CONSTRUCTION CONTRACT
PROJECT NO. 25-02

THIS CONSTRUCTION CONTRACT ("Contract") is made and entered into on the date of the last signature set forth below, by and between the City of Littleton, a municipal corporation within the State of Colorado ("City"), and A-1 Chipseal Company, a Colorado corporation ("Contractor"). The Contractor and the City are referred to as a "Party" or collectively the "Parties."

1.1 **Contract Documents and Exhibits**. The term "Contract Documents" consist of this Contract together with the following:

Exhibit A	Scope of Work
Exhibit B	Bid Schedule
Exhibit C	Performance and Payment Bond
Exhibit D	Littleton Engineering Design Standards ("Standards and Specifications") (Incorporated by Reference Only) (Exhibit D Available online)
Exhibit E	Drawings and Specifications
Exhibit F	Special Conditions

All exhibits referred to in this Contract are attached hereto and are, by reference, incorporated herein for all purposes. Any forms provided within the Contract are not intended to be considered final, and the City expressly reserves the right to modify said contract forms, in its sole discretion. In the event any matter, term, provision, or condition that is the subject of this Contract requires clarification or is in dispute, or is the subject of a difference of opinion, the purpose and intent of the Contract shall be first ascertained by reference to the Contract Documents in their entirety. In the event of any dispute or differences between the respective documents that constitute the Contract Documents, then the Contractor shall secure the written instructions from the City before proceeding with the performance of the services affected by such conflicts, omissions or discrepancies.

1.2 **Project.**

1.2.1 The Contractor shall commence and complete the Scope of Work ("Work"), **Exhibit A**, in accordance with the Contract Documents, as defined herein. The Contractor agrees to perform and complete the Work in a proper and workmanlike manner, consistent with the highest standards of professional and construction practices and in full compliance with, and as required by or pursuant to, this Contract, and with the greatest economy, efficiency, and expedition consistent therewith. The Contractor shall, at its own expense, furnish all labor, materials, tools, supplies, machinery, utilities, permits, licenses, and other equipment that may be necessary for the completion of the Work, as outlined in the Contract Documents. The Contractor shall have

no property right in materials after they have been attached, affixed or incorporated in the Work or the soil.

1.2.2 Further, the Contractor acknowledges that all reasonably necessary steps were taken to ascertain the nature and location of the Work, and the general and local conditions which can affect the Work or the cost of the Work. Failure by the Contractor to do so will not relieve it from responsibility for successfully performing Work without additional expense to the City. The City will not be responsible for any understanding or representations concerning conditions unless such understanding or representations are expressly stated in the Contract.

1.2.3 The City shall furnish all lands and rights-of-way required for completion of the Work. In acquiring rights-of-way, the City will proceed as expeditiously as possible, but in the event all rights-of-way or easements are not acquired prior to the beginning of construction, the Contractor shall begin Work on such lands and rights-of-way as have been acquired. No claim for damage will be allowed or shall be made by reason of the City's delay in obtaining lands, easements or rights-of-way. In the event of litigation or other delays in acquiring rights-of-way, the time allowed herein for completion will be extended to compensate for the time actually lost by such delay.

1.3 **Commencement and Completion of the Project**. The Contractor understands and agrees that all Work required under this Contract shall not commence until a Notice to Proceed is issued and shall be fully completed within **90 calendar days of receiving Notice to Proceed**. The Contractor acknowledges and understands that it is an essential term of this Contract that Contractor maintain a rate of progress in the Work that will result in completion of the Work in accordance with the Contract Documents, and to that end, Contractor agrees to proceed with all due diligence to complete the Work in a timely manner in accordance with the Contract Documents.

1.4 **Contract Price**. The City accepts the Contractor's bid as set forth in the Bid Schedule, **Exhibit B**, in the total amount of **$1,984,700.29**. The City shall make payment(s) to Contractor in the manner and at such times as set forth in the Standards and Specifications. Should the Contract price exceed one-hundred and fifty-thousand dollars ($150,000.00), the City shall deduct and retain five (5) percent from the total amount of each approved invoice, including Change Orders. The City may also deduct in addition to retainage as stated above, the additional amount(s) of any and all outstanding claims pursuant to Colorado Revised Statute ("C.R.S.") §38-26-107 from each approved invoice.

1.5 **Payments to Constitute Current Expenditures.**

1.5.1 Notwithstanding any other term, provision, or condition herein, all financial obligations of the City are contingent on funds for that purpose being appropriated, budgeted and otherwise made available by the City Council. The City's obligations under the Contract shall not constitute a multiple-fiscal year direct or indirect debt or other financial obligation of the City within the meaning of Article X, Section 20 of the Colorado Constitution.

1.5.2 Further, pursuant to 103.6(2) of Article 91, Title 24, C.R.S., no Change Order, Amendment, or other form of order or directive by the City which requires additional compensable work to be performed, and which work causes the aggregate amount payable under this Contract to exceed the amount appropriated for the original Contract, shall be executed, or shall work be performed by the Contractor, unless the City provides written assurances to the Contractor that lawful appropriations to cover the costs of such additional work have been made or unless such work is covered under a remedy-granting provision of this Contract. For purposes of this paragraph, "remedy-granting provision" shall be defined as set forth in C.R.S. §24-91-103.6(4).

1.6 **Confidentiality.** Notwithstanding any provision in the Contract Documents to the contrary, the City is obligated to comply with the Colorado Open Records Act (C.R.S. §§24-72-101 *et seq.*), which may require the City to disclose all or a portion of communications relating to the Contract, or terms of same, or of any transaction under the Contract, and other related matters. The Contractor shall familiarize itself with the Colorado Open Records Act. In no event shall the City be liable to the Contractor for the disclosure of all or a portion of communications, or relating documents, or electronic imaging, including all documents and exhibits that may be included as part of this Contract.

1.7 **Bonds**.

1.7.1 Contemporaneous with the Contractor's execution of this contract, the Contractor shall provide a Performance Bond and a Labor and Material Payment Bond as security for the faithful performance and payment of all the Contractor's obligations under the Contract Documents. All bonds shall be in the form prescribed by the City, executed by a surety company i) licensed to do business in the State of Colorado; ii) with a general rating of A and a financial size category of Class X or better in Best's Insurance Guide, each in the penal sum of the contract price; and iii) in conformance with C.R.S. §§ 38-26-105 and 106 ("Bonds"). All Bonds signed by an agent or attorney-in-fact shall be accompanied by a certified copy of the signatory's authority to act. The Contractor shall, at all times while providing, performing, or completing the Work including without limitation at all times while correcting any failure to meet warranty pursuant to the Standards and Specifications, maintain and keep in force the Bonds at the Contractor's expense.

1.7.2 If the Surety for any Bond furnished by the Contractor is placed in a receivership or declared bankrupt, or its rights to do business in Colorado are terminated, or it ceases to meet the requirements specified herein, the Contractor shall within five (5) days thereafter substitute another Bond and Surety, both of which shall be acceptable to the City.

1.8 **Insurance.**

1.8.1 The Contractor shall not commence work, and shall not allow any subcontractor to commence work, until it has obtained all insurance required herein and such insurance has been approved by City. For the duration of the Contract, the Contractor must maintain the insurance coverage required in this section. The City's acceptance of a certificate of insurance or other proof of insurance that does not comply with all insurance requirements set forth in this Contract shall not act as a waiver of the Contractor's breach of Contract or of any of the City's rights or remedies under this Contract.

1.8.2 The Contractor shall not be relieved of any liability, claims, demands, or other obligations assumed pursuant to the Contract Documents by reason of its failure to procure or maintain insurance, or by reason of its failure to procure or maintain insurance in sufficient amounts, durations, or types.

1.8.3 The Contractor shall procure and maintain at its own cost and shall cause each subcontractor of the Contractor to procure and maintain at its own cost (or shall insure the activity of Contractor's subcontractors in Contractor's own policy with respect to), the minimum insurance coverages listed below. Such coverages shall be procured and maintained with forms and insurers acceptable to the City. All coverages shall be continuously maintained from the date of commencement of the Work. In the case of any claims-made policy, the necessary retroactive dates and extended reporting periods shall be procured to maintain such continuous coverage.

i. Workers' Compensation and Employers' Liability insurance with minimum limits as required by state law. The policy shall cover obligations imposed by the Workers' Compensation Act of Colorado and any other applicable laws for any employee engaged in the performance of Work.

ii. Commercial General Liability insurance with minimum combined single limits of ONE MILLION DOLLARS ($1,000,000) each occurrence and TWO MILLION DOLLARS ($2,000,000) aggregate. The policy shall be applicable to all premises and operations. The policy shall include coverage for bodily injury, broad form property damage (including

completed operations), personal injury (including coverage for contractual and employee acts), blanket contractual, independent contractors, products, and both ongoing and completed operations. The policy shall include coverage for explosion, collapse, and underground hazards (XCU). The policy shall contain a severability of interests provision.

iii. Comprehensive Automobile Liability insurance with a minimum combined single limit for bodily injury and property damage of ONE MILLION DOLLARS ($1,000,000) with respect to each of Contractor's owned, hired and/or non-owned vehicles assigned to or used in performance of the Work. The policy shall contain a severability of interests provision.

iv. Installation Floater/Inland Marine insurance with minimum limits of not less than the insurable value of the work to be performed at completion. The value shall include the aggregate value of any City-furnished equipment and materials to be erected or installed by the Contractor not otherwise insured. The policy shall protect the Contractor and the City from all insurable risks of physical loss or damage to materials and equipment not otherwise covered, while in warehouses or storage areas, during installation, during testing, and after the Work under this Contract is completed. The policy shall be of the "all risks" type, with coverages designed for the circumstances which may occur in the particular Work to be performed under this Contract. The policy shall provide for losses to be payable to the Contractor and the City as their interests may appear. The policy shall contain a provision that in the event of payment for any loss under the coverage provided, the insurance company shall have no rights of recovery against the Contractor or the City.

1.8.4 The City of Littleton shall be included as additional insured for Commercial General Liability and Comprehensive Automobile Liability insurance. The City of Littleton shall be included as additional insured or loss payee for Installation Floater/Inland Marine insurance. All policies of insurance providing additional insured status shall be primary insurance, and any insurance carried by the City, its officers, or its employees, shall be excess and not contributory insurance to that provided by Contractor. The additional insured endorsement for the Commercial General Liability insurance required above shall not contain any exclusion for bodily injury or property damage arising from completed operations. The Contractor shall be solely responsible for any deductible losses under each of the policies required above.

1.8.5 Certificates of insurance shall be completed by the Contractor's insurance company as evidence that policies providing the required coverages, conditions, and minimum limits are in full force and effect, and shall be subject to review and approval by the City. The certificate cannot contain "endeavor to" language in the portion of the certificate addressing cancellation. The City of Littleton shall be included as Certificate Holder. The City reserves the right to request and receive a certified copy of any policy and any endorsement thereto.

1.8.6 The coverages afforded under the policies shall not be cancelled, terminated or materially changed until at least thirty (30) days' prior written notice has been given to the City. Failure on the part of the Contractor to procure or maintain policies providing the required coverages, conditions, and minimum limits shall constitute a material breach of Contract upon which the City may immediately terminate the Contract, or at its discretion may procure or renew any such policy or any extended reporting period thereto and may pay any and all premiums in connection therewith, and all monies so paid by the City shall be repaid by Contractor to the City upon demand, or the City may offset the cost of the premiums against any monies due to Contractor from the City.

1.8.7 The Parties hereto understand and agree that the City is relying on, and does not waive or intend to waive by any provision of this Contract, the monetary limitations or any other rights, immunities, and protections provided by the Colorado Governmental Immunity Act, C.R.S. § 24-10-101 et seq., as from time to time amended, or otherwise available to the City, its officers, or its employees.

1.9 **Patented Devises, Materials and Processes**. If the Contractor is required or desires to use any design, device, material or processes covered by patent or copyright, the Contractor shall provide for such use by suitable legal agreement with the patentee or patent owner. The Contractor shall warrant that the materials, equipment or devices used on or incorporated in the Work shall be delivered free of any rightful claim of any third-party for infringement of any United States patent or copyright. If notified promptly in writing and given authority, information and assistance, the Contractor shall defend, or may settle, at its expense, any suit or proceeding against the City so far as based on a claimed patent or copyright infringement which would result in a breach of this warranty, and the Contractor shall pay all damages and costs awarded therein against the City due to such breach. In case any use of any materials, equipment or devices is in such suit held to constitute an infringement and such use is enjoined, the Contractor shall, at its expense and option, either procure for the City the right to continue using said materials, equipment or devices, or replace same with non-infringing materials, equipment or devices, or modify the same so it becomes non-infringing. The Contractor shall report to the City promptly and in reasonable written detail each

notice or claim of patent or copyright infringement based on the performance of this Contract of which the Contractor has knowledge. In the event of any claim or suit against the City as a result of any alleged patent or copyright infringement arising out of the performance of this Contract or out of the use of any supplies furnished or Work or services performed hereunder, the Contractor shall furnish to the City when requested by the City, all evidence and information in possession of the Contractor pertaining to such suit or claim. Such evidence and information shall be furnished at the expense of the City except where the Contractor has agreed to indemnify the City. This clause shall be included in all subcontracts.

1.10 **Taxes.** The City of Littleton is not subject to taxation. The Contractor shall not invoice the City for any state, federal or local taxes whatsoever. Upon written notification by the City, the Contractor shall reimburse the City in a timely manner for any taxes erroneously paid by the City.

1.11 **Termination for Convenience of City.** This Contract and the performance of the Work hereunder may be terminated at any time, in whole or in part, for convenience. Any such termination shall be effected by delivery to the Contractor of a written notice ("Notice of Termination") specifying the extent to which performance of Work is terminated, the date upon which termination becomes effective, and any necessary actions to be taken by the Contractor to effectuate termination and close-out the Contract. If the Contract is terminated, the Contractor shall be paid on a prorated basis of Work satisfactorily completed, under the Work. The portion of Work satisfactorily completed but not yet accepted by the City shall be determined by the City.

1.12 **Cooperation with Other Contractors.** In connection with the improvements under this Contract, the right is reserved by the City to award any Work not included in the Contract to another contractor for performance during the progress of this Contract, or to perform such Work with the City's forces, and the Contractor shall cooperate and so conduct its operation as to minimize the interference therewith, as directed by the Project Manager.

1.13 **Termination of Contractor's Responsibility**. This Contract will be considered complete when all Work and final cleanup has been finished, the Work has been accepted by the City, and all claims for payment of labor, materials, or services of any kind used in connection with the Work have been settled for by the Contractor or its Surety. The Contractor will then be released from further obligation except as set forth in the Bond and for its responsibility for injury to persons or property arising from its duties and obligations under the Standards and Specifications. The Bond executed for performance of this Contract shall be in full effect for a period of one (1) year following acceptance of the Work; except with regard to the representation regarding copyright infringement found in Section 1.9 where the Bond shall remain in effect for three (3) years, and except with regard to the representation regarding patent infringement found in Section 1.9, where the Bond shall remain in effect for six (6) years. Neither the final payment nor any provision

in the Contract Documents shall relieve the Contractor of the responsibility for negligence or faulty materials or workmanship. Payment to the Contractor will not relieve the Contractor of any obligation under this Contract.

1.14 **Subcontracting or Assignment of Work.** No contractual relationship will be recognized under the Contract other than the contractual relationship between the City and Contractor. No portion of the Contract shall be subcontracted, assigned or otherwise disposed of except with the written consent of the City, which consent shall not be unreasonably withheld. Requests for permission to subcontract, assign or otherwise dispose of any portion of the Contract shall be in writing to the Project Manager and shall be accompanied by documents demonstrating the organization which will perform the Work is particularly experienced and equipped for such Work. Consent to subcontract, assign or otherwise dispose of any portion of the Contract shall not be construed to relieve the Contractor of any responsibility for the fulfillment of the Contract.

1.15 **Waiver of Breach.** A waiver by any Party to the Contract or the breach of any term or provision of the Contract shall not operate or be construed as a waiver of any subsequent breach by either Party.

1.16 **No Third-Party Beneficiaries.** It is expressly understood and agreed that enforcement of the terms and conditions of this Contract, and all rights of action relating to such enforcement, shall be strictly reserved to the City and the Contractor and nothing contained in this Contract shall give or allow any such claim or right of action to any other third-party on this Contract. It is the express intention of the City and the Contractor that any person other than the City or the Contractor receiving services or benefits under this Contract shall be deemed to be an incidental beneficiary only.

1.17 **Independent Contractor.** The Contractor shall perform the Work as an independent contractor and shall not be deemed by virtue of this Contract to have entered into any partnership, joint venture, employer/employee or other relationship with the City other than as a contracting party and independent contractor.

1.18 **Accessibility Standards.** The Contractor shall comply with the accessibility standards for an individual with a disability adopted by the Colorado Office of Information Technology, in accordance with C.R.S. § 24-85-103 and its implementing regulations. Notwithstanding the foregoing, this requirement shall not be applicable to contracts or agreements for professional services, as defined by C.R.S. § 24-30-1402, or to any portion or part of the contract or agreement that is providing professional services. Further, the contractor shall indemnify, hold harmless, and assume liability on behalf of the city and the city's officers, employees, and agents, for all costs, expenses, claims, damages, liabilities, court awards, attorney fees and related costs, and any other amounts incurred by the city in relation to the contractor's noncompliance with the accessibility standards

for an individual with a disability adopted by the Colorado Office of Information Technology, in accordance with C.R.S. § 24-85-103, and its implementing regulations.

1.19 **Non-Discrimination.** In connection with the performance of the Work, the Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, national origin, ethnicity, citizenship, immigration status, sex, gender, age, sexual orientation, gender identity or gender expression, marital status, source of income, military status, protective hairstyle, genetic information, pregnancy, or disability, or any other status protected by applicable law. The Contractor will take affirmative action to ensure applicants are employed, and employees are treated during employment, without regard to their race, color, religion, national origin, ethnicity, citizenship, immigration status, sex, gender, age, sexual orientation, gender identity or gender expression, marital status, source of income, military status, protective hairstyle, genetic information, pregnancy, disability, or any other status protected by applicable law. Such action shall include, but not be limited to the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship.

1.20 **Indemnification.** The Contractor agrees to investigate, defend, indemnify and hold harmless the City, its officers, employees, insurers, and self-insurance pool, from and against all liability, claims and demands on account of any losses, injuries, and damages, including but not limited to, alleged personal injury claims, and/or death claims, or property damage claims, or errors and omissions, which arise solely out of the Contractor's and/or any of its agents' officers or employees performance of the Contractor's obligations under this Contract. The City is prohibited by Article XI, Section 1, Colorado Constitution, from indemnifying any individual or entity. Therefore, the City does not indemnify the Contractor, successors, or assigns under this Contract. Notwithstanding the foregoing, nothing herein is intended to constitute a covenant, promise, or agreement to indemnify and hold harmless the City from any liability or damages directly caused by or attributable to the City's own negligence, nor is anything herein intended to be nor may be construed as a waiver of the immunities, protections, or limitations on damages provided to the City by the Colorado Governmental Immunity Act, C.R.S. §§24-10-101 et seq., as it may from time to time be amended.

1.21 **Governing Law and Venue.** The Contract shall be governed by the laws of the State of Colorado. Venue for any action arising under the Contract or for the enforcement of the Contract shall be in the appropriate court for Arapahoe County, Colorado.

1.22 **Additional Documents or Action**. The Parties agree to execute any additional documents and to take any additional action that is necessary to carry out this Contract.

1.23 **Binding Effect.** This Contract shall inure to the benefit of, and be binding upon, the Parties, their respective legal representatives, successors, heirs, and assigns; provided, however, that nothing in this paragraph shall be construed to permit the assignment of this Contract except as otherwise expressly authorized herein.

1.24 **Integration, Amendment, and Severability.** This Contract represents the entire agreement between the Parties and there are no oral or collateral agreements or understandings. This Contract may be amended only by an instrument in writing signed by the Parties or as otherwise provided herein. If any other provision of this Contract is held invalid or unenforceable, no other provision shall be affected by such holding, and all of the remaining provisions of this Contract shall continue in full force and effect.

1.25 **Binding Authority.** The Contractor represents and affirms that the signature page hereof accurately states the full legal name of Contractor (whether as a corporation, partnership, limited liability company, sole proprietorship, or other), contains all requisite signature(s) on behalf of Contractor, has been properly acknowledged by attestation, notary acknowledgment, or both, and in all other respects is effective to bind Contractor, in accordance with all applicable statutes, regulations, resolutions, rules, bylaws, agreements, or similar sources of authority or limitation. This Contract may be executed in counterpart(s), each of which shall be deemed to be an original, and all of which, taken together, shall constitute one instrument.

1.26 **Subject to Legislative Approval and Compliance with Law.** The Contractor acknowledges and agrees that if a Change Order is required under the terms of the Contract, the City shall not incur any liability whatsoever for claims of payment, compensation, damages, or adjustment of any kind by the Contractor due to any delays for the required approvals and execution under the City's Purchasing Ordinance. The Contractor further acknowledges and agrees that this Contract's execution may be contingent upon approval by the City Council, in compliance with all applicable provisions of the City Charter and City Code. The City shall not incur any liability whatsoever if this Contract is not approved by City Council.

1.27 **Notices.** All notices required under this Contract shall be in writing and shall be sent by registered or certified mail, return receipt requested, to the addresses of the Parties herein set forth. A Party may change its mailing address by giving written notice of such change of address to other Party.

Notice to City:
City of Littleton
City Manager
2255 West Berry Avenue
Littleton, CO 80120

Notice to Contractor: A-1 CHIPSEAL COMPANY
2505 E 74th Avenue
Denver, Colorado 80229

1.28 **Force Majeure.** Neither Party shall be responsible for a delay in its respective performance under this Contract, other than a delay in payment for Work already performed, if such delay is caused by extraordinary weather conditions or other natural catastrophes, war, terrorist attacks, sabotage, computer viruses, riots, strikes, lockouts or other industrial disturbances, epidemics, pandemics, acts of governmental agencies or authorities, discovery of hazardous materials or differing and unforeseeable site conditions, or other events beyond the reasonable control of the claiming Party. Contractor shall be entitled to an equitable adjustment to the project schedule in accordance with the Standards and Specifications. When a delay on any aspect of the Work occurs, the Contractor, to the maximum extent possible, shall utilize its resources elsewhere in the Work.

1.29 **Electronic Signatures and Electronic Records.** The Contractor consents to the use of electronic signatures by the City. The Contract, and any other documents requiring a signature hereunder, may be signed electronically by the City in the manner specified by the City. The Parties agree not to deny the legal effect or enforceability of the Contract solely because it is in electronic form or because an electronic record was used in its formation. The Parties agree not to object to the admissibility of the Contract in the form of an electronic record, or a paper copy of an electronic document, or a paper copy of a document bearing an electronic signature, on the ground that it is an electronic record or electronic signature or that it is not in its original form or is not an original.

[signatures to follow]

CITY OF LITTLETON, COLORADO

_____
Kyle Schlachter
MAYOR

ATTEST

_____
Colleen Norton
CITY CLERK

APPROVED AS TO FORM:

_____
Reid Betzing
CITY ATTORNEY

CONTRACTOR

_____ _____
Josh Krueger Date
VICE PRESIDENT

Exhibit A
Scope of Work

The City is focusing on maintaining and preserving the condition of existing roadway infrastructure throughout Littleton, along with implementing its Safer Streets program and initiatives. This project includes the removal of approximately 50,000 square feet of pavement markings, both chip and slurry seal application of a combined 360,000 square yards, installation of over 21,000 square feet of thermoplastic pavement markings, and installation of new striping, signs, and traffic calming devices.

The Contractor shall furnish all labor, materials, and equipment necessary to complete in place the application of emulsified asphalt and aggregate cover coat to the streets listed on the Location Schedule in Exhibit F.

It's anticipated the project will require approximately 258,000 square yards of Slurry Seal, Type II, and 102,000 square yards of one-fourth inch (1/4”) Chip Seal with Fog Coat. The City will be performing all required pavement patching with its own City staff in advance of the project. Other anticipated work includes temporary traffic control, cleaning of manholes and valves, removal of existing pavement markings installation of signs, furnishing and installing traffic calming devices, and pavement marking.

Exhibit B

Code	Description	UOM	Price	Quantity	Total Cost
202-00250	REMOVAL OF PAVEMENT MARKINGS	Square Foot/Feet	$1.00	49,379	$49,379.00
403	INSTALL SPEED CUSHION	Each	$1,800.00	33	$59,400.00
408	MASTIC	Ton	$4,250.00	5	$21,250.00
409	SEAL COAT (1/4" CHIP)	Square Yard	$3.75	102,065	$382,743.75
410	SLURRY SEAL TYPE II	Square Yard	$2.68	257,528	$690,175.04
614-00011	SIGN PANEL (CLASS 1)	Square Foot/Feet	$12.50	407	$5,087.50
614	SIGNPOST ANCHOR ASSEMBLY (2.25x2.25 INCH TUBING)	Each	$55.00	65	$3,575.00
614-00216	STEEL SIGNPOST (2x2 INCH TUBING)	Linear Foot/Feet	$7.50	780	$5,850.00
627-00008	MODIFIED EPOXY PAVEMENT MARKING	Gallon	$135.00	752	$101,520.00
627-30323	PREFORMED THERMOPLASTIC PAVEMENT MARKING (WORD-SYMBOL)(INLAID)	Square Foot/Feet	$12.50	12,744	$159,300.00
627-30328	PREFORMED THERMOPLASTIC PAVEMENT MARKING (XWALK-STOP)(INLAID)	Square Foot/Feet	$12.50	8,430	$105,375.00
612	36" SHUR-FLEX VERTICAL FLEX POST (WHITE)	Each	$85.00	86	$7,310.00
612	36" SHURE-FLEX VERTICAL FLEX POST (WHITE)(FURNISH ONLY)	Each	$50.00	17	$850.00
612	36" SHUR-FLEX VERTICAL FLEX POST (GREEN)	Each	$85.00	187	$15,895.00
612	36" SHUR-FLEX VERTICAL FLEX POST (GREEN)(FURNISH ONLY)	Each	$50.00	37	$1,850.00
612	ZICLA ZIPPER (B+AA+B)	Each	$395.00	272	$107,440.00
612	ZICLA ZIPPER (B+AA+B) (FURNISH ONLY)	Each	$375.00	54	$20,250.00
612	ZICLA ZEBRA 13	Each	$165.00	245	$40,425.00
612	ZICLA ZEBRA 13 (FURNISH ONLY)	Each	$105.00	49	$5,145.00
612	ZICLA ZEBRA 9	Each	$130.00	329	$42,770.00
612	ZICLA ZEBRA 9 (FURNISH ONLY)	Each	$85.00	66	$5,610.00
626	MOBILIZATION	Lump-Sum	$15,000.00	1	$15,000.00
630	TRAFFIC CONTROL	Lump-Sum	$108,500.00	1	$108,500.00
700	FORCE ACCOUNT				$30,000.00
				TOTAL:	**$1,984,700.29**

Exhibit C

Bond No. 30275646

PERFORMANCE, LABOR AND MATERIAL PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS that A-1 CHIPSEAL COMPANY (Contractor), as Principal (the "Principal") and Western Surety Company, a corporation organized under the laws of the State of South Dakota, and authorized to transact business in the State of Colorado, as "Surety", jointly and severally, including their heirs, personal representatives, successors and assigns, are held and firmly bound unto the City of Littleton as Obligee, hereinafter called Owner, for the use and benefit of claimants as herein below defined, in the amount of one million nine hundred eighty-four thousand seven hundred dollars and twenty-nine cents ($1,984,700.29), for the payment and interest as provided by law for the performance of the Contract between the Principal and the Owner, dated _____, 2026, for the Surface Sealing #25-02 Project in accordance with drawings and specifications; which the Contract is made a part hereof, and is hereinafter referred to as the Contract, and incorporated by this reference.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that if the Principal, at all times, shall promptly and faithfully perform said Contract, and shall promptly make payment to all claimants as hereinafter defined, for all labor and material used or reasonably required for use in the performance of the Contact, any authorized modifications thereof during the original term of the Contract, any extensions thereof that may be granted by the Owner, and during the term of any guarantee or warranty required under the Contract, and shall fully indemnify and save harmless the Owner from all costs and damages which it may suffer by reason of failure to do so, and shall reimburse and repay the Owner all outlay and expense when the Owner may incur in making good any default, then the Principal and Surety shall have no obligation under this Bond, otherwise it shall remain in full force and effect for a period of one (1) year following execution of the Contract. Upon expiration, this Bond shall be extended by a continuation certificate for an additional one (1) year, and extended thereafter until the warranty period has expired in accordance with the terms of the Contract.

The Surety, for value received, agrees that no extension of time, change in, addition to, or other alteration or modification of the terms of the Contract or work to be performed there under or any other forbearance on the part of either the Owner or the Principal to the other shall in any way release or impact the Surety's liability or obligation on this Bond, and the Surety hereby waives notice of any extension of time, change in, addition to, or other alteration or forbearance.

Whenever the Owner terminates the Contract in accordance with the terms thereof, the Surety shall, within fifteen (15) calendar days after written notice of such termination, notify the Owner in writing of its election to complete the Contract in accordance with its terms and conditions, or notify the Owner that the Surety elects not to complete the Contract. If the Surety fails to provide the written notice within the fifteen (15) calendar day period, then it will have deemed to have not elected to complete the Contract. Should the Surety elect to complete the Contract, then it shall, within fifteen (15) additional calendar days, following written notice of such election, obtain a bid or bids for submission to Owner for completing the Contract in accordance with its terms and conditions. The Surety shall arrange for a contract between bidder and Owner, and make available as work progresses (even though there should be a default or a succession of

defaults under the contract or contracts of completion arranged under this paragraph) sufficient funds to pay the cost of completion less the balance of the Contract price; but not exceeding, including other costs, attorneys fees of the Owner and damages for which the Surety shall be liable hereunder, the amount set forth in the first paragraph hereof. In the event of termination, the Surety may not engage the Principal to complete the Contract, without prior written consent of the Owner, which consent may be withheld in the Owner's sole discretion. If the Surety elects to complete the Contract, then it shall be entitled to receive the balance of the Contract price, less i) any amounts paid by the Owner to the Principal; ii) costs incurred by the Owner in correcting the defective work; iii) any additional legal, design professional or other costs incurred by the Owner resulting from Principal's default; and iv) any liquidated damages caused by the delayed performance or nonperformance of the Principal. Any progress payments, less retainage, due but not paid at the date of termination shall be paid to the Surety so long as the Surety has agreed to indemnify the Owner for the amount thereof and no other claims have been made to such funds by subcontractors or suppliers in accordance with the Contract or any applicable law. In the event that the Surety elects not to complete the Contract, the Owner may then have work completed by such means and in such manner, as it may deem advisable. The Surety, in such event, shall at all times make available, as work progresses under the Contract between the Owner and new contractor, sufficient funds to pay the cost of completion of the Contract pursuant to the its terms together with the other amounts set forth above, but in no event shall the Surety be responsible for the payment of any sums to the Owner until the Owner has paid in full its total obligation under the terms of the original Contract, plus Change Orders or amendments less deductions and claims chargeable by law or by the Contract, if any, and less the retainage which will be disbursed as provided by the Contract and any applicable law.

Any proceeding, whether legal or equitable, under this Bond, except for claims for payment of labor and material, or copyright or patent infringement, must be instituted before the expiration of two (2) years from the date on which final payment under the Contract falls due.

Further, the above named Principal and Surety hereby jointly and severally agree with the Owner that the Principal shall promptly make payment to all persons, firms, subcontractors, and corporations furnishing materials for or performing labor in the prosecution of the work provided for in such Contract ("claimant"), and any authorized extension or modification thereof, including all amounts due for materials, lubricants, oil, gasoline, repairs or machinery, equipment and tools, consumed or used in connection with the construction of such work, whether by subcontractor or otherwise, then this obligation shall be void; otherwise to remain in full force and effect.

The above-named Principal and Surety hereby jointly and severally agree with the Owner that every claimant, who has not been paid in full at any time up to and including the time of final settlement for the work contracted to be done, file with the Owner, a verified statement of the amount due and unpaid in accordance with Section 38-26-107, C.R.S. Provided, further, that no final settlement between the Owner and the Principal shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied. The Owner shall not be liable for the payment of any costs, attorney fees, or other expenses of any such legal remedies a claimant may have against the Principal or Surety.

SIGNED this _____ day of _____ 2026.

In the presence of:

A-1 Chipseal Company

_____
(Contractor / Principal) Josh Krueger, Vice President

Western Surety Company

_____
(Surety) Jody L. Anderson, Attorney-in-Fact

(Accompany this Bond with Attorney in-fact's authority from the Surety to execute the Bond, certified to include the date of the Bond.)

APPROVED FOR THE OWNER:

_____
BRENT SODERLIN
DIRECTOR OF PUBLIC WORKS AND UTILITIES

Western Surety Company

POWER OF ATTORNEY APPOINTING INDIVIDUAL ATTORNEY-IN-FACT

Know All Men By These Presents, That WESTERN SURETY COMPANY, a South Dakota corporation, is a duly organized and existing corporation having its principal office in the City of Sioux Falls, and State of South Dakota, and that it does by virtue of the signature and seal herein affixed hereby make, constitute and appoint

Jody L Anderson, Evan E Moody, Karen A Feggestad, Tina Marie Post, Bradley J Moody, Andrew J Waterbury, Elizabeth Ostblom, Regina R Fleming, Individually

of Denver, CO, its true and lawful Attorney(s)-in-Fact with full power and authority hereby conferred to sign, seal and execute for and on its behalf bonds, undertakings and other obligatory instruments of similar nature

- In Unlimited Amounts -

and to bind it thereby as fully and to the same extent as if such instruments were signed by a duly authorized officer of the corporation and all the acts of said Attorney, pursuant to the authority hereby given, are hereby ratified and confirmed.

This Power of Attorney is made and executed pursuant to and by authority of the Authorizing By-Laws and Resolutions printed at the bottom of this page, duly adopted, as indicated, by the shareholders of the corporation.

In Witness Whereof, WESTERN SURETY COMPANY has caused these presents to be signed by its Vice President and its corporate seal to be hereto affixed on this 25th day of February, 2026.

