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FIRST AMENDMENT TO Q-FREE HARDWARE AND SOFTWARE SALES AGREEMENT

THIS FIRST AMENDMENT ("Amendment") amends the Agreement for hardware and software ("Agreement") entered into between the City of Redmond ("City"), and Q-Free America Inc., ("Q-Free"). The City and Q-Free are individually a party and collectively the parties.

RECITALS

A. The parties entered into the Agreement effective August 30, 2024. The Agreement the provision of certain hardware and software sales by Q-Free to the City.

B. As part of the provision of services under the Agreement, Q-Free will provide consulting services to the City and the parties desire to modify the Agreement to incorporate provisions regarding the provision of consulting services.

C. The parties also desire to include an exhibit that sets forth the specifications for the hardware to be installed.

D. The parties agree to amend the Agreement as set forth herein.

NOW, THEREFORE, the parties agree as follows:

1. Section 12 of the Agreement Amended. Section 12 is hereby deleted in its entirety and replaced as follows:

A. Q-Free agrees to indemnify and defend the City, its officers, agents, and employees, from and against any and all claims, or liability, for injuries, sickness or death of persons, including employees of the Consultant, or damage to tangible property, arising out of any willful misconduct or negligent act, error, or omission of Q-Free, its officers, agents, subconsultants or employees, in connection with the Services required by this Agreement, provided, however, that:

i. Q-Free's obligations to indemnify, defend and hold harmless shall not extend to injuries, sickness, death or damage caused by or resulting from the sole willful misconduct or sole negligence of the City, its officers, agents or employees; and

ii. Q-Free's obligations to indemnify and defend for injuries, sickness, death or damage caused by or resulting from the concurrent negligence or willful misconduct of Q-Free and the City, or of Q-Free and a third party other than an officer, agent, subconsultant or employee of Q-Free, shall apply only to the extent of the negligence or willful misconduct of Q-Free.

B. In addition to Q-Free's obligations under Section 12(A) above, Q-Free shall indemnify the City and its directors, officers, employees, agents and other representatives against any damages finally awarded by a court in connection with Claims made or alleged against the City by a third party that the services, software or deliverables infringes a U.S. patent, copyright

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or other intellectual property rights of any third party. The foregoing indemnification obligation does not apply to any claims or losses arising out of or relating to any:

i. access to or use of the software in combination with any hardware, system, software, network or other materials or service not provided or authorized by this Agreement or otherwise in writing by Q-Free; or

ii. modification of the software other than: (a) by or on behalf of Q-Free; or (b) with Q-Free's written approval or in accordance with Q-Free's written specifications.

C. If any of the services, software or deliverables are, or in Q-Free's opinion are likely to be, claimed to infringe, misappropriate or otherwise violate any third-party intellectual property right, or if the City's use of the services, software or deliverables is enjoined or threatened to be enjoined, Q-Free may, at its option and sole cost and expense:

i. obtain the right for City to continue to use the Services, Software and Deliverables materially as contemplated by this agreement;

ii. modify or replace the services, software and deliverables, in whole or in part, to seek to make the services, software and deliverables (as so modified or replaced) non-infringing, while providing materially equivalent features and functionality; or

iii. by written notice to the City, terminate this Agreement with respect to all or part of the services, software and deliverables, and require the City to immediately cease any use of the services, software and deliverables or any specified part or feature thereof, provided that if such termination occurs, Q-Free shall refund any prepaid fees to City and provide transition services free of charge.

iv. The foregoing sections C(i)-(iii) state the entire liability and obligations of Q-Free and the exclusive remedy of the City with respect to infringement Claims described in section B.

2. New Sections Added. The following are added as new sections to the Agreement:

Section 21. Retention of Consultant – Scope of Work. The City hereby retains Q-Free to provide professional services as defined in this agreement and as necessary to accomplish the schedule and scope of work attached hereto as **Exhibit C** and incorporated herein by this reference as if set forth in full. Q-Free shall furnish all services, labor and related equipment necessary to conduct and complete the work, except as specifically noted otherwise in this agreement. Q-Free shall not begin any work under the terms of this agreement until authorized in writing by the City. A failure to complete the work according to **Exhibit C**, except where such failure is due to circumstances beyond the control of Q-Free, shall be deemed a breach of this agreement. The established completion time shall not be extended because of any delays attributable to Q-Free, but shall be extended by the City, in the event of a delay attributable to the City, or because of unavoidable delays

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caused by circumstances beyond the control of Q-Free. All such extensions shall be in writing and shall be executed by both parties.

Section 22. Changes in Work. Q-Free shall make such changes and revisions in the complete work provided by this Agreement as may be necessary to correct errors made by Q-Free and appearing therein when required to do so by the City. "Error" means failure of work to conform to express contract requirements. Q-Free shall make such corrective changes and revisions without additional compensation from the City. Should the City find it desirable for its own purposes to have previously satisfactorily completed work or parts thereof changed or revised, Q-Free shall make such revisions as directed by the City. This work shall be considered as extra work and will be paid for as provided in Section 23.

Section 23. Extra Work.

A. The City may, at any time, by written order, make changes within the general scope of the agreement in the services to be performed. If any such change causes an increase or decrease in the estimated cost of, or the time required for, performance of any part of the work or services under this agreement, whether or not changed by the order, or otherwise affects any other terms or conditions of the agreement, the City shall make an equitable adjustment in the (1) maximum amount payable; (2) delivery or completion schedule or both; and (3) other affected terms, and shall modify the agreement accordingly.

B. Q-Free must submit any "proposal for adjustment" under this clause within 30 days from the date of receipt of the written order to make changes. However, if the City decides that the facts justify it, the City may receive and act upon a proposal submitted at any time before final payment of the agreement.

C. Notwithstanding any other provision in this section, the maximum amount payable for this agreement shall not be increased or considered to be increased except by specific written amendment of this agreement.

Section 24. Ownership of Work Product. Any and all documents, drawings, reports, and other work product produced by Q-Free under this agreement shall become the property of the City upon payment of Q-Free's fees and charges therefore, unless such items are derivative works of intellectual property developed at Q-Free's expense, in which case ownership of such work products shall remain with Q-Free and the City will receive a license in such work products that is commensurate with the City's license in the intellectual property from which the work product is derived. The City shall have the complete right to use and re-use such work product in any manner deemed appropriate by the City, provided, that use on any project other than that for which the work product is prepared shall be at the City's risk unless such use is agreed to by Q-Free.

Section 25. Independent Consultant. Q-Free is an independent consultant for the performance of services under this agreement. The City shall not be liable for, nor obligated to pay to Q-Free, or any employee of Q-Free, sick leave, vacation pay, overtime or any other benefit applicable to employees of the City, nor to pay or deduct any social security,

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income tax, or other tax from the payments made to Q-Free which may arise as an incident of Q-Free performing services for the City. The City shall not be obligated to pay industrial insurance for the services rendered by Q-Free.

Section 26. Insurance.

Prior to commencing the services outlined in Exhibit C, Q-Free shall procure and maintain at its sole cost and expense at least the following insurance covering its obligations under this agreement.

A. Insurance Coverages:

i. Worker's compensation and employer's liability insurance as required by the State of Washington;

ii. General public liability and property damage insurance in an amount not less than a combined single limit of two million dollars ($2,000,000) for bodily injury, including death, and property damage per occurrence;

iii. Professional Liability/Errors and Omissions Insurance (including Technology Errors and Omissions) of at least $1,000,000 per occurrence and $2,000,000 in the annual aggregate.

B. The amounts listed above are the minimum deemed necessary by the CITY to protect the CITY'S interests in this matter. The CITY has made no recommendation to the CONSULTANT as to the insurance necessary to protect the CONSULTANT'S interests and any decision by the CONSULTANT to carry or not carry insurance amounts in excess of the above is solely that of the CONSULTANT.

C. All insurance shall be obtained from an insurance company authorized to do business in the State of Washington. Excepting the professional liability insurance and the cyber liability insurance, the City will be named on all insurance as an additional insured. Q-Free shall submit a certificate of insurance to the City evidencing the coverages specified above, together with an additional insured endorsement naming the City, within fifteen (15) days of the execution of this agreement. The additional insured endorsement shall provide that to the extent of Q-Free's negligence, Q-Free's insurance shall be primary and non-contributing as to the City, and any other insurance maintained by the City shall be excess and not contributing insurance with respect to Q-Free's insurance. The certificates of insurance shall cover the work specified in or performed under this agreement.

