



TRAFFIC RESPONSIVE
SIGNAL COORDINATION
IN
SACRAMENTO COUNTY

WHO IS “BILL CROWL”?

(aka - William D. Crowl P.E. T.E.)

Associate Transportation Engineer

Sacramento County Department of Transportation (SACDOT)

Assigned to the Sacramento County Traffic Operations Center

BS Applied Science & Technology – Emphasis in Aviation

California Registered Professional Engineer - Electrical

California Registered Professional Traffic Engineer

TRAFFIC RESPONSIVE COORDINATED CORRIDORS (24X7)

Arden – 1 section – 5 signals – 9 patterns

Bradshaw – 1 section – 5 signals – 2 patterns

Calvine – 1 section – 6 signals – 9 patterns

Elk Grove Florin – 1 section – 4 signals – 9 patterns

Fair Oaks – 1 section – 11 signals – 15 patterns

Florin – 1 section – 10 signals – 6 patterns

Fulton – 1 section - 4 signals – 15 patterns

Hazel – 1 section – 7 signals – 5 patterns

Howe – 1 section - 9 signals – 9 patterns

Watt – 4 sections – 33 signals – 25 patterns

SOME DEFINITIONS

- TRAFFIC ACTUATED (Behavior Accommodating) – A single signal operating independently in accordance with the status of local vehicle detection to achieve a *point location* oriented mobility goal.
- TRAFFIC RESPONSIVE (Behavior Accommodating) – A “team” of signals operating together (two axis data responsive signal control) in accordance with wide area vehicle detection to achieve a *corridor* oriented mobility goal.
- TRAFFIC ADAPTIVE (Route Perceptive – Behavior Accommodating) – A “team” of signals operating together (three axis data responsive wide-area signal control) in accordance with wide area vehicle detection to achieve a *grid* oriented mobility goal. (Outside of today’s presentation scope.)

TIME OF DAY OPERATING MODES

- FREE (in the overnight)
- Coordination (Y/N ? – per schedule)
- Variable Cycle Length (per schedule)
- Compromise Offset (per schedule)
- Holiday Exception Days (pre-programmed)

TOD

AM Commute	130 sec C/L
Mid-Day	120 sec C/L
PM Commute	140 sec C/L
Weekend	120 sec C/L

TRAFFIC RESPONSIVE OPERATING MODES

- FREE (whenever feasible)
- Coordination (based upon demand)
- Variable Cycle Length (road data driven)
- Variable Offset (road data driven)

TR

Directional Preference (offset)