WESTERN SURETY COMPANY

Larry Kasten, Vice President

State of South Dakota }
County of Minnehaha } ss

On this 25th day of February, 2026, before me personally came Larry Kasten, to me known, who, being by me duly sworn, did depose and say: that he resides in the City of Sioux Falls, State of South Dakota; that he is a Vice President of WESTERN SURETY COMPANY described in and which executed the above instrument; that he knows the seal of said corporation; that the seal affixed to the said instrument is such corporate seal; that it was so affixed pursuant to authority given by the Board of Directors of said corporation and that he signed his name thereto pursuant to like authority, and acknowledges same to be the act and deed of said corporation.

My commission expires
December 4, 2031

K WALSH
NOTARY PUBLIC
SOUTH DAKOTA

K. Walsh, Notary Public

CERTIFICATE

I, Paula Kolsrud, Assistant Secretary of WESTERN SURETY COMPANY do hereby certify that the Power of Attorney hereinabove set forth is still in force, and further certify that the By-Laws and Resolutions of the corporation printed below this certificate are still in force. In testimony whereof I have hereunto subscribed my name and affixed the seal of the said corporation this day of

WESTERN SURETY COMPANY

Paula Kolsrud, Assistant Secretary

Authorizing By-Laws and Resolutions

ADOPTED BY THE SHAREHOLDERS OF WESTERN SURETY COMPANY

This Power of Attorney is made and executed pursuant to and by authority of the following By-Law duly adopted by the shareholders of the Company.

Section 7. All bonds, policies, undertakings, Powers of Attorney, or other obligations of the corporation shall be executed in the corporate name of the Company by the President, Secretary, and Assistant Secretary, Treasurer, or any Vice President, or by such other officers as the Board of Directors may authorize. The President, any Vice President, Secretary, any Assistant Secretary, or the Treasurer may appoint Attorneys in Fact or agents who shall have authority to issue bonds, policies, or undertakings in the name of the Company. The corporate seal is not necessary for the validity of any bonds, policies, undertakings, Powers of Attorney or other obligations of the corporation. The signature of any such officer and the corporate seal may be printed by facsimile.

This Power of Attorney is signed by Larry Kasten, Vice President, who has been authorized pursuant to the above Bylaw to execute power of attorneys on behalf of Western Surety Company.

This Power of Attorney may be signed by digital signature and sealed by a digital or otherwise electronic-formatted corporate seal under and by the authority of the following Resolution adopted by the Board of Directors of the Company by unanimous written consent dated the 27th day of April, 2022:

"RESOLVED: That it is in the best interest of the Company to periodically ratify and confirm any corporate documents signed by digital signatures and to ratify and confirm the use of a digital or otherwise electronic-formatted corporate seal, each to be considered the act and deed of the Company."

Go to www.cnasurety.com > Owner / Obligee Services > Validate Bond Coverage, if you want to verify bond authenticity.

MOODY
INSURANCE AGENCY

May 12, 2026

City of Littleton
2255 West Berry Avenue
Littleton, CO 81020

RE: A-1 Chipseal Company

Project Name:	2026 Surface Sealing (City Project No. 25-02)
Contract Amount:	$1,984,700.29
Bond No:	30275646

The performance and payment bonds covering the above captioned project were executed by this agency, through Western Surety Company on May 11, 2026.

We hereby authorize the City of Littleton to date all bonds and powers of attorney to coincide with the date of the contract.

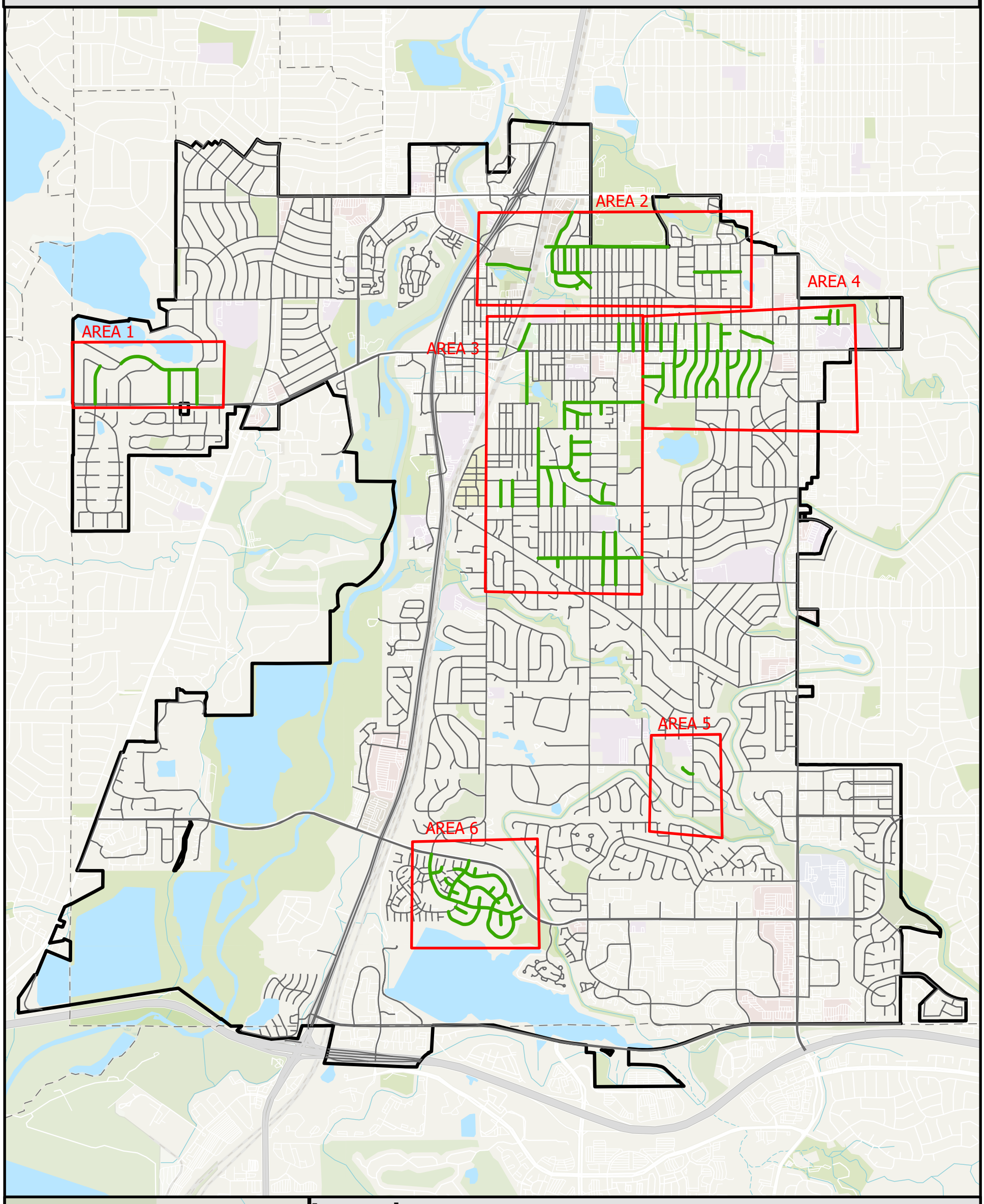
If you should have additional questions or concerns, please do not hesitate to give me a call at 303-824-6600.