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Section 27. Records. Q-Free shall keep all records related to this agreement for a period of three years following completion of the work for which Q-Free is retained. Q-Free shall permit any authorized representative of the City, and any person authorized by the City for audit purposes, to inspect such records at all reasonable times during regular business hours of Q-Free. Upon request, Q-Free will provide the City with reproducible copies (which may be electronic) of any such records. The copies will be provided without cost if required to substantiate any billing of Q-Free, but Q-Free may charge the City for copies requested for any other purpose.

Section 28. Reserved.

Section 29. Non-Discrimination. Q-Free agrees not to discriminate against any customer, employee or applicant for employment, subconsultant, supplier or materialman, because of race, creed, color, national origin, sex, religion, honorable discharged veteran or military status, familial status, sexual orientation, age, or the presence of any sensory, mental, or physical disability or the use of a trained dog or service animal by a person with a disability, except for a bona fide occupational qualification. Q-Free understands that if it violates this provision, this Agreement may be terminated by the City and that Q-Free may be barred from performing any services for the City now or in the future.

Section 30. Compliance and Governing Law. Q-Free shall at all times comply with all applicable federal, state, and local laws, rules, ordinances, and regulations. This Agreement shall be governed by and construed in accordance with the laws of the State of Washington.

Section 31. Subcontracting or Assignment. Q-Free may not assign or subcontract any portion of the services to be provided under this agreement without the express written consent of the City. Any sub-consultants approved by the City at the outset of this agreement are named on separate Exhibit attached hereto and incorporated herein by this reference as if set forth in full.

Section 32. Non-Waiver. Payment for any part of the work or services by the City shall not constitute a waiver by the City of any remedies of any type it may have against Q-Free for any breach of the agreement by Q-Free, or for failure of Q-Free to perform work required of it under the agreement by the City. Waiver of any right or entitlement under this agreement by the City shall not constitute waiver of any other right or entitlement.

3. New Exhibit Added. A new exhibit E is added regarding system requirements.

4. Other Provisions Not Affected. Except as expressly amended herein, all provisions of the Agreement remain unchanged and in full force and effect.

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5. Counterparts. This Amendment may be executed in counterparts each of which is an original and all of which shall constitute a single agreement.

EXECUTED by the parties on the dates set forth below.

CITY OF REDMOND	Q-Free
Angela Birney, Mayor Date:	Signed by: Whitney Nottage Whitney Nottage Chief Operations Officer Date: 9/20/2024

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Exhibit E: System Requirements

System Req Reference #	System Requirement Statement	Mandatory (M) Desirable (D)	Status # (1, 2, 3, 4)	Requirement Status Explanation
1 Network Characteristics				
1.0-1	The ASCT shall control a minimum 12 traffic signals concurrently that are owned and operated by the City of Redmond. The ASCT may be expanded to an additional 13 traffic signals.	M	1	MAXTIME adaptive has been demonstrated on systems as large as 90+ intersections
1.0-2	The ASCT shall support a variable number of signal groups that is user-defined.	M	1	MAXTIME adaptive can support ASCT control of signals in a variable number of groups. The total number of groups is not limited.
1.0-2.0-1	The boundaries surrounding signal controllers that operate in a coordinated fashion shall be defined by the user.	M	1	MAXTIME adaptive allows users to define the boundaries of the adaptive system.
1.0-2.0-2	The ASCT shall control a minimum of 7 groups of signals and should not be limited to a maximum number of groups.	M	1	See 1.0-2
1.0-2.0-3	The size of a group shall be user-defined.	M	1	MAXTIME adaptive allows users to configure the intersections within a group. This can be static, changed on command, or changed by TOD or traffic conditions.
1.0-2.0-4	Each group shall operate independently.	M	1	MAXTIME adaptive allows users to configure groups to operate independently, or as a single system. This can be static, changed on command, or changed by TOD or traffic conditions.
1.0-2.0-5	The boundaries surrounding signal controllers that operate in a coordinated fashion shall be autonomously altered by the ASCT system according to configured parameters such as traffic and active mode volume fluctuations.	D	1	See 1.0-2.0-3, and 1.0-2.0-4
1.0-2.0-5.0-1	The boundaries surrounding signal controllers that operate in a coordinated fashion shall have the capability to be altered by the system according to a time of day schedule.	D	1	See 1.0-2.0-3, and 1.0-2.0-4
1.0-2.0-5.0-2	The boundaries surrounding signal controllers that operate in a coordinated fashion shall have the capability to be altered by the system according to traffic and active mode conditions.	D	1	See 1.0-2.0-3, and 1.0-2.0-4
1.0-2.0-5.0-3	The boundaries surrounding signal controllers that operate in a coordinated fashion shall have the capability to be altered by the system when commanded by the user.	D	1	See 1.0-2.0-3, and 1.0-2.0-4
2 Type of Operation				
2.1 General				
2.1.1 Mode of Operation				
2.1.1.0-1	The ASCT shall operate non-adaptively during the presence of a defined condition.	M	1	MAXTIME adaptive allows users to configure conditions that will deactivate adaptive operations. These conditions include, but are not limited to; • Critical communication failures • # of communication

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System Req Reference #	System Requirement Statement	Mandatory (M) Desirable (D)	Status # (1, 2, 3, 4)	Requirement Status Explanation
				failures • Detection failures • # of detection failures • Volume thresholds • Occupancy thresholds • Queue failures • Time of Day • User-command
2.1.1.0-2	The ASCT shall operate non-adaptively when adaptive control equipment fails.	M	1	See 2.1.1.0-1
2.1.1.0-2.0-1	The ASCT shall operate non-adaptively when a user-specified detector fails.	M	1	See 2.1.1.0-1
2.1.1.0-2.0-2	The ASCT shall operate non-adaptively when the number of failed detectors connected to a signal controller exceeds a user-defined value.	M	1	See 2.1.1.0-1
2.1.1.0-2.0-3	The ASCT shall operate non-adaptively when the number of failed detectors in a group exceeds a user-defined value.	M	1	See 2.1.1.0-1
2.1.1.0-2.0-4	The ASCT shall operate non-adaptively when a user-defined communications link fails.	M	1	See 2.1.1.0-1
2.1.1.0-3	The ASCT shall operate non-adaptively when a user manually commands the ASCT to cease adaptively controlling a group of signals.	M	1	See 2.1.1.0-1
2.1.1.0-4	The ASCT shall operate non-adaptively when a user manually commands the ASCT to cease adaptive operation.	M	1	See 2.1.1.0-1
2.1.1.0-5	The ASCT shall operate non-adaptively in accordance with a user-defined time-of-day schedule.	D	1	See 2.1.1.0-1
2.1.1.0-6	The ASCT shall alter the adaptive operation to achieve required group objectives in user-specified conditions.	D	1	
2.1.1.0-6.0-1	When current measured multimodal conditions meet user-specified criteria, the ASCT shall alter the state of the signal controllers, minimizing vehicle delay while accommodating active modes along the coordinated route.	M	1	
2.1.1.0-6.0-2	When current measured traffic conditions meet user-specified criteria, the ASCT shall alter the state of signal controllers, preventing queues from exceeding the storage capacity at user-specified locations.	M	1	MAXTIME adaptive supports userconfigurable split equity, allowing for splits to be more aggressively adjusted, thus preventing queues. Additionally, queue detectors can be used in user-defined conditions to alter the adaptive operations in a user-defined manner
2.1.1.0-6.0-3	When current measured multimodal conditions meet user-specified criteria, the ASCT shall alter the state of signal controllers providing equitable distribution of green times and pedestrian crossing times.	M	1	MAXTIME Adaptive's split algorithm is designed to equitably distribute green times to phases based on current traffic conditions. The aggressiveness by which time distributes is user-configurable
2.1.1.0-6.0-4	When current measured traffic conditions meet user-defined criteria, the ASCT shall alter the state of signal controllers providing two-way progression on a coordinated route.	M	1	MAXTIME Adaptive's offset algorithm allows the system to provide