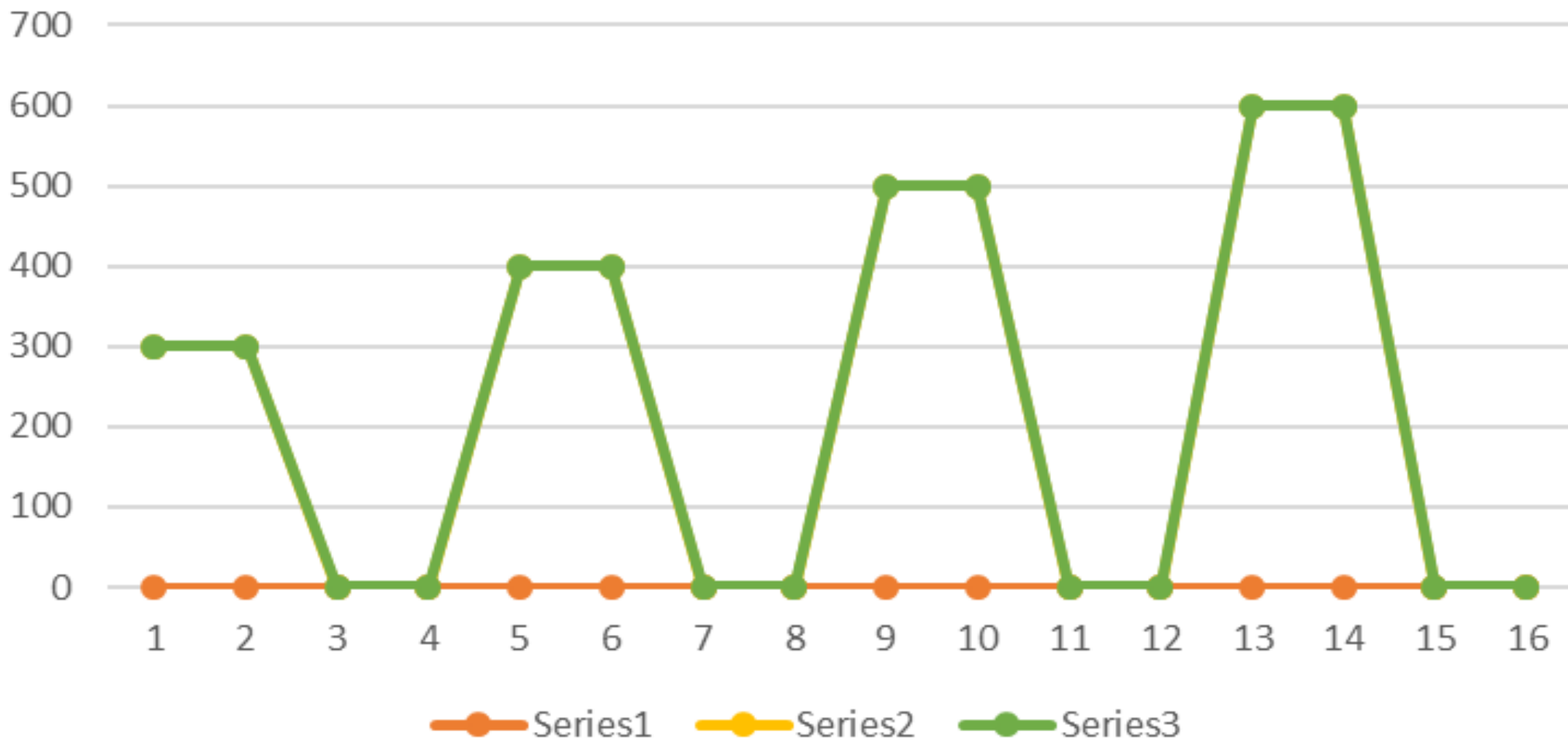
S/B or W/B	Semi S/B or W/B	Bi-Directional	Semi N/B or E/B	N/B or E/B	
151	152	153	154	155	150 sec C/L
141	142	143	144	145	140 sec C/L
131	132	133	134	135	130 sec C/L
121	122	123	124	125	120 sec C/L
111	112	113	114	115	110 sec C/L