Regards,

Karen A. Feggestad
Senior Surety Account Manager

Exhibit E

CITY OF LITTLETON
PAVEMENT PRESERVATION
2026 SLURRY



Legend

- 2026 Slurry Seal
- Slurry Areas 1-6

0 0.25 0.5 Miles

N

Littleton Colorado

Latest Update: 2/19/2026

CITY OF LITTLETON
PAVEMENT PRESERVATION
2026 SLURRY

AREA 1

S LUPINE DRIVE

BOWLES AVE

BELLFLOWER

TULE LAKE DR

BLUESAGE DR

Trailmark

TRAILMARK

Legend

2026 Slurry Seal

Slurry Areas 1-6

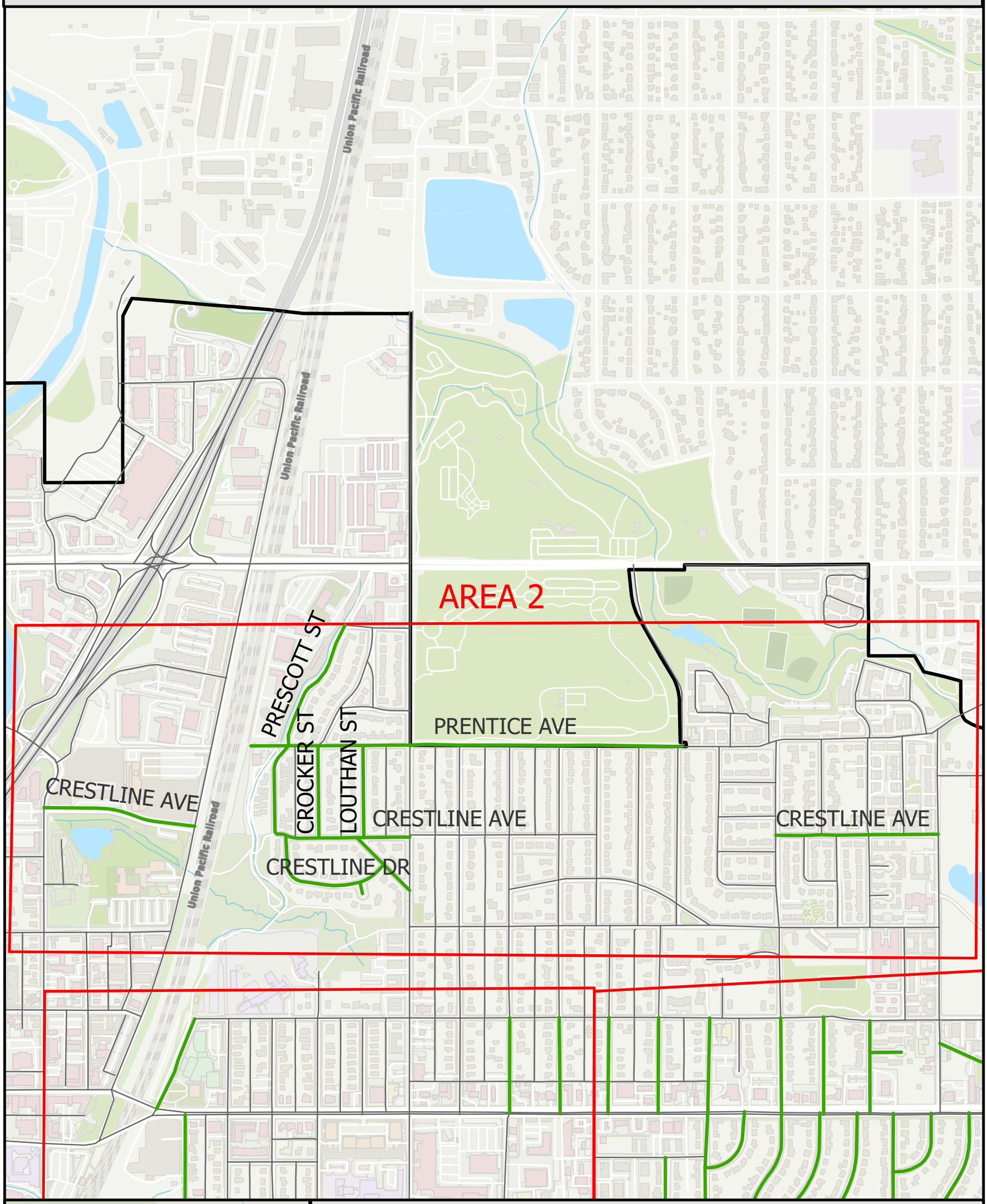
0 0.25 0.5 Miles

N

Littleton Colorado

Latest Update: 2/19/2026

CITY OF LITTLETON
PAVEMENT PRESERVATION
2026 SLURRY



Legend

- 2026 Slurry Seal
- Slurry Areas 1-6

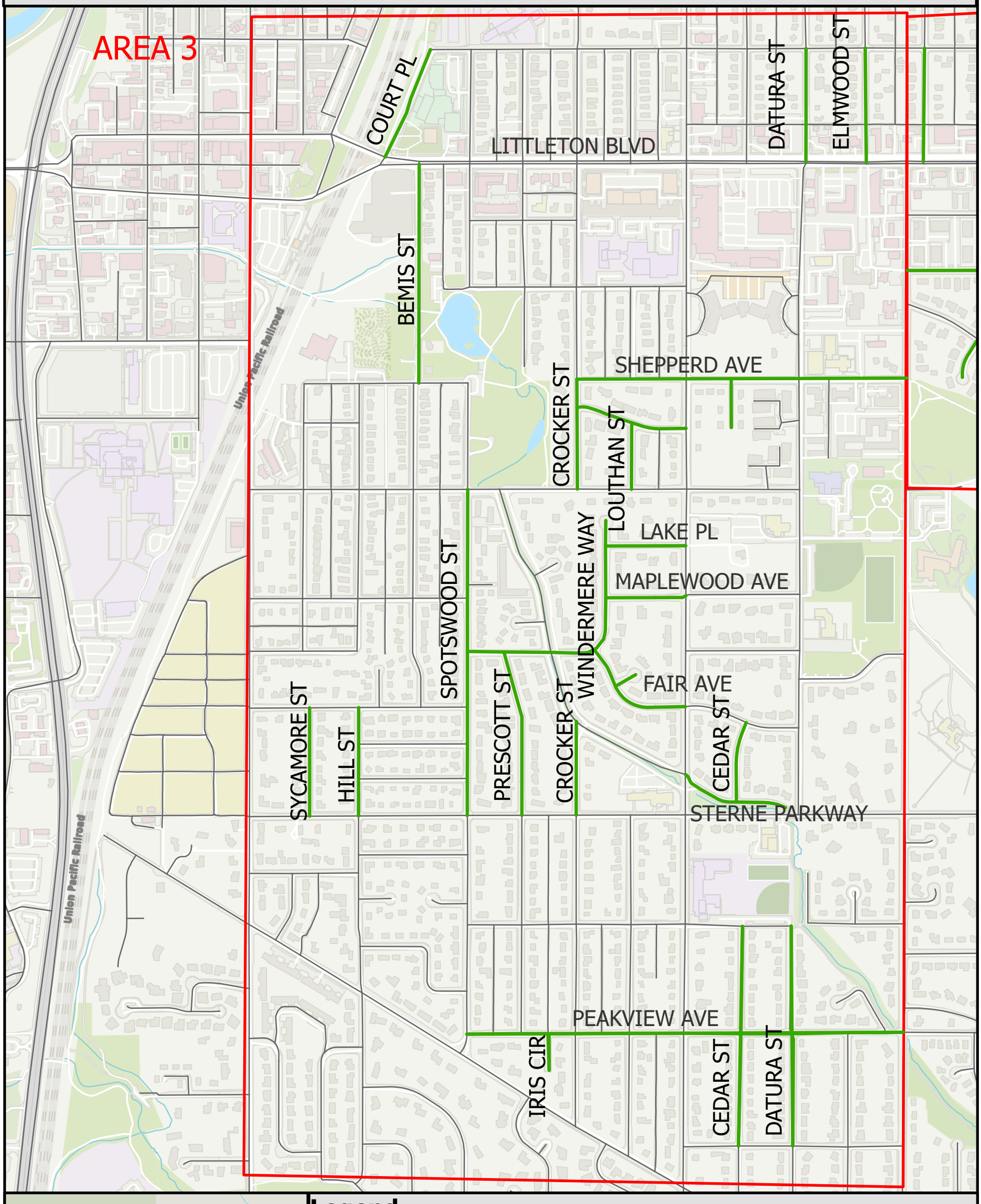
0 0.25 0.5 Miles

N

Littleton Colorado

Latest Update: 2/19/2026

CITY OF LITTLETON
PAVEMENT PRESERVATION
2026 SLURRY



Legend

- 2026 Slurry Seal
- Slurry Areas 1-6

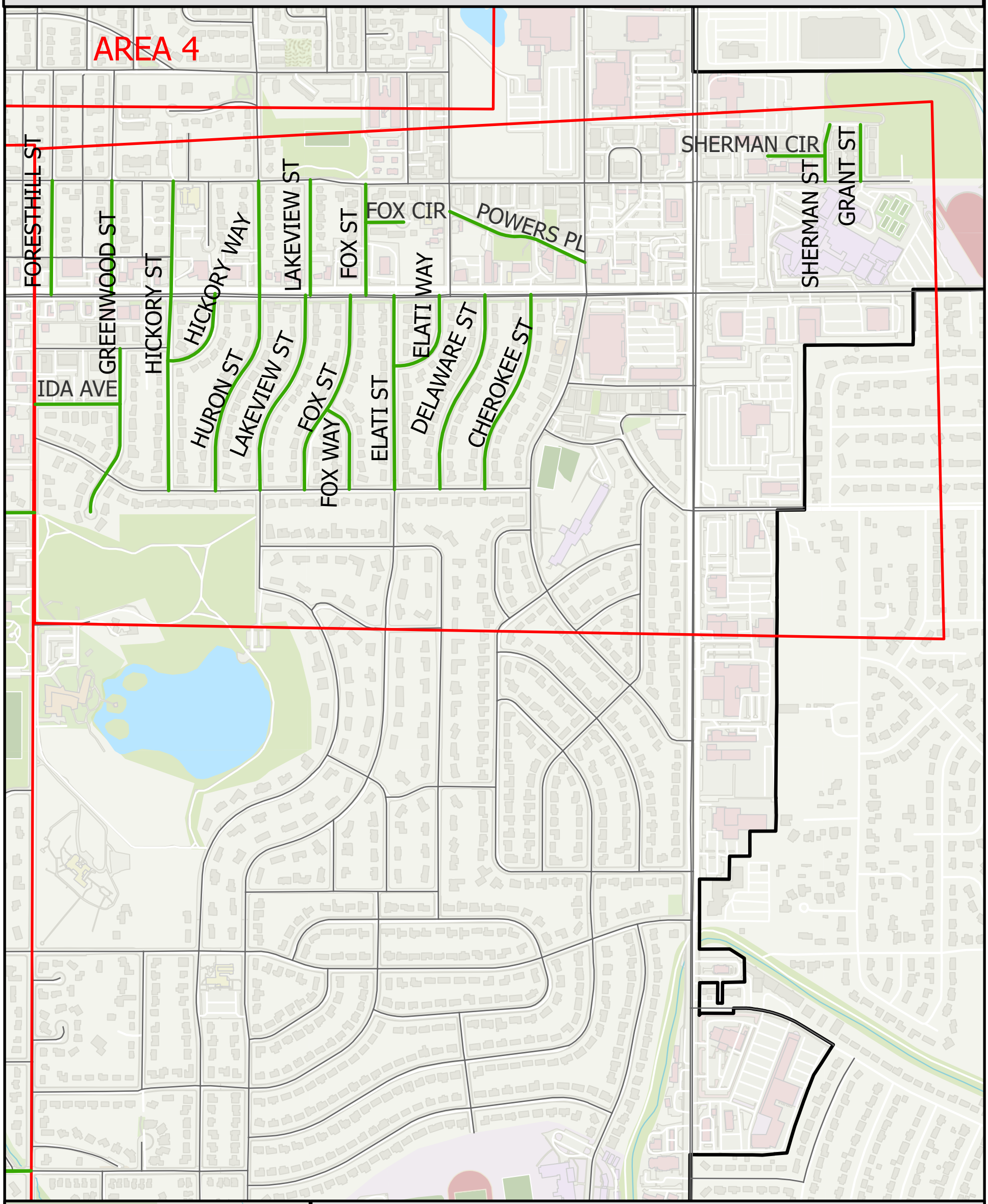
0 0.25 0.5 Miles

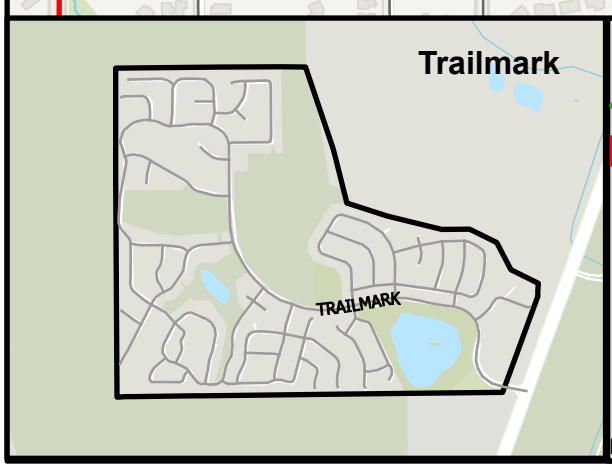
N

Littleton Colorado

Latest Update: 2/19/2026

CITY OF LITTLETON
PAVEMENT PRESERVATION
2026 SLURRY





Legend

- 2026 Slurry Seal
- Slurry Areas 1-6

0 0.25 0.5 Miles

N

Littleton Colorado

Latest Update: 2/19/2026

CITY OF LITTLETON
PAVEMENT PRESERVATION
2026 SLURRY

AREA 5

FREMONT COURT

Trailmark

TRAILMARK

Legend

2026 Slurry Seal

Slurry Areas 1-6

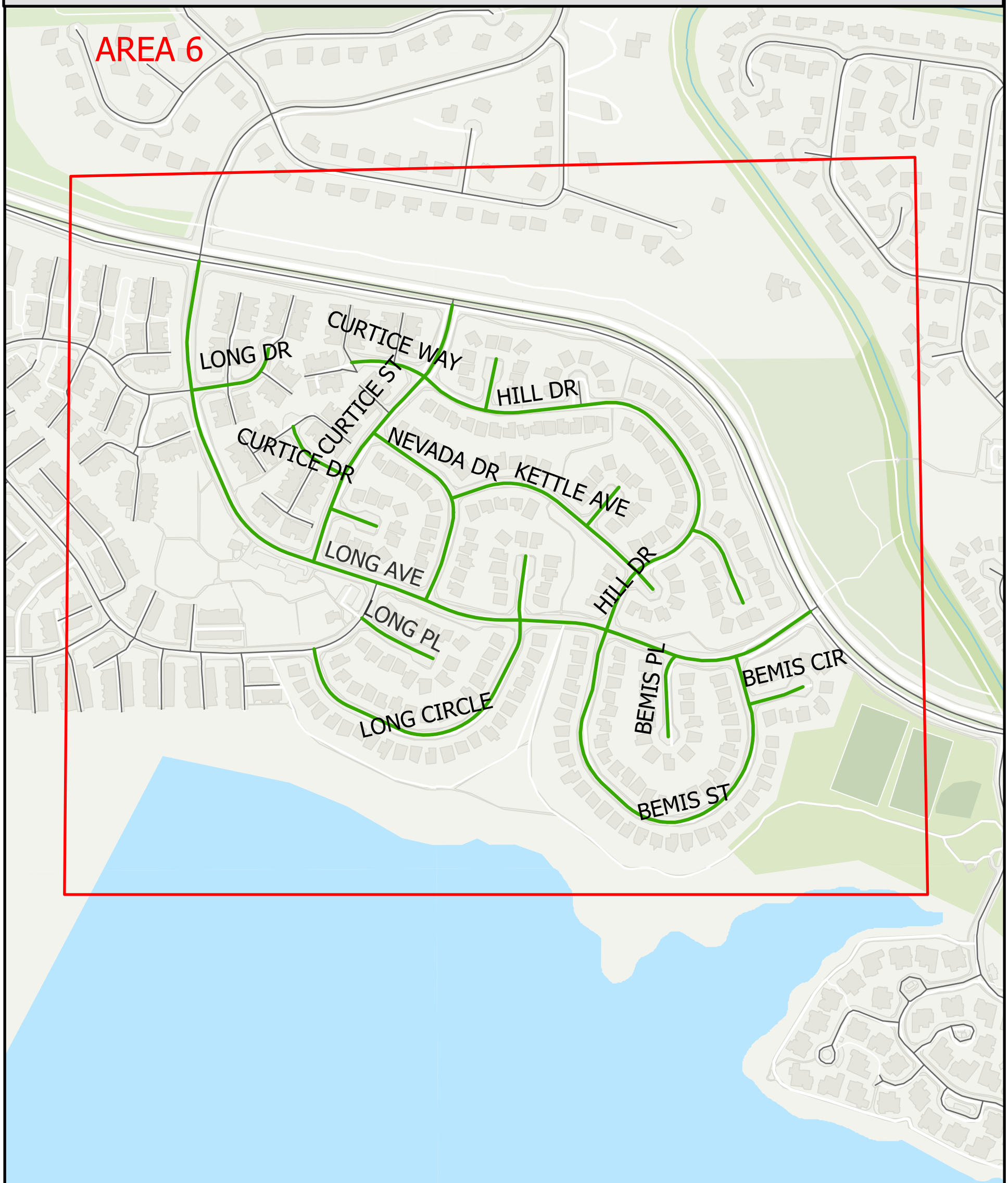
0 0.25 0.5 Miles

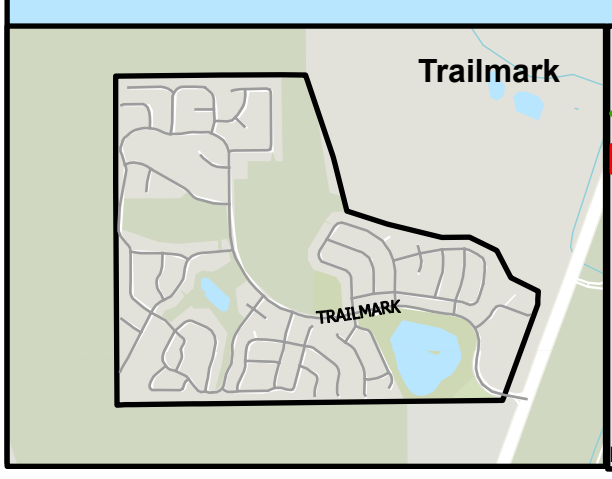
N

Littleton Colorado

Latest Update: 2/19/2026

CITY OF LITTLETON
PAVEMENT PRESERVATION
2026 SLURRY





Legend

- 2026 Slurry Seal
- Slurry Areas 1-6

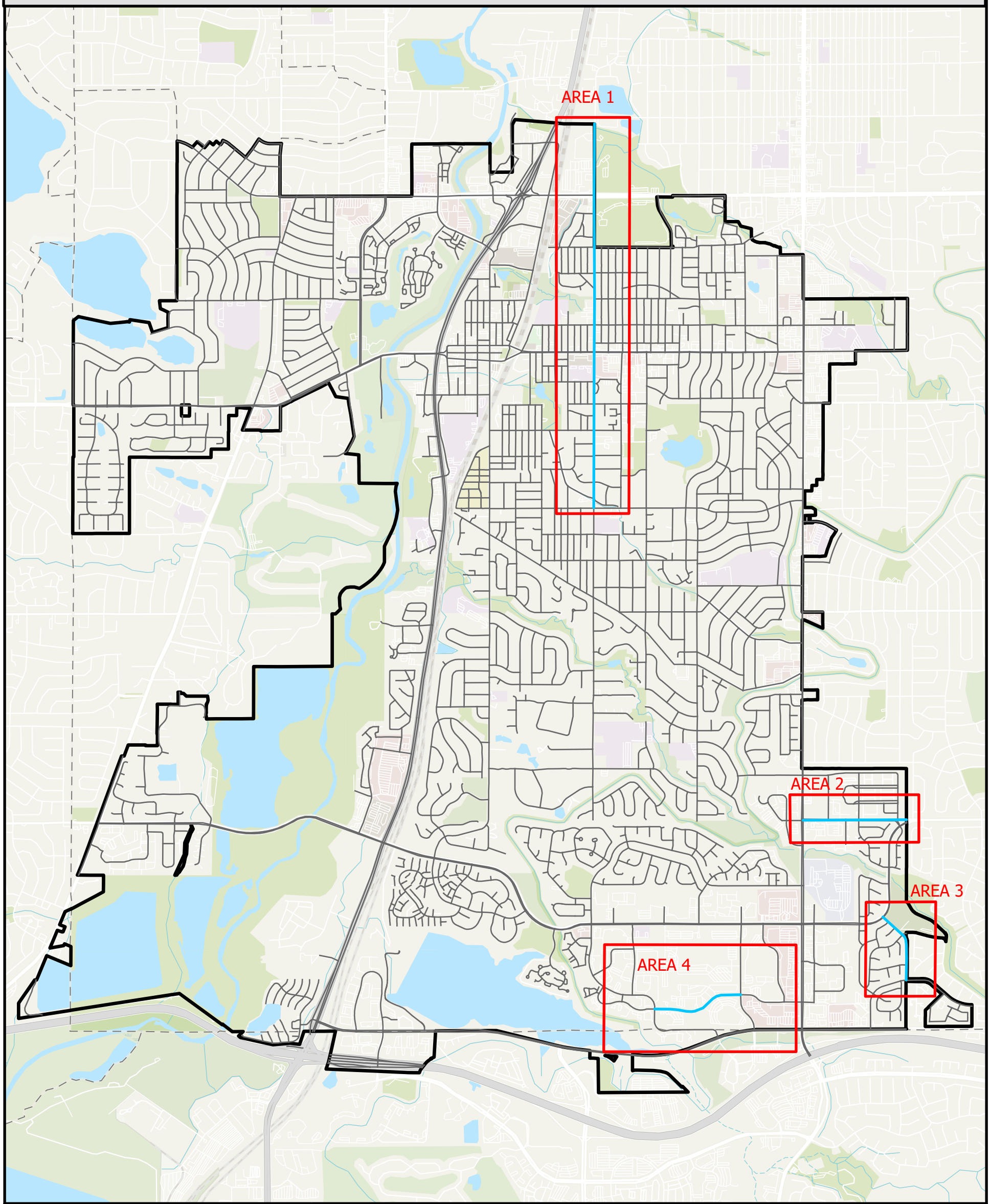
0 0.25 0.5 Miles

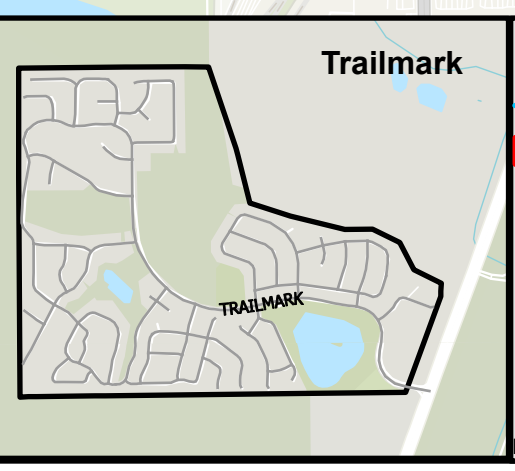
N

Littleton Colorado

Latest Update: 2/19/2026

CITY OF LITTLETON
PAVEMENT PRESERVATION
2026 CHIP SEAL





Legend

- 2026 Chip Seal
- Chip Seal Areas 1-4

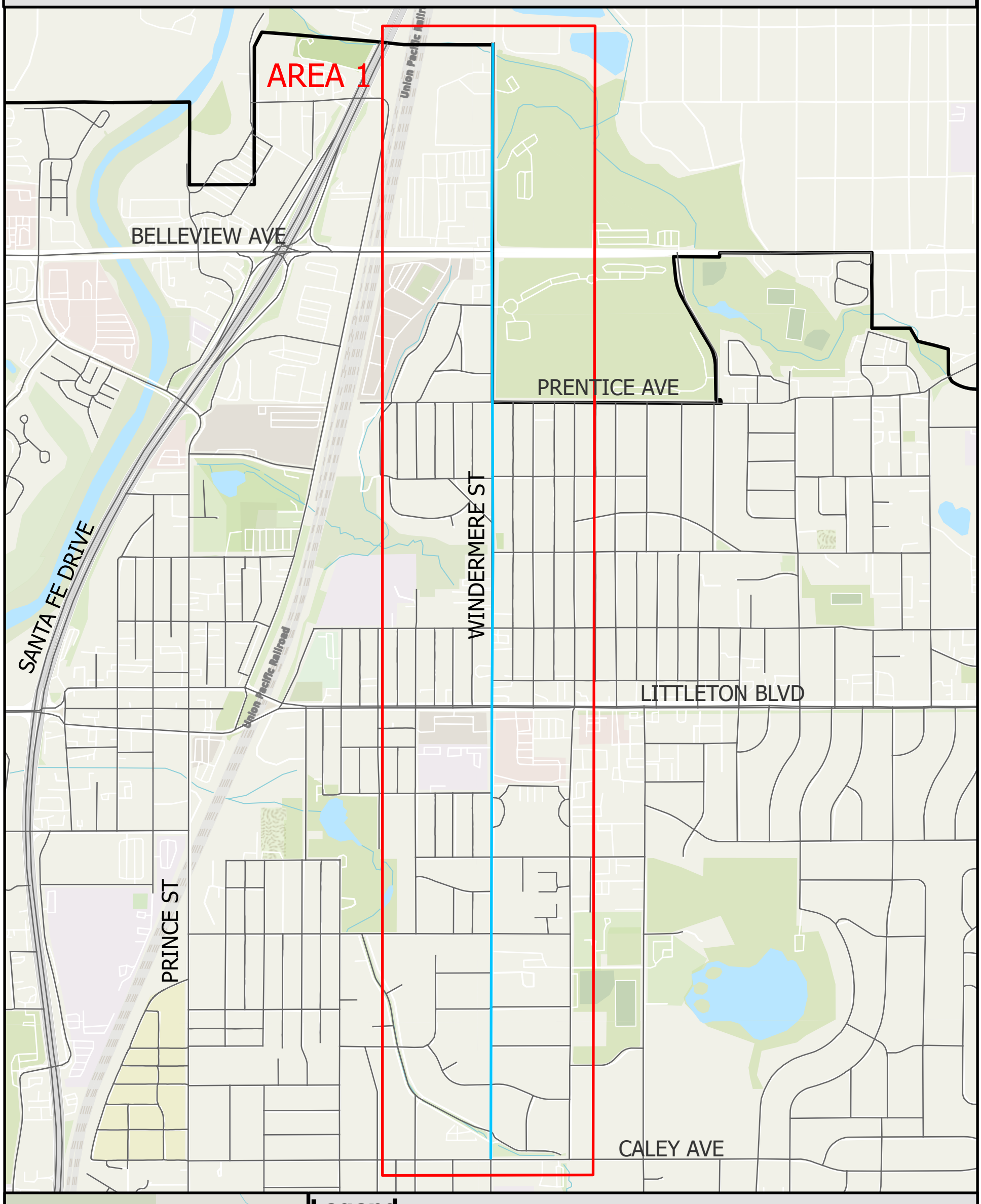
0 0.25 0.5 Miles

N

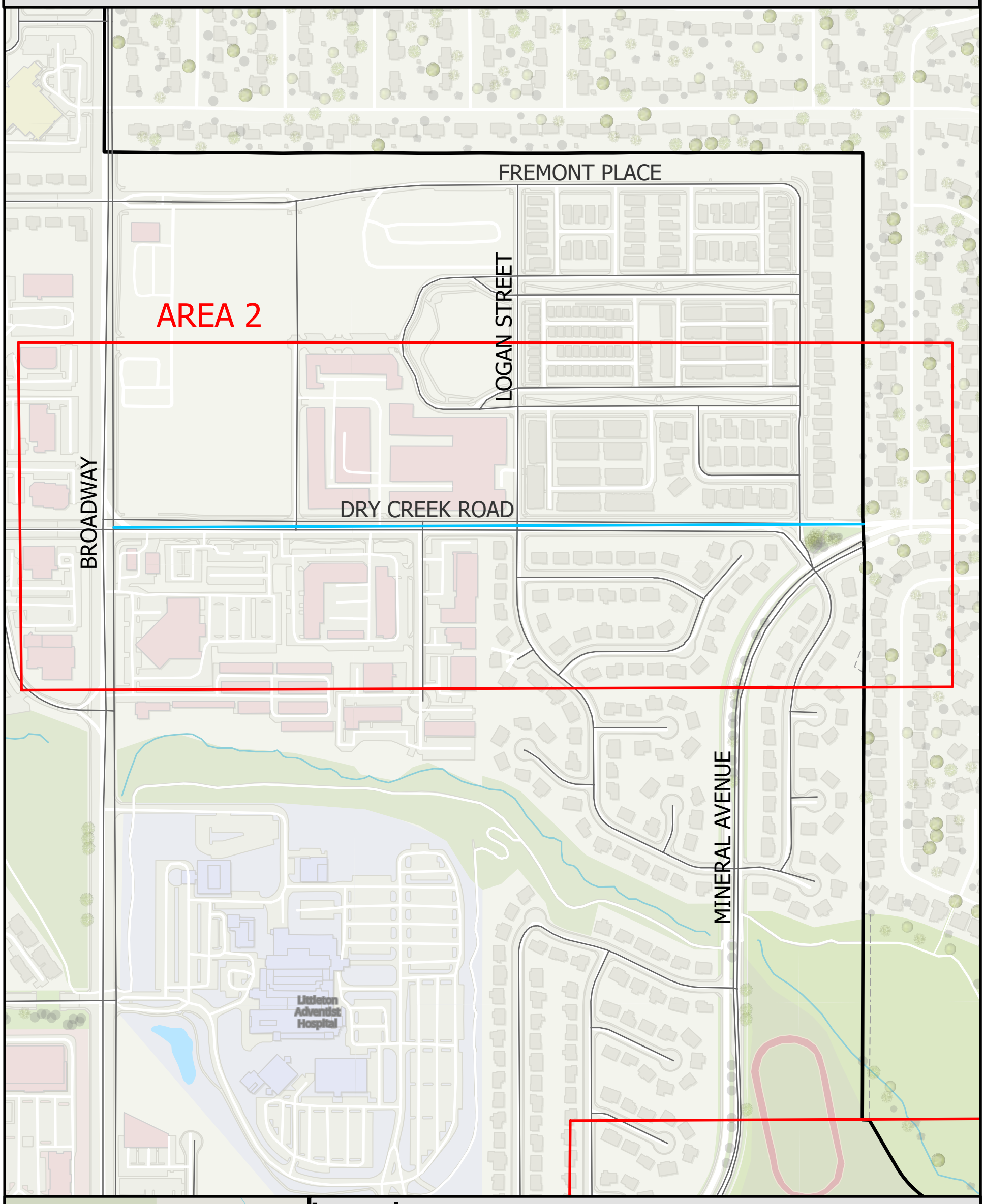
Littleton Colorado

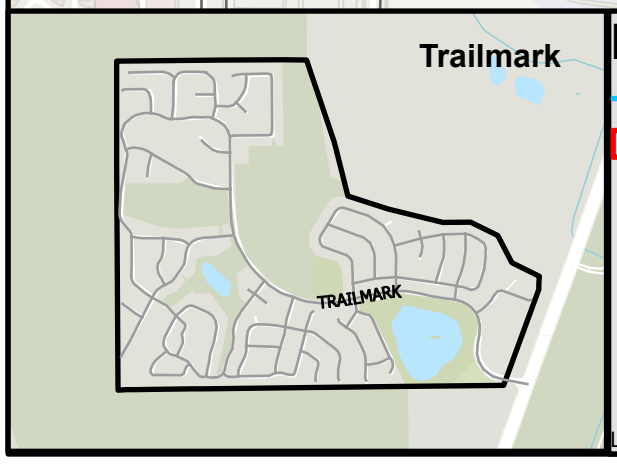
Latest Update: 2/26/2026

CITY OF LITTLETON
PAVEMENT PRESERVATION
2026 CHIP SEAL



CITY OF LITTLETON
PAVEMENT PRESERVATION
2026 CHIP SEAL





Legend

- 2026 Chip Seal
- Chip Seal Areas 1-4

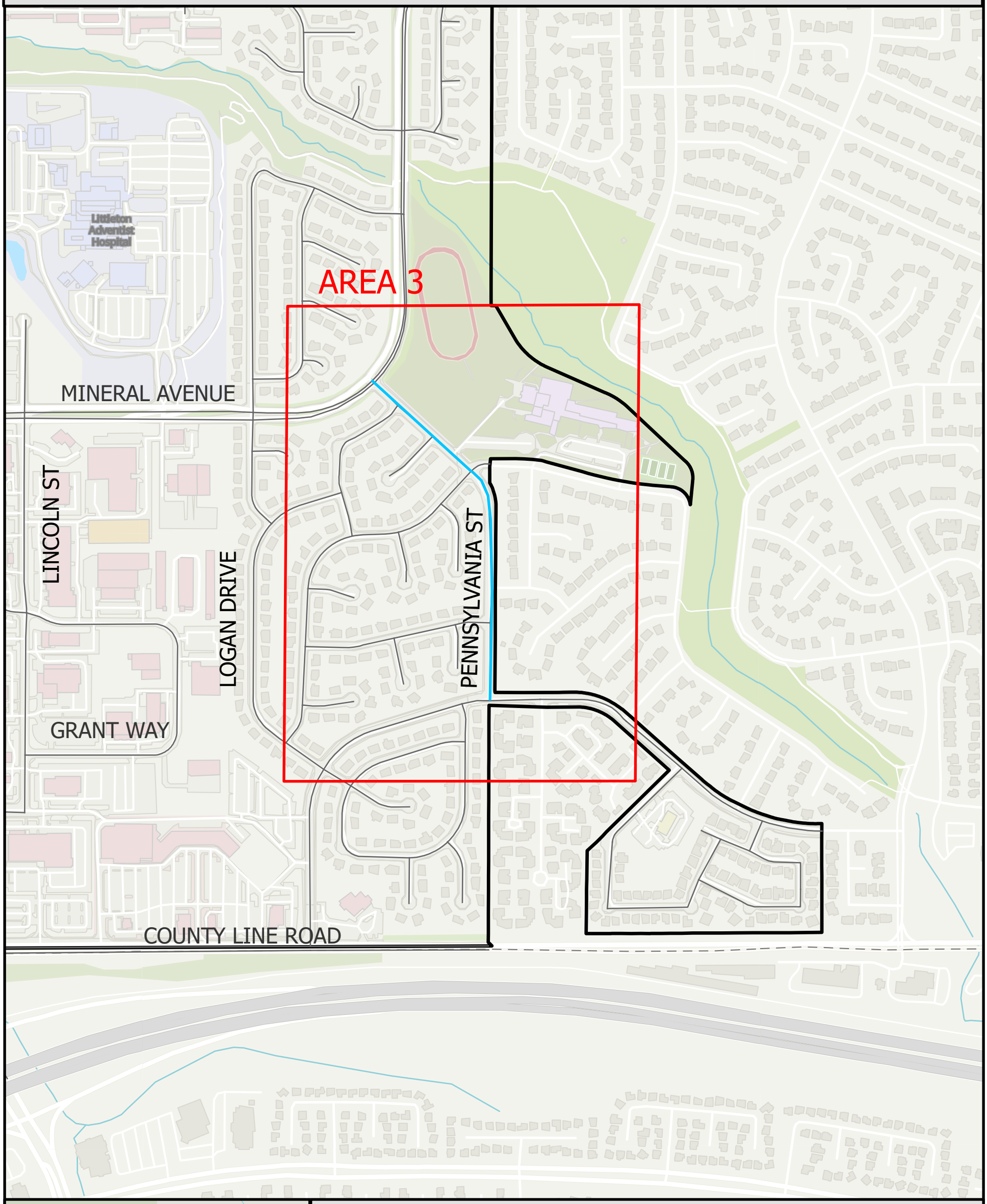
0 0.25 0.5 Miles

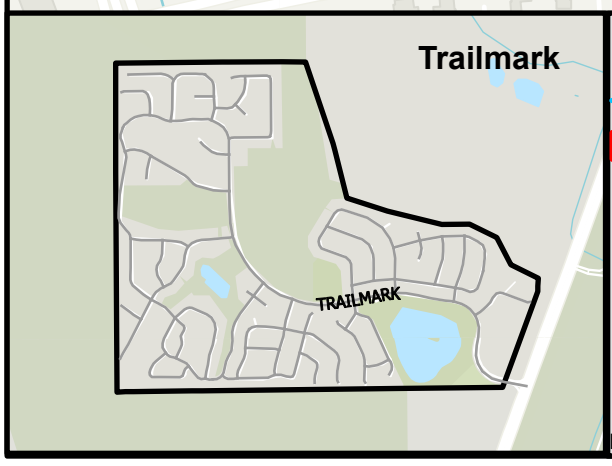
N

Littleton Colorado

Latest Update: 2/26/2026

CITY OF LITTLETON
PAVEMENT PRESERVATION
2026 CHIP SEAL





Legend

- 2026 Chip Seal
- Chip Seal Areas 1-4

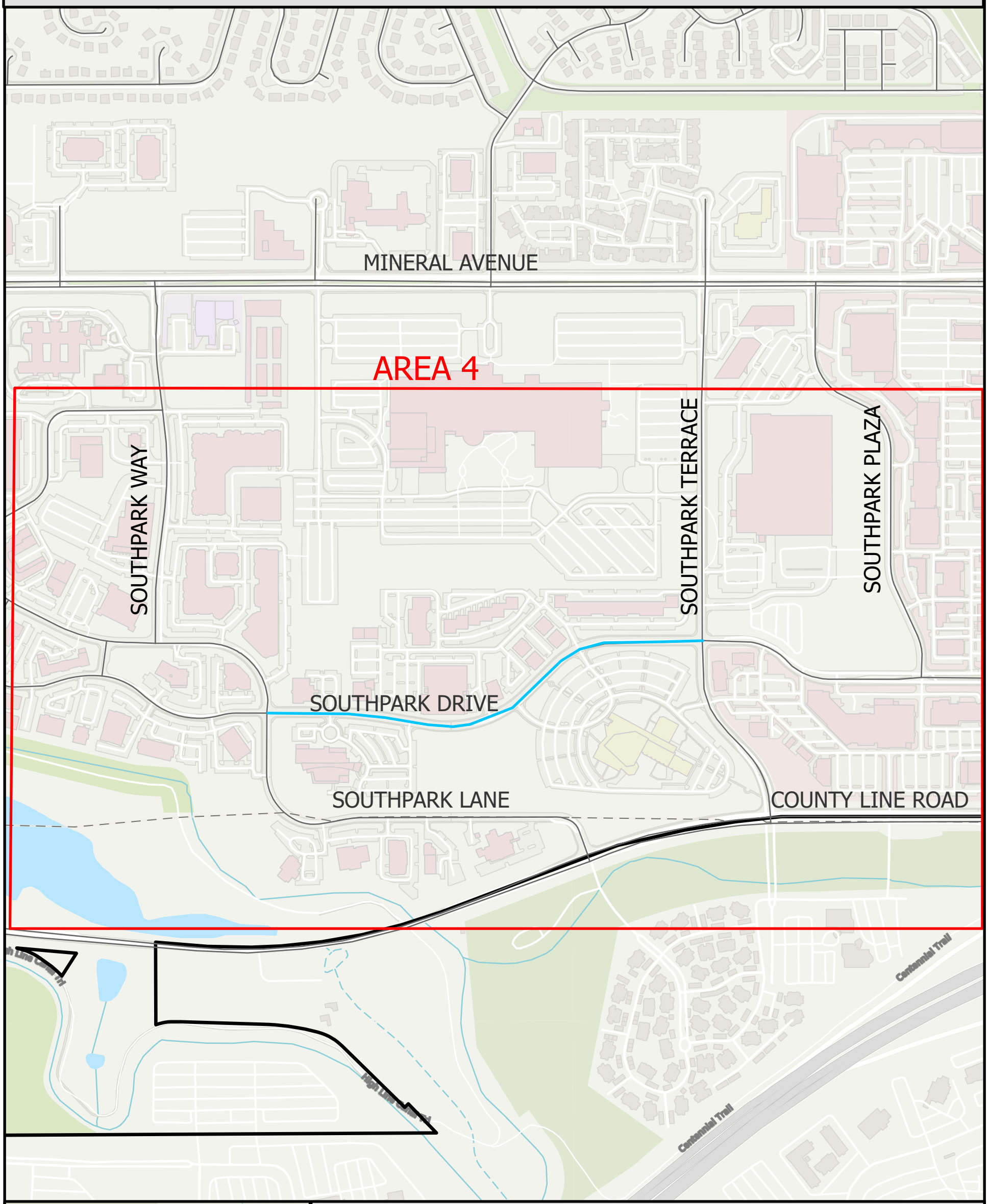
0 0.25 0.5 Miles

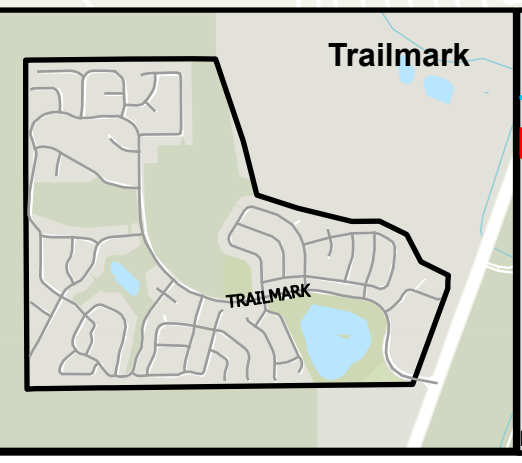
N

Littleton Colorado

Latest Update: 2/26/2026

CITY OF LITTLETON
PAVEMENT PRESERVATION
2026 CHIP SEAL





Legend

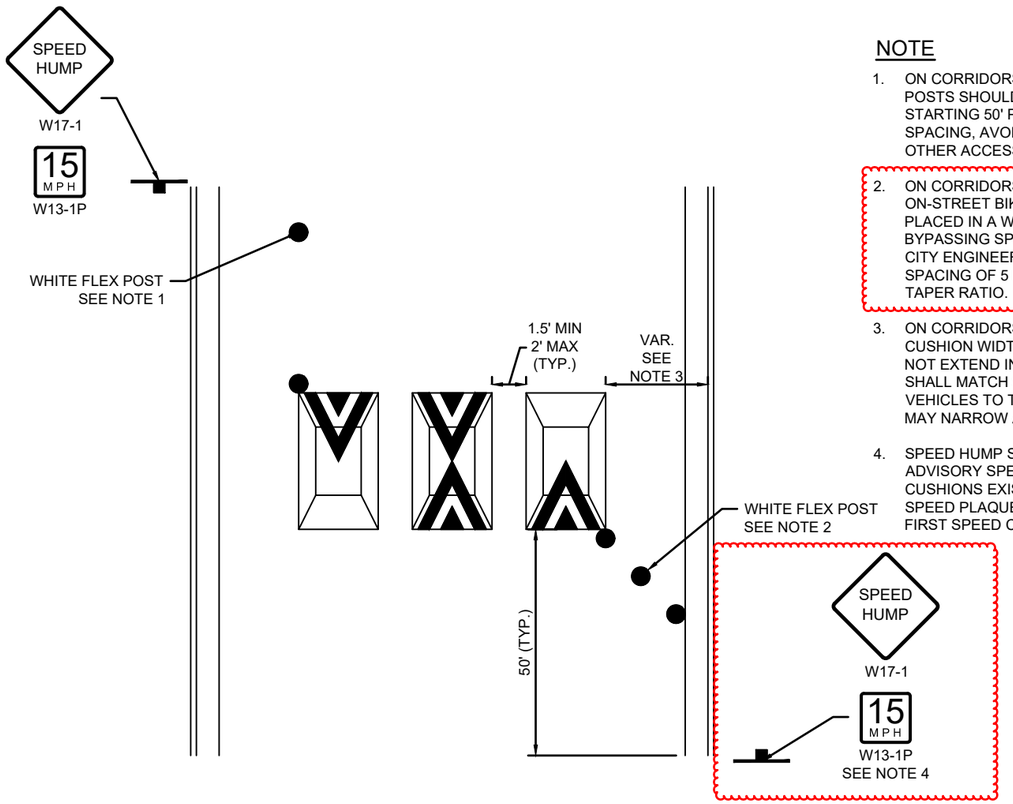
- 2026 Chip Seal
- Chip Seal Areas 1-4

0 0.25 0.5 Miles

N

Littleton Colorado

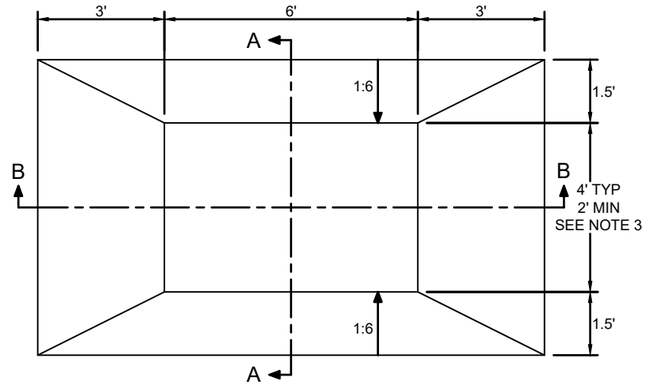
Latest Update: 2/26/2026



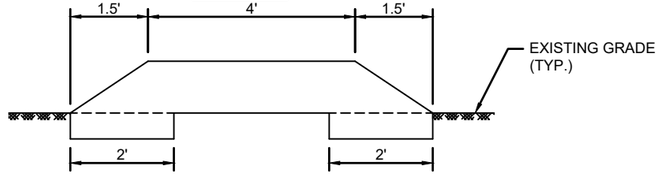
NOTE

1. ON CORRIDORS WITH ON-STREET BIKE LANES, FLEX POSTS SHOULD BE PLACED ON THE APPROACH STARTING 50' PRIOR TO SPEED CUSHIONS AT 10' SPACING, AVOIDING DRIVEWAYS, CROSSINGS, AND OTHER ACCESSES.
2. ON CORRIDORS WITH ON-STREET PARKING BUT NO ON-STREET BIKE LANES, FLEX POSTS SHOULD BE PLACED IN A WAY TO PREVENT VEHICLES FROM BYPASSING SPEED CUSHIONS, AS APPROVED BY THE CITY ENGINEER, WITH A RECOMMENDED MAXIMUM SPACING OF 5 FEET, EQUALLY SPACED OVER A 2:1 TAPER RATIO.
3. ON CORRIDORS WITH ON-STREET BIKE LANES, SPEED CUSHION WIDTH AND SPACING SHALL BE DESIGNED TO NOT EXTEND INTO BIKE LANE. CENTER SPEED CUSHION SHALL MATCH STANDARD TO ALLOW EMERGENCY VEHICLES TO TRAVERSE. OUTSIDE SPEED CUSHIONS MAY NARROW AT TOP TO A MINIMUM WIDTH OF 2 FEET.
4. SPEED HUMP SIGN SHOULD BE SUPPLEMENTED WITH ADVISORY SPEED PLAQUE. IF A SERIES OF SPEED CUSHIONS EXISTS IN CLOSE PROXIMITY, ADVISORY SPEED PLAQUE MAY BE ELIMINATED ON ALL BUT THE FIRST SPEED CUSHION IN THE SERIES.

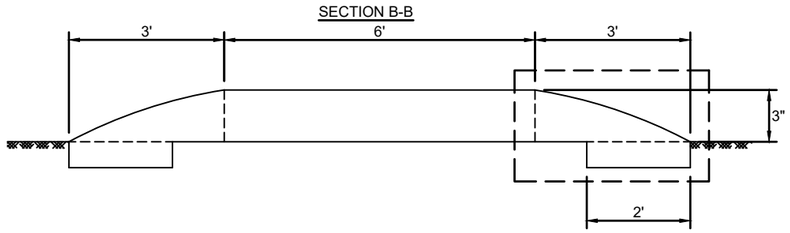
CUSHION PLAN VIEW



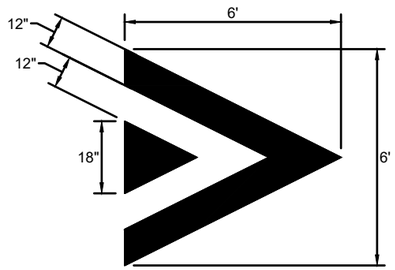
SECTION A-A

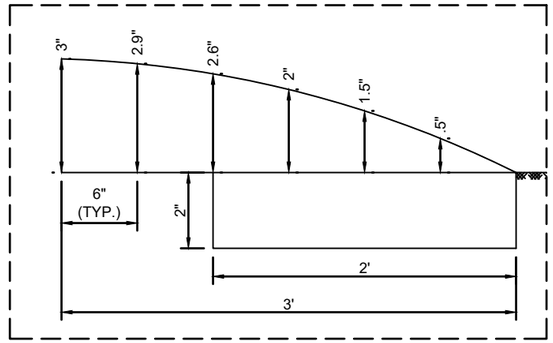


SECTION B-B



PAVEMENT MARKING DETAIL





DIMENSIONS IN DETAIL ABOVE ONLY APPLICABLE TO CONCRETE AND ASPHALT SPEED CUSHIONS

SPEED CUSHION

Littleton Colorado

DAVID EVANS AND ASSOCIATES INC.
1600 Broadway Street Suite 800
Denver Colorado 80202
Phone: 720.946.0969

LITTLETON TRAFFIC CALMING DESIGN GUIDANCE

SHEET 1

SHUR-FLEX® SURFACE MOUNT WHITE
36" POST W/ 7X7 WHITE BASE
#EW7C36WP3 (AS CONFIGURED)

Post Type:	
X	Round Top
	Flat Top

Post Colors:	
X	(W) White
	(Y) Yellow
	(O) Orange
	(B) Black

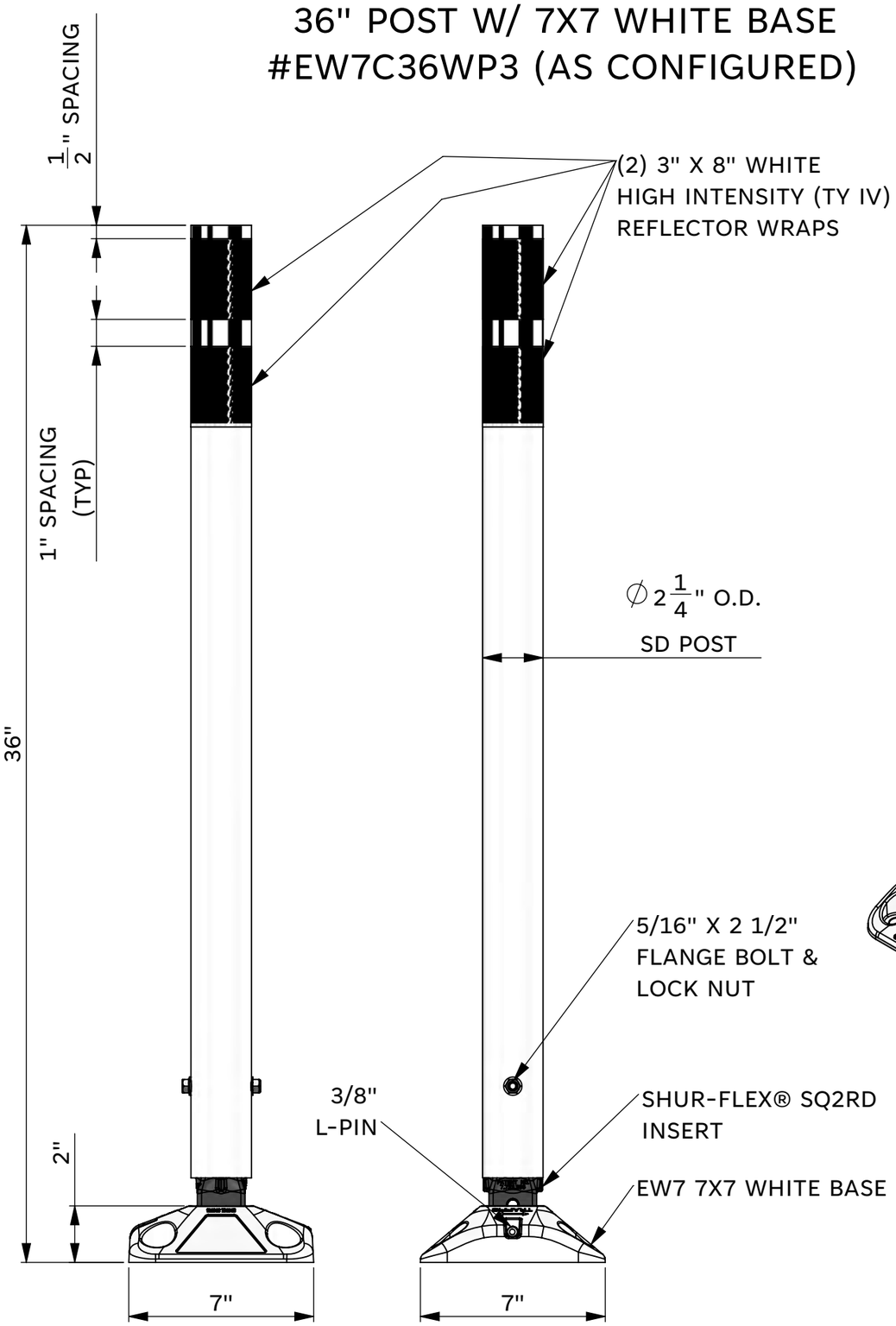
Base Colors:	
X	(W) White
	(Y) Yellow
	(O) Orange
	(B) Black

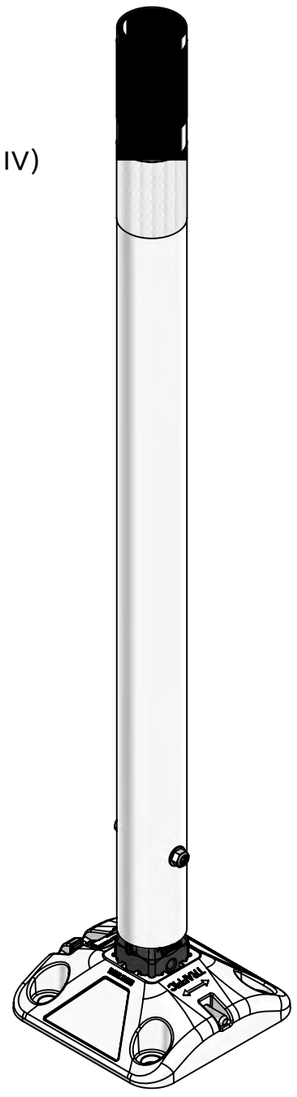
Post Height:	
	18"
	24"
	28"
X	36"
	42"
	48"
	54"
	60"

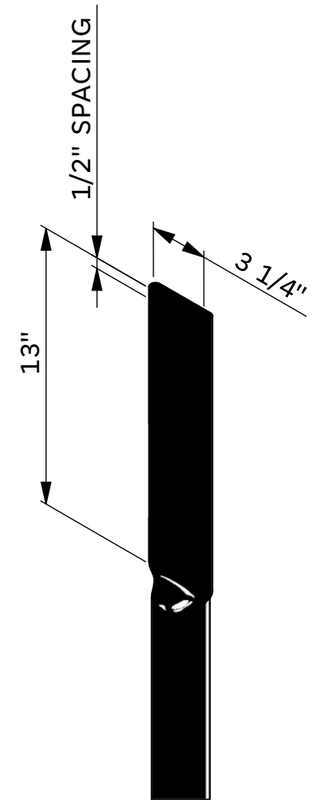
Sheeting Type:	
X	Type III/IV High Intensity
	Type V AR1000
	Type XI Diamond Grade

Sheeting Size:	
	3" X 3"
	3" X 4"
X	3" X 8" (Wraps)
	3" X 9"
	3" X 12"

Sheeting Colors:	
X	(W) White
	(Y) Yellow
	(O) Orange
	(R) Red
	(G) Green
	(B) Blue







OPTIONAL FLAT TOP

SHUR-TITE® PRODUCTS
(512) 218-9500
www.shur-tite.com

Title:

SHUR-FLEX® SURFACE MOUNT 36" WHITE POST

Date:	Item #:
09/12/23	EW7C36WP3

SHUR-TITE®

1920 North Weaver
Gainesville, TX 76240

512-218-9500

sales@shur-tite.com
www.shur-tite.com

SHUR-FLEX® SURFACE MOUNT

INSTALLATION INSTRUCTIONS

- Use supplied 5/8” green nylon plugs and ½” x 3-½” hex lag bolts with washers. Using a hammer drill with an industrial 5/8” diameter bit, drill 4 ea - 5/8” diameter holes 3-½” deep using the base as your pattern. Blow the holes clean.
- Insert the nylon plugs into the holes so the top of the plugs are flush with the surface of the roadway. Note: the top of the plugs must fit flush with the surface of the roadway.
- Position the base over the holes with plugs in place and screw the ½” lag bolts with the washers into the nylon plug and tighten. Use a ¾” socket to tighten bolts snugly to a (torque rating of min 30 - max 38 ft lbs). An impact wrench is recommended, however “DO NOT OVER TIGHTEN”.
- After securing the base, insert the post into the base and secure with the L-Pin.
- When installing the 7” x 10” fixed base, you may use the center mounting holes if the base is being placed on a narrow headwall.

7” x 7” Fixed Base

Fixed Base Anchor Bolts

7” x 10” Fixed Base

ZICLA®

Zebra Family® Products User Guide and Installation Manual.

Accessible, inclusive, friendly streets with a small environmental footprint.

Index.

ABOUT THE USER GUIDE AND INSTALLATION MANUAL.

Ever since 2005 ZICLA has been supporting cities in the transformation process they need to undergo to deal with the challenges of the 21st century. Over the years, we have worked to help make city streets more accessible, sustainable, inclusive and friendly. Our products allow cities to improve mobility, traffic and accessibility, always using recycled materials.

It is estimated that, by 2050, 70% of the world's population will live in cities. Our challenge is to help make the streets of these cities accessible, inclusive and friendly with a small environmental footprint.

The Zebra Family® products includes the Zebra® and Zebra® | Zero bike lane separators and the Zebra® | Planter. All of them allow the rapid transformation of city streets through the construction of bike lanes and widening of the sidewalks and narrowing of the streets at intersections. In the case of bike lanes, the Zebra® and Zebra® | Zero bike lane separators protect cyclists and prevents other vehicles from invading them. All the Zebra Family® products are recycled, recyclable, reusable, competitive and resistant to weathering.

Only recycled materials are used in the manufacture of the Zebra Family® products.

- Zebra® and Zebra® | Zero bike lane separators two different recycled materials are used in the manufacture of these bike lane separators:

  - The Zebra® bike lane separators are manufactured with various mixtures of industrial and post-consumer plastic waste, basically PVC from remnants of tarpaulins, hoses, coating of electrical cables, off-standard items, etc.

  - The Zebra® | Zero bike lane separators are manufactured with a material developed entirely from municipal post-consumer waste. This waste comes from the rejection of packaging plants and is made up of all mixed plastic waste whose type separation would be very complex and expensive, and which usually ends up or is deposited in landfills or incinerated.

- Zebra® | Planter:

  - The Zebra® | Planter is made from Linear Low Density Polyethylene (LLDPE) originating from the manufacturing processes of various rotomolded products and consisting mainly of parts that do not pass quality control or that are distorted, contaminated, with errors of weight, color, etc. such as pots, containers, septic tanks, water tanks, furniture, lighting, etc

More information on these materials can be found in the materials section of this Guide.
ZICLA offers this guide and this manual to technicians to show the wide range of configurations that it is possible to build on the streets with the Zebra Family® products.

ABOUT LIABILITY ARISING FROM THE INSTALLATION AND USE OF ZICLA PRODUCTS.

ZICLA shall not be liable for any damage or prejudice arising from the installation or use of its products.

The advice that ZICLA provides to the customer in the form of proposals for solutions, configurations and customizations of the products marketed, will be purely advisory and will be carried out with the sole objective of helping the customer to make his decisions, it is the sole responsibility of the customer to adopt the final solutions, configurations and/or customizations and to ensure that they comply with urban planning regulations, traffic, safety or any other type that is applicable and in force at the time and location in each case, with the customer being solely and exclusively responsible for any damages that may arise from its actions, omission and/or non-compliance with implementing legislation.

ZICLA®

Vol. 1 – User Guide.

Accessible, inclusive, friendly streets with a small environmental footprint.

