Opportunities for Broader Impact

- Standardisation Advocacy: Push for industry-wide standards that allow the use of more generic components (e.g., standard lamp monitoring across manufacturer's signals, cable terminations which can be enclosed in standardised enclosures, replacing just the terminals when needed, and standard cabinets).
- Lifecycle Cost Modelling: Develop models that show the long-term savings of retaining vs. replacing, to support policy justification with hard data.
- Policy Feedback Loops: Work with policy teams to evolve procurement rules that allow for engineering-led decisions.
- Knowledge Sharing: Formalise the philosophy into a white paper or internal guidance document for other engineers and procurement officers.

Case Study – Replacing a far side Pelican crossing with HI-Lamps to a near side Puffin crossing with ELV and low power LED-arrays.

The HI-lamps have served faithfully, but the energy inefficiency, maintenance burden, and rising costs made LED arrays a clear upgrade. This transition exemplifies value engineering—not chasing the new but embracing the better.

Strategic Infrastructure Replacement

1. Spend to Save Philosophy

• Recognise that upfront costs needed (e.g., LED array replacements) may include embedded savings.

• These investments should yield long-term benefits such as reduced energy consumption, fewer site visits, and improved safety.

2. Budget-Conscious Value Delivery

• Every upgrade within a replacement must be justified by short-term efficiencies and long-term outcomes.

3. Integrated Upgrades

• Integrate infrastructure improvements, LED arrays on traffic signals as well as the puffin units when replacing ageing equipment like Pelican crossings.

4. Appropriate Crossing Type Selection

• Replacement should reflect current and future use. Avoid over-specifying unless justified.

5. Community Engagement & Risk Perception

• Engage the community early to explain rationale, explore support, and mitigate resistance.

Crossing Upgrade Considerations: Equipment Needs & Cost Implications

1. On-Crossing Detection

• Purpose: Extends clearance time for vulnerable and slower pedestrians or high footfall.

• Cost Impact: Additional sensors and configuration requirements.

• When to Use: Recommended for wide crossings or areas with vulnerable users.

2. Kerbside Detection

• Purpose: Cancels pedestrian demand if the person crosses during a gap in traffic.

• Cost & Complexity: Often the most expensive and require a stable environment.

• Risk: Potential for erroneous cancellations affecting safety.

Strategic Guidance

- Assess Site-Specific Needs: Tailor solutions to road width, traffic volume, and pedestrian demographics.
- Balance Innovation with Reliability: Ensure newer systems are robust and predictable.
- Community Impact: Consult and communicate clearly when replacing long-standing infrastructure.

Crossing replacement with Upgrade Summary: Basingstoke Rd – Hartland Rd (PR 081)

Project Type: Replacement of 1990s-era staggered dual Pelican crossing due to failures.

Funding TSOG “Thank you Department of Transport”.

And in the words of Oliver, “Can I have some more please Sir”

Crossing Replacement Summary

- Type: From a Dual Pelican → Dual Puffin (DfT-compliant)
  Signals: From a Far-side → Near-side crossing.
  Benefits: Safer use for pedestrians. Better visibility of vehicles approaching and coming to a stop. Lower maintenance risks and costs. Improved accessibility.

Detection Strategy

- Vehicles: Smartmicro Radar (UMRR-11 Type 132), Supports MOVA for speed-based clearance, SCOOT & Bus priority integration
- Pedestrians: AGD: 940 Demand, 941 Puffin Display, 326 On-Crossing Detection
- Kerbside Detection: Excluded (perception of reliability, cost, and environmental concerns)

Signal & Infrastructure Changes

- Reduced signal heads (4 → 3 per approach), Fewer poles (down by 2)
- Lower energy use and maintenance
- Reused existing ducts (avoided ~70m trenching), Controller relocated (avoided ~30m ducting), NAL retention sockets, low-level chamber for resilience and ease of access.

Traffic Timing

- Vehicle max time reduced to 20-seconds, and Pre-time-max set. Encourages pedestrian use and promotes active travel, safe crossing behaviour, with a "please cross here safely" ethos.

Cabling & Equipment

- Core size reduced (1.5mm² → 1.0mm²), Shared returns and power supplies
- No intentional spare cores (earthed for noise reduction)
- Standardised drop cables: 6-core, 8-core, 12-core
- GIS mapping used to avoid utility strikes

Preferred Suppliers

- AGD Ltd: Reliable with longevity of castings, and great service of its detection & near-side units.
- NAL Ltd: Built to last, great products, like its new LOCKlift access lids, Retention sockets & Controller base chambers.
- Simone Surveys Ltd: the most dynamic surveys finding road crossing ducts without visible chambers.
- TRP products Ltd: pole brackets and extension poles to hold almost anything.
- Yunex Traffic Ltd: ST950 controller + Actis LP ELV signals for very low power consumption.