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				twoway progression of a coordinated route
2.1.1.0-7	The ASCT shall provide maximum and minimum phase times, within a user-defined range.	D	1	MAXTIME adaptive allows users to configure minimum and maximum phase times that the split algorithm will honor during split calculations – ensuring that no splits below the minimum or above the maximum are programmed.
2.1.1.0-7.0-1	The ASCT shall provide a user-specified maximum value for each phase at each signal controller.	D	1	See 2.1.1.0-7
2.1.1.0-7.0-1.0-1	The ASCT shall not provide a phase length longer than the maximum value.	D	1	See 2.1.1.0-7
2.1.1.0-7.0-2	The ASCT shall provide a user-specified minimum value for each phase at each signal controller.	D	1	See 2.1.1.0-7
2.1.1.0-7.0-2.0-1	The ASCT shall not provide a phase length shorter than the minimum value.	D	1	See 2.1.1.0-7
2.1.1.0-8	The ASCT shall detect repeated phases that do not serve all waiting vehicles. (These phase failures may be inferred, such as by detecting repeated max-out.)	M	1	MAXTIME adaptive supports conditions based on “split failures” wherein GOcc and ROcc5 can be configured to detect phases that do not serve all waiting vehicles.
2.1.1.0-8.0-1	The ASCT shall alter operations, to minimize repeated phase failures.	M	1	conditions described in 2.1.1.0-8 can be used to increase cycle lengths, or change corridor plans (thus the coordination strategies)
2.1.1.0-9	The ASCT shall determine the order of phases at a user-specified intersection. Conflicting movements shall be prevented from operating concurrently. (The calculation will be based on the optimization function.)	M	1	MAXTIME adaptive allows users to configure allowable sequences. The offset algorithm will choose which sequence to use based on the traffic conditions
2.1.1.0-10	The ASCT shall provide coordination along a route.	M	1	MAXTIME adaptive can provide coordination along a route or multiple routes
2.1.1.0-10.0-1	The ASCT shall coordinate along a user-defined route.	M	1	MAXTIME adaptive allows users to configure and store the coordinated routes. These routes can be static, or changed by user command, TOD, or traffic conditions
2.1.1.0-10.0-2	The ASCT shall determine the coordinated route based on traffic conditions.	M	1	See 2.1.1.0-10.0-1
2.1.1.0-10.0-3	The ASCT shall determine the coordinated route based on a user-defined schedule.	M	1	See 2.1.1.0-10.0-1

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2.1.1.0-10.0-4	The ASCT shall store user-defined coordination routes.	D	1	See 2.1.1.0-10.0-1
2.1.1.0-10.0-4.0-1	The ASCT shall implement a stored coordinated route by operator command.	D	1	See 2.1.1.0-10.0-1
2.1.1.0-10.0-4.0-2	The ASCT shall implement a stored coordinated route based on traffic conditions.	D	1	See 2.1.1.0-10.0-1
2.1.1.0-10.0-4.0-3	The ASCT shall implement a stored coordinated route based on a user-defined schedule.	D	1	See 2.1.1.0-10.0-1
2.1.1.0-11	The ASCT shall not prevent the use of phase timings in the local controller set by City of Redmond policy.	M	1	MAXTIME adaptive writes cycles, splits, and offsets to MAXTIME. MAXTIME continues to run the intersection normally. This includes the use of phase timings set in the controller
2.1.1.0-12	The ASCT shall allow operator to override one individual intersection to manual operation while keeping others under adaptive operation.	M	1	MAXTIME Adaptive allows operator override on individual intersections using commands from Kinetic Signals or in the maxtime interface by manually selecting the running pattern.
2.1.2 Allowable Phases				
2.1.2.0-1	The ASCT shall support protected/permissive left turn phase operation allowing the system and operator to omit when user-specified condition is met.	D	1	MAXTIME supports phase omits by time of day through sequences, phase plans, or split plans or by condition through user logic. Overlaps can be omitted by TOD through pattern parameters or omitted by condition through user logic.
2.1.2.0-2	The ASCT shall support the protected left turn phase to lead or lag the opposing through phase based upon user-specified conditions.	D	1	MAXTIME adaptive will support any sequence operation including leading left turns, lagging left turns, doubleservice left turns, or other complex configurations
2.1.2.0-3	The ASCT shall prevent skipping a user-specified phase when the user-specified phase sequence is operating.	D	1	MAXTIME adaptive will write splits to all phases that are part of the sequence. MAXTIME will not skip any phases that have split times assigned. The sequence that MAXTIME runs is user defined, time of day, or changeable by adaptive based on traffic conditions.

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2.1.2.0-4	The ASCT shall prevent skipping a user-specified phase based on an event such as during a construction closure.	D	1	See 2.1.2.0-3
2.1.2.0-5	The ASCT shall prevent skipping a user-specified phase according to a time of day schedule.	D	1	See 2.1.2.0-3
2.1.2.0-6	The ASCT shall omit a user-specified phase when the cycle length is below a user-specified value.	D	1	MAXTIME's user logic can be utilized to omit phases based on the cycle length
2.1.2.0-7	The ASCT shall omit a user-specified phase based on measured traffic conditions.	D	1	MAXTIME's user logic can be utilized to omit phases based on traffic conditions
2.1.2.0-8	The ASCT shall omit a user-specified phase according to a time of day schedule	D	1	MAXTIME and MAXTIME adaptive can change sequences based on a TOD schedule. Sequences can be configured such that phases are omitted.
2.1.2.0-9	The ASCT shall assign unused time from a preceding phase that terminates early to a user-specified phase as follows: • next phase • next coordinated phase • user-specified phase	D	1	MAXTIME allows users to configure fixed force off (assigning time to the next phase), or floating force off (assigning time to the coordinated phase) on a per pattern basis. Additionally, MAXTIME supports configuring this on a per-phase basis allowing user-specified phases to run fixed force off (receiving extra time) and others to run floating forceoff.
2.1.2.0-10	The ASCT shall assign unused time from a preceding phase that is skipped to a user-specified phase as follows: • previous phase • next phase • next coordinated phase • user-specified phase	D	1	See 2.1.2.0-9. Additionally, time can be assigned to the previous phase based on the configured coordination mode.
2.1.2.0-11	The ASCT shall restrict phase sequences that are user-specified.	M	1	MAXTIME adaptive will only use sequences that are configured to be allowable
2.1.3 Oversaturation				
2.1.3.0-1	The ASCT shall detect the presence of queues at preconfigured locations.	M	1	MAXTIME adaptive supports queue detection as a condition for triggering different operational responses including, but not limited to: • Activating a pre-defined pattern • Disabling adaptive • Triggering a cycle length increase / decrease • Changing corridor plans

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				(operational strategy)
2.1.3.0-2	When queues are detected at user-specified locations, the ASCT shall execute user-specified timing plan/operational mode.	D	1	See 2.1.3.0-1
2.1.3.0-3	When queues are detected at user-specified locations, the ASCT shall execute user-specified adaptive operation strategy.	M	1	See 2.1.3.0-1
2.1.3.0-4	When queues are detected at user-specified locations, the ASCT shall omit a user-specified phase at a user-specified signal controller.	D	1	MAXTIME user logic can be used to trigger an omit based on detected queues
2.1.3.0-5	The ASCT shall meter traffic into user-specified bottlenecks by storing queues at user-specified locations.	D	1	MAXTIME Adaptive allows users to configure “allowed stops” which will modify the offset algorithm to ensure any required stops happen where allowed, preventing bottlenecks where stops are not allowed
2.1.3.0-6	The ASCT shall store queues at user-specified locations.	D	1	See 2.1.3.0-5
2.1.3.0-7	The ASCT shall maintain capacity flow through user-specified bottlenecks.	D	1	MAXTIME Adaptive’s cycle length algorithm chooses cycle lengths that best fit the current traffic patterns. The split algorithm will equitably distribute splits in a way that optimizes split utilization. The offset algorithm optimizes AoGs to minimize stops on the corridor. These three in combination meet this goal
2.1.3.0-8	When queues are detected at user-specified locations, the ASCT shall limit the cycle length of the group to a user-specified value.	D	1	See 2.1.3.0-1. All cycle length triggers include a minimum/maximum cycle length value. Thus, a queue detector condition that triggers cycle length changes will also limit the cycle length to the range configured within that condition.
2.2 Sequence-based Adaptive Coordination				
2.2.0-1	The ASCT shall be capable of sequence-based adaptive coordination where the system adjusts cycle, split, and offset as part of the algorithm decision to optimize signal operations in real-time.	M	1	MAXTIME Adaptive is a sequence-based adaptive system that adjusts Cycle, Splits, Offset and Sequence as part of the algorithm decision
2.2.0-2	The ASCT shall calculate phase lengths for all phases at each signal controller to suit the current coordination strategy.	M	1	MAXTIME adaptive calculates splits for all phases at each signal using green occupancy