Index Vol.1

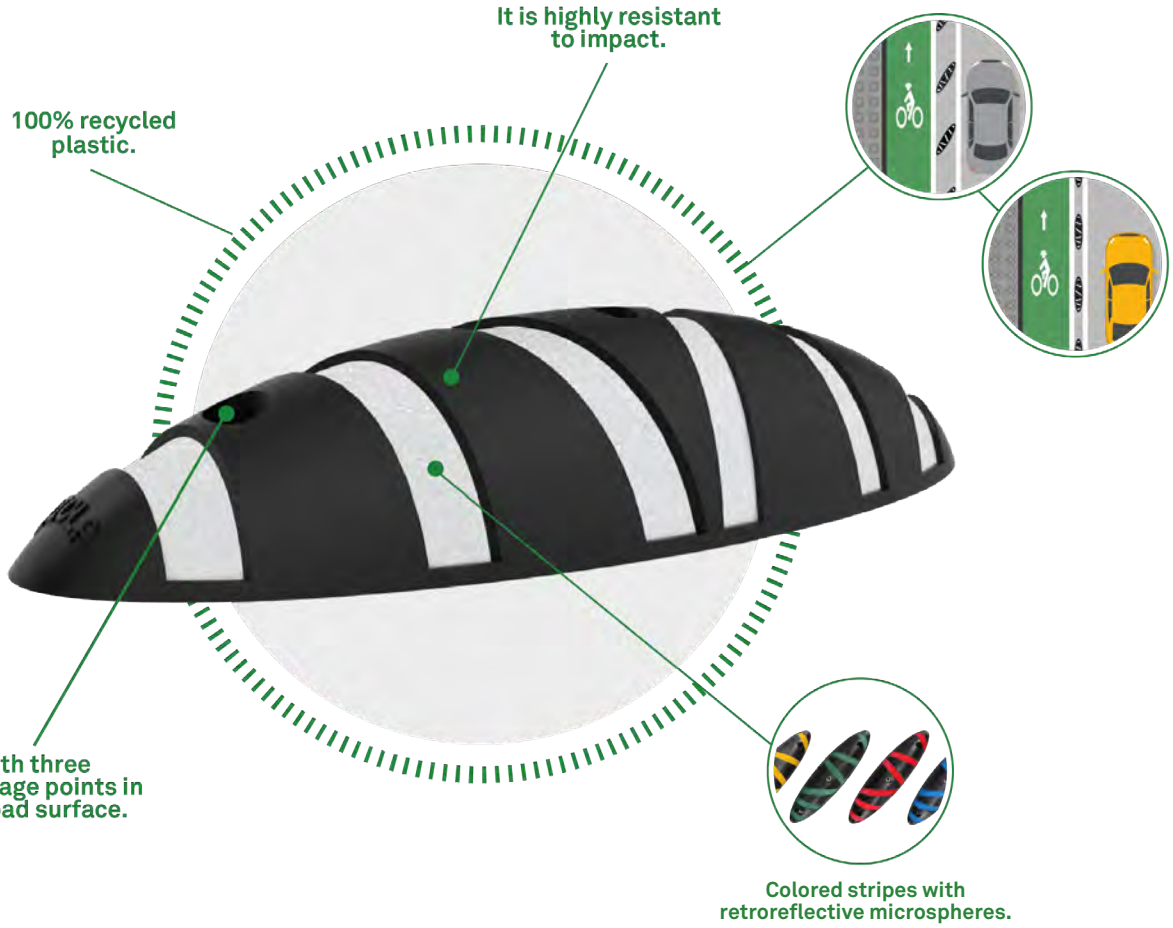
Zebra Family® Cycle Lane Separators.

The products of the Zebra Family® have been designed to improve the safety of citizens in the streets of cities and, especially, of users of bike paths.

1. They can be adapted to any kind of road surface.
2. They are highly visible thanks to the fact that almost 40% of their surface is retroreflective.
3. They are made with recycled plastic, so their environmental impact is minimal. They are ecodesigned products.
4. They are highly resistant to impact and bad weather and they have various anchorage points in the road surface.
5. They are competitive because they make it possible to carry out a project with minimal intervention on the public roads.

Zebra®.

Zebra® cycle lane separators are available in three sizes: **Zebra® 13, Zebra® 9 and Zebra® 5.**

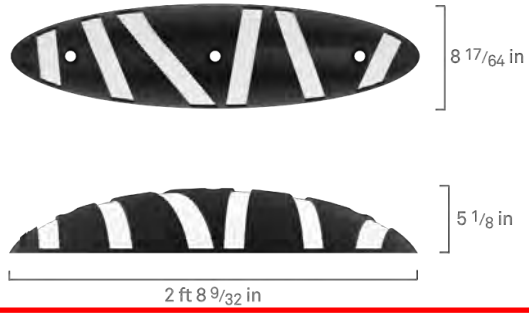


Garantía de calidad ambiental

Zebra® 13

18 lb 12 oz

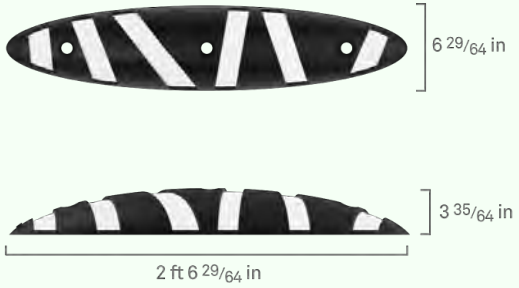
19 lb 13 oz of CO_2 equiv/u



Zebra® 9

9 lb 15 oz

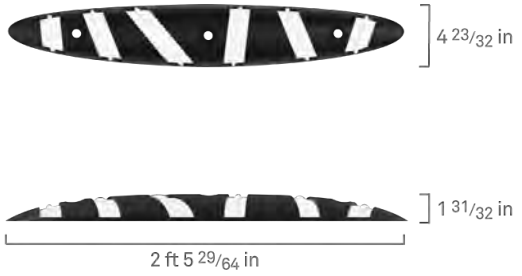
12 lb 9 oz of CO_2 equiv/u



Zebra® 5

4 lb 3 oz

7 lb 2 oz of CO_2 equiv/u



Zebra® | Zero.

Zebra® | Zero separators are available in two sizes **Zebra® 13 | Zero** and **Zebra® 9 | Zero.**

100%
recycled plastic
post consumption

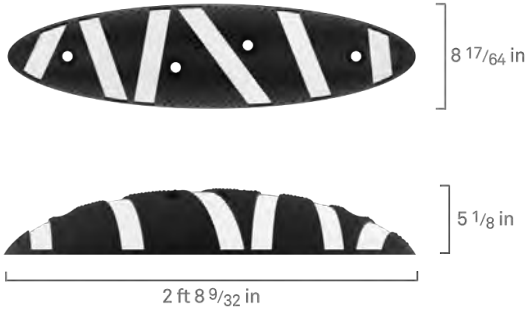
BLAUER ENGEL
DAS UMWELTZEICHEN

The Emblem of Guarantee
of Environmental Quality

Zebra® 13 | Zero

13 lb 7 oz

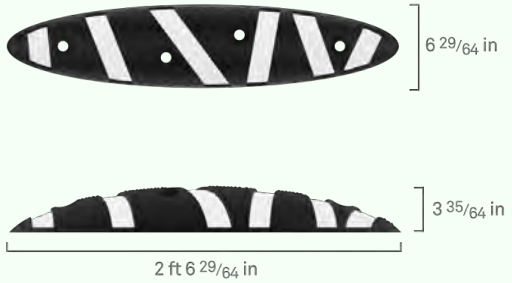
11 lb 10 oz of CO_2 equiv/u



Zebra® 9 | Zero

7 lb 8 oz

8lb 6 oz of CO_2 equiv/u

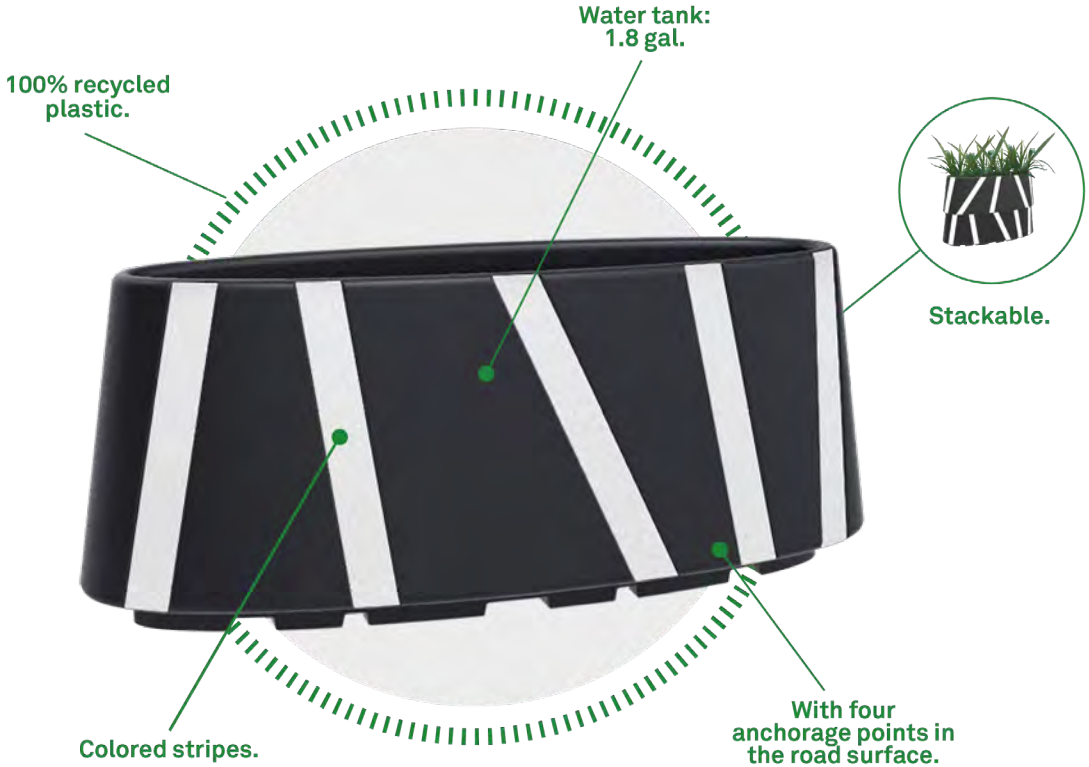


Zebra® | Planter.

The Zebra® | Planter cycle lane separator is a stackable element.

100%
recycled plastic

The Emblem of Guarantee of Environmental Quality

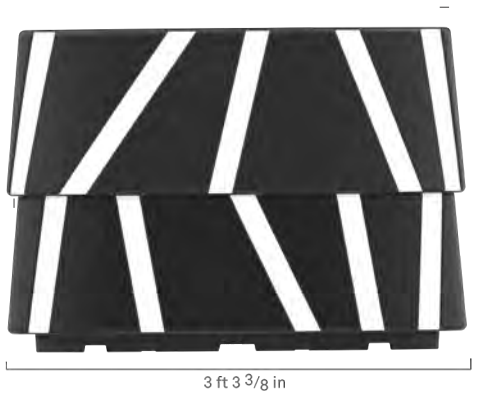


17 lb 10 oz

20 lb 16 oz of CO_2 equiv/u

35 lb 4 oz

41 lb 16 oz of CO_2 equiv/u



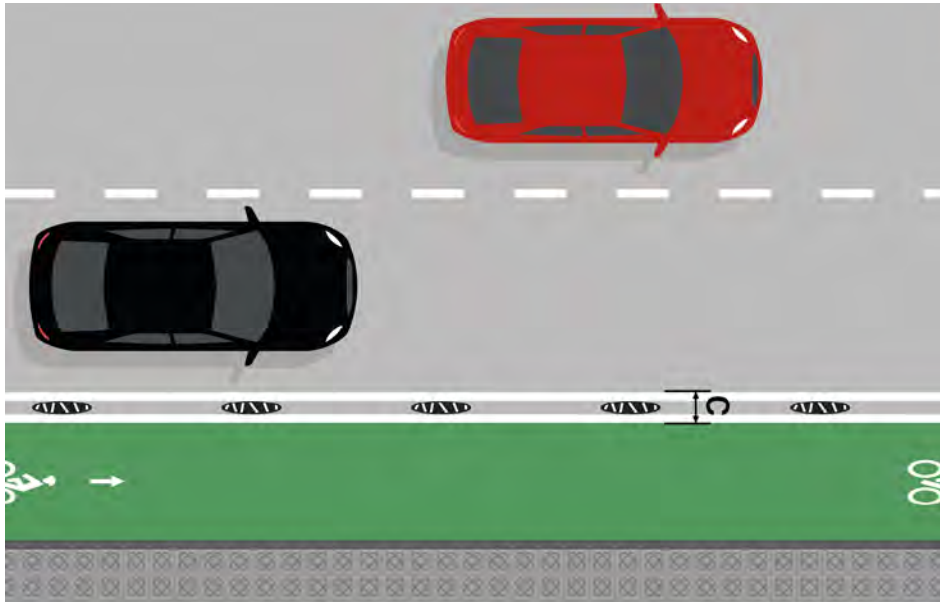
Zebra® & Zebra® | Zero configurations: position.

PARALLEL POSITION

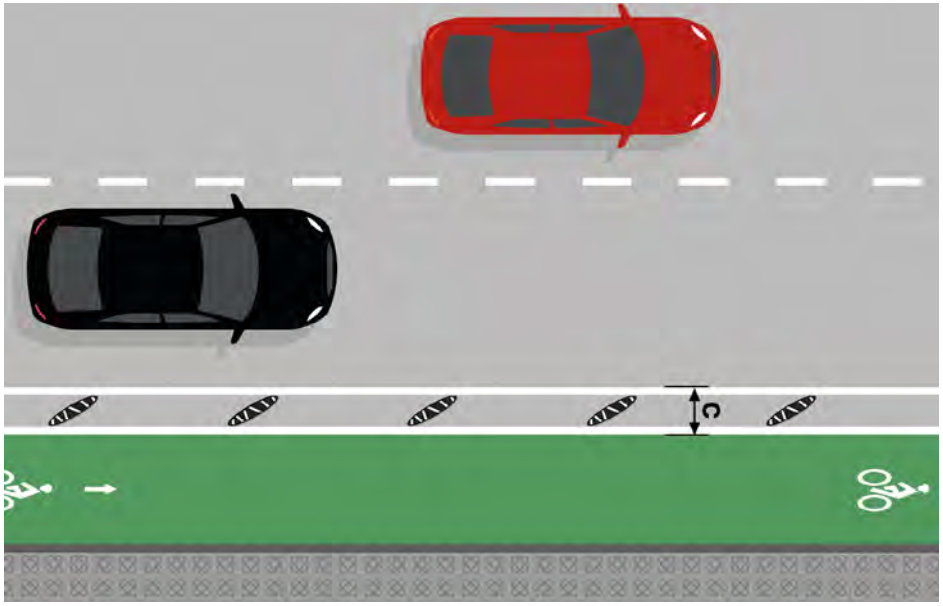
The parallel position is ideal for the occasions on which the available buffer space is limited.

OBLIQUE POSITION

The oblique position is ideal for ocassions on which the buffer space needs to be wider. The wider the buffer space, the safer the bike lane.



PARALLEL POSITION

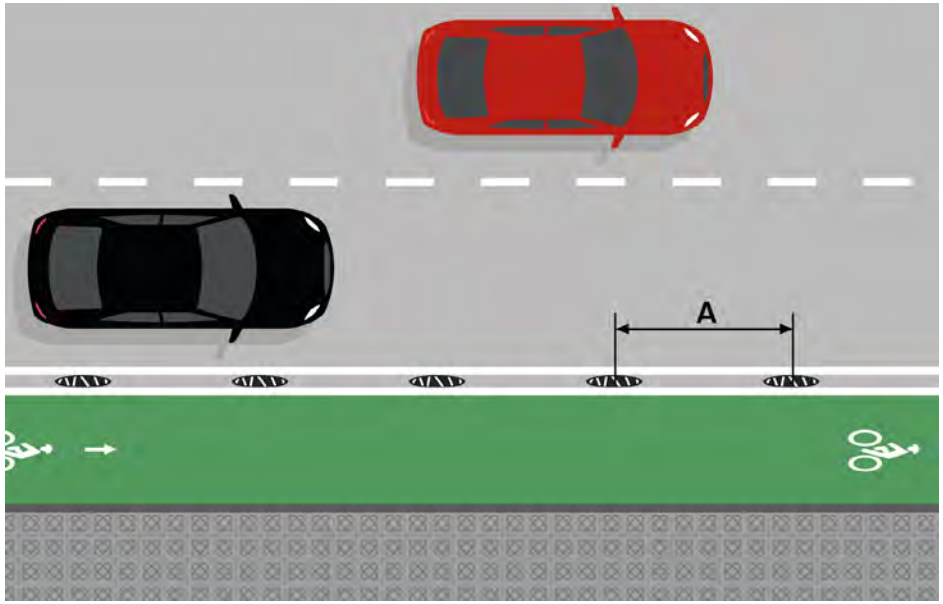


OBLIQUE POSITION

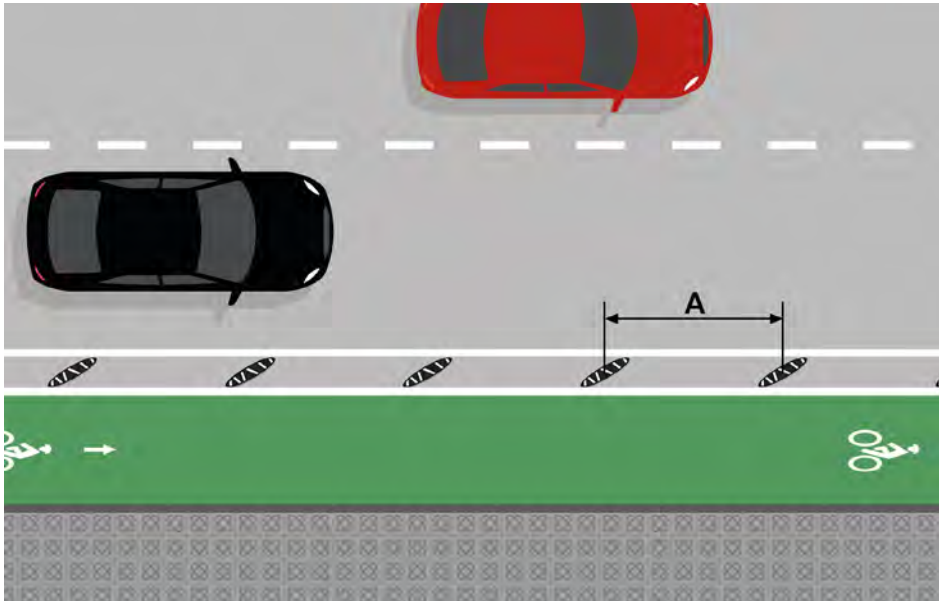
Zebra® & Zebra® | Zero configurations: spacing.

MAXIMUM SPACING BETWEEN CENTERS

It is recommended that the spacing between the Zebra Family® bike lane separators does not exceed **8ft 6 23/64 in (A)**. The shorter the distance between separators, the more difficult it will be for motor vehicles to invade the bike lane and the safer it will be for cyclists.



PARALLEL POSITION

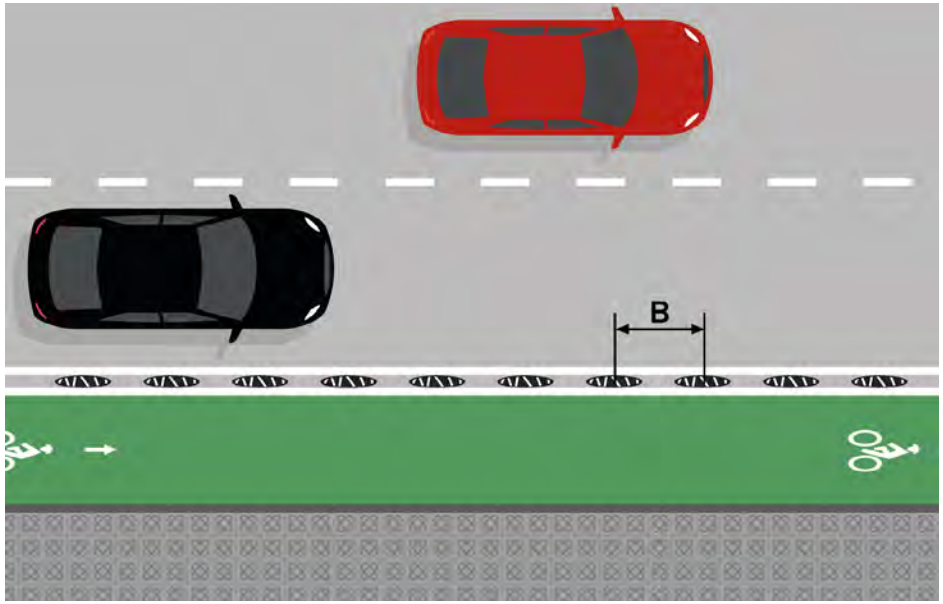


OBLIQUE POSITION

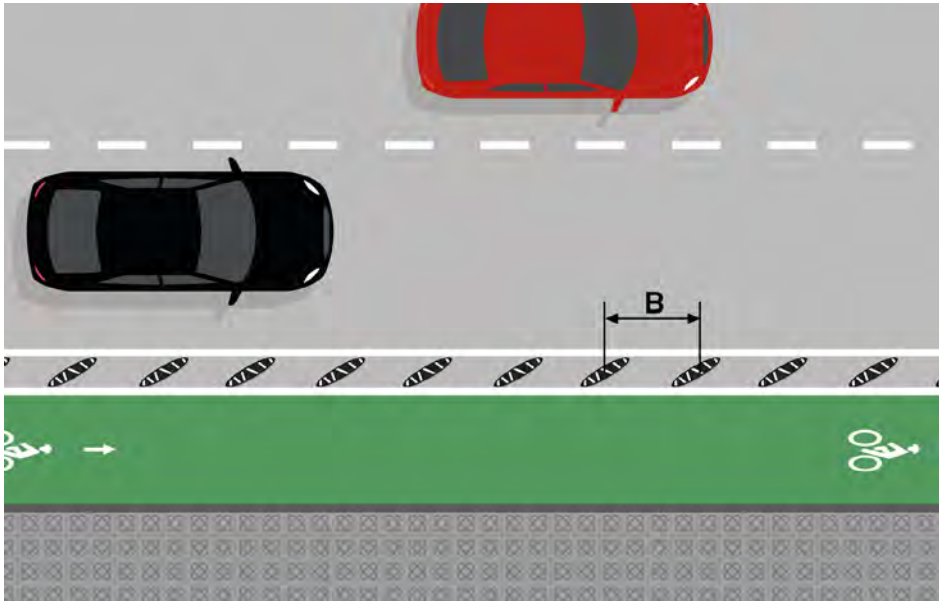
Zebra® & Zebra® | Zero configurations: spacing.

MINIMUM SPACING BETWEEN CENTERS

It is recommended to minimize the distance between the Zebra Family® bike lane separators at **4ft 3 3/16 in (B)** in heavily trafficked areas and near intersections. The smaller the distance between separators, the more difficult it is for motor vehicles to invade the bike lane. This measure increases the safety of the bike lane in areas near intersections or where there is a flow of heavy traffic.



PARALLEL POSITION



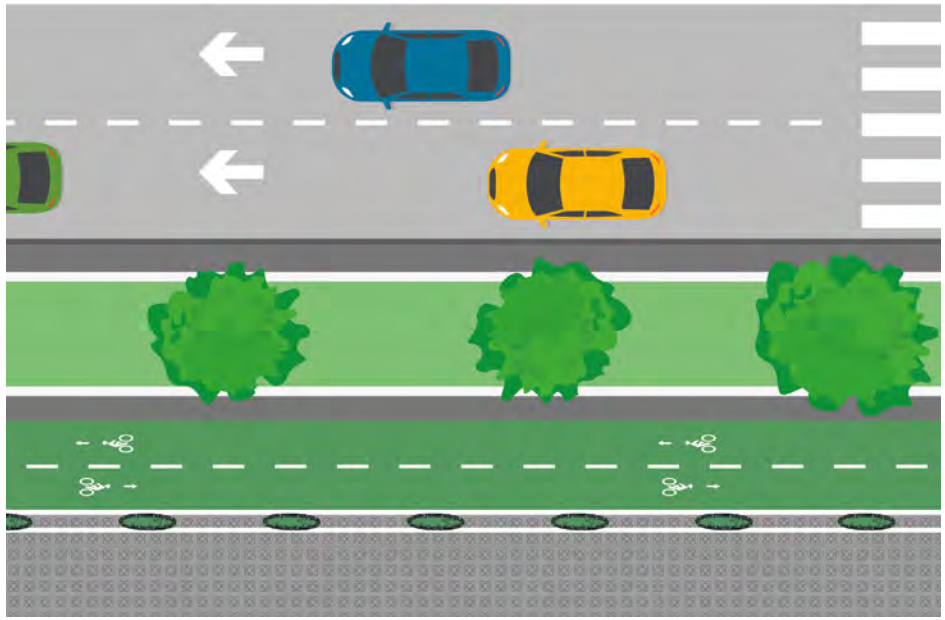
OBLIQUE POSITION

Zebra® | Planter configurations.

PEDESTRIAN AREA.

In some occasions, the bike lane is located at a pedestrian area, in which it is essential to give priority to pedestrians.

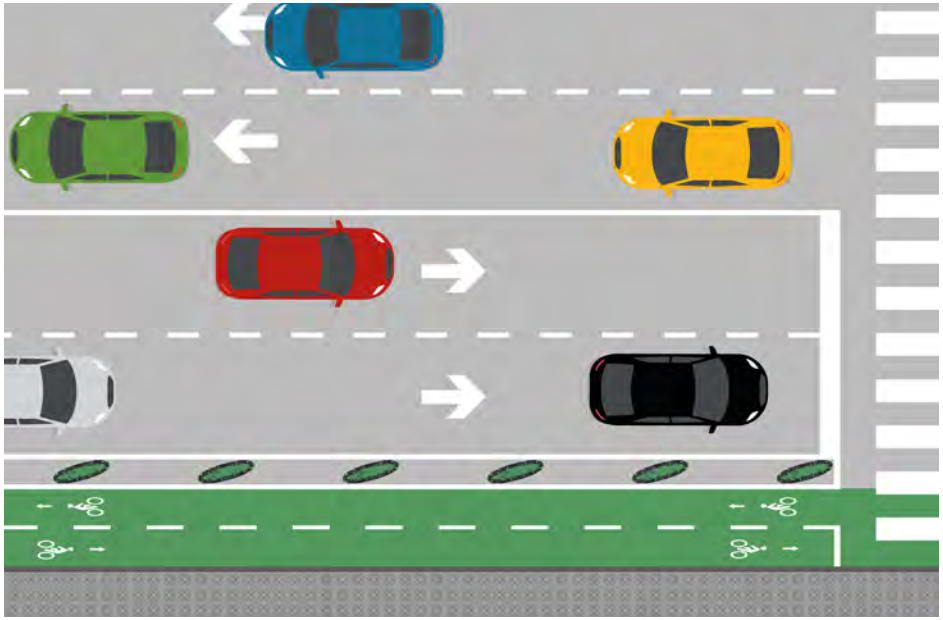
The Zebra® | Planter can be used to delineate the space reserved for the flow of bicycles, without interfering with pedestrians. It is an optimal solution for separating at same level bike lanes and pedestrian pathways.



BIKE LANE.

When the bike lane is located on the road, it is normally segregated from traffic with different types of separating elements.

The Zebra® | Planter can be used to segregate the bike lane and separate it from the driveway lanes intended for motor vehicles.



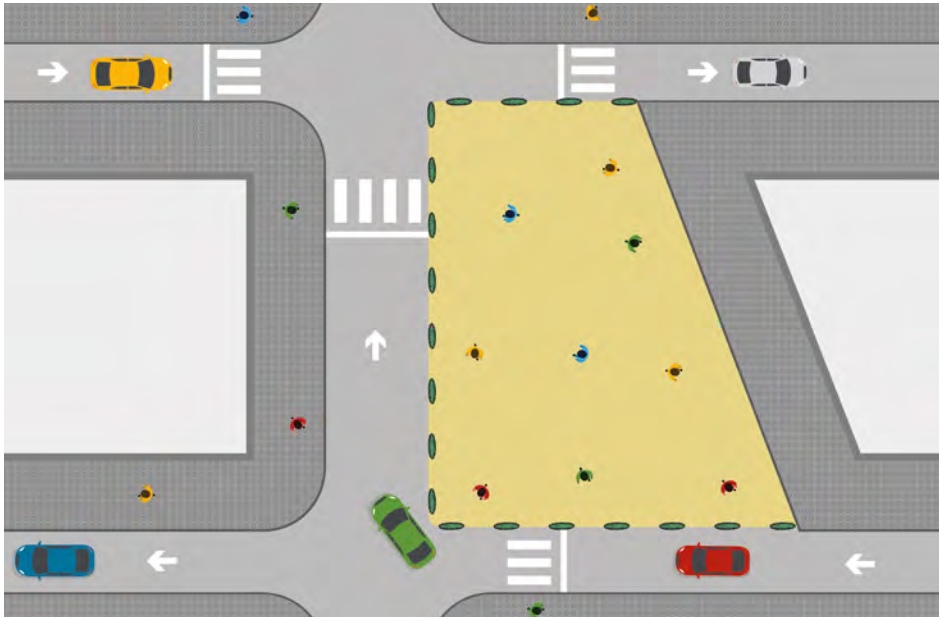
WIDENING OF THE SIDEWALKS AND NARROWING OF THE STREETS AT INTERSECTIONS.

The Zebra® | Planter can be used to expand sidewalks at intersections quickly and cheaply. These extensions offer several advantages for pedestrians:

- They facilitate the crossing thanks to the decrease of the width of the road.
- They prevent parking at the corners.
- They reduce the speed of traffic by narrowing the street and reducing the turning radius.

DELIMITATION OF PEDESTRIAN ZONES.

The underused areas of the roads can be transformed into pedestrian zones if they are signaled and are correctly and safely delimited. The Zebra® | Planter allows to delimit these areas clearly, quickly and economically.



Zebra Family® properties.

NIGHTTIME VISIBILITY.

Zebra Family® cycle lane separators are highly visible thanks to the fact that almost 40% of their surface is retroreflective.

DAYTIME VISIBILITY: COLOR.

White is the standard color of the stripes of Zebra® , Zebra® | Zero and Zebra® | Planter.

Zebra® 13

Available colors

Zebra® 13 | Zero

Available colors

Zebra® | Planter

Available colors

Zebra® STRIP COLOR CUSTOMIZATION.

The stripes of the Zebra® bike lane separators are also available in a variety of colors:

RAL 1003

RAL 6018

RAL 3020

RAL 5017

Zebra® | ZERO STRIP COLOR CUSTOMIZATION.

The stripes of the Zebra® | Zero bike lane separator are also available in a variety of colors:

RAL 1003

RAL 6018

RAL 3020

RAL 5017

Zebra® | PLANTER STRIP COLOR CUSTOMIZATION.

The stripes of the Zebra® |Planter are also available in a variety of colours:

RAL 1003

RAL 6018

RAL 3020

RAL 5017

MATERIALS.

Zebra® bike lane separator.

The Zebra® bike lane separator is manufactured with various mixtures of plastic waste of industrial and post-consumer origin, basically PVC from remnants of tarpaulins, hoses, coating of electrical cables, materials out of the norm, etc. Thanks to this, the Zebra® bike lane separator has the **Emblem of Guaranty of Environmental Quality** which is an eco-label that recognizes products and services that exceed certain environmental quality requirements beyond those established as mandatory by the current regulations.

Material properties	Unit	Regulation	Value
Hardness	ShD	ASTM D2240	41
Tensile strength	MPa	ASTM D638	10.2
Elongation at break	%	ASTM D638	101
Tear resistance	kN/m	ASTM D624	27.2
Taber abrasion loss	mg/1.000 cycles	ASTM D4060	262
Lightfastness		ASTM G154	Excellent
Resistance to acids		ASTM D471	Excellent
Resistance to bases		ASTM D471	Excellent
Reaction to fire		UL94	V-0
Density	g/cm^3	ASTM D792	1.25

MATERIALS.

Zebra® | Zero bike lane separator.

The Zebra® | Zero bike lane separator is manufactured from a material developed entirely from post-consumer waste of municipal origin. This waste comes from municipal waste treatment plants and is made up of all mixed plastic waste whose type separation would be very complex and expensive, and which usually is landfilled or incinerated. This material has the Blue Angel, a German eco-label that recognizes environmentally friendly products and services.

Material properties	Unit	Regulation	Value
Hardness	ShD	ASTM D2240	55
Tensile strength	MPa	ASTM D638	8
Elongation at break	%	ASTM D638	10.3
Tear resistance	kN/m	ASTM D624	7.9
Taber abrasion loss	mg/1.000 cycles	ASTM D4060	79
Lightfastness		ASTM G154	Excellent
Resistance to acids		ASTM D471	Excellent
Resistance to bases		ASTM D471	Excellent
Reaction to fire		UL94	E
Density	g/cm^3	ASTM D792	0.996

MATERIALS.

Zebra® | Planter

The Zebra® | Planter is made from **Linear Low Density PolyEthylene (LLDPE)** originating from the manufacturing processes of various rotomolded products and consisting mainly of parts that do not pass quality control or that are distorted, contaminated, with errors of weight, colour, etc. such as pots, containers, septic tanks, water tanks, furniture, lighting, etc. Zebra® | Planter has the Emblem of Guaranty of Environmental Quality which is an eco-label that recognizes products and services that exceed certain environmental quality requirements beyond those established as mandatory by the current regulations.

Material properties	Unit	Regulation	Value
Hardness	Shore D	ISO 868/A	53
Tensile strength at breack	MPa	ISO 527	16
Flexural modulus	MPa	ISO 178	600
Elongation at break	%	ISO 527	> 700
Density	g/cm^3	ISO 1183	0,935

ZICLA®

Vol. 2 – Installation Manual.

Accessible, inclusive, friendly streets with a small environmental footprint.

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ANCHORING Zebra Family® PRODUCTS.

The choice of the anchor type and its correct installation are both essential to achieve optimal performance of the Zebra Family® products. If Zebra Family ® products are not installed correctly, their service life could be reduced.

In order to choose the most suitable type of anchorage for the Zebra Family® products, it is necessary to bear in mind that these products must be able to withstand shock and friction loads generated by the wheels of the vehicles. As these products are anchored to the road surface, all impact or friction loads are transmitted to the road surface via the installed anchorages, so it is vital that both the anchors and the pavement of the road can withstand these loads. In addition, the type and condition of the pavement of the street and the degree of cracking should be taken into account when choosing the type and dimensions of the anchors.

The following sections describe the types of anchors that can be used for the installation of the Zebra Family® products, and their most important characteristics.

Chemical anchors.