Key Points with Examples

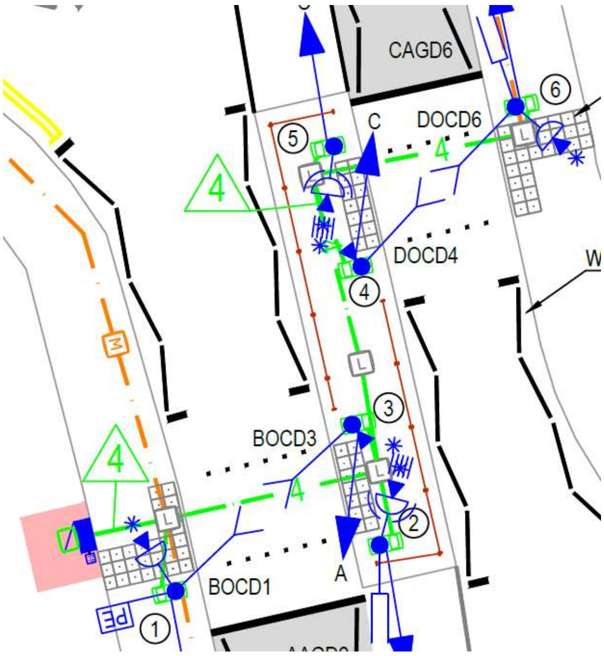
- **Incomplete data leads to overdesign**
  Example: **The original design assumed all ducts were unusable, resulting in 70m of new ducting and 24m of trenching—much of which was unnecessary.**

- **Reusing existing ducts reduces civil works**
  Example: **The revised design identified reusable ducts, cutting new ducting significantly and avoiding costly trenching.**

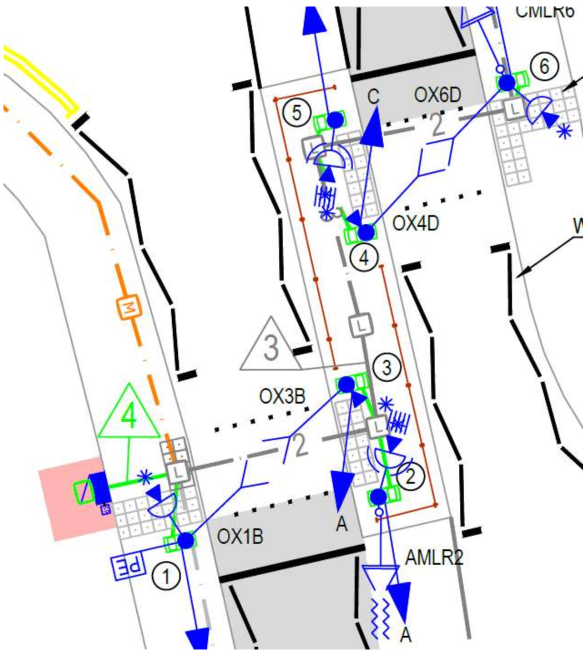
- **Early design reviews prevent waste**
  Example: **A simple review before pricing revealed savings in materials, labour, and time—avoiding over-specification.**

- **Accurate site surveys inform smarter decisions**
  Example: **Ground checks confirmed duct viability, allowing the design to be adapted to real conditions rather than assumptions.**

Before our survey.



Following our survey.



Infrastructure Standard requirements.

- **NAL Retention sockets, NAL twin-walled LIFTlock chambers, and NAL controller bases** for ease of installation, durability and accessibility.
- **GIS mapping** for the avoidance of future utility works damage.
- **Cable routing and ducting practices** refined for maintainability and fault prevention.

1. Ducting & Chambers

- **Professionally installed and maintained duct networks.**
- **Proper chamber sizing and accessibility based on duct depth and cable volume.**
- **Use of jointing collars, duct reduction adapters, and chamber ports.**
- **Sleeving ducts in older networks to avoid trenching (e.g., 70mm duct inside 110mm).**

2. Controller & Base Installation

- **Use of controller bases (e.g., large ST950 case) with orientation flexibility to prevent installation errors.**

3. Cable Rationalisation

- **We have needed to revisit our appendix 12/5**: while our Reading standard cabling would be possible with the amount of ducting already in place at this site, we still wished to look at the overall scheme and other sites which may not have significant ducts across the road. A drive to reduce the overall cost of cabling used, and working with containment improvements, with the goal of less maintenance issues with too many spare cores obstructing equipment.

Cable schematic of six pole Dual crossing with Smartmicro MLRs and On-crossing detection, but without Kerb-side detection and audio, however, there is spare capacity for additional equipment

Site 2

PR184 Basingstoke Rd - Hardland Rd 2025.