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				and red occupancy to provide equitable distribution of time.
2.2.0-3	The ASCT shall calculate offsets to suit the current coordination strategy for the user-specified reference point for each signal controller along a coordinated route within a group.	M	1	MAXTIME adaptive calculates offsets for the coordinated phases for each signal along the corridor, for each coordinated route. The algorithm uses arrivals on green to optimize offsets via a link pivot algorithm
2.2.0-3.0-1	The ASCT shall apply offsets for the user-specified reference point of each signal controller along a coordinated route.	D	1	MAXTIME adaptive writes offsets to MAXTIME which uses the user specified reference point
2.2.0-4	The ASCT shall calculate a cycle length for each cycle based on its optimization objectives (as required	M	1	MAXTIME adaptive uses progression as the primary optimization objective for calculating cycle length. When conditions are triggered, cycle lengths may change based on those conditions. Conditions can be triggered for more equitable distribution of green by programming “split failure conditions” based on a combination of GOcc and ROcc5 of any combination of phases. Conditions can be triggered for queue management by programming queue detection as a trigger
	elsewhere, e.g., progression, queue management, equitable distribution of green).			
2.2.0-4.0-1	The ASCT shall limit cycle lengths to user-specified values.	M	1	MAXTIME adaptive allows users to configure min/max cycle change values which ensures the cycle length will always change by a minimum of x and a maximum of y. This will limit cycle lengths to user-specified values.
2.2.0-4.0-2	The ASCT shall limit cycle lengths to a user-specified range.	M	1	MAXTIME adaptive allows users to configure min/max cycle lengths. These can be configured globally, and on a per-condition basis.
2.2.0-4.0-3	The ASCT shall calculate optimum cycle length according to the user-specified coordination strategy.	M	1	See 2.2.0-4

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2.2.0-4.0-4	The ASCT shall limit changes in cycle length to not exceed a user-specified value.	M	1	See 2.2.0-4.0-1 and 2.2.0-4.0-2
2.2.0-4.0-4.0-1.0-2	The increased limit shall be user-defined.	D	1	See 2.2.0-4.0-1
2.2.0-4.0-5	The ASCT shall adjust offsets to minimize the chance of stopping vehicles approaching a signal that have been served by a user-specified phase at an upstream signal.	M	1	MAXTIME adaptive utilizes the Link Pivot algorithm to maximize throughput on the coordinated routes based on real-time AoG data. This can be balanced for two-way progression, or to favor a specific direction. When suitable data is not available for link pivot (or when configured to do so permanently), MAXTIME adaptive will optimize offsets using a "geometric mode", wherein real-time data is used to calculate travel time between intersections and identify the optimal offsets. Additionally, MAXTIME adaptive is compatible with the use of MAXTIME local TSP features
2.4 Single Intersection Adaptive Operation				
2.4.0-1	The ASCT shall be capable of non-coordinated adaptive operation at a single intersection.	D	1	MAXTIME adaptive supports single intersection operation and can run on a Cycle and splits or splits only optimization mode.
2.4.0-2	The ASCT shall calculate a cycle length of a single intersection, based on current measured traffic conditions. (The calculation is based on the optimization objectives.)	D	1	MAXTIME adaptive allows for cycle length optimization based on measured traffic conditions wherein user-specified conditions will trigger a cycle length increase or decrease
2.4.0-3	The ASCT shall calculate optimum phase lengths, based on current measured traffic conditions. (The calculation is based on the optimization objectives.)	D	1	MAXTIME adaptive will calculate splits for a single intersection based on the green and red occupancy of each phase providing the most equitable distribution of time.
2.4.0-3.0-1	The ASCT shall limit the difference between the length of a given phase and the length of the same phase during its next service to a user-specified value.	D	1	MAXTIME adaptive has a "minimum change" and "maximum change" value for splits that is user configurable. This will limit the difference of time splits get

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				changed between each adjustment.
2.4.0-3.0-2	When queues are detected at user-specified locations, the ASCT shall execute user-specified timing plan/operational mode.	D	1	See 2.1.3.0-1
2.4.0-4	The ASCT shall calculate phase order, based on current measured traffic conditions. (The calculation is based on the optimization objectives.)	D	1	See 2.1.1.0-9
2.6 Responsiveness				
2.6.0-1	The ASCT shall limit the change in consecutive cycle lengths to be less than a user-specified value.	M	1	MAXTIME adaptive allows users to configure a minimum number of cycles to make cycle length changes for all cycle length conditions, as well as a cycle length lockout timer
2.6.0-2	The ASCT shall limit the change in phase times between consecutive cycles to be less than a user-specified value. (This does not apply to early gap-out or actuated phase skipping.)	M	1	MAXTIME adaptive has a “minimum change” and “maximum change” value for splits that is user configurable.
2.6.0-3	The ASCT shall limit the changes in the direction of primary coordination to a user-specified frequency.	M	1	The primary direction of coordination is determined by the active corridor plans. These are changed by TOD thus the TOD schedule limits the number of changes. Additionally, corridor plans can be changed by condition, wherein timer limits are available to limit the frequency of changes.
2.6.0-4	When a large change in traffic demand is detected, the ASCT shall respond more quickly than normal operation, subject to user-specified limits.	M	1	MAXTIME Adaptive’s condition plans have parameters that determine the frequency and range of changes being made. Separate conditions with more aggressive frequencies and ranges can be used for largescale traffic changes
2.6.0-5	The ASCT shall select cycle length based on a user-defined incremental range.	M	1	See 2.2.0-4.0-1 and 2.2.0-4.0-2
3 External/Internal Interfaces				
3.0-1.0-1	Allow operation of external devices using discrete signal outputs such as blank-out signs.	M	1	MAXTiME adaptive does not take over control of the intersection operations during adaptive operations, MAXTIME IC continues to run the operations of the intersection. This allows

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				for normal operation of external and internal interfaces to operate as normal. Examples of these operations are listed but not limited to; Blank out signs Preemption Transit Signal Priority SDLC communications NTCIP transaction Advanced pedestrian features FYA operations Red Extention
3.0-1.0-2	The ASCT shall receive commands from King County Metro's Transit Priority Request Generator (TPRG) located in the upper compartment of the traffic signal cabinet. The TPRG places low priority TSP calls via traditional signal controller cabinet preemption inputs.	M	1	See 3.0-1.0-1
3.0-1.0-3	The ASCT shall receive NTCIP-based TSP requests from King County Metro's Cloud-based TSP System.	D	1	See 3.0-1.0-1
3.0-1.0-4	The ASCT shall receive location information from King County Metro's CAD/AVL system API.	D	1	See 3.0-1.0-1
3.0-1.0-5	The ASCT shall receive and process NTCIP messages and SDLC inputs from the Multimodal Detection and Analytics system.	M	1	See 3.0-1.0-1
3.0-1.0-6	The ASCT shall be capable of multimodal signal timing strategies actuated by NTCIP messages and SDLC	D	1	See 3.0-1.0-1
	inputs from the Multimodal Detection and Analytics system including, but not limited to:			
3.0-1.0-6.1	Pedestrian Clearance – hold all red when pedestrian has not cleared crosswalk.	D	1	See 3.0-1.0-1
3.0-1.0-6.2	Pedestrian Extension – extend pedestrian crossing time based on pedestrian speeds and volumes.	D	1	See 3.0-1.0-1
3.0-1.0-6.3	Red Light Running – hold all red when red light running occurrence is anticipated based on phase state and vehicle trajectory.	D	1	See 3.0-1.0-1
3.0-1.0-6.4	Dynamic Flashing Yellow Arrow – transition to protected left turn operation only when pedestrian detected.	D	1	See 3.0-1.0-1
3.0-1.0-6.5	Leading Pedestrian Interval – implement leading pedestrian interval when pedestrian detected.	D	1	See 3.0-1.0-1
3.0-1.0-6.6	No Right Turn on Red – support No Right Turn on Red blank-out sign activation based on active, conflicting pedestrian crossing movements.	D	1	See 3.0-1.0-1
4 Crossing Arterials and Boundaries				
4.0-1.0-1	The ASCT shall alter its operation to minimize interruption to the freeway mainline.	D	1	MAXTIME Adaptive's split algorithm will prevent interruption to