Chemical anchors work well on both bituminous and concrete pavement. For this reason, it is recommended to use this type of anchorage when you are not sure about the type of existing pavement or its condition at the installation site.

The chemical anchor consists of a threaded rod of $^{15}/_{32}$ in and a $^{15}/32$ in hexagonal nut, and is installed using epoxy, polyester or styrene-free resins (The use of a resin without styrene is suggested because styrene emits a strong odor and can be toxic if inhaled deeply). These types of resin have demonstrated good performance in all climatic conditions and all types of pavement.

When using chemical anchor, attention should be paid to the following two aspects:

- Both the rods and the holes where they are to be inserted should be clean and dust-free.
- The curing time of the resin varies according to weather conditions. The instruction manual of the resin manufacturer should provide information on this point and it is recommended to always consult the manufacturer's safety data sheet before its use.

The chemical anchors must:

- Be zinc galvanized steel of grade 5,8 or higher (with a minimum coating of 5 µm).

- Have a minimum length of 5 $^{29}/_{32}$ in, with 1 $^{31}/_{32}$ in inside the separator and the remaining 3 $^{15}/_{16}$ in below the surface of the road surface. For concrete roadways, the anchorage can be shorter, but never shorter than $^{31}/_{32}$ in.

- Be $^{15}/_{32}$ in diameter to withstand the impact of the wheel of an average vehicle. However, if the road has a heavy traffic of heavy vehicles, or if the rate of accidents in the streets of the city is high, it is recommended to increase the diameter of the rod to $^{35}/_{64}$ in or even to $^{5}/_{8}$ in.

This is possible since the Zebra Family® can accommodate anchors of different diameters.

Mechanical anchors.

Galvanized steel mechanical wedge anchors perform very well when they are used in concrete pavement. They can also be installed very quickly. However, mechanical anchors are not recommended for bituminous pavements as this type of pavement deforms more easily with changes in temperature, which may lead to a loss of friction on the external surface of the anchors and a consequent loss of efficiency in their behavior.

The mechanical anchorages must:

- Be $^{15}/_{32}$ in diameter to withstand the impact of the wheel of an average vehicle. However, if the road has a heavy traffic of heavy vehicles, or if the rate of accidents in the streets of the city is high, it is recommended to increase the diameter to $^{35}/_{64}$ in or even to $^{5}/_{8}$ in. This is possible since Zebra Family® separator can accommodate anchors of different diameters.

- Have a minimum length of 5 $^{29}/_{32}$ in, with 1 $^{31}/_{32}$ in inside the Zebra Family® separator and the remaining 3 $^{15}/_{16}$ in below the pavement surface of the street. If the street surface is not in good condition it is advisable to use longer anchors.

Reversible anchors.

The use of reversible anchorages is recommended in cases where the installation of the Zebra Family® separator is assumed to be temporary. These modules can be installed and uninstalled quickly and easily with minimal intervention on the street. The use of reversible anchors allows the impact on the street to be minimal, so when the Zebra Family® separator are uninstalled, the street quickly recovers to its original use.

Comparative table of anchors of the Zebra Family® separator.

The following table summarizes the most suitable types of anchor for the different types of flooring.

	CHEMICAL ANCHOR		MECHANICAL ANCHOR	
	Anchor Rod	**Internally Threaded Insert**	**Screw Anchor**	**Wedge Anchor**
Pavements no Bituminous	**Rod:** HAS-U 5.8 $^{15}/_{32}$'' x 6'$^{19}/_{64}$''  **Resin:** HIT HY -10 	**Hexagon bolt :** $^{25}/_{64}$'' x 2' $^{11}/_{64}$''  **Threaded insert:** HIS-N $^{25}/_{64}$'' x 4' $^{21}/_{64}$''  **Resin:** HIT HY-10 	**Screw:** HUS-HR $^{25}/_{64}$'' x 5' $^{1}/_{8}$'' 	**Kwik bolt:** HSV $^{15}/_{32}$'' x 5' $^{29}/_{32}$'' 
Pavements Bituminous				
Permament long duration	✓ ✓			✓
Long-lasting reversible		✓ ✓	✓	✓
Reversible short duration			✓	

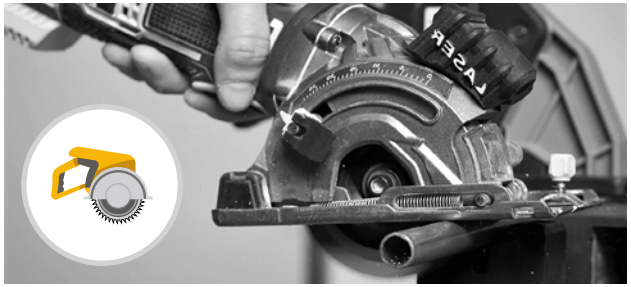
Tools and materials required to install Zebra® products.

1.15/32 IN. DIAMETER DRILL.

2. AIR COMPRESSOR TO REMOVE THE DUST THAT OCCUPIES THE HOLES AND A VACUUM TO AVOID THE DISPERSION OF THE DUST.

3.RESIN DISPENSER GUN.

4. SOCKET WRENCH FOR NUTS.



4.CIRCULAR SAW FOR CUTTING XCOMPONENTS WHEN NECESSARY.

Installation process of the Zebra® | Zero.

Mechanical anchors.

Figure 1 - Place the modules and mark the holes.

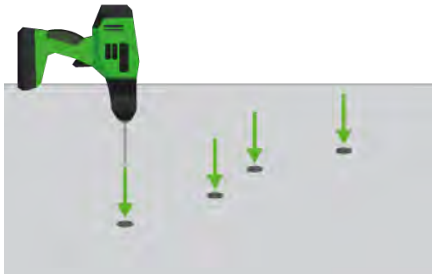


Figura 2 - Drill the holes.

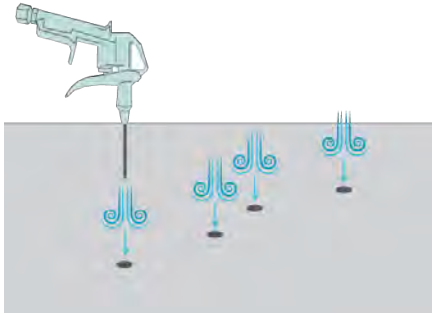


Figure 3 - Blow away and vacuum the dust.

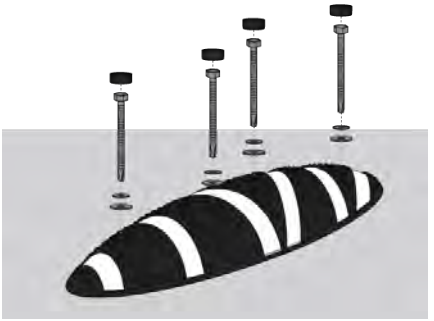


Figure 4 - Install the anchors and tighten the nuts with the socket wrench.

Installation process of the Zebra® | Zero.

Chemical anchors.

Figure 1 - Place the modules and mark the holes.

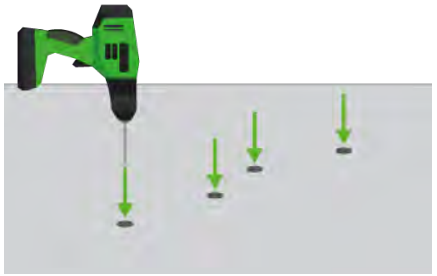


Figura 2 - Drill the holes.

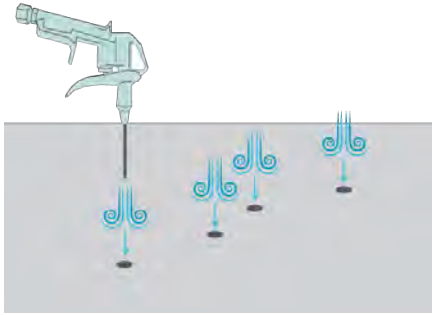


Figure 3 - Blow away and vacuum the dust.

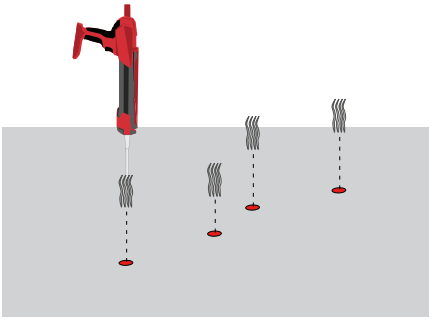


Figure 4 - Inject the resin.

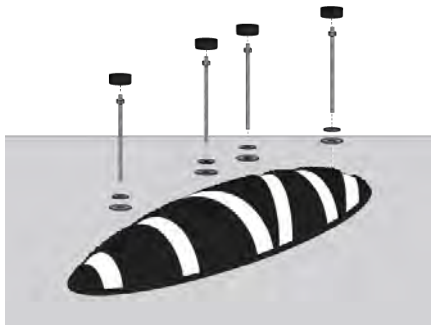


Figure 5 - Install the anchors. To ensure that the threaded rod is correctly anchored, it should be rotated while being inserted into the hole (full of resin) so that is covered completely with resin. Once the resin is dry, tighten the nuts with the socket wrench.

Installation process of an individual Zebra® | Planter.

Chemical anchors.

Figure 1 - Place the planter and mark the holes.

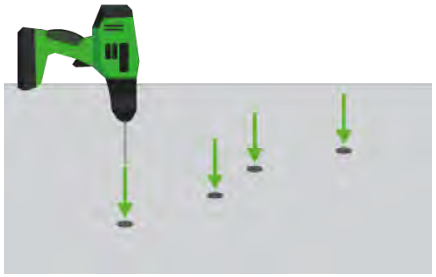


Figura 2 - Drill the holes.

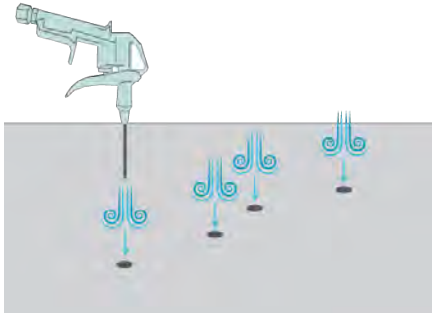


Figure 3 - Blow away and vacuum the dust.

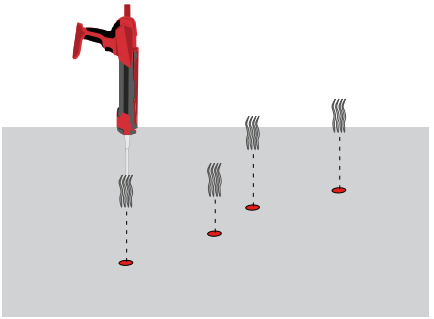


Figure 4 - Inject the resin.

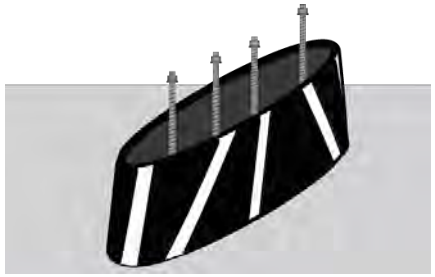


Figure 5 - Install the anchors. To ensure that the threaded rod is correctly anchored, it should be rotated while being inserted into the hole (full of resin) so that it is covered completely with resin. Once the resin is dry, tighten the nuts with the socket wrench.

Installation process of a double Zebra® | Planter.

Chemical anchors.

Figure 1 - Place a planter and mark the holes.

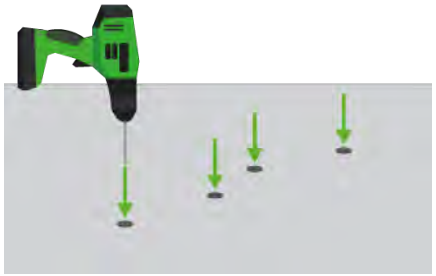


Figura 2 - Drill the holes.

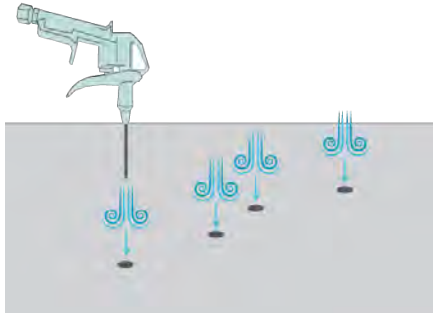


Figure 3 - Blow away and vacuum the dust.

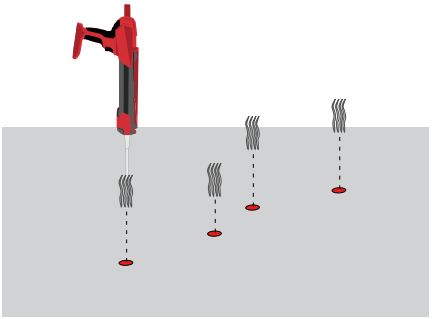


Figure 4 - Inject the resin.

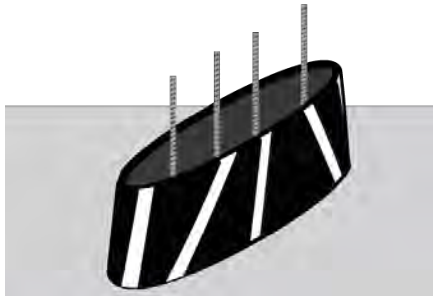


Figure 5 - Install the anchors. To ensure that the threaded rod is correctly anchored, it should be rotated while being inserted into the hole (full of resin) so that it is covered completely with resin. Once the resin is dry, tighten the firsts nuts with the socket wrench.

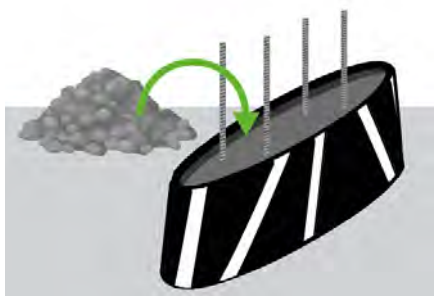


Figure 6 - Fill in with concrete, gravel, soil or other heavy material.

Figure 7 - Place on top the second planter. Tighten the last nuts with the socket wrench.

Removal and re-installation of the Zebra Family® separator.

Sometimes it may be necessary to temporarily remove the Zebra Family® products. Some of the most common reasons are:

- Celebration of special events in the streets of the city.
- Repainting of the horizontal street signs.
- Street surface repair: If you want to repave the road without removing the Zebra Family® products, they must be covered to protect the retro-reflective paint. If street repair work involves milling the entire surface of the street, it is advisable to remove the anchors to avoid damage to the milling equipment.

The removal of the Zebra Family® products requires the same precautions as its installation, in terms of pre-signaling to prevent and protect users from the street from which works are being carried out. Warning signs should be directed both at motorized traffic on the road and at bike lane users.

ZICLA®

Annex 1- Decision Factors.

Accessible, inclusive, friendly streets with a small environmental footprint.

ZICLA®

Zebra® 5
Zebra® 9
Zebra® 13
Zipper® BAAB
Zipper® AA
More Crossable
Less Crossable
Less Crossable
Narrower buffer space
Wider buffer space

ZICLA®

Annex 2- Utilization of Chemical Anchors .

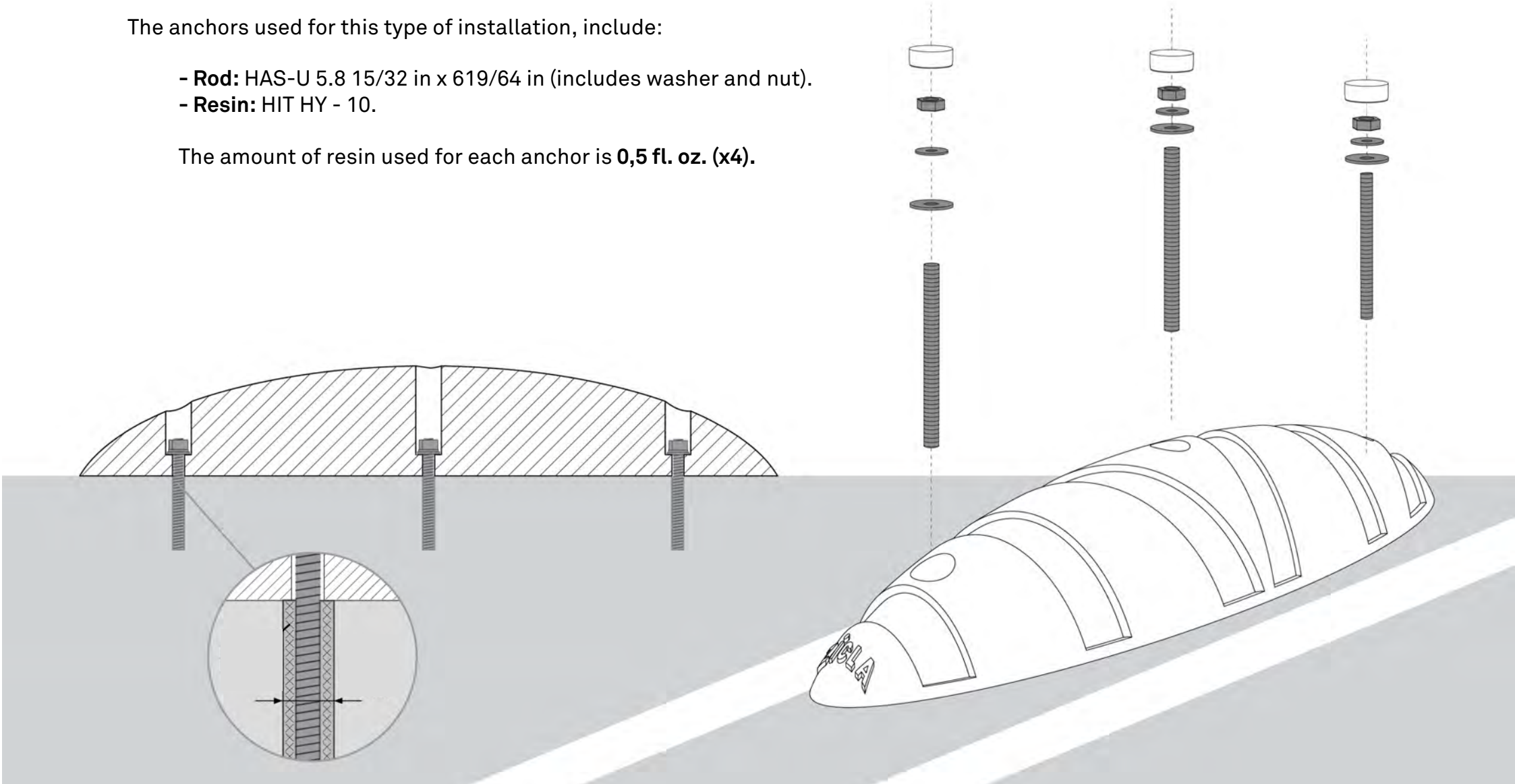
Accessible, inclusive, friendly streets with a small environmental footprint.

Zebra® 13 – Chemical anchors.

The anchors used for this type of installation, include:

- **Rod:** HAS-U 5.8 15/32 in x 619/64 in (includes washer and nut).
- **Resin:** HIT HY - 10.

The amount of resin used for each anchor is **0,5 fl. oz. (x4).**

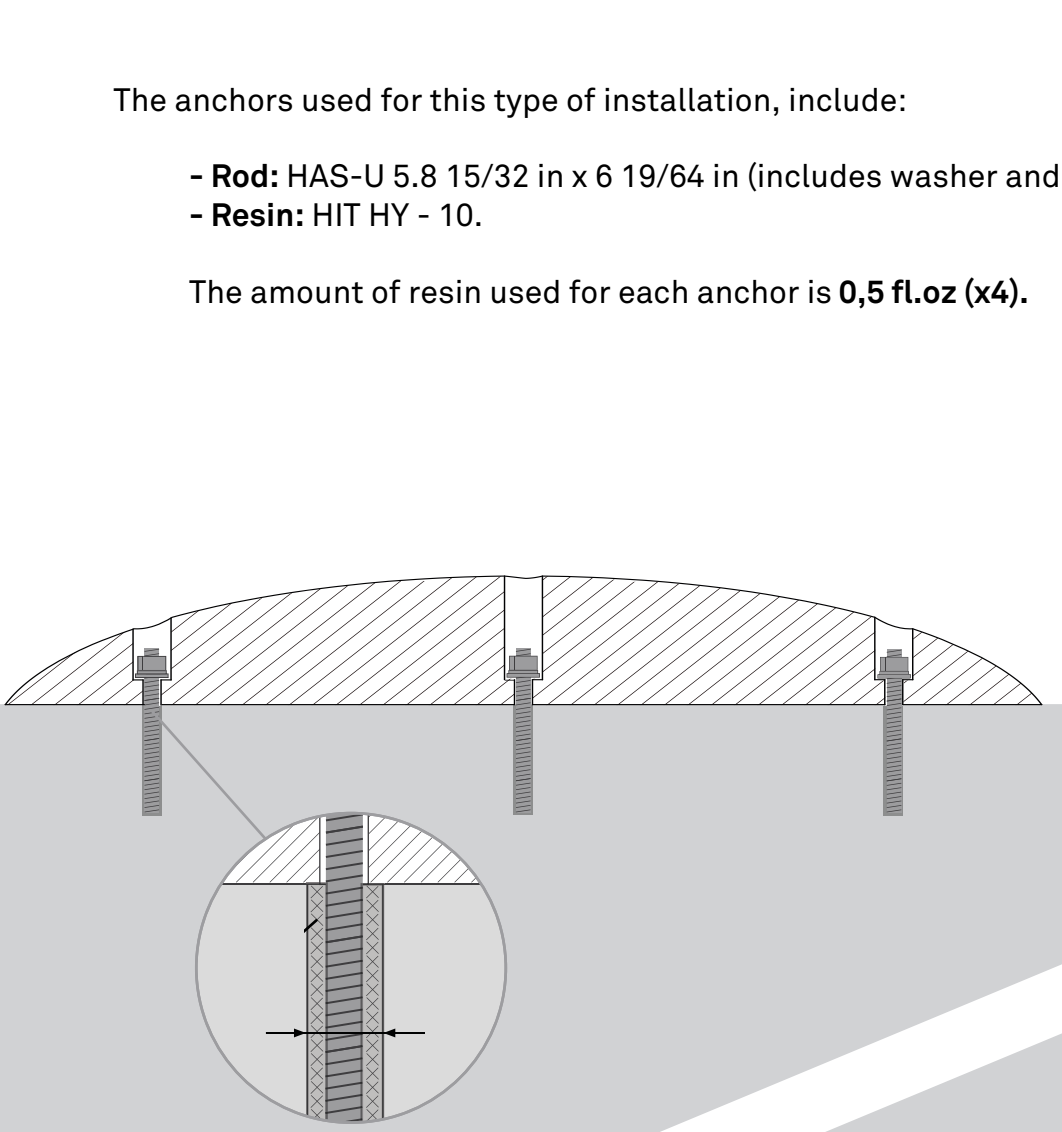


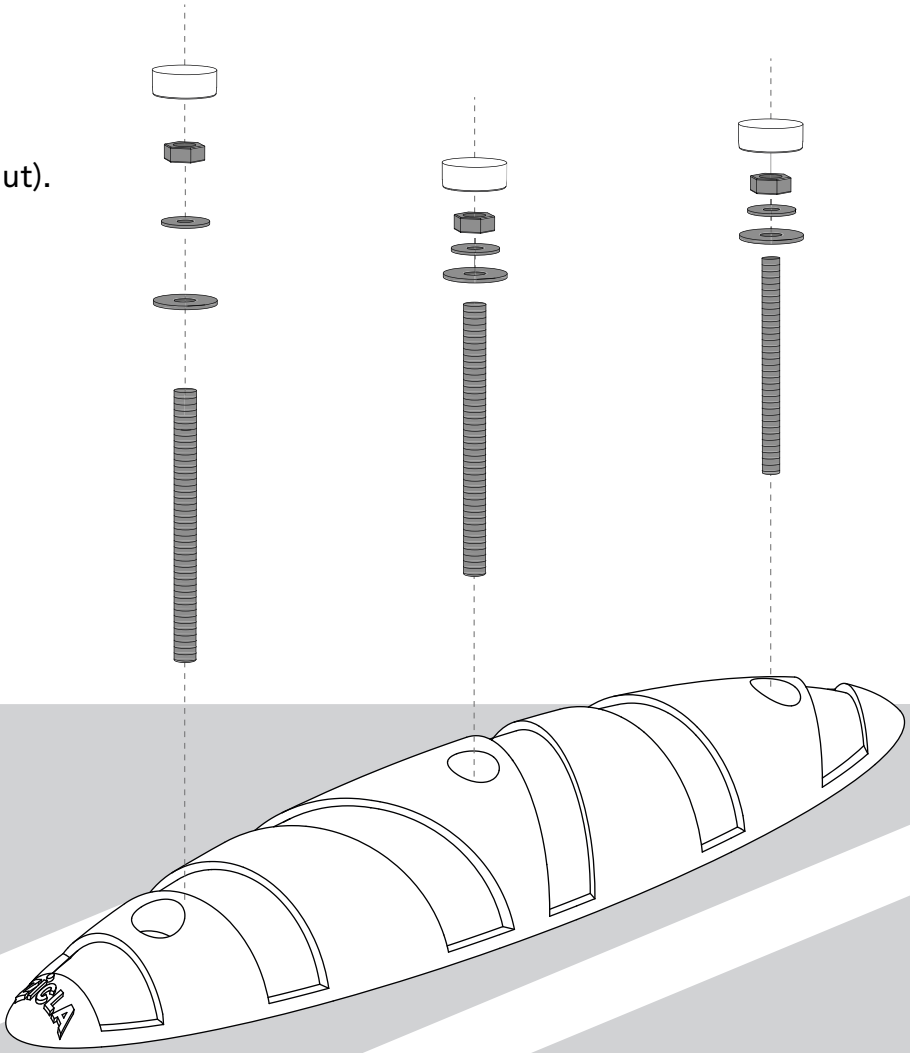
Zebra® 9 - Chemical anchors.

The anchors used for this type of installation, include:

- **Rod:** HAS-U 5.8 15/32 in x 6 19/64 in (includes washer and nut).
- **Resin:** HIT HY - 10.

The amount of resin used for each anchor is **0,5 fl.oz (x4).**



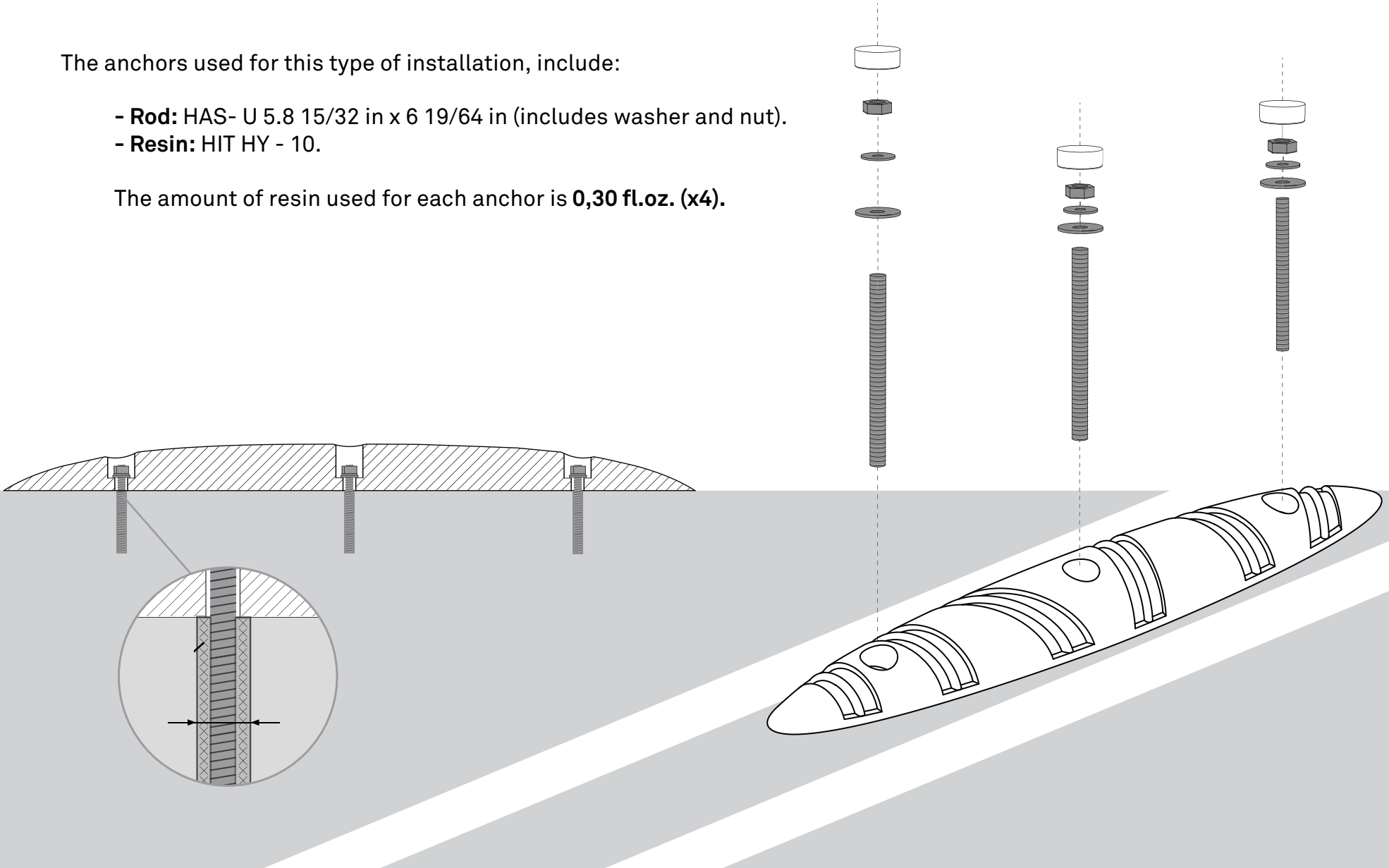


Zebra® 5 - Chemical anchors.

The anchors used for this type of installation, include:

- **Rod:** HAS- U 5.8 15/32 in x 6 19/64 in (includes washer and nut).
- **Resin:** HIT HY - 10.

The amount of resin used for each anchor is **0,30 fl.oz. (x4).**

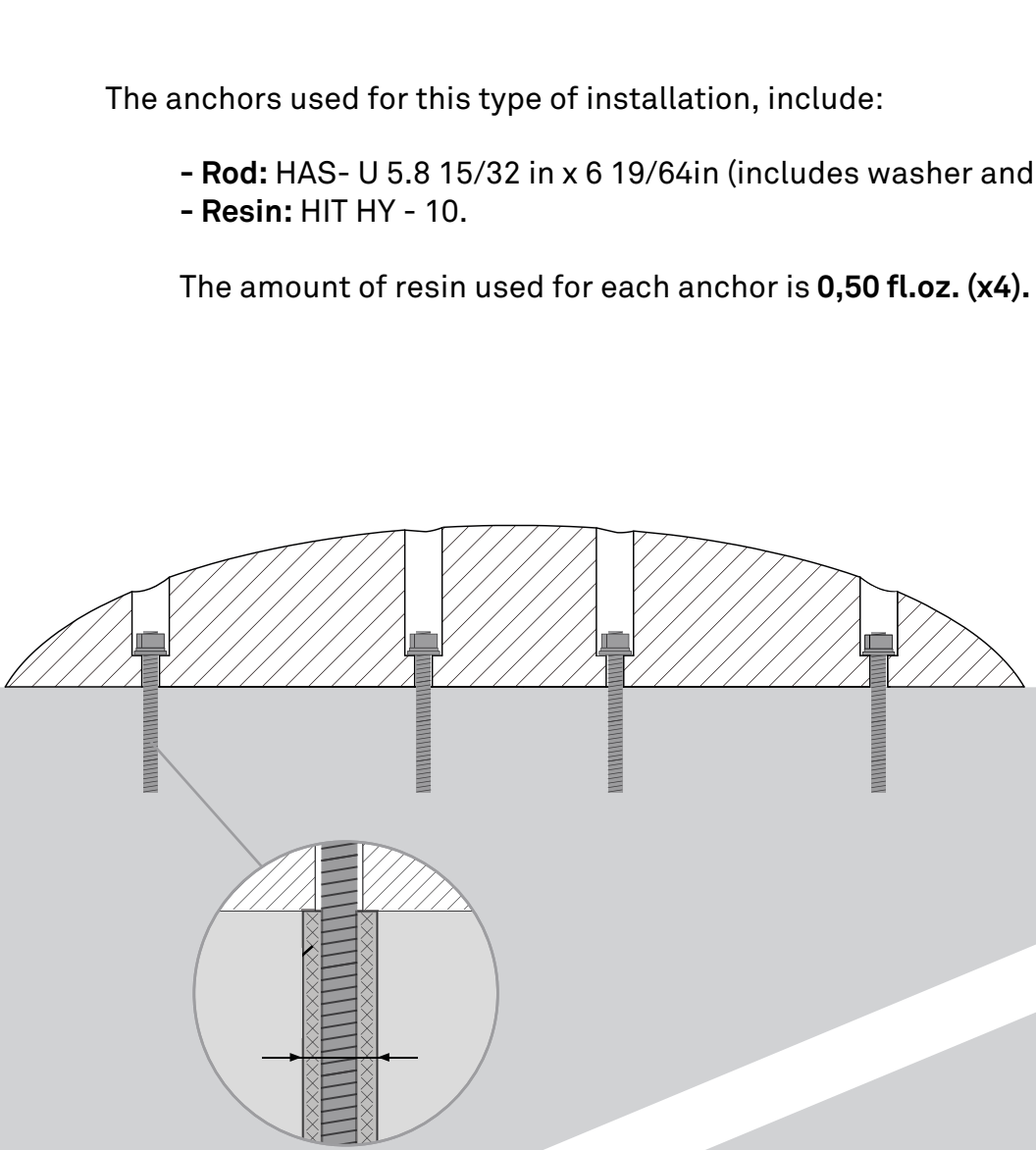


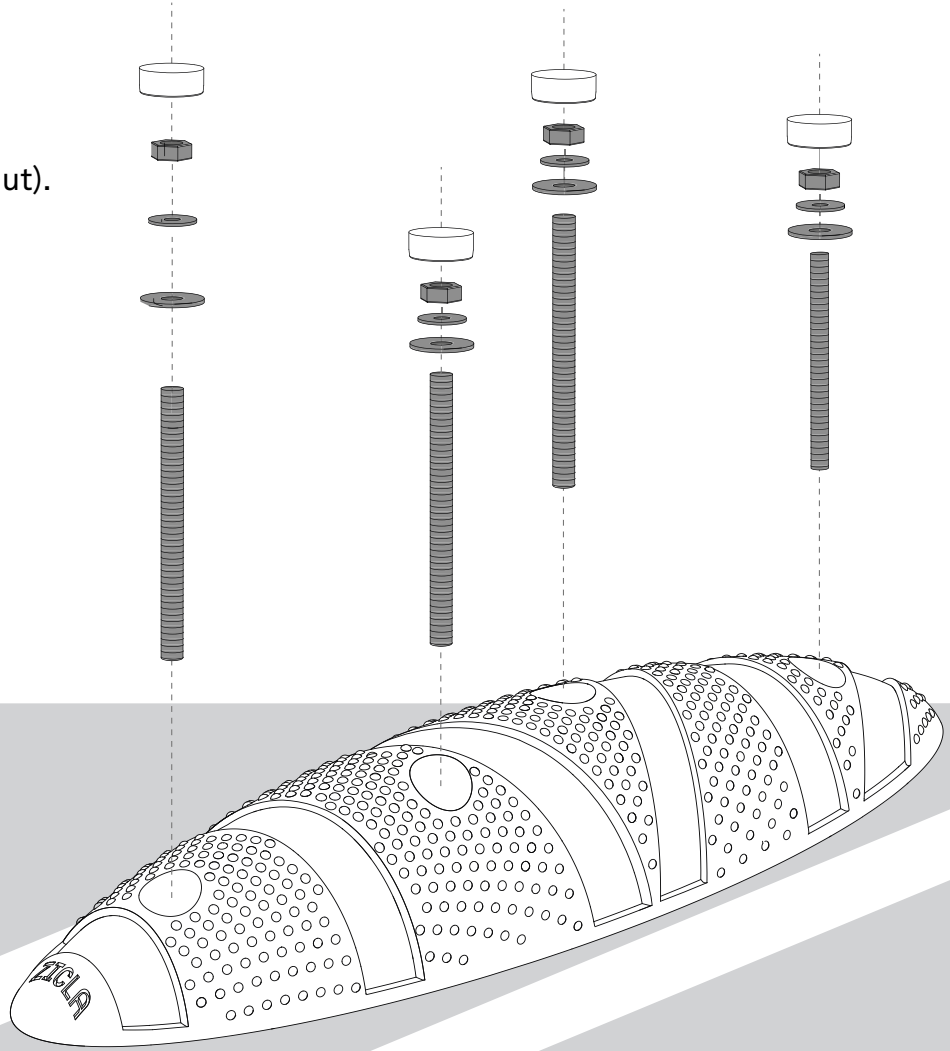
Zebra® 13 | Zero – Chemical anchors.