CLOSED LOOP CONTROL SYSTEM CONCEPTS

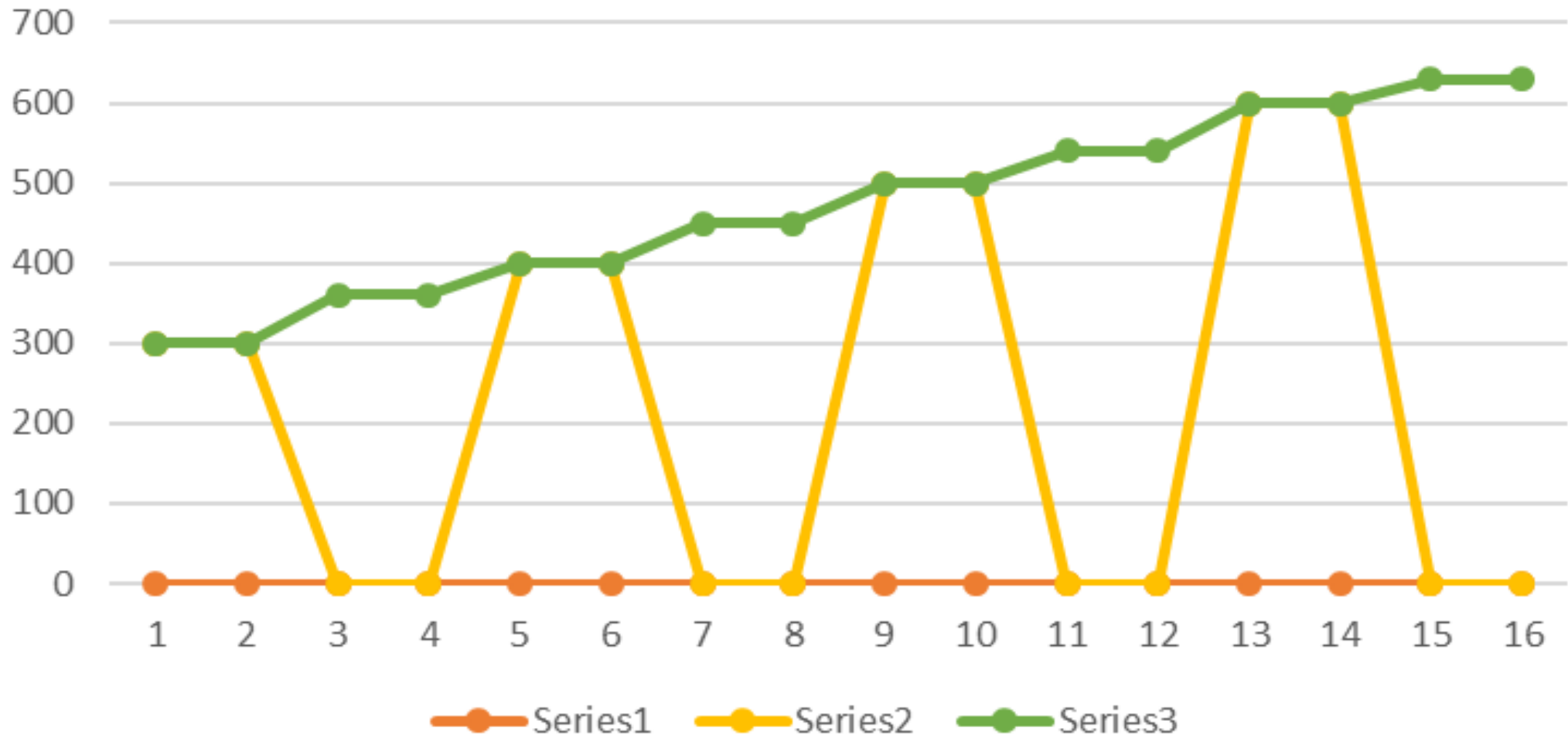
Stability (computer output vs system reaction)

- If “X”, Then “Y” (“Y” had better address “X” or else...)
- Computer input data as it relates to traffic (Volume – Occupancy)
- Mathematical correlation between data and intent (the purpose of “k” in $V+kO$)
- Free Stream vs Signalized - V and O data (why and how of $V+kO$)

Effect of "k" in $V+kO$ ($k=1$)



Effect of "k" in V+kO (k=900)



“TRANSITION” MITIGATION

- Underlying Traffic Pattern Design (stable platform)
- Signal Controller (coordinator) Programming
- Algorithm Definition (constraints)
- Algorithm “Tuning” (stability - S/N ratio)
- Long term monitoring

DISASTER PLANNING

- Controller clocks constantly updated by central system
- Backup TBC/TOD resides on-board at the controller
- Backup TBC replicates (simplified) TR performance
- Long-term plan to maintain controller clocks
- Technician training regarding “clock hygiene”

SUMMARY

TRAFFIC RESPONSIVE SIGNAL COORDINATION IS;

- Attainable
- Sustainable
- Available
- Efficient

OPEN DISCUSSION

- Questions?
- Comments....
- Criticism!
- Complaints!