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				the freeway. Additionally, queue detection can be used to make other changes to the adaptive operation as-needed to prevent interruption to the freeway.
4.0-1.0-2	The ASCT shall operate a fixed cycle length to match the cycle length of an adjacent system.	D	1	MAXTIME adaptive supports splits and offsets only operation where in the software can mimic a desired pattern / cycle length in a fixed fashion or by TOD.
4.0-1.0-3	The ASCT shall be capable of receiving data from partner agency central and roadside systems such as transit data from King County Metro and signal operations data from WSDOT, City of Bellevue, and City of Kirkland.	D	1	MAXTIME supports receipt of compatible data from any agency that can access the network.
4.0-1.0-4	The ASCT shall support adaptive coordination on crossing routes.	M	1	MAXTIME adaptive supports adaptive coordination on crossing routes.
5 Access and Security				
5.0-1	The ASCT shall be implemented with a security policy that addresses the following selected elements:	M	1	See below
5.0-1.0-1	• Local access to the ASCT.	M	1	MAXTIME and MAXTIME adaptive can be accessed locally by a wired or wireless ethernet connection via the WebUI. The WebUI supports user logins and require a login and password for any access to the software. These can be stored locally and/or centrally for cloud authentication. Logins can be configured to provide varying degrees of user-privileges.
5.0-1.0-2	• Remote access to the ASCT.	M	1	MAXTIME and MAXTIME adaptive can be accessed remotely over the network via the WebUI. The WebUI supports user logins and require a login and password for any access to the software. These can be stored locally and/or centrally for cloud authentication. Logins can be configured to provide varying degrees of user-privileges

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5.0-1.0-3	• System monitoring.	M	1	MAXVIEW provides system monitoring. MAXVIEW supports user logins and require a login and password for any access to the software. Logins can be configured to provide varying degrees of user privileges including view only, monitoring, command and control, and system administrator
5.0-1.0-4	• System manual override.	M	1	Logins are required for a system manual override.
5.0-1.0-7	• User login	M	1	See 5.0-1.0-1, 5.0-1.0-2, and 5.0-1.0-3
5.0-1.0-8	• User password	M	1	See 5.0-1.0-1, 5.0-1.0-2, and 5.0-1.0-3
5.0-1.0-9	• Administration of the system	M	1	See 5.0-1.0-3
5.0-1.0-14	• System parameters	M	1	See 5.0-1.0-3
5.0-1.0-15	• Report generation	M	1	See 5.0-1.0-3
5.0-1.0-16	• Configuration	M	1	See 5.0-1.0-1, 5.0-1.0-2, and 5.0-1.0-3
5.0-1.0-17	• Security alerts	M	1	See 5.0-1.0-3
5.0-1.0-18	• Security logging	M	1	MAXTIME, MAXTIME adaptive, and MAXVIEW log all changes made by users along with the date, username, and what changes were made
5.0-1.0-19	• Security reporting	M	1	Change logs can be viewed in the database menus
5.0-1.0-20	• Database access	M	1	See 5.0-1.0-1, 5.0-1.0-2, and 5.0-1.0-3
5.0-1.0-21	• Signal controller access	M	1	See 5.0-1.0-1, 5.0-1.0-2, and 5.0-1.0-3
5.0-2	The ASCT shall provide monitoring and control access all required features of adaptive operation. This includes enabling/disabling individual detectors, vehicle minimum and maximum recalls, and pedestrian recalls at the following locations:	M	1	Remote access as described in 5.0- 1.0-2 can be obtained from any location with access to the primary network.
5.0-2.0-1	• City of Redmond TMC	M	1	See 5.0-2
5.0-2.0-2	• Maintenance shop	M	1	See 5.0-2
5.0-2.0-3	• Workstations on City of Redmond LAN or WAN for monitoring purposes	M	1	See 5.0-2
5.0-2.0-5	• Local controller cabinets – local controller shall display phase timing, phase calls, and phase status (e.g. minimum green, detector extension, phase omits, operating mode, preemption).	M	1	See 5.0-2
5.0-2.0-6	• Maintenance vehicles	M	1	See 5.0-2
5.0-2.0-7	• Remote locations via laptop/tablet	M	1	See 5.0-2

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5.0-2.0-8	The ASCT system shall allow permanent modifications to the adaptive signal parameters from either the ASCT central software installed on a workstation or laptop or at the local controller. The ASCT system shall consist of a local controller software package, a centralized signal software package, and an adaptive component.	M	1	See 5.0-2
5.0-3	The ASCT shall comply with the City of Redmond's TIS security policies.	M	1	MAXTIME adaptive will be implemented in coordination with the City's IT Department.
5.0-4	The ASCT shall not prevent access to the local signal controller database, monitoring or reporting functions by any installed signal management system.	M	1	MAXTIME adaptive does not prevent access to MAXTIME or any monitoring/reporting functions
5.0-5	The ASCT shall allow permanent modification to the adaptive signal parameters from the ASCT central system and local controller via a workstation or laptop.	M	1	See 5.0-1.0-1
6 Data Log				
6.0-1	The ASCT shall log the following events:	D	1	See below
6.0-1.0-1	Time-stamped vehicle phase calls	D	1	This is part of the hi-resolution logging generated by MAXTIME and stored by Kinetic.
6.0-1.0-2	Time-stamped pedestrian phase calls	D	1	This is part of the hi-resolution logging generated by MAXTIME and stored by Kinetic.
6.0-1.0-3	Time-stamped emergency vehicle preemption calls	D	1	This is part of the hi-resolution logging generated by MAXTIME and stored by Kinetic.
6.0-1.0-4	Time-stamped transit priority calls	D	1	This is part of the hi-resolution logging generated by MAXTIME and stored by Kinetic.
6.0-1.0-5	Time-stamped railroad preemption calls	D	1	This is part of the hi-resolution logging generated by MAXTIME and stored by Kinetic.
6.0-1.0-6	Time-stamped start and end of each phase	D	1	This is part of the hi-resolution logging generated by MAXTIME and stored by Kinetic.
6.0-1.0-7	Time-stamped controller interval changes	D	1	This is part of the hi-resolution logging generated by MAXTIME and stored by Kinetic.
6.0-1.0-8	Time-stamped start and end of each transition to a new timing plan	D	1	This is part of the hi-resolution logging generated by MAXTIME and stored by Kinetic.

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6.0-1.0-9	Time-stamped detection actuation per lane	D	1	This is part of the hi-resolution logging generated by MAXTIME and stored by Kinetic.
6.0-2	The ASCT shall export its systems log in the following formats: • UTDF (Synchro) • MS Excel • Text • CSV • XML • PDF • Open source SQL database	D	2	Kinetic supports exporting logs and timings to UTDF, Excel, CSV, PDF, or SQL. XML and Text are supported through third party conversion tools.
6.0-3	The ASCT shall store the event log for a minimum of 365 days	D	1	Kinetic will store hi resolution logs for any user-defined period of time if the server is sized appropriately.
6.0-4	The ASCT shall store results of all signal timing parameter calculations for a minimum of 365 days.	D	1	Kinetic will store all uploaded/backed-up databases for any user-defined period of time if the server is sized appropriately
6.0-5	The ASCT shall store the following measured data in the form used as input to the adaptive algorithm for a minimum of 365 days: • Volume • Occupancy • Queue length • Phase utilization • Arrivals in green • Green band efficiency • Split times (cycle-by-cycle basis) • Transit signal priority requests	M	1	MAXTIME stores all of this information via the ATSPM reports and hi resolution logs (which is the form in which adaptive uses this data for its algorithms).
6.0-6	The ASCT system shall archive all data automatically after a user-specified period not less than 365 days.	D	1	This is a server-level feature that can be done by configuring the server appropriately to do so.
6.0-7	The ASCT shall provide data storage for a system size minimum of 100 signal controllers with the potential for expansion for up to 200 traffic signal controllers. The data to be stored shall include the following: • Controller state data • Reports • Log data • Security data • ASCT parameters • Detector status data	M	1	Kinetic can store this data if the server is appropriately sized to do so.
6.0-8	The ASCT shall calculate and report relative data quality including: • The extent data is affected by detector faults • Other applicable items	D	1	Kinetic provides detector failure reports that can be used to determine how many detector faults are impacting the system.