The anchors used for this type of installation, include:

- **Rod:** HAS- U 5.8 15/32 in x 6 19/64in (includes washer and nut).
- **Resin:** HIT HY - 10.

The amount of resin used for each anchor is **0,50 fl.oz. (x4).**



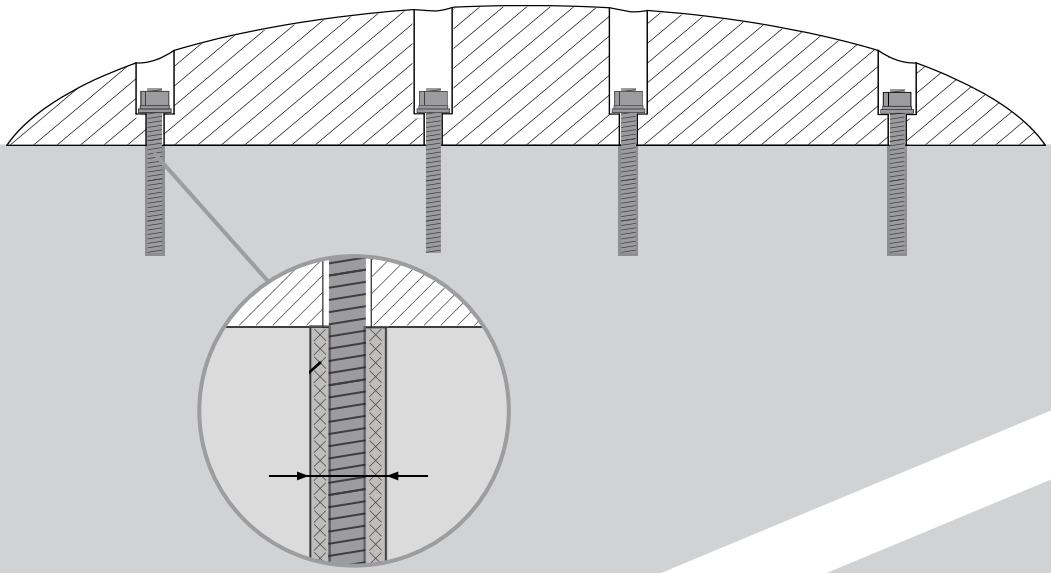


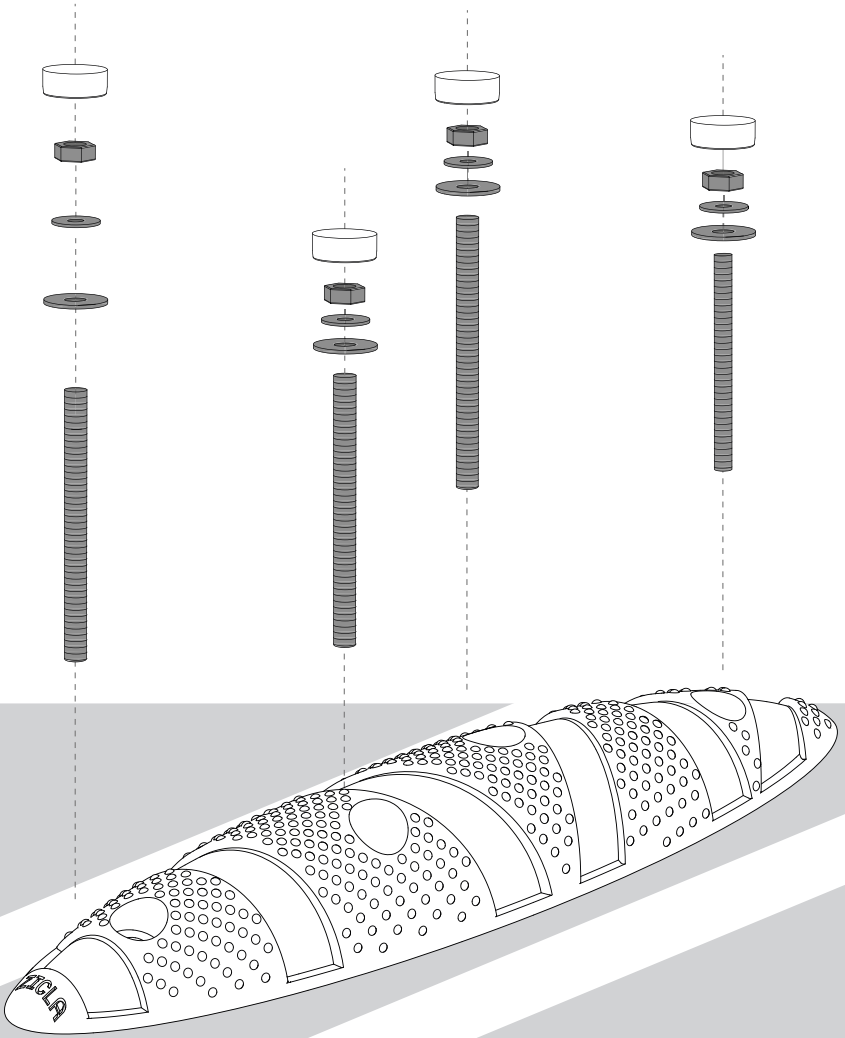
Zebra® 9| Zero - Chemical anchors.

The anchors used for this type of installation, include:

- **Rod:** HAS- U 5.8 15/32 in x 6 19/64 in (includes washer and nut).
- **Resin:** HIT HY - 10.

The amount of resin used for each anchor is **0,50 fl.oz. (x4).**



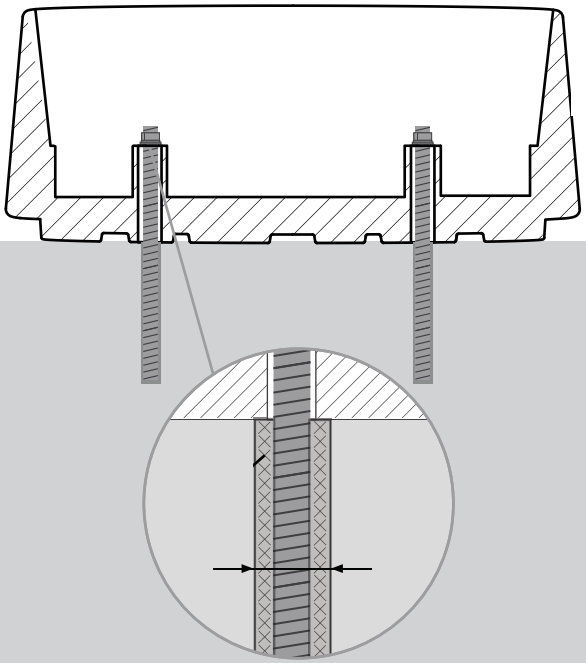


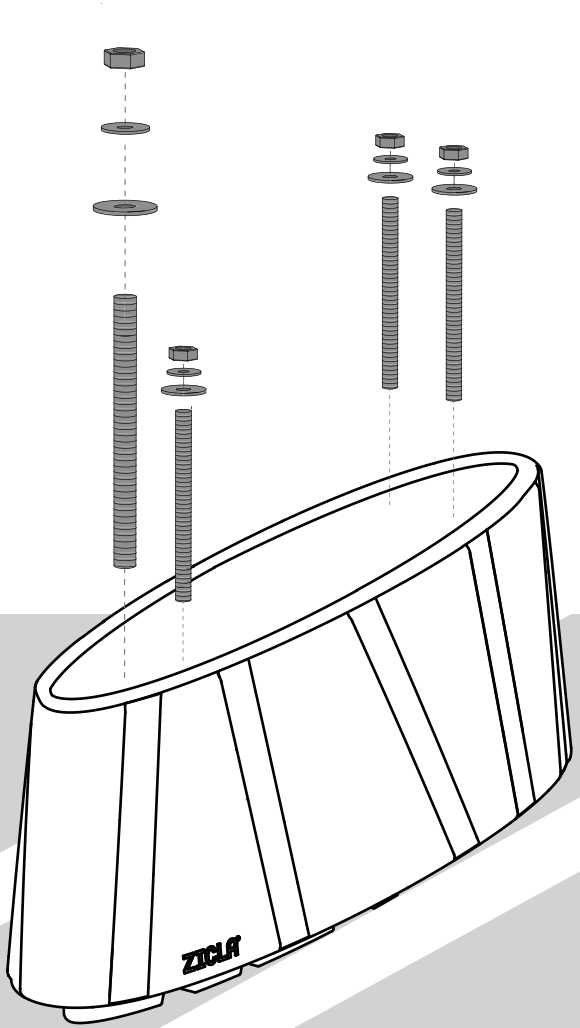
Individual Zebra® | Planter with chemical anchors.

The anchors used for this type of installation, include:

- **Rod:** 15/32 in x 12 13/64 in (To be cut in place).
- **Resin:** HIT HY - 10.
- **Washer and nut:** Included with rod.

The amount of resin used for each anchor is **0,67 fl. oz. (x4).**



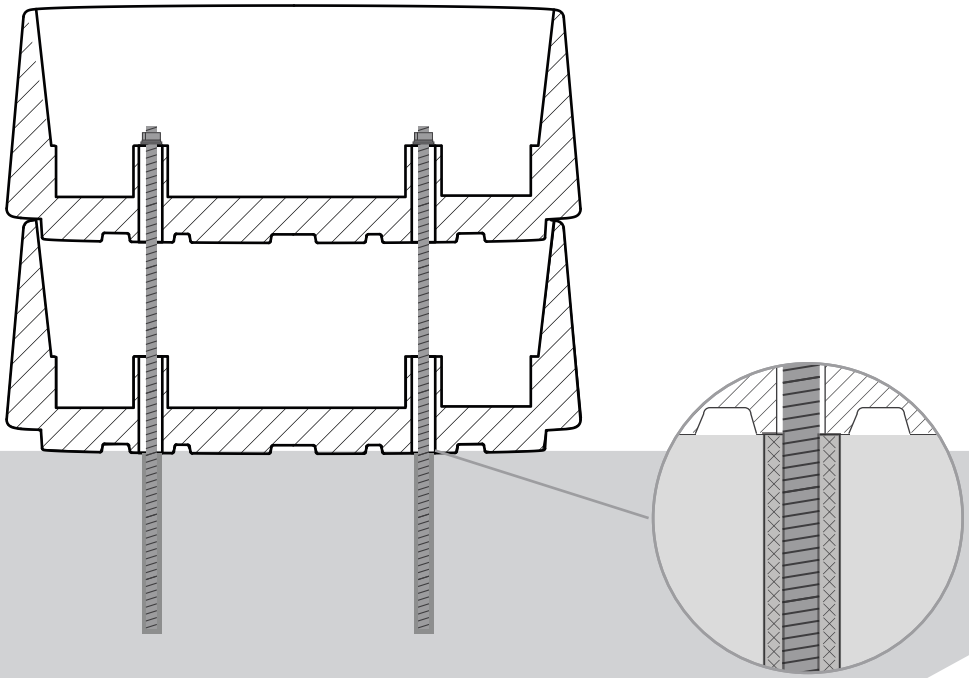


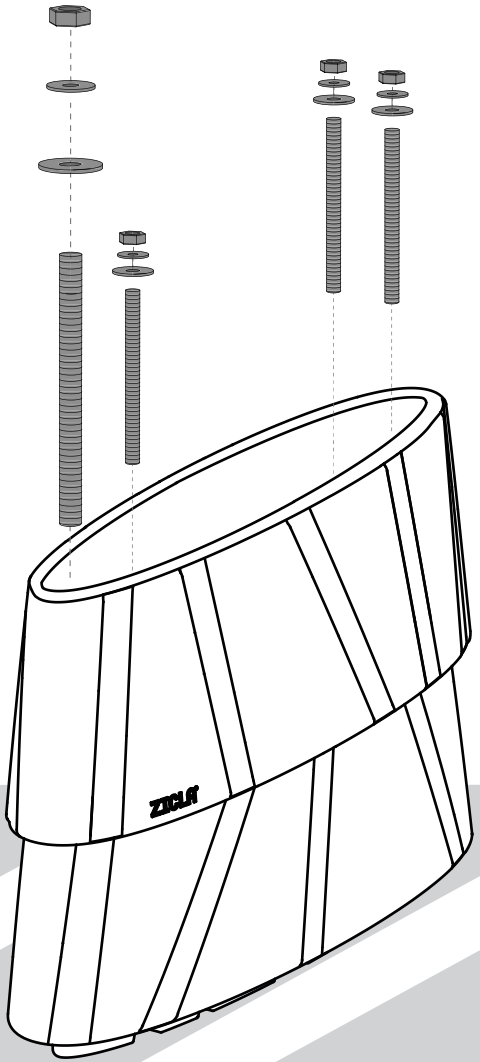
Double Zebra® | Planter with chemical anchors.

The anchors used for this type of installation, include:

- **Rod:** 15/32 in x 25 19/32 in (To be cut in place).
- **Resin:** HIT HY - 10.
- **Washer and nut:** Included with rod.

The amount of resin used for each anchor is **0,38 fl. oz. (x4).**





ZICLA®

Annex 3 - Measures to Extend the Life of the Zebra Family® Products.

Accessible, inclusive, friendly streets with a small environmental footprint.

Measures to extend the service life of the Zebra® bike lane separators.

Zebra® and Zebra® | Zero bike lane separators can suffer damage and breakage but nevertheless continue to fulfill their role:

Normally, after suffering an impact, the Zebra® and Zebra® | Zero bike lane separators, neither separate from the road surface, nor wobbles; it remains in place and it does not break or crack.

The Zebra® and Zebra® | Zero bike lane separators continue to fulfill their function as long as the retroreflective surface continues to be visible in low light and the anchor system is not exposed. If any of these two conditions is not fulfilled, the Zebra® or the Zebra® | Zero bike lane separator must be repainted or replaced.

Additionally, if Zebra® or Zebra® | Zero bike lane separators have been fully pulled out, this may signal that they have not been properly anchored to the pavement. This may be due to the use of an improper type of anchor or bolt size.

Measures to extend the service life of the Zebra® bike lane separators.

Preventive maintenance should begin during the design phase of the project with the aim of extending the service life of the Zebra Family® products . The need to replace the Zebra Family® products more than once a year may indicate a defective design in the original design of the project or in its installation.

The basic points to consider are:

- To reduce the overexposure of the Zebra Family® products. The highly exposed areas tend to be those at the beginning of the bike lanes and in the proximity of the crossings where the motor vehicles turns are made. In these areas the damage to the products may be more obvious and/or frequent and it will be necessary to foresee:
    - A higher maintenance level and frequency for Zebra Family® products.
    - A lower separation between the Zebra Family ® products.
    - More frequent replacement of damaged Zebra Family® products.
- Select the most appropriate configuration for each case.
- Choose the most appropriate anchors.
- Ensure a correct installation.

ZICLA®

Annex 4 – Operation of the Zebra® | Planter.

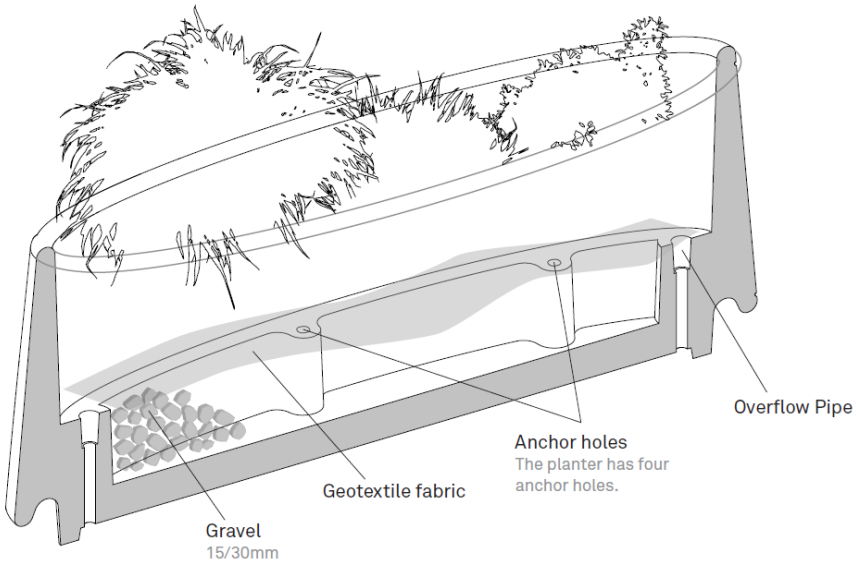
Accessible, inclusive, friendly streets with a small environmental footprint.

Zebra® | Planter: gravel.

Soil Capacity:
7.9gal.

- - - - - - - - - - -

Reservoir:
1.8 gal.



For the drainage to work in the planters, the bottom of the planter must be filled with a layer of gravel with a diameter between 0,6 - 1,2 inches.

Zebra® | Planter: geotextile membrane.

The gravel and the substrate must be separated by a geotextile membrane that acts as a barrier that prevents the substrate from mixing with the gravel when it needs to be replaced or replenished. This geotextile membrane must be resistant and permeable, and it must allow air and water to pass through but retaining the substrate.

Different types can be used:

- Geotextile braided polypropylene groundcover type (105 g/m^2)
- Nonwoven geotextile with water retention capacity and high capillarity type (150/300 g/m^2) (fibertex)

The geotextile membrane can be placed in two ways:

- Above the gravel.
- Below the gravel and climbing up the sides to the middle of the substrate and another layer above the gravel.

Zebra® | Planter: geotextile membrane.

The use of a good substrate will help the correct growth of plants.

To achieve a substrate that can be sustained over time and that has good physical/chemical conditions, in terms of water retention, aeration, and drainage capacity, it suggested to prepare a mix of:

- 40% of inorganic materials such as gravel, expanded clay balls, volcanic earth, pumice stone, grit, recycled masonry, sand, etc. This material facilitates a good space where the water reserves can accumulate.
- 60% of organic matter such as soil substrate, peat, coconut fibers, mulch, etc. A slow release fertilizer could be added in the first months.

Zebra® | Planter: recommended species of plants and irrigation.

Recommended species of plants.

The most suitable species of plants will depend on the climate conditions of the place of the installation of the Zebra® | Planter. In the Mediterranean area, the following species are recommended: Poacea, Ornamental grasses, Gramineae and other "vivacious" Xerophyte hardy grasses of low water requirements and resistant to the conditions of the zone.

- Agapanthus africanus (evergreen): It is very resistant, low maintenance, with no need for pruning. Often dark blue at the beginning of autumn.
- Phormium tenax "Variegatum“: It is a very strong plant, resistant to the sea and to the frost of up to -6 / -8 ºC, to droughts, and lives in any type of soil. The only recommended care is to cut the dry leaves from the base; one pruning a year is enough during the fall.
- Aloes, Agaves or Cactus: They are recommended in extreme heat climate conditions.

Irrigation.

According to the season and depending on the plant type, it is advisable to fill the deposit once a month or every two weeks (in dry extremely seasons). To save time in the irrigation, it is recommended to place a vertical tube of PVC with holes in the bottom to fill up the water tank directly.

ZICLA®

Glossary.

Accessible, inclusive, friendly streets with a small environmental footprint.

ANCHORING SYSTEM
A combination of anchoring equipment and anchor assemblies that will, when properly designed and installed, resist the uplift, overturning, and lateral forces on the product and on its support and foundation system.

BUFFER
A space between two painted lines that creates a separation between bicycles and autos.

CHEMICAL ANCHORS
Element fasteners that rely on a structural chemical bond based generally on a single or dual component resin.

CYCLE LANE
Lane for bicycle users, segregated to a large degree from motorized vehicle traffic, except at junctions, access to service bays, etc., and normally installed on the road.

CYCLE LANE SEPARATOR
Element of urban furniture, whether continuous such as a Curb, or discontinuous such as Zebra Family® cycle lane separators, which creates a greater segregation of the cycle lane from motorised vehicle lanes.

MECHANICAL ANCHORS
Element fasteners that utilize friction to obtain holding values.

PAVEMENT
A paved road.

QUICK-BUILD
Designed to be assembled very quickly.

REFLECTIVE MATERIAL
Material which reflects part or all incidental light.

ROAD
A thoroughfare, route, or way on land between two places that has been paved or otherwise improved to allow travel by motor vehicle.

ROADWAY MARKINGS
Horizontal signage element. Painted indications on the pavement, generally white to contrast with the dark asphalt, or yellow in areas where roadwork is being performed.

Legal Note.

ZICLA®

Zipper® system User Guide and Installation Manual.

Accessible, inclusive, friendly streets with a small environmental footprint.

Index.

ABOUT THE USER GUIDE AND INSTALLATION MANUAL.

Ever since 2005 ZICLA has been supporting cities in the transformation process they need to undergo to deal with the challenges of the 21st century. Over the years, we have worked to help make city streets more accessible, sustainable, inclusive and friendly. Our products allow cities to improve mobility, traffic and accessibility, always using recycled materials.

It is estimated that, by 2050, 70% of the world's population will live in cities. Our challenge is to help make the streets of these cities accessible, inclusive and friendly with a small environmental footprint.

The Zipper® system allows the rapid transformation of city streets through the construction of cycle lanes and roundabouts and widening of the sidewalks and narrowing of the streets at intersections. In the case of bike lanes, the Zipper® system protects cyclists and prevents other vehicles from invading them. The Zipper® system is modular and its modules can be installed continuously or discontinuously, allowing the design and construction of multiple configurations. These modules are recycled, recyclable, reusable, competitive and resistant to weathering and impact.

Two different recycled materials are used in the manufacture of the modules of the Zipper® system, giving rise to two product lines:

- Traditional line: manufactured with various mixtures of industrial and post-consumer plastic waste, basically PVC from remnants of tarpaulins, hoses, coating of electrical cables, off-standard items, etc.

- Zero line: made of a material developed entirely from municipal post-consumer waste. This waste comes from the rejection of packaging plants and is made up of all mixed plastic waste whose type separation would be very complex and expensive, and which usually ends up or is landfilled or incinerated.

More information on these materials can be found in the materials section of this Guide.

ZICLA offers this guide to show practitioners the full range of quick-build street configurations that are possible to implement thanks to the Zipper® system.

ABOUT LIABILITY ARISING FROM THE INSTALLATION AND USE OF ZICLA PRODUCTS.

ZICLA shall not be liable for any damages or losses arising from the installation or use of its products.

The advice that ZICLA provides to the customer, in the form of proposals for solutions, configurations and customizations of the products marketed, is merely consultative and is carried out with the sole purpose of assisting the customer to make decisions. It is the sole responsibility of the customer to adopt the final solutions, configurations and/or customizations and to ensure that they comply with all urban planning, traffic, safety and any other regulations applicable and in force at the location at hand. As such, the customer shall be solely and exclusively responsible for any damages or losses that may arise from its actions, omissions and/or non-compliance with any applicable regulations.

ZICLA®

Vol. 1 – User Guide.

Accessible, inclusive, friendly streets with a small environmental footprint.

Index Vol 1.

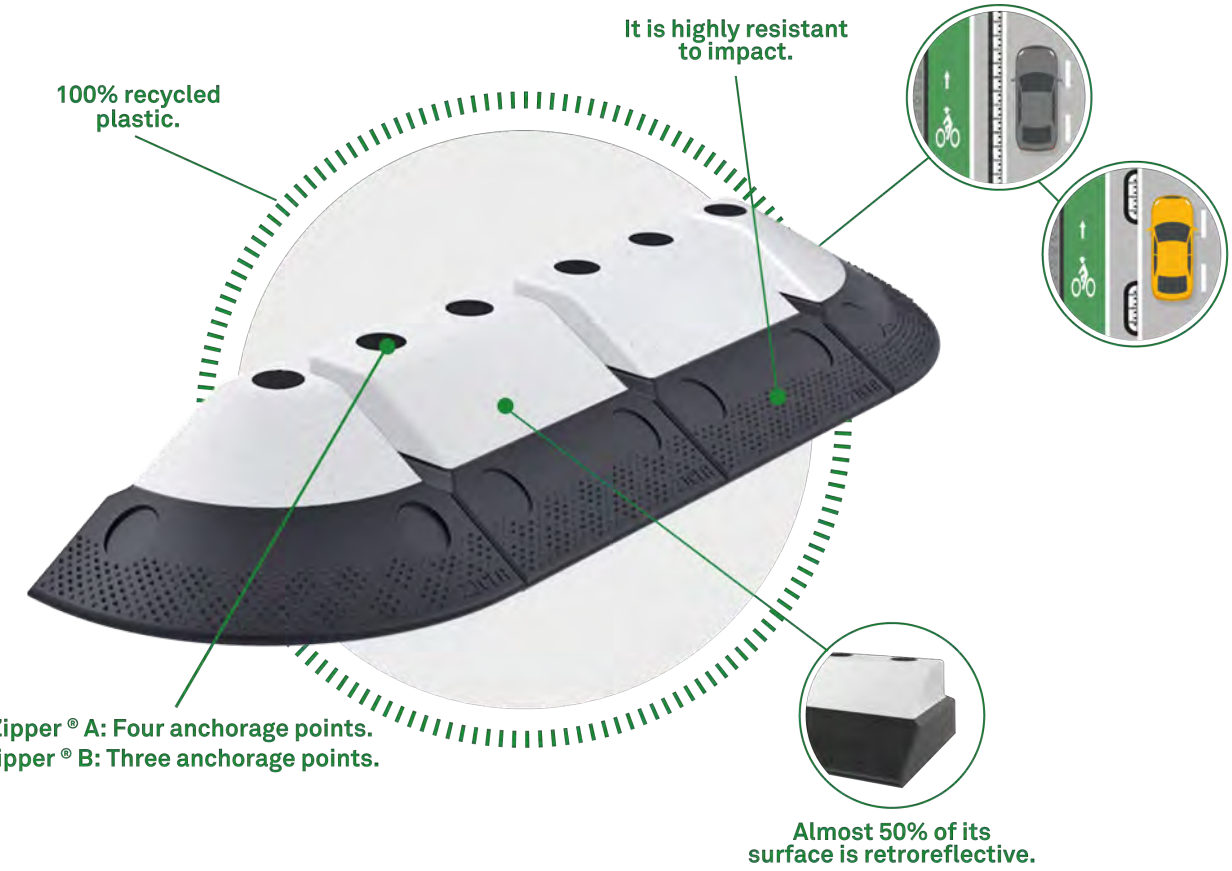
The Zipper® system.

The Zipper® system make it possible to transform urban space quickly by building segregated bike lanes and roundabouts, and by modifying the radius of curvature of the corners at intersections. It protects cyclists and prevents other vehicles on the road from invading the bike lanes. It is modular and its modules can be installed continuously or discontinuously, allowing the construction of multiple configurations.

1. It can be adapted to any kind of road surface.
2. It is highly visible because 50% of the surface of its modules is retroreflective.
3. Its modules are manufactured from recycled plastic so its environmental impact is minimal. It is an ecodesigned product.
4. It is competitive because it makes it possible to carry out a project with minimal intervention on the public roads.
5. Its modules are highly resistant to impact and bad weather and they can be anchored to the road surface.

The Zipper® modules.

The Zipper® system is made of two different components: **Zipper® A and Zipper® B.**



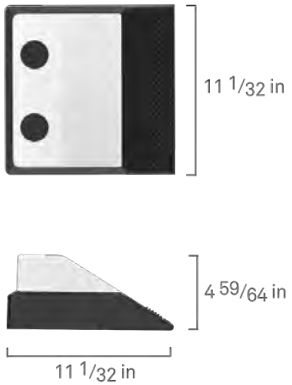
100%
recycled plastic

The Emblem of Guarantee of Environmental Quality

Zipper® A

11 lb 7 oz

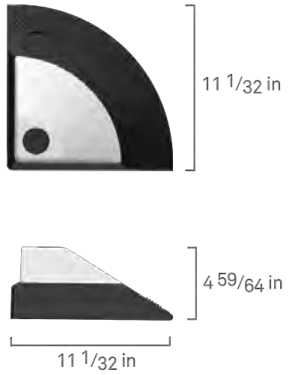
18 lb 2 oz of CO_2 equiv/u



Zipper® B

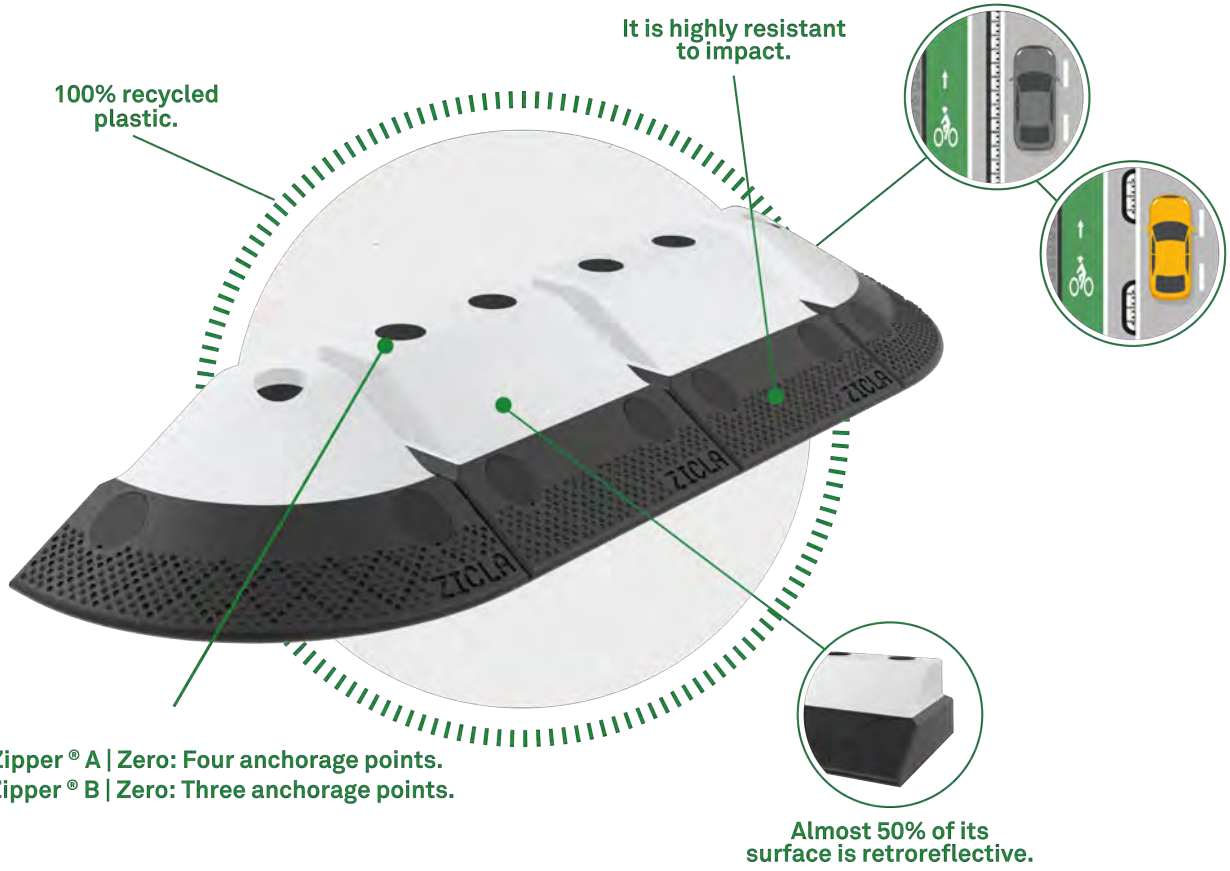
7 lb 15 oz

14 lb 915oz of CO_2 equiv/u



The Zipper® | Zero modules.