Core	Pole 1	Pole 2	Pole 3	Demand Units
	20c x 19m	16c x 21m	16c x 21-m	4 x 3.5 meters=14m
1) Brown	A Red (I/B)	A Red (I/B)	A Red (I/B)	6 Core Dropper
2) Red	Det Supply +	Det Supply +	Det Supply +	11) Wait
3) White	0V Det	0V Det	0V Det	3) 0V Det
4) Blue	A Lamp Return	A Lamp Return	A Lamp Return	12) Lamp Return
5) Black	Det Supply -	Det Supply -	Det Supply -	13) PB SW-1 1st
6) Orange	A Amber (I/B)	A Amber (I/B)	A Amber (I/B)	12) Tactile Drive -
7) Yellow	B Tac Dr +	B Tac Dr +	B Tac Dr +	7) Tactile Drive +
8) Green/Blue	A Green (I/B)	A Green (I/B)	A Green (I/B)	
9) Red/White	B Red/Man	B Red/Man		
10) Slate	B Green/Man	B Green/Man		
11) Red/Blue	B Amber/Wait	B Amber/Wait	B Amber/Wait	
12) Violet	B L-Return	B L-Return	B L-Return	
13) Red/Brown	BPB 1	BPB 2	BPB 3	
14) Red/Yellow	BOCD 1		BOCD 3	
15) Red/Slate		AAGD 2 (MVD)		
16) Red/Black				
17) Red/Violet				
18) Red/Orange	PE L			
19) Red/Green	PE SW			
20) Blue/White	PE N			

Civil works will be done by RBC. Or appointed Contractor. Pole 2 31m of 20 core, Pole1 12m 16 core, Pole termination shall be as shown, and as listed here. And will run Brown to Blue-White and Brown to Red-Black of 16 core. The 6 Core drop cable will

Core	Pole 4	Pole 5	Pole 6	Repeater Units
				Repeater Units
	16c x 31m	16c x 35m	16c x 43m	4 x 3 meters = 12m
1) Brown	C Red (O/B)	C Red (O/B)	C Red (O/B)	6 Core Dropper
2) Red	Det Supply +	Det Supply +	Det Supply +	9) B/D Red/Man
3) White	0V Det	0V Det	0V Det	12) B/D L-Return
4) Blue	C Lamp Return	C Lamp Return	C Lamp Return	10) B/D Grn/Man
5) Black	Det Supply -	Det Supply -	Det Supply -	12) B/D L-Return
6) Orange	C Amber (O/B)	C Amber (O/B)	C Amber (O/B)	
7) Yellow	D Tac Dr +	D Tac Dr +	D Tac Dr +	
8) Green/Blue	C Green (O/B)	C Green (O/B)	C Green (O/B)	MLR Comms
9) Red/White		D Red/Man	D Red/Man	A P2 = 25m
10) Slate		D Green/Man	D Green/Man	C P6 = 47m
11) Red/Blue	D Wait	D Wait	D Wait	Sensor VCC (1)
12) Violet	D L-Return	D L-Return	D L-Return	RS485 TX L (5)
13) Red/Brown	DPB 4	DPB 5	DPB 6	Sensor GND (2)
14) Red/Yellow	DOCD 4		DOCD 6	RS485 RX L (7)
15) Red/Slate			CAGD 6	RS485 TX H (4)
16) Red/Black				RS485 RX H (6)
17) Red/Violet				
18) Red/Orange				
19) Red/Green				
20) Blue/White				

Terminal numbers will start from the top left terminal on the ELV side of the plate. Vehicle Red and Amber with share the Green as well all lamp drive returns where the load on the core is less than 10 amps, Lamp return.

CONDENSED CABLING DESIGN STRATEGY

Core Principles

- Default: 1.0 mm² CSA unless manufacturer specifies higher load requirements—then revert to 1.5 mm².
- Function Consolidation:
  - One lamp return per phase
  - One 0 V core
  - One power supply pair for all detection units
  - 12-core for combined units with audio

Drop Cable Standards

- 6-core for standard units.
- 8-core non-armoured for combined units
- 8-core for demand units with audio
- 12-core for combined units with audio

Spare Core Policy

- No intentional spare cores

Any leftover cores (due to cable size) should be earthed to

- Improve Earth Loop Impedance (ELI)
- Reduce electrical noise especially important for IP-based detection syste:

Spare Core Policy

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  - Improve Earth Loop Impedance (ELI)
  - Reduce electrical noise especially important for IP-based detection systems

Equipment Strategy

Preferred supplier: AGD Ltd

- Near-side equipment robust aluminium casting
- Long-lasting
- electronic components

"No more will you see me shine so bright," the humble HI-lamp mutters with its last flicker of light.

Lyndon George, Traffic Signals and ITS Engineer, Reading Borough Council.