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6.0-9	The ASCT shall report comparisons of logged data when requested by the user: • Day-to-day, • Hour-to-hour • Cycle-to-cycle • Hour of day to hour of day • Hour of week to hour of week • Day of week to day week • Day of year to day of year	D	1	Kinetic's ATSPM reporting can achieve this goal
6.0-10	The ASCT shall store data logs in a standard database.	D	1	Kinetic stores all data via a SQL database
6.0-11	The ASCT shall report stored data in a form suitable (i.e. printable documentation) to provide explanations of system behavior to troubleshoot the system.	D	1	Hi resolution data and timing databases can be exported to excel for printing.
6.0-12	The ASCT shall store the following data in user-specified increments for split monitoring on a cycle-by-cycle basis: • Volume • Occupancy • Queue length • Splits	D	1	See 6.0-5. The data increments are configured in MAXVIEW's system settings.
6.0-13	The ASCT shall identify changes made to the system with time stamp and associated user information.	D	1	MAXTIME identifies changes with date and time stamps and any user associated information.
7 Advanced Controller Operation				
7.0-1	When specified by the user, the ASCT shall serve a vehicle phase more than once for each time the coordinated phase is served.	D	1	MAXTIME supports configuration of a double-service phase. Additionally, MAXTIME supports conditional service and conditional reservice parameters
7.0-2	The ASCT shall provide a minimum of 8 phase overlaps.	M	1	MAXTIME supports up to 32 overlaps
7.0-3	The ASCT shall accommodate a minimum of 16 phases at each signal.	M	1	MAXTIME supports up to 40 phases at each signal
7.0-4	The ASCT shall accommodate a minimum of 4 rings at each signal.	M	1	MAXTIME supports up to 16 rings
7.0-5	The ASCT shall accommodate a user-defined number of phases per ring.	M	1	MAXTIME supports a combination of phases in each ring
7.0-6	The ASCT shall accommodate a minimum of 32 detector inputs per signalized intersection.	M	1	MAXTIME supports 128 vehicle detector inputs per intersection
7.0-7	The ASCT shall provide a minimum of 8 different user-defined phase sequences for each signal.	D	1	MAXTIME supports up to 20 different sequences
7.0-7.0-1	Each permissible phase sequence shall be user-assignable to any signal timing plan.	D	1	MAXTIME supports the selection of a sequence in any of the 128 patterns which can be called up by time of day.
7.0-7.0-2	Each permissible phase sequence shall be executable by a time of day schedule.	D	1	See 7.0-7.0-1
7.0-7.0-3	Each permissible phase sequence shall be executable based on measured traffic conditions	D	1	See 2.1.1.0-9
7.0-8	The ASCT shall support phase/overlap output by time-of-day.	D	1	MAXTIME supports the change of phase and overlap operation by

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				time of day
7.0-9	The ASCT shall support a phase/overlap output based on an external input.	D	1	MAXTIME supports NEMA external inputs operations.
7.0-10	The ASCT shall not prevent the phases to be designated as coordinated phases.	D	1	MAXTIME allows any phase to be a coordinated phase
7.0-11	The ASCT shall have the option for a coordinated phase to be released early based on a user-definable point in the phase or cycle.	D	1	MAXTIME supports configuration of “early coord gap-out" wherein the coordinated phase can terminate X seconds early where X is defined by the user if demand is not present
7.0-12	The ASCT shall not prevent the controller from displaying flashing yellow arrow left turn or right turn.	M	1	MAXTIME adaptive will not interfere with any phase or overlap configurations.
7.0-13	The ASCT shall not prevent the local signal controller from performing actuated phase control using specified extension/passage timers as assigned to user-specified vehicle detector input channels in the local controller.	D	1	MAXTIME adaptive writes pattern parameters to MAXTIME and leaves all other controller parameters intact. MAXTIME is the intersection control software and adaptive has no impact on its operation. As such, all phase timers will be honored.
7.0-13.0-1	The ASCT shall operate adaptively using user-specified detector channels.	D	1	Any of MAXTIME’s 128 detector channels can be used in the adaptive system
7.0-14	When adaptive operation is used in conjunction with non-adaptive coordination, the ASCT shall not prevent a controller serving a cycle length different from the cycles used at adjacent intersections.	D	1	MAXTIME adaptive will not interfere with controllers that are not part of the adaptive system. As such, those controllers can run any timers (cycles, splits, etc.) they have
7.0-15	The ASCT shall be capable of accommodating the following custom controller features:	M	1	See below
7.0-15.0-1	Allow dynamic max green time to increase or decrease the max green time dynamically based on max out or gap out termination.	M	1	MAXTIME supports all volume density parameters including dynamic max green.
7.0-15.0-2	Dynamically group and ungroup lanes such as a with split phasing and variable phase sequences (e.g. changing a shared left-through lane with through lane only).	M	1	MAXTIME supports changing sequences by time of day.
7.0-15.0-3	The ASCT shall assign a detector to call and extend a permissive left-turn phase, and then to call and extend the protected left-turn phase after a specified delay.	M	1	MAXTIME supports call, extend, or switch-phase parameters for any detectors including those for left turn phases

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7.0-15.0-4	The ASCT shall modify phases called/extended by a specified detector.	M	1	MAXTIME supports modification of the phase that a detector calls/extends
7.0-15.0-5	The ASCT shall assign two phases to a single detector.	M	1	MAXTIME supports assigning multiple phases per detector
7.0-15.0-6	The ASCT shall allow the user to configure phase sequencing when traditionally concurrent vehicle movements conflict due to intersection geometry.	M	1	MAXTIME supports this via sequence configuration for split phase operation and with no-serve phases for lead/lag left turns when the left turns are nonconcurrent
7.0-15.0-7	The ASCT shall operate adaptively while allowing for flexible detector logic (i.e. transit only phase, right turn overlaps).	M	1	MAXTIME adaptive will operate with flexible detector logic
8 Pedestrians				
8.0-1	When a pedestrian phase is called, the ASCT shall execute pedestrian phases up to user-specified time before the vehicle green of the related vehicle phase.	M	1	MAXTIME supports the advanced walk function to serve the pedestrian phase before the associated vehicle green.
8.0-2	When a pedestrian phase is called, the ASCT shall accommodate pedestrian crossing times during adaptive operations.	M	1	MAXTIME will always accommodate pedestrian times during normal operation and adaptive operation whether the pedestrian call is from a detector, failed detector response, or a recall.
8.0-3	The ASCT shall execute user-specified exclusive pedestrian phases during adaptive operation.	D	1	MAXTIME will accommodate pedestrian crossings larger than a split then recover in transition while running adaptive operations.
8.0-4	The ASCT shall execute pedestrian recall on user-defined phases in accordance with a time of day schedule.	D	1	MAXTIME supports ped-recalls by TOD
8.0-5	The ASCT shall begin a non-coordinated phase later than its normal starting point within the cycle when all of the following conditions exist: • The user enables this feature • Sufficient time in the cycle remains to serve the minimum green times for the phase and the subsequent non-coordinated phases before the beginning of the coordinated phase • The phase is called after its normal start time • The associated pedestrian phase is not called	D	1	MAXTIME has coordination modes that can be used to enable this feature, wherein a late-call will be served if sufficient time in the cycle remains to serve the minimum time.
8.0-6	When specified by the user, the ASCT shall execute pedestrian recall on a pedestrian phase.	D	1	MAXTIME supports configuration of pedestrian recalls.
8.0-7	When the pedestrian phases are on recall, the ASCT shall accommodate pedestrian timing during adaptive operation.	D	1	See 8.0-2
8.0-8	During preemption system shall not truncate don't walk time, but can truncate the walk time.	D	1	MAXTIME allows programing this operation during

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				preemption
8.0-9	The system operator needs to accommodate the following custom pedestrian features: • Walk extension (based on pedestrian volume and actuations) • Pedestrian recycle/re-service • Rest-in-walk • Negative pedestrian overlap • Early start of walk • Late start of walk • FYA served simultaneous with conflicting ped movement, where enabled • FYA served exclusive from conflicting pedestrian protection, where enabled • Pedestrian, minimum, and maximum recalls. • Automatic pedestrian call when vehicular split guaranteed long enough to serve pedestrian movement • Leading pedestrian intervals.	M	1	MAXTIME ic supports all listed pedestrian features. These features will continue to function as normal during adaptive operation without additional programming.
8.0-10	The following is a list of pedestrian-related controller features that shall be accommodated by the ASCT:	M	1	See below
8.0-10.0-1	Allow variable cycle operation (i.e. double or half) to better serve pedestrians.	M	1	MAXTIME adaptive allows for an intersection to half cycle. This can be set as an “alway on” meaning if the split times can fit it will run half cycle or can be triggered by an event if needed.
8.0-10.0-2	Support accessible pedestrian signals (APS).	M	1	MAXTIME ic and adaptive support APS operations
8.0-10.0-3	Support mid-block pedestrian crossing integration.	D	1	MAXTIME ic and adaptive support mid-block ped integration.
9 Special Functions				
9.0-1	The ASCT shall set a specific state for each special function output based on the occupancy on a user-specified detector.	M	1	MAXTIME’s user logic can be used to achieve this goal
9.0-2	The ASCT shall set a specific state for each special function output based on the current cycle length.	D	1	MAXTIME’s user logic can be used to achieve this goal
9.0-3	The ASCT shall set a specific state for each special function output based on a time-of-day schedule (i.e. no U-turns).	M	1	MAXTIME’s action plan configuration allows users to activate special function outputs on a TOD schedule.
10 Existing Systems				
10.0-1	The ASCT shall be compatible with the following controller types: • NEMA	M	1	MAXTIME adaptive will run on both the XN-1 and XN-2 NEMA controllers from Q-Free
10.0-2	The ASCT shall be compatible with the following detector technologies: • Inductive Loop • Video/Thermal Detection • Radar/Microwave • Magnetometer	M	1	MAXTIME adaptive is compatible with any form of detection