The Zipper® system (Zero line) is made of two different components: **Zipper® A | Zero and Zipper® B | Zero.**



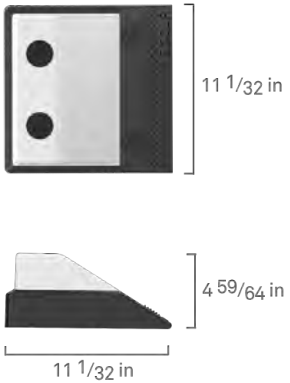
100%
recycled plastic from postcomsumption waste

The Emblem of Guarantee of Environmental Quality

Zipper® A | Zero

8 lb 8 oz

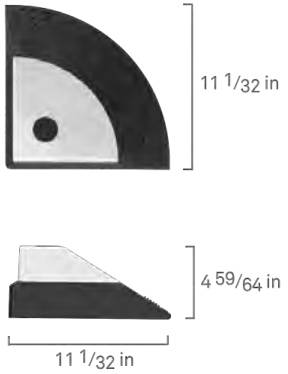
7 lb 8 oz of CO_2 equiv/u



Zipper® B | Zero

5 lb 7 oz

4 lb 11 oz of CO_2 equiv/u



Zipper® system modularity.

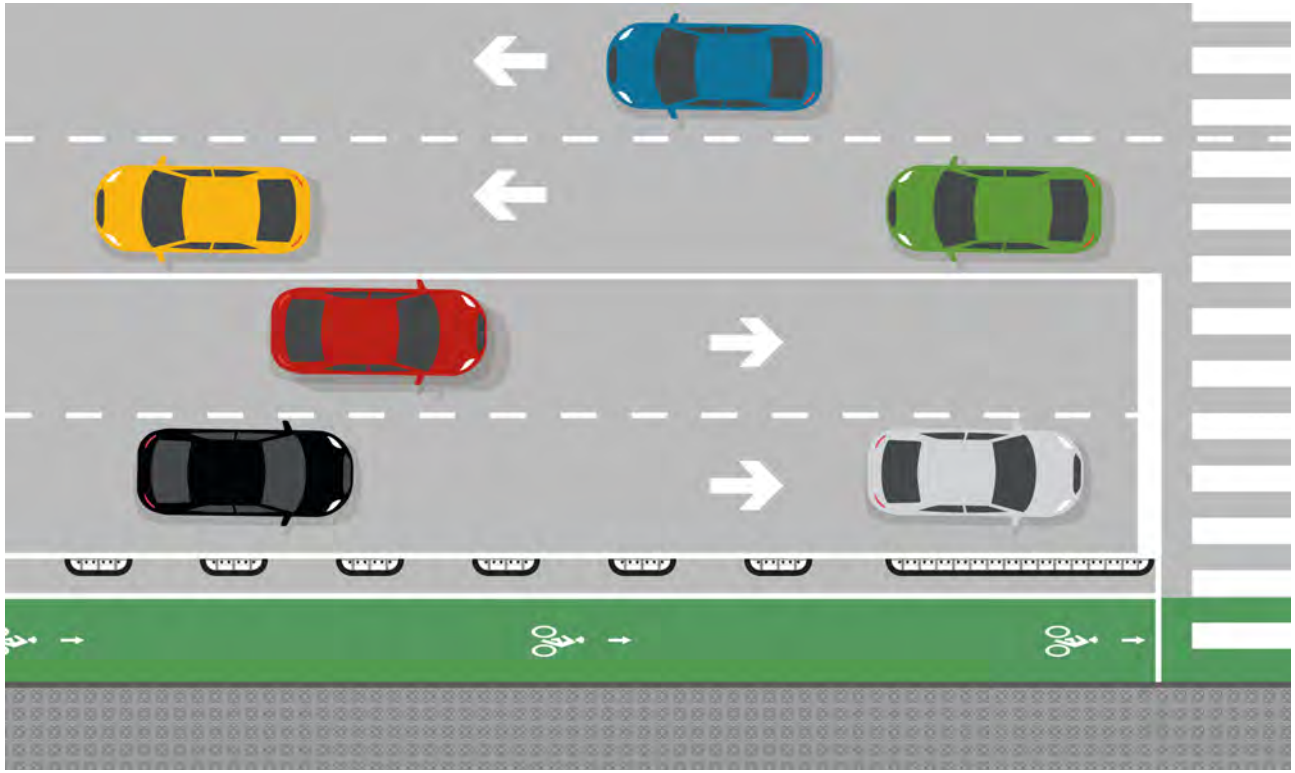
One of the main properties of Zipper® system is its own modularity. You can create many different configurations in order to solve each situation.

Zipper® & Zipper® | Zero configurations.

BAAB CONFIGURATION.

The BAAB configuration is the ideal option when the available buffer space is limited.

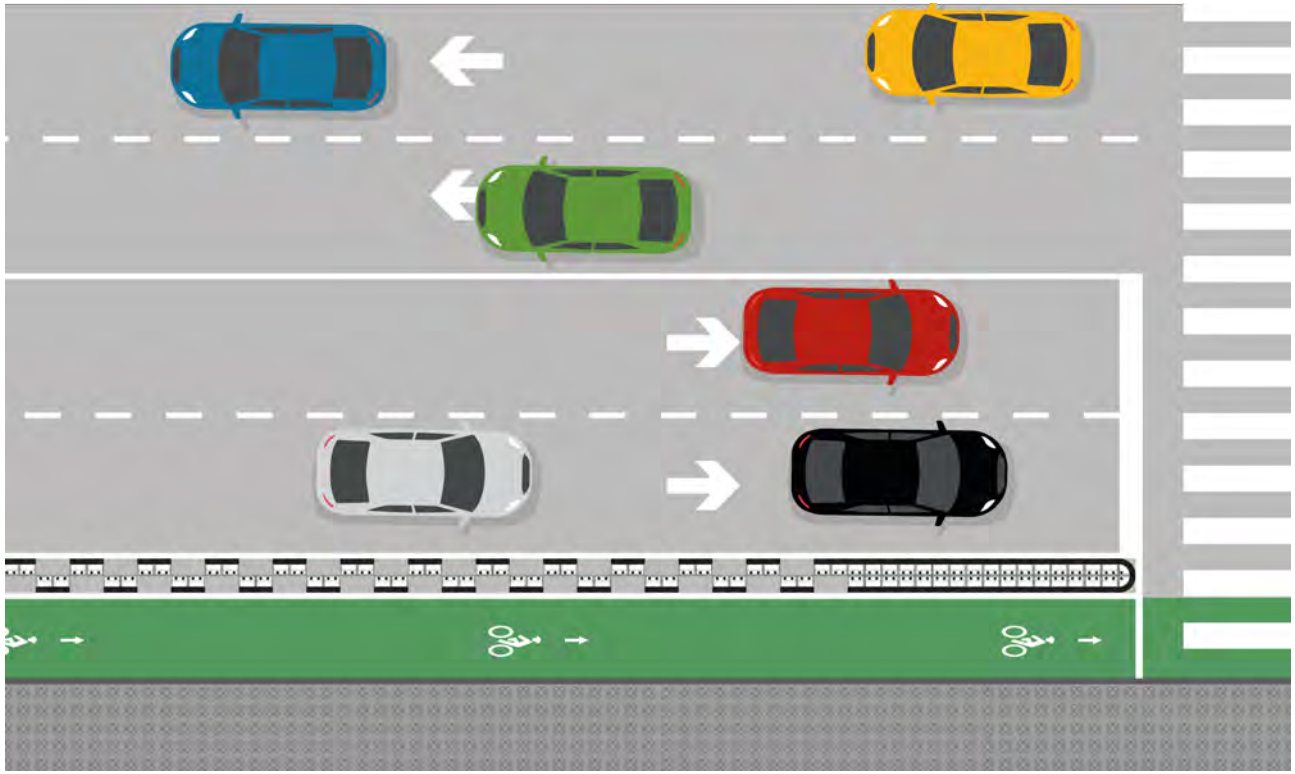
The distance between the BAAB sets can be reduced or eliminated to make the bike lane less crossable, thus increasing safety at areas near an intersection or high-traffic areas.



AA CONFIGURATION.

The AA configuration is the ideal option when the safety needs to be maximized.

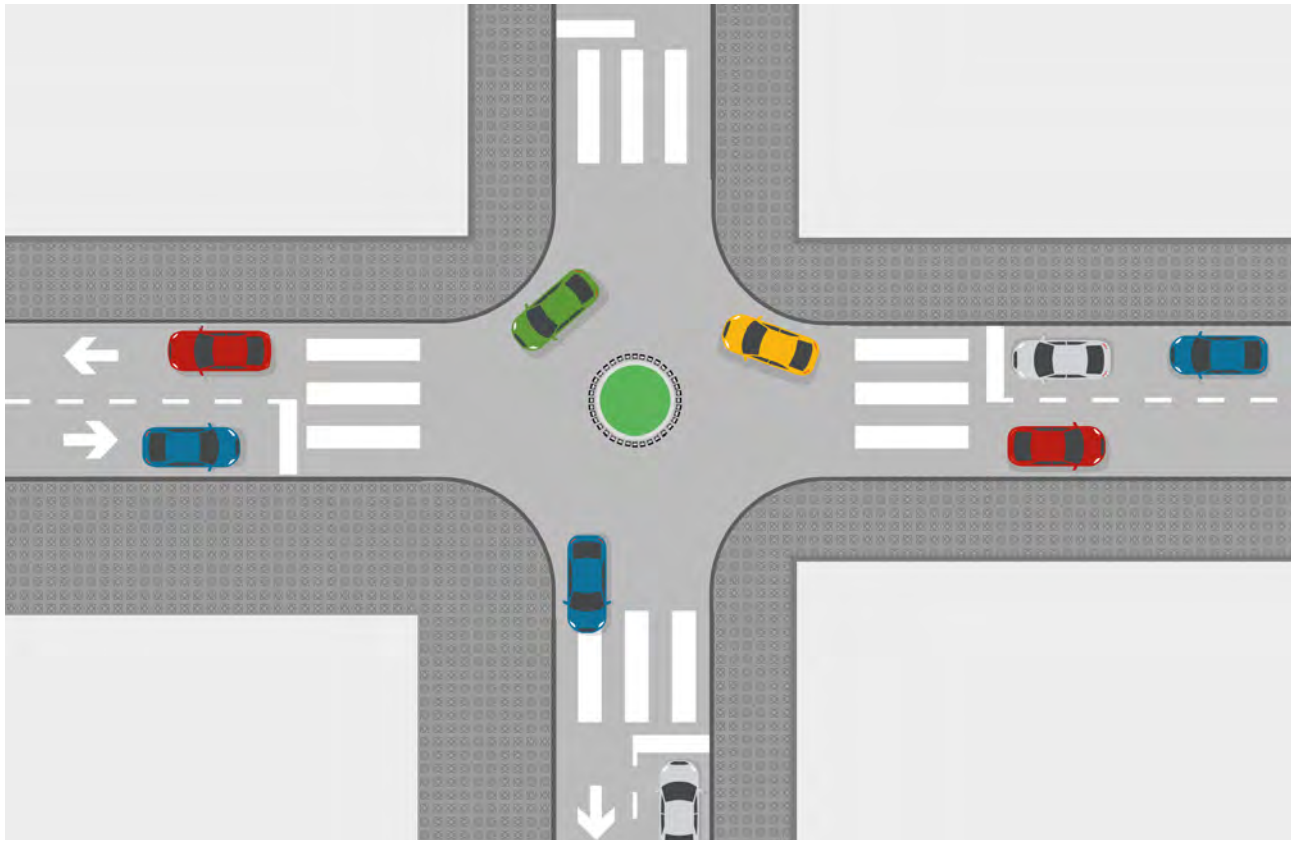
The distance between the AA sets can be reduced or eliminated to make the bike lane less crossable thus increasing safety at areas near an intersection or high-traffic areas.



MINI ROUNDABOUT.

Mini roundabouts reduce speeds at intersection crossings and are an ideal treatment for uncontrolled intersections.

It does not require civil engineering and if traffic were reordered differently, the roundabout could be quickly dismantled. This solution is specially suitable for quick-build projects.



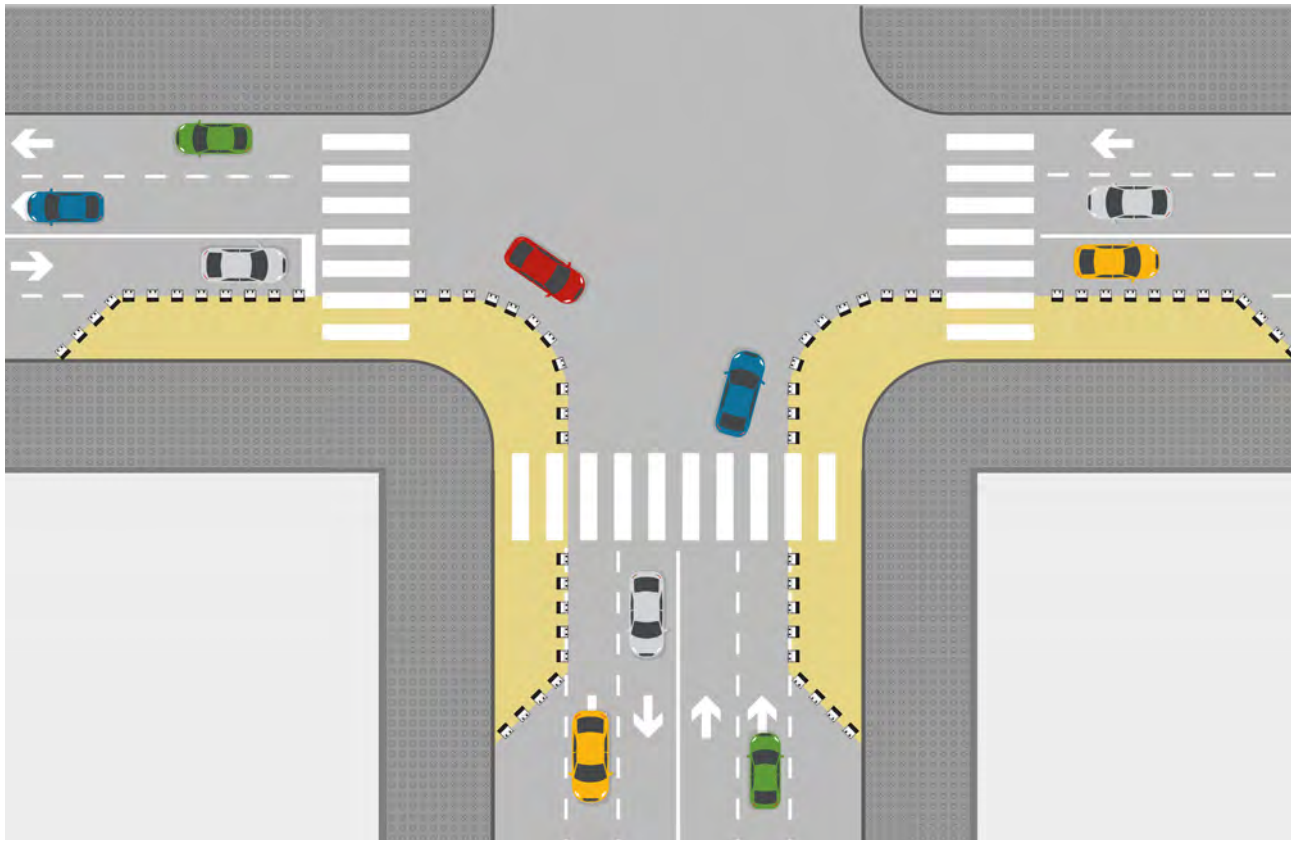
WIDENING OF THE SIDEWALKS AND NARROWING OF THE STREET AT INTERSECTIONS.

The modules of the Zipper® system can be used to expand sidewalks at intersections quickly and cheaply. These extensions offer several advantages for pedestrians:

- They facilitate the crossing thanks to the decrease of the width of the road.

- They prevent parking at the corners.

- They reduce the speed of traffic by narrowing the street and reducing the turning radius.



Zipper® system properties.

NIGHTTIME VISIBILITY.

Zipper® system modules are highly visible thanks to the fact that almost 50% of their surface is retroreflective.

DAYTIME VISIBILITY: COLOR.

White is the standard color of the retroreflective surface of Zipper® system modules.

Zipper® A

Available colors

Zipper® A | Zero

Available colors

Zipper® B

Available colors

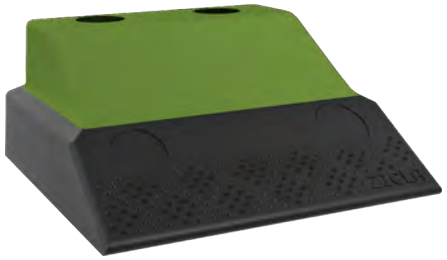
Zipper® B | Zero

Available colors

SURFACE PAINTING CUSTOMIZATION Zipper® A MODULES.

The Zipper® A modules are also available in a variety of colors.

RAL 1003



RAL 6018

RAL 3020

RAL 5017

SURFACE PAINTING CUSTOMIZATION Zipper® B MODULES.

The Zipper® B modules are also available in a variety of colors.

RAL 1003

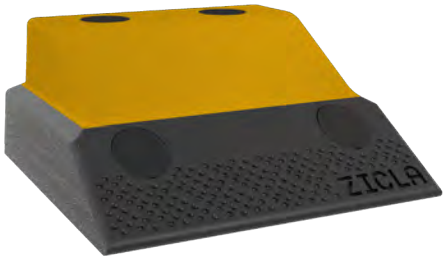
RAL 6018

RAL 3020

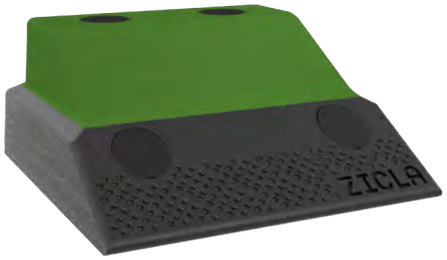
RAL 5017

SURFACE PAINTING CUSTOMIZATION Zipper® A | Zero MODULES.

The Zipper® A | Zero modules are also available in a variety of colors.

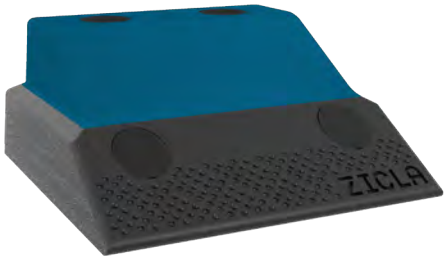


RAL 1003



RAL 6018

RAL 3020



RAL 5017

SURFACE PAINTING CUSTOMIZATION Zipper® B | Zero MODULES.

The Zipper® B | Zero modules are also available in a variety of colors.

RAL 1003

RAL 6018

RAL 3020

RAL 5017

MATERIAL USED TO MANUFACTURE THE Zipper® A and Zipper® B MODULES.

The Zipper® system modules are manufactured using various mixtures of plastic waste of industrial and post-consumer origin, basically PVC from remnants of tarpaulins, hoses, coating of electrical cables, materials out of the norm, etc. Thanks to this, the Zipper® system has the Emblem of Guaranty of Environmental Quality which is an eco-label that recognizes products and services that exceed certain environmental quality requirements beyond those established as mandatory by the current regulations.

Material properties	Unit	Regulation	Value
Hardness	ShD	ASTM D2240	41
Tensile strength	MPa	ASTM D638	10.2
Elongation at break	%	ASTM D638	10.1
Tear resistance	kN/m	ASTM D624	27.2
Taber abrasion loss	mg/1.000	ASTM D4060	262
Lightfastness		ASTM G154	Excellent
Resistance to acids		ASTM D471	Excellent
Resistance to bases		ASTM D471	Excellent
Reaction to fire		UL94	V-0
Density	g/cm^3	ASTM D792	1.25

MATERIAL USED TO MANUFACTURE THE Zipper® A | Zero and Zipper® B | Zero MODULES.

The Zipper® system (Zero line) modules are manufactured using a material developed entirely from post-consumer waste of municipal origin. This waste comes from municipal waste treatment plants and is made up of all mixed plastic waste whose type separation would be very complex and expensive, and which usually is landfilled or incinerated. This waste comes from municipal waste treatment plants and is made up of all mixed plastic waste whose type separation would be very complex and expensive, and which usually is landfilled or incinerated. This material has the Blue Angel, a German eco-label that recognizes environmentally friendly products and services.

Material properties	Unit	Regulation	Value
Hardness	ShD	ASTM D2240	55
Tensile strength	MPa	ASTM D638	8
Elongation at break	%	ASTM D638	10.3
Tear resistance	kN/m	ASTM D624	7.9
Taber abrasion loss	mg/1.000	ASTM D4060	8
Lightfastness		ASTM G154	Excellent
Resistance to acids		ASTM D471	Excellent
Resistance to bases		ASTM D471	Excellent
Reaction to fire		Euroclass	E
Density	g/cm^3	ASTM D792	0.996

ZICLA®

Vol. 2 – Installation Manual.

Accessible, inclusive, friendly streets with a small environmental footprint.

Index Vol. 2

ANCHORING Zipper® SYSTEM MODULES.

The choice of the anchor type and its correct installation are both essential to achieve optimal performance of the Zipper® system. If Zipper® system modules are not installed correctly, their service life could be reduced.

In order to choose the most suitable type of anchorage for the Zipper® system modules, it is necessary to bear in mind that these modules must be able to withstand shock and friction loads generated by the wheels of the vehicles. As these modules are anchored to the road surface, all impact or friction loads are transmitted to the road surface via the installed anchorages, so it is vital that both the anchors and the pavement of the road can withstand these loads. In addition, the type and condition of the pavement of the street and the degree of cracking should be taken into account when choosing the type and dimensions of the anchors.

The following sections describe the types of anchors that can be used for the installation of the Zipper® system modules, and their most important characteristics.

Chemical anchors.

Chemical anchors work well on both bituminous and concrete pavement. For this reason, it is recommended to use this type of anchorage when you are not sure about the type of existing pavement or its condition at the installation site.

The chemical anchor consists of a threaded rod of $^{15}/_{32}$ in and a $^{15}/_{32}$ in hexagonal nut, and is installed using epoxy, polyester or styrene-free resins (The use of a resin without styrene is suggested because styrene emits a strong odor and can be toxic if inhaled deeply). These types of resin have demonstrated good performance in all climatic conditions and all types of pavement.

When using chemical anchor, attention should be paid to the following two aspects:

- Both the rods and the holes where they are to be inserted should be clean and dust-free.
- The curing time of the resin varies according to weather conditions. The instruction manual of the resin manufacturer should provide information on this point and it is recommended to always consult the manufacturer's safety data sheet before its use.

The chemical anchors must:

- Be zinc galvanized steel of grade 5,8 or higher (with a minimum coating of 5 µm).

- Have a minimum length of 5 $^{29}/_{32}$ in, with 1 $^{31}/_{32}$ in inside the module and the remaining 3 $^{15}/_{16}$ in below the road surface. For concrete roadways, the anchorage can be shorter, but never shorter than $^{31}/_{32}$ in.

- Be $^{15}/_{32}$ in diameter to withstand the impact of the wheel of an average vehicle. However, if the road has a heavy traffic of heavy vehicles, or if the rate of accidents in the streets of the city is high, it is recommended to increase the diameter of the rod to $^{35}/_{64}$ in or even to $^{5}/_{8}$ in.

This is possible since Zipper® system modules can accommodate anchors of different diameters.

Mechanical anchors.

Galvanized steel mechanical wedge anchors perform very well when they are used in concrete pavement. They can also be installed very quickly. However, mechanical anchors are not recommended for bituminous pavements as this type of pavement deforms more easily with changes in temperature, which may lead to a loss of friction on the external surface of the anchors and a consequent loss of efficiency in their behavior.

The mechanical anchorages must:

- Be $^{15}/_{32}$ in diameter to withstand the impact of the wheel of an average vehicle. However, if the road has a heavy traffic of heavy vehicles, or if the rate of accidents in the streets of the city is high, it is recommended to increase the diameter to $^{35}/_{64}$ in or even to $^{5}/_{8}$ in. This is possible since Zipper® system modules can accommodate anchors of different diameters.

- Have a minimum length of 5 $^{29}/_{32}$ in, with 1 $^{31}/_{32}$ in inside the Zipper® system module and the remaining 3 $^{15}/_{16}$ in below the pavement surface of the street. If the street surface is not in good condition it is advisable to use longer anchors.

Reversible anchors.

The use of reversible anchorages is recommended in cases where the installation of the Zipper® system modules is assumed to be temporary. These modules can be installed and uninstalled quickly and easily with minimal intervention on the street. The use of reversible anchors allows the impact on the street to be minimal, so when the Zipper® system modules are uninstalled, the street quickly recovers its original use.

Comparative table of anchors of the Zipper® system.

The following table summarizes the most suitable types of anchor for the different types of flooring.

Pavements no Bituminous

Pavements Bituminous

	CHEMICAL ANCHOR		MECHANICAL ANCHOR	
	Anchor Rod	Internally Threaded Insert	Screw Anchor	Wedge Anchor
	Rod: HAS-U 5.8 $^{15}/_{32}$'' x 6' $^{19}/_{64}$''  **Resin:** HIT HY -10 	**Hexagon bolt :** $^{25}/_{64}$'' x 2' $^{11}/_{64}$''  **Threaded insert:** HIS-N $^{25}/_{64}$'' x 4' $^{21}/_{64}$''  **Injectable hybrid mortar:** HIT HY-10 	**Screw:** HUS-HR $^{25}/_{64}$'' x 5' $^{1}/_{8}$'' 	**Kwik bolt:** HSV $^{15}/_{32}$'' x 5' $^{29}/_{32}$'' 
Permament long duration	✓ ✓			✓
Long-lasting reversible		✓ ✓	✓	✓
Reversible short duration			✓	

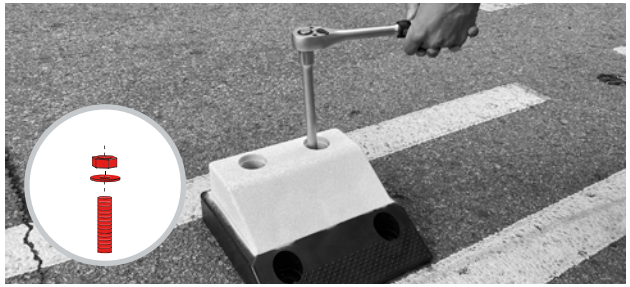
Tools and materials required to install Zipper® system modules.

MAIN MATERIALS AND TOOLS RECOMMENDED TO INSTALL Zipper® SYSTEM MODULES

1.15/32 IN. DIAMETER DRILL.

2. AIR COMPRESSOR TO REMOVE THE DUST THAT OCCUPIES THE HOLES AND A VACUUM TO AVOID THE DISPERSION OF THE DUST.

3.RESIN DISPENSER GUN.



4. SOCKET WRENCH FOR NUTS.

Installation process of the Zipper® system modules.

Mechanical anchors.

Figure 1 - Place the modules and mark the holes.

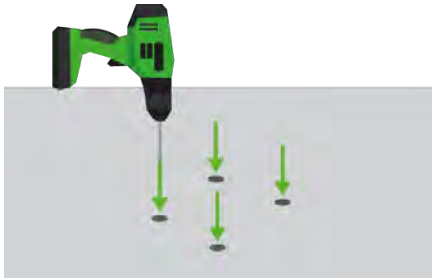


Figura 2 - Drill the holes.

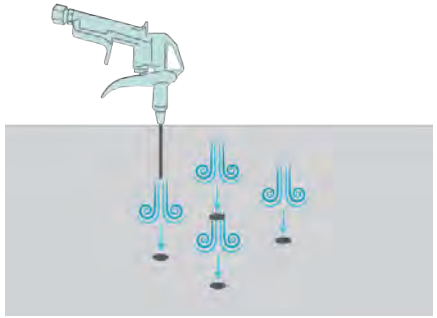


Figure 3 - Blow away and vacuum the dust.

Figure 4 - Install the anchors and tighten the nuts with the socket wrench.

Installation process of the Zipper® system modules.

Chemical anchors.

Figure 1 - Place the modules and mark the holes.

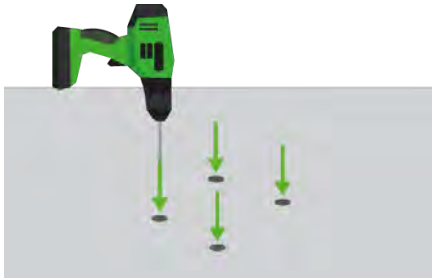


Figura 2 - Drill the holes.

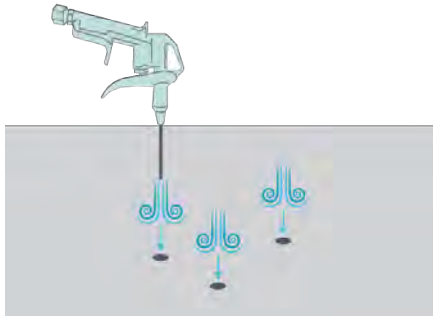


Figure 3 - Blow away and vacuum the dust.

Figure 4 - Inject the resin.

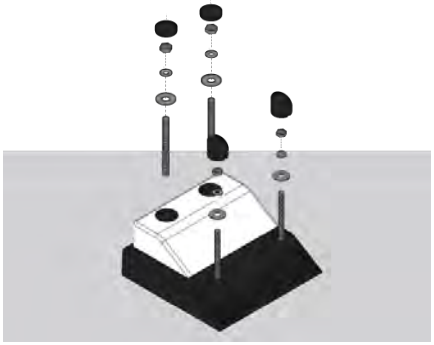


Figure 5 - Install the anchors. To ensure that the threaded rod is correctly anchored, it should be rotated while being inserted into the hole (full of resin) so that it is covered completely with resin. Once the resin is dry, tighten the nuts with the socket wrench.

Removal and re-installation of the Zipper® system modules.

Sometimes it may be necessary to temporarily remove the Zipper® system modules. Some of the most common reasons are:

- Celebration of special events in the streets of the city.

- Repainting of the horizontal street signs.

- Street surface repair: If you want to repave the road without removing the Zipper® system modules, they must be covered to protect the retroreflective paint. If street repair work involves milling the entire surface of the street, it is advisable to remove the anchors to avoid damage to the milling equipment.

The removal of the Zipper® system modules requires the same precautions as its installation, in terms of pre-signaling to prevent and protect users of the street from which works are being carried out. Warning signs should be installed both at motorized traffic on the road and at bike lane users.

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Annex 1 - Decision Factors.

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Narrower buffer space

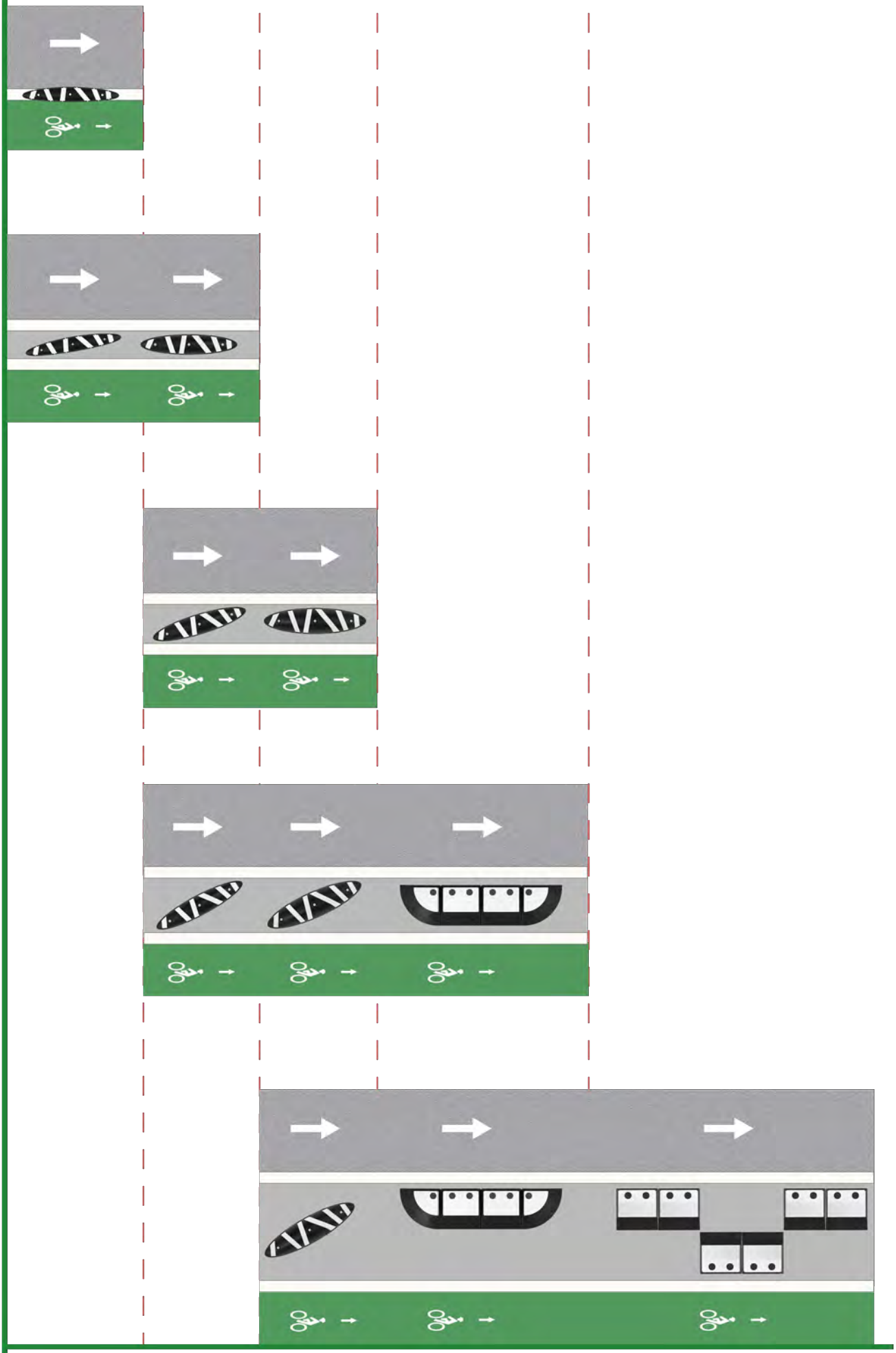
Zebra® 5

Zebra® 9

Zebra® 13

Zipper® BAAB

Zipper® AA



Wider buffer space

Less Crossable

More Crossable

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Annex 2- Utilization of Chemical Anchors.