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10.0-3	The ASCT shall be compatible with the following communication systems • Fiber patch panels • Fiber (Ethernet) switches • Fiber (Point-to-Point and Redundant Ring)	M	1	MAXTIME adaptive meets this requirement.
10.0-4	The ASCT shall be compatible with the following cabinet types and sizes: • NEMA – TS2 Type 1	M	1	See 10.0-1
10.0-5	The ASCT shall be compatible (run in coordination) with the following local traffic signal controller software: • Econolite Cobalt Local Software	D	4	MAXTIME adaptive currently does not work with the Econolite Cobalt local software
10.0-6	The ASCT shall be compatible with the following signal management system: • Q-Free Kinetic Signals Software	D	1	MAXTIME adaptive is compatible with Q-Free Kinetic Signal Software.
11 Railroad and EV Preemption				
11.0-1	The ASCT shall maintain adaptive operation at non-preempted intersections during railroad preemption. This requirement will accommodate future expansion as there are no railroad crossings within the project boundaries.	D	1	MAXTIME adaptive will remain active at all intersections in a network when any preempt is active at any intersection in the network. Adaptive algorithms can still run and write to controllers while preempts are active. The intersection in preempt will go out of coordination to serve the preempt but will still receive adaptive timing changes. The rest of the system will remain in coordination
11.0-2	The ASCT shall maintain adaptive operation at non-preempted intersections during emergency vehicle preemption.	M	1	See 11.0-1
11.0-3	The ASCT shall maintain adaptive operation at non-preempted intersections during Light Rail Transit preemption. This requirement will accommodate future expansion as there are no Light Rail Transit crossings within the project boundaries.	D	1	See 11.0-1
11.0-4	The ASCT shall resume adaptive control of signal controllers when preemptions are released.	D	1	See 11.0-1
11.0-5	The ASCT shall execute user-specified actions at non-preempted signal controllers during preemption. (E.g., inhibit a phase, activate a sign, display a message on a DMS)	D	1	MAXTIME with peer-to-peer supports execution of actions at nonpreempted signal controllers during preempt at another controller
11.0-6	The ASCT shall operate normally at non-preempted signal controllers when special functions are engaged by a preemption event. (Examples of such special functions are a phase omit, a phase maximum recall or a fire route.)	D	1	MAXTIME will continue to operate normally at non-preempted signal controllers when special functions are engaged by a preempt event, given that the special function is not programmed to change operations.
11.0-7	The ASCT shall release user-specified signal controllers to local control when one signal in a group is preempted.	M	1	MAXTIME adaptive can be configured to support

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				this operation
11.0-8	The ASCT shall not prevent the local signal controller from operating in normally detected limited-service actuated mode during preemption.	D	1	MAXTIME will continue to operate normally detected limited-service actuated mode during preemption while Adaptive is running.
11.0-9	The ASCT shall allow peer to peer custom functionality to coordinate operations with adjacent signals during preemption.	D	1	MAXTIME allows for peer to peer functionality to coordinate operations with adjacent signals
11.0-10	The ASCT shall return to adaptive control within a user-specified number of cycles after preemption.	M	1	MAXTIME ic includes an exit preempt option of “exit coord” this exit type will drop the intersection right back into coord operation (adaptive pattern) without transitioning the intersection.
12 Transit Priority				
12.0-1	The ASCT shall continue adaptive operations of a group when one of its signal controllers has a transit priority call.	M	1	MAXTIME adaptive will remain active at all intersections in a network when any priority call is active, and during the entirety of a priority service at any intersection in the network.
12.0-2	The ASCT shall advance the start of a user-specified green phase in response to a transit priority call.	M	1	MAXTIME’s transit signal priority will truncate user-specified phases greens in response to a TSP call
12.0-2.0-1	The advance of start of green phase shall be user-defined.	D	1	MAXTIME allows users to configure how much each phase will truncate on a per-phase basis and TOD basis.
12.0-2.0-2	Adaptive operations shall continue during the advance of the start of green phase.	D	1	See 12.0-1
12.0-3	The ASCT shall delay the end of a green phase, in response to a priority call.	M	1	MAXTIME’s transit signal priority will extend user-specified phases greens in response to a TSP call.
12.0-3.0-1	The delay of end of green phase shall be user-defined.	D	1	MAXTIME allows users to configure how much each phase will extend on a per phase basis and TOD basis.
12.0-3.0-2	Adaptive operations shall continue during the delay of the end of green phase.	D	1	See 12.0-1
12.0-4	The ASCT shall permit at least 2 exclusive transit phases such as at a queue jump.	M	1	MAXTIME supports exclusive transit phases and queue jump for up to 40 phases.

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12.0-4.0-1	Adaptive operations shall continue when there is an exclusive transit phase call.	D	1	See 12.0-1
12.0-5	The ASCT shall accept a transit priority calls from a McCain Transit Priority Request Generator (TPRG) providing the same level of TSP control that currently exists. The ASCT shall provide user-defined lockouts for TSP service.	M	1	MAXTIME can accept TSP calls from any standard source this includes check in/out detectors, GTT opticom detectors, NTCIP 1211 object via CAD/AVL system. Any of these can be set by the user to lockout back-to-back calling.
12.0-6	The ASCT shall be capable of receiving CAD/AVL information from King County Metro's CAD/AVL external system. ASCT logic shall use location information to grant or deny TSP requests to maintain a user-defined headway spacing between buses.	D	1	See 12.0-5
13 Failure Events and Fallback				
13.1 Detector Failure				
13.1.0-1	The ASCT shall take user-specified action in the absence of valid detector data from a user-specified number of vehicle detectors within a group.	D	1	MAXTIME supports several user defined actions in the event of a detector failure including; • Max1, max2, or max3 recall • Min1, min2 recall • Fail time • Fail link • Issue an alarm MAXTIME adaptive supports several user defined actions in the event of a detector failure, including; • Revert to local TOD • Activate a new condition plan • Activate a new corridor plan • Use historical detector data Any of the above adjustments, when configured, occur automatically and in real-time without interruption of any other operations.
13.1.0-1.0-2	The ASCT shall release control to local operations to operate under its own time-of-day schedule.	D	1	See 13.1.0-1
13.1.0-2	The ASCT shall use the following user-specified alternate data sources for operations in the absence of the real-time data from a detector:	M	1	See 13.1.0-1
13.1.0-2.0-1	• Data from a user-specified alternate detector	M	1	See 13.1.0-1. Alternate condition plans accomplish this
13.1.0-2.0-2	• Stored historical data from the failed detector	M	1	See 13.1.0-1
13.1.0-2.0-3	The ASCT shall switch to the alternate source in real time without operator intervention.	D	1	See 13.1.0-1

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13.1.0-3	In the event of a detector failure, the ASCT shall issue an alarm to user-specified recipients. This requirement shall be fulfilled by sending the alarm to a designated list of recipients by a designated means (i.e. text or email), or by using an external maintenance management system.	M	1	See 13.1.0-1. MAXVIEW supports email notifications of alarms on a per-user and/or TOD basis.
13.1.0-4	All detector failures shall be indicated on the system's operator interface.	M	1	MAXTIME's alarm status and MAXVIEW's alarm log indicates all detector failures
13.1.0-5	In the event of a failure, the ASCT shall log details of the failure in a permanent log.	M	1	MAXVIEW has a historical alarm log where detector failures will be stored permanently if configured to do so
13.1.0-6	The permanent failure log shall be searchable, achievable and exportable.	M	1	All failure logs are stored in your existing Kinetic signals system and are searchable, archivable and exportable.
13.2 Communications Failure				
13.2-1	The ASCT shall execute user-specified actions when communications to one or more signal controllers fails within a group.	D	1	MAXTIME adaptive supports two types of communication failures and can respond to each differently; critical communication failures and non-critical communication failures. Intersections are user configurable as critical or noncritical. When communications to a critical intersection fails, the adaptive software will terminate and revert to local TOD control. When communications to non-critical intersections fail, adaptive will dynamically regroup the network accordingly and continue to run. This will continue until a user-defined number of non-critical intersections has failed, at which point adaptive will terminate and revert to local TOD control.
13.2-1.0-1	In the event of loss of communication to a user-specified signal controller, the ASCT shall be capable of releasing control of all signal controllers within a user-specified group to local control.	M	1	See 13.2-1
13.2-1.0-2	The ASCT shall switch to user-specified operation in real time without operator intervention.	D	1	See 13.1.0-1; Users can specify to fail to TOD schedule or to a specific TOD plan.

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13.2-2	In the event of communications failure, the ASCT shall issue an alarm to user-specified recipients. (This requirement may be fulfilled by sending the alarm to a designated list of recipients by a designated means, or by using an external maintenance management system.	M	1	Kinetic Signals issues alarm notifications to users when controllers lose communications.
13.2-3	The ASCT shall issue an alarm at the point of failure detection.	M	1	See 13.1.0-3.
13.2-4	In the event of a communications failure, the ASCT shall log details of the failure in a permanent log.	M	1	Kinetic Signals has a historical alarm log where communication failures will be stored permanently if configured to do so.
13.2-5	The permanent failure log shall be searchable, achievable and exportable.	M	1	Historical alarm logs are searchable, achievable, and exportable.
13.3 Adaptive Processor Failure				
13.3-1	The ASCT shall execute user-specified actions when adaptive control fails:	M	1	MAXTIME adaptive supports several actions when adaptive control fails: • Automated restart • Revert to local TOD control • Trigger an alarm in MAXTIME
13.3-1.0-2	The ASCT shall release control to local operations to operate under its own time-of-day schedule.	M	1	See 13.3-1
13.3-2	In the event of adaptive processor failure, the ASCT shall issue an alarm to user-specified recipients. (This requirement may be fulfilled by sending the alarm to a designated list of recipients by a designated means, or by using an external maintenance management system.	M	1	See 13.3-1
13.3-3	The permanent failure log shall be searchable, achievable and exportable.	D	1	Historical alarm logs are searchable, achievable, and exportable
13.3-4	During adaptive processor failure, the ASCT shall provide all local detector inputs to the local controller.	D	1	MAXTIME adaptive never takes control of local detector inputs. Therefore, if the adaptive processor fails local detector inputs continue to work as normal.
14 Software				
14.0-1	The System Integrator's adaptive software shall be fully operational within the following platform: • Windows Server OS 2022 • Windows-PC • Linux	M	1	MAXTIME and MAXTIME adaptive are installed locally on the controller's Linux OS, and the interface for command and control is operational with a Windows platform.
	• Mac-OS • Unix			
15 Training				
15.0-1	The System Integrator shall provide the following training.	D	1	See Below
15.0-1.0-1	The System Integrator shall provide training on the operations of the adaptive system.	D	1	Trainings will include all aspects of the adaptive system including; • Config and operation •

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				Troubleshooting • Maintenance • Administration • Calibration
15.0-1.0-2	The System Integrator shall provide training on troubleshooting the system.	D	1	See 15.0-1.0-1
15.0-1.0-3	The System Integrator shall provide training on preventive maintenance and repair of equipment.	D	1	See 15.0-1.0-1
15.0-1.0-4	The System Integrator shall provide training on system configuration.	D	1	See 15.0-1.0-1
15.0-1.0-5	The System Integrator shall provide training on administration of the system.	D	1	See 15.0-1.0-1
15.0-1.0-6	The System Integrator shall provide training on system calibration.	D	1	See 15.0-1.0-1
15.0-1.0-7	The System Integrator's training delivery shall include: printed course materials and references, electronic copies of presentations and references.	D	1	All course materials and references will be included in printed form and digital.
15.0-1.0-8	The System Integrator's training shall be delivered at the Redmond TMC which will be connected to the adaptive system for operations and maintenance training.	D	1	Q-Free agrees to this requirement.
15.0-1.0-9	The System Integrator shall provide a sufficient amount of training to fully prepare maintenance and operations staff to operate, configure, maintain and calibrate the ASCT. The System Integrator shall provide a training program for agency review one month prior to scheduled training.	M	1	Q-Free will provide support for loaded cabinet testing and field training. The training will be primarily focused on topics relevant to technicians. This will be a 1-day on-site training. Q-Free will conduct a comprehensive training on MAXTIME ic and MAXTIME adaptive. The purpose of the training is to provide engineers and technicians an understanding of the fully capabilities of MAXTIME ic and MAXTIME adaptive. This will be a 1.5 day on-site training.
16 Maintenance, Support and Warranty				
16.0-1	The initial implementation plan shall include two years of maintenance. The ASCT System Integrator shall provide maintenance according to a separate maintenance contract. That contract should identify repairs necessary to preserve requirements fulfillment, responsiveness in effecting those repairs, and all requirements on the maintenance provider while performing the repairs.	M	1	Q-Free will provide a 2-year maintenance agreement that will include technical support, hardware repairs, and software upgrades needed for bugs as-needed. Q-Free provides an 833 number that is staffed from 5am-5pm PST as well as an online ticketing system to ensure responsiveness in addressing all maintenance needs.

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16.0-2	The ASCT System Integrator shall provide routine updates to the software and software environment necessary to preserve the fulfillment of requirements. Preservation of requirements fulfillment especially includes all IT management requirements as previously identified.	D	1	Software updates are made available to all customers with an active maintenance agreement (See 16.0-1) is in place. The City will receive access to these via an account on the Q-Free website where they can be downloaded and installed directly on the controller remotely without signal interruption.
16.0-3	The ASCT System Integrator shall warrant the system to be free of defects in materials and workmanship. Warranty is defined as correcting defects in materials and workmanship (subject to other language included in the purchase documents). Defect is defined as any circumstance in which the material does not perform according to its specification.	D	1	Q-Free warrants the system to be free of defects in materials and workmanship. The standard warranty documentation is included with this proposal.
16.0-4	The ASCT System Integrator shall provide support with the following response times: • Support provided by telephone – 24 hours • Support provided via remote login to the system – 24 hours • Support requiring System Integrator staff onsite – 3 business days.	M	1	Q-Free agrees to this requirement.
16.0-5	The ASCT System Integrator shall have replacement equipment readily available in case of equipment failure per warranty.	D	1	Q-Free builds controllers to stock and can ship replacements quickly.
17 Performance Measurement, Monitoring and Reporting				
17.0-1	The ASCT system shall report high fidelity and high-resolution data (1/10th second) from within the ASCT local, central, and adaptive software to support system	M	1	MAXTIME ic reports all 1/10th of a sec data to the central system, Kinetic Signals.
	performance monitoring. All data shall be searchable through system filters.			
17.0-2	The ASCT shall report measures of current traffic conditions on which it bases signal state alterations.	D	1	See 6.0-1 and 6.0-2
17.0-3	The ASCT shall report all intermediate calculated values that are affected by calibration parameters.	M	1	This is part of the high-resolution data.
17.0-4	The ASCT shall maintain a real-time log of all signal state alterations directed by the ASCT.	M	1	This is part of the high-resolution data.
17.0-4.0-1	The ASCT log shall include all events directed by the external inputs.	D	1	This is part of the high-resolution data.
17.0-4.0-2	The ASCT log shall include all external output state changes.	D	1	This is part of the high-resolution data.
17.0-4.0-3	The ASCT log shall include all actual parameter values that are subject to user-specified values.	D	1	MAXTIME adaptive logs all parameters as part of an adaptive file. MAXTIME logs all parameters as part of an intersection file
17.0-4.0-4	The ASCT shall maintain the records in this ASCT log for a user-specified period.	D	1	Kinetic Signals can conduct nightly backups of MAXTIME files and store them for a specified period

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17.0-4.0-5	The ASCT shall archive the ASCT log in a searchable and exportable manner.	M	1	Kinetic Signals allows searching through historical databases by date. Databases can be exported in their original file format or printed to a template and exported as a PDF
17.0-5	The ASCT shall maintain a log of all TSP interactions with the ASCT including TSP requests received and ASCT response.	M	1	MAXTIME ic sends all TSP logs as high resolution data to Kinetic Signals.
17.0-6	The ASCT shall include a GUI which provides easy and quick access to real time and historical graphical representations and spreadsheets of the performance measures.	D	1	MAXTIME adaptive includes an easy to understand GUI that is accessible via a standard web browser. The user can access historical data from the system in the GUI.
17.0-7	The ASCT shall be capable of reporting performance data in real time to an Application Programming Interface (API).	D	2	MAXTIME adaptive currently does not have an API however Kinetic Signals does include an API and all the data that the adaptive system uses is stored in Kinetic and can be accessed via its API for reporting.

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