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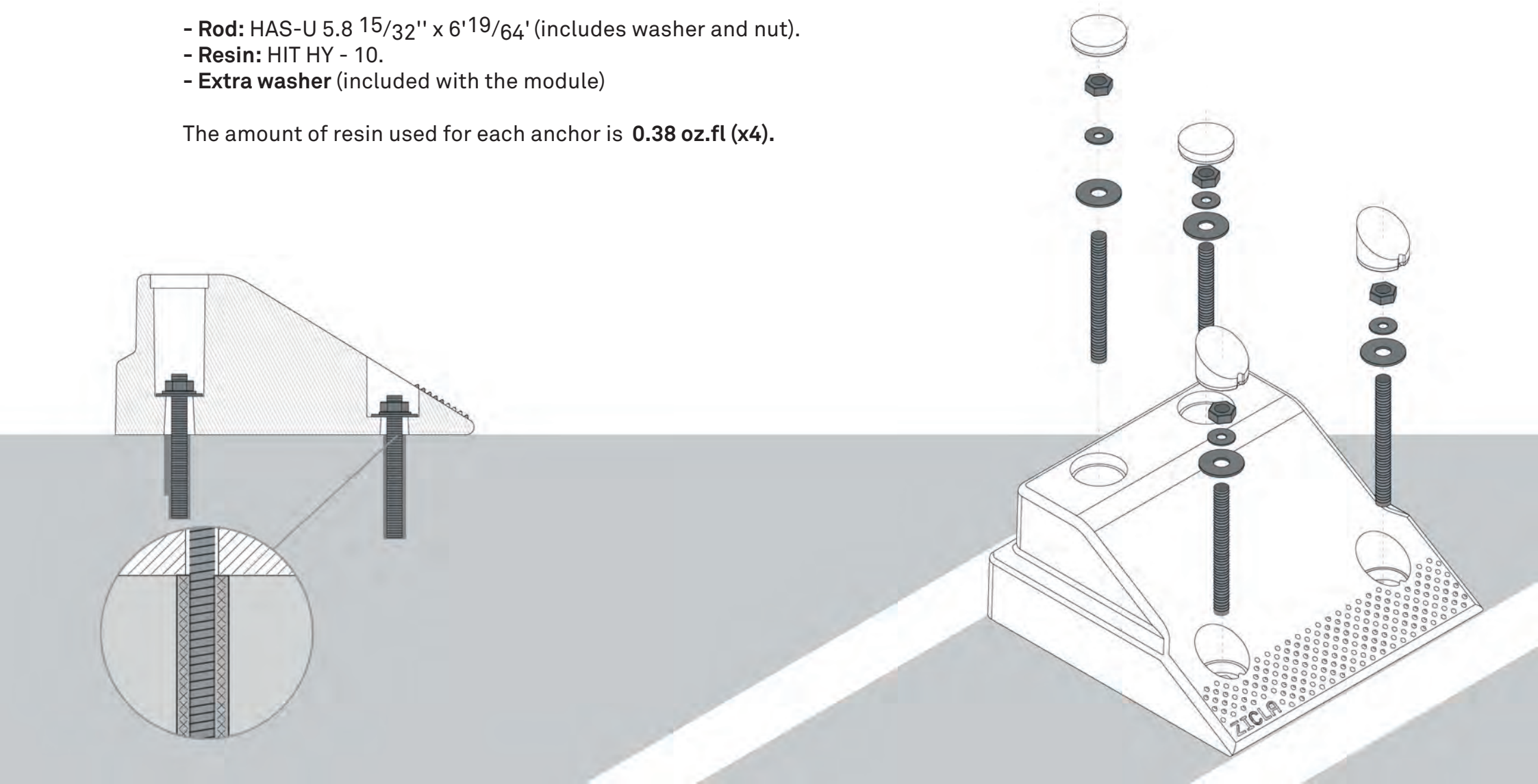
Zipper® A & Zipper® A | Zero – Chemical anchors.

The anchors used for this type of installation, include:

- **Rod:** HAS-U 5.8 $^{15}/_{32}$'' x 6'$^{19}/_{64}$' (includes washer and nut).
- **Resin:** HIT HY - 10.
- **Extra washer** (included with the module)

The amount of resin used for each anchor is **0.38 oz.fl (x4).**

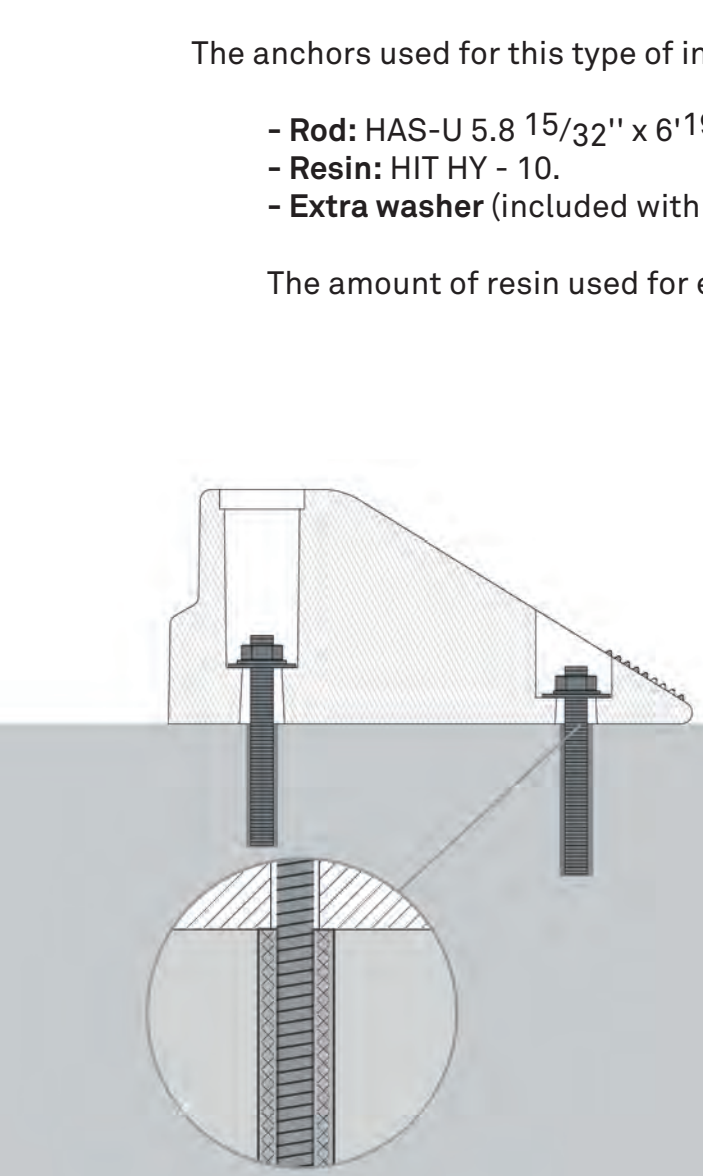


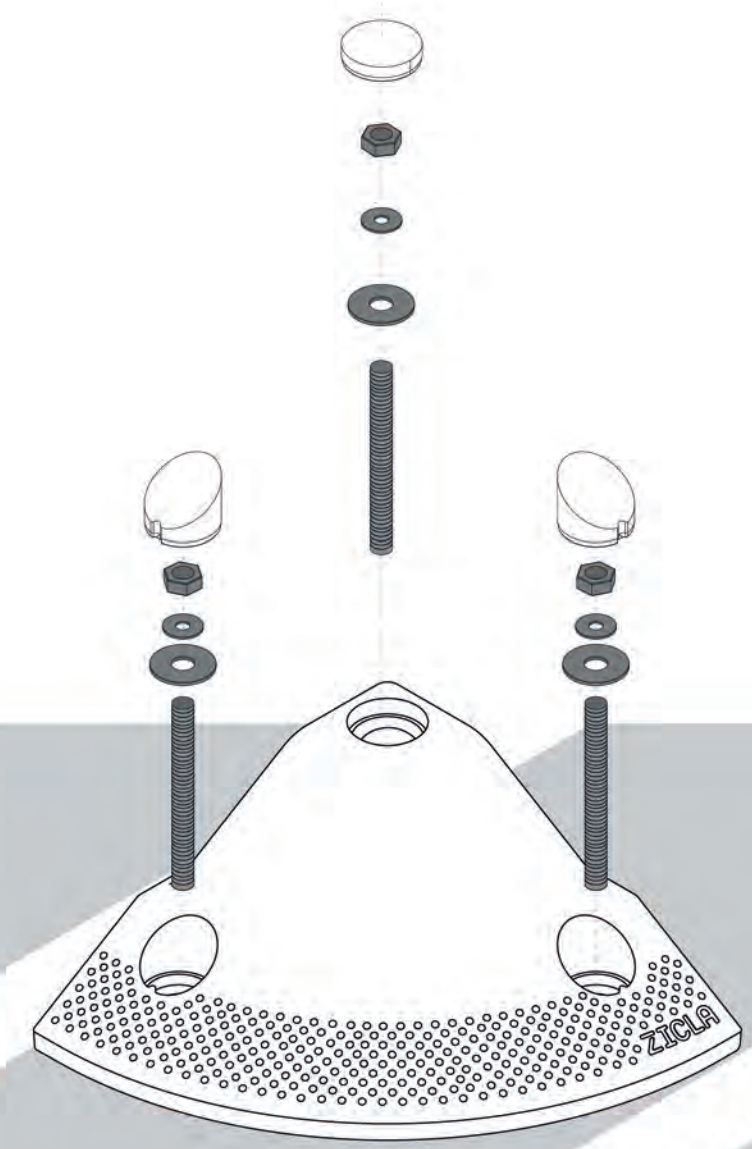
Zipper® B & Zipper® B | Zero - Chemical anchors.

The anchors used for this type of installation, include:

- **Rod:** HAS-U 5.8 $^{15}/_{32}$'' x 6'$^{19}/_{64}$' (includes washer and nut).
- **Resin:** HIT HY - 10.
- **Extra washer** (included with the module)

The amount of resin used for each anchor is **0.285 oz.fl (x3)**





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Annex 3 - Measures to Extend the Life of Zipper® system.

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Measures to extend the service life of the Zipper® system.

Zipper® system modules can suffer damage and breakage but nevertheless continue to fulfil their role:

- Normally, after suffering an impact, the module, neither separate from the road surface, nor wobbles; it remains in place and it does not break or crack.

- The Zipper® system modules continue to fulfil its function as long as the retro-reflective surface continues to be visible in low light and the anchor system is not exposed. If any of these two conditions is not fulfilled, the module must be repainted or replaced.

Additionally, if Zipper® modules have been fully pulled out, this may indicate that they have not been properly anchored to the pavement. This may be due to the use of an improper type of anchor or bolt size.

Measures to extend the service life of the Zipper® system.

Preventive maintenance should begin during the design phase of the project with the aim of extending the service life of the Zipper® system modules. The need to replace a module more than once a year may indicate a defective design in the original design of the project, or in its installation.

The basic points to consider are:

- To reduce the overexposure of the modules of the Zipper® system. The highly exposed areas tend to be those at the beginning of the bike lanes and in the proximity of the crossings where the motor vehicles turns are made. In these areas the damage to the modules may be more obvious and/or frequent and it will be necessary to foresee:

    - A higher maintenance level and frequency for the Zipper® system modules.
    - A lower separation between modules of the Zipper® system.
    - More frequent replacement of damaged modules.

- Select the most appropriate configuration for each case.
- Choose the most appropriate anchors.
- Ensure a correct installation.

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Glossary.

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ANCHORING SYSTEM
A combination of anchoring equipment and anchor assemblies that will, when properly designed and installed, resist the uplift, overturning, and lateral forces on the product and on its support and foundation system.

BUFFER
The space between two painted lines that creates a separation between bicycles and other motor vehicles.

CHEMICAL ANCHORS
Element fasteners that rely on a structural chemical bond based generally on a single or dual component resin.

BIKE LANE
Lane for bicycle users, segregated to a large degree from motorized vehicle traffic, except at junctions, access to service bays, etc., and normally installed on the road.

BIKE LANE SEPARATOR
Element of urban furniture, whether continuous such as a Curb, or discontinuous such as Zipper® and Zipper® | Zero modules, which create a greater segregation of the bike lane from motorized vehicle lanes.

MECHANICAL ANCHORS
Element fasteners that utilize friction to obtain holding values.
A combination of anchoring equipment and anchor assemblies that will, when properly designed and installed, resist the uplift, overturning, and lateral forces on the product and on its support and foundation system.

PAVEMENT
The artificially covered surface of a public thoroughfare.

QUICK-BUILD
Designed to be assembled very quickly.

REFLECTIVE MATERIAL
Material which retroreflects part or all incidental light.

ROAD
A thoroughfare, route, or way on land between two places that has been paved or otherwise improved to allow travel by motor vehicle.

ROADWAY MARKINGS
Horizontal signage element. Painted indications on the pavement, generally white to contrast with the dark asphalt, or yellow in areas where roadwork is being performed.

Legal Note.

GENERAL NOTES:

1. A CITY OF LITTLETON RIGHT OF WAY PERMIT AND FORMAL NOTICE TO PROCEED SHALL BE OBTAINED BY THE CONTRACTOR PRIOR TO THE START OF WORK.
2. TRAFFIC CONTROL PLANS SHALL BE SUBMITTED FOR REVIEW AND APPROVED BY THE CITY OF LITTLETON PRIOR TO THE START OF WORK. TRAFFIC CONTROL PLANS SHALL INCLUDE ANY NECESSARY PEDESTRIAN DETOURS AND SIGNAGE FOR EXISTING BIKE LANES.
3. ALLOWABLE LANE CLOSURE HOURS ALONG PENNSYLVANIA STREET SHALL BE FROM 9:00 AM – 3:00 PM ON MONDAYS, TUESDAYS, THURSDAYS, AND FRIDAYS. ALLOWABLE LANE CLOSURE HOURS ALONG PENNSYLVANIA ST ON WEDNESDAYS SHALL BE FROM 10:00 AM –3:00 PM.
4. ALLOWABLE LANE CLOSURE HOURS ALONG IRVING STREET SHALL BE FROM 8:30 AM – 4:30 PM.
5. ZICLA ZEBRA 9 AND ZICLA ZEBRA 13 SPECIFICATION SHEET AND INSTALLATION INSTRUCTIONS SHALL BE OBTAINED FROM THE MANUFACTURER. ZICLA ZEBRA PRODUCTS SHALL BE FURNISHED AND INSTALLED BY THE CONTRACTOR.
6. ALL VERTICAL FLEX POSTS SHALL BE GREEN 36" TALL TUBULAR SURFACE MOUNTED SHUR–FLEX, MANUFACTURED BY SHURE–TITE. ALL FLEX POSTS SHALL HAVE WHITE REFLECTIVE SHEETING PER MANUFACTURER'S SPECIFICATIONS. BOLTED INSTALLATION SHALL BE USED. ALL FLEX POSTS, BASES, AND INSTALLATION HARDWARE SHALL BE FURNISHED AND INSTALLED BY THE CONTRACTOR.
7. STAGING AND STORAGE AREA FOR MATERIALS SHALL BE IDENTIFIED BY THE CONTRACTOR.
8. A PREMARKING LAYOUT INSPECTION SHALL BE CONDUCTED BY THE CITY OF LITTLETON PRIOR TO THE INSTALLATION OF ANY BIKE LANE PROTECTION AND PAVEMENT MARKING MATERIALS.
9. THE CONTRACTOR SHALL PROVIDE THE CITY OF LITTLETON 48 HOURS ADVANCED NOTICE TO SCHEDULE INSPECTIONS.
10. ONCE WORK HAS BEEN STARTED, CONTINUOUS PROGRESS TOWARD COMPLETION OF THE PROJECT SHALL BE MADE BY THE CONTRACTOR UNLESS OTHERWISE OPPROVED BY THE CITY OF LITTLETON PROJECT ENGINEER.
11. THE CONTRACTOR IS RESPONSIBLE FOR NOTIFYING ADJACENT PROPERTY OWNERS SEVEN DAYS PRIOR TO THE START OF WORK. THIS NOTIFICATION SHALL INCLUDE CONTACT INFORMATION FOR AN ON–SITE REPRESENTATIVE FROM THE CONTRACTOR, AS WELL AS ESTIMATED DATES OF IMPACT.
12. TEMPORARY NO PARKING SIGNS SHALL BE PLACED 48 HOURS PRIOR TO THE START OF WORK.

PROJECT NUMBER
25-02

2026 CITY OF LITTLETON SURFACE SEAL
GENERAL NOTES

Designer	KDM
Detailer	KDM
Checked	

Littleton Colorado
ENGINEERING & UTILITIES DIVISION
2255 West Berry Avenue
Littleton, CO 80120 (303) 795-3865
www.littletongov.org

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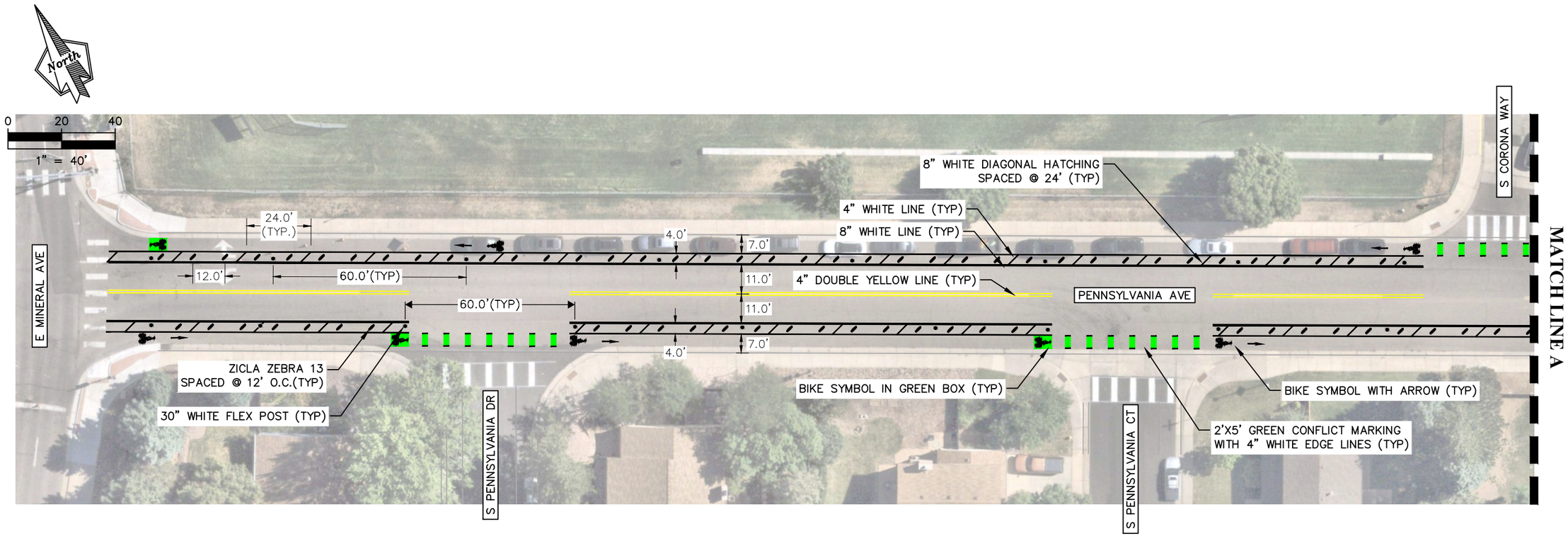

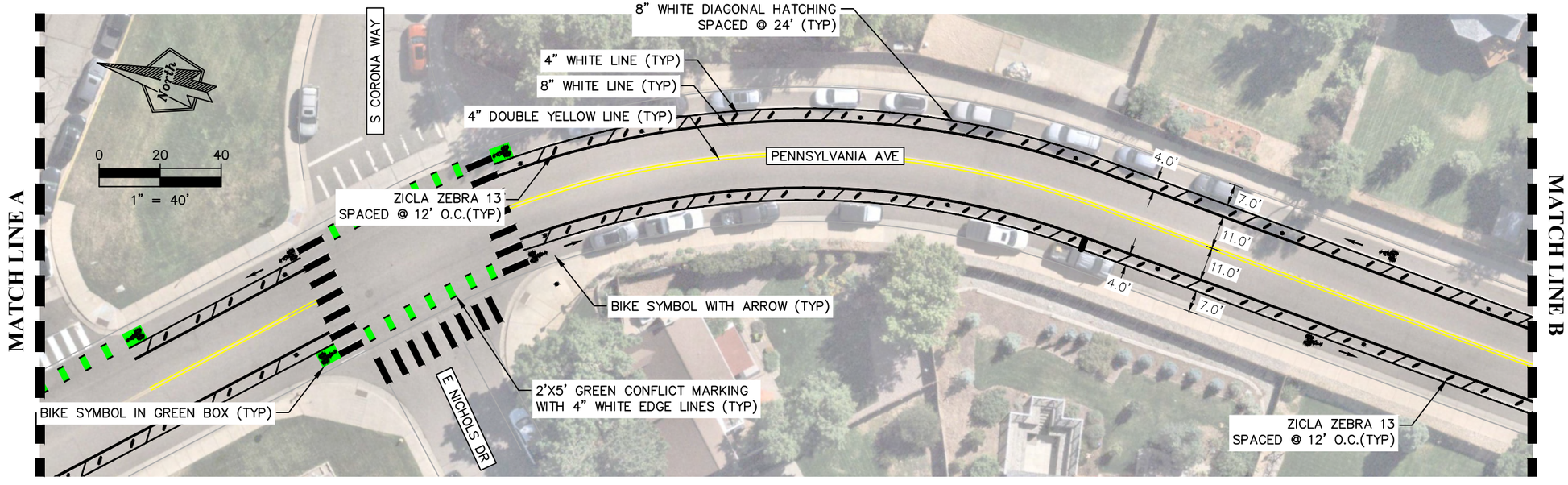

PROJECT NUMBER
25-02

2026 CITY OF LITTLETON SURFACE SEAL
PENNSYLVANIA ST

Designer	KDM
Detailer	KDM
Checked	

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ENGINEERING & UTILITIES DIVISION
2255 West Berry Avenue
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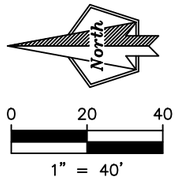

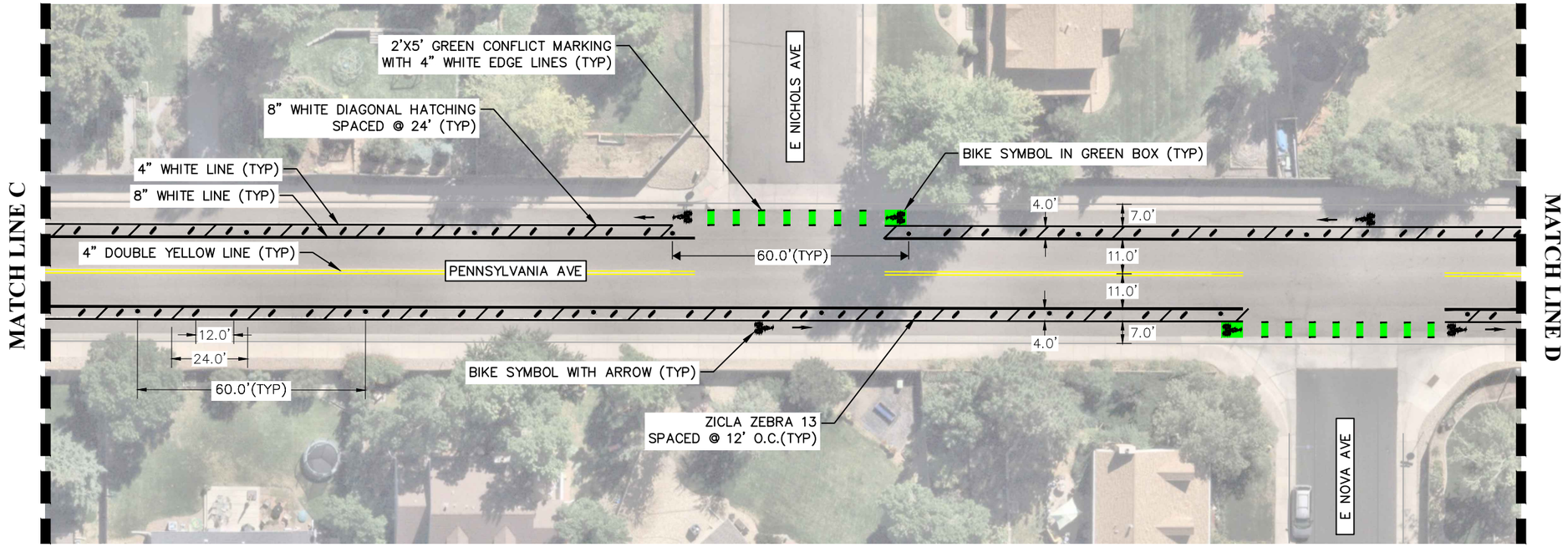

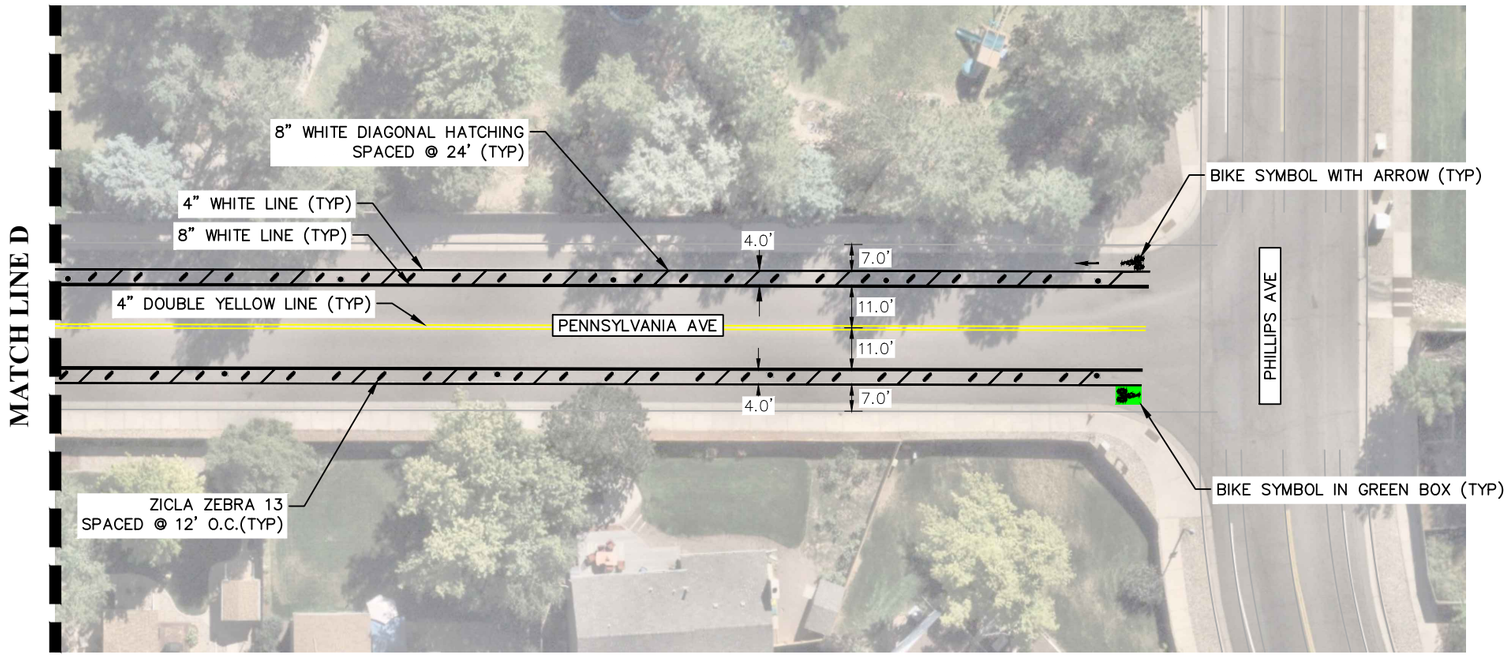

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PENNSYLVANIA ST

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Detailer	KDM
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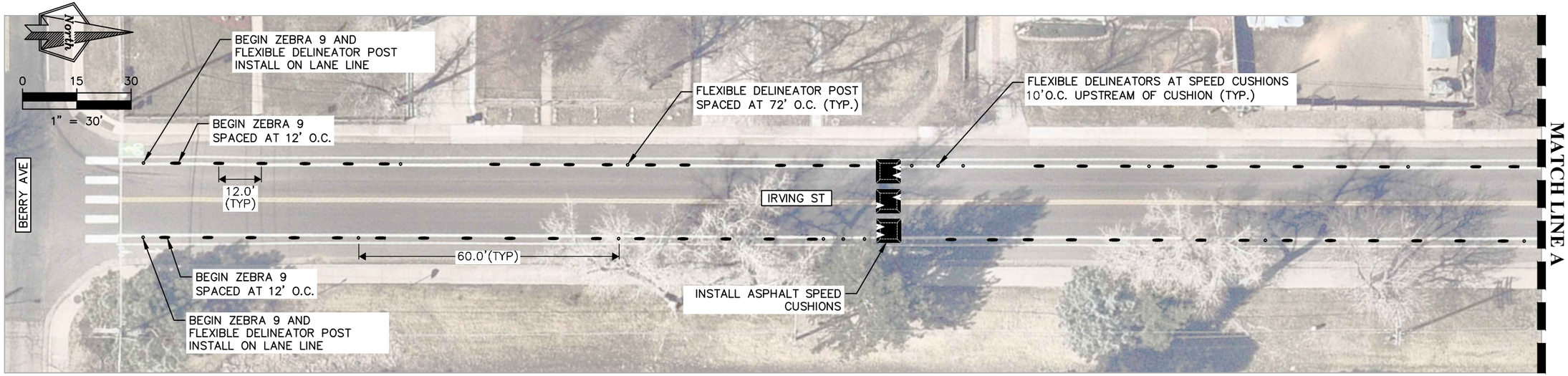

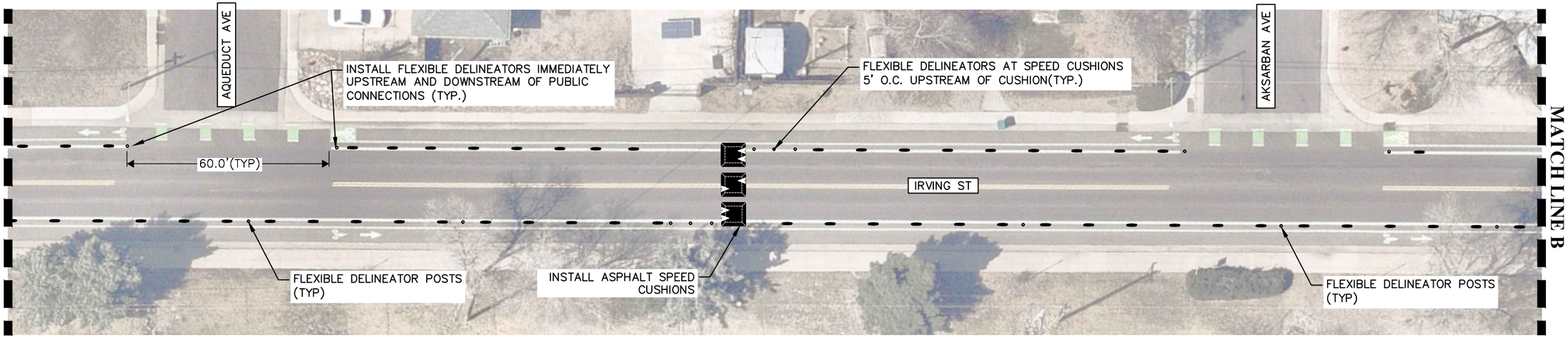

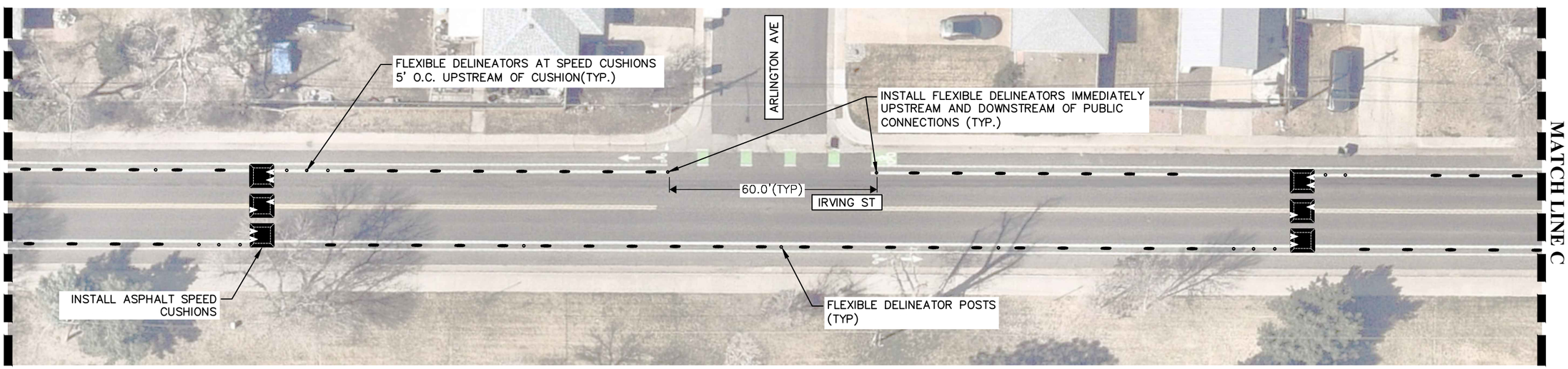

PROJECT NUMBER
25-02

2026 CITY OF LITTLETON SURFACE SEAL
IRVING ST

Designer	KDM
Detailer	KDM
Checked	

Littleton Colorado
ENGINEERING & UTILITIES DIVISION
2255 West Berry Avenue, Suite 200
Littleton, CO 80120 (303) 795-3865
www.littletongov.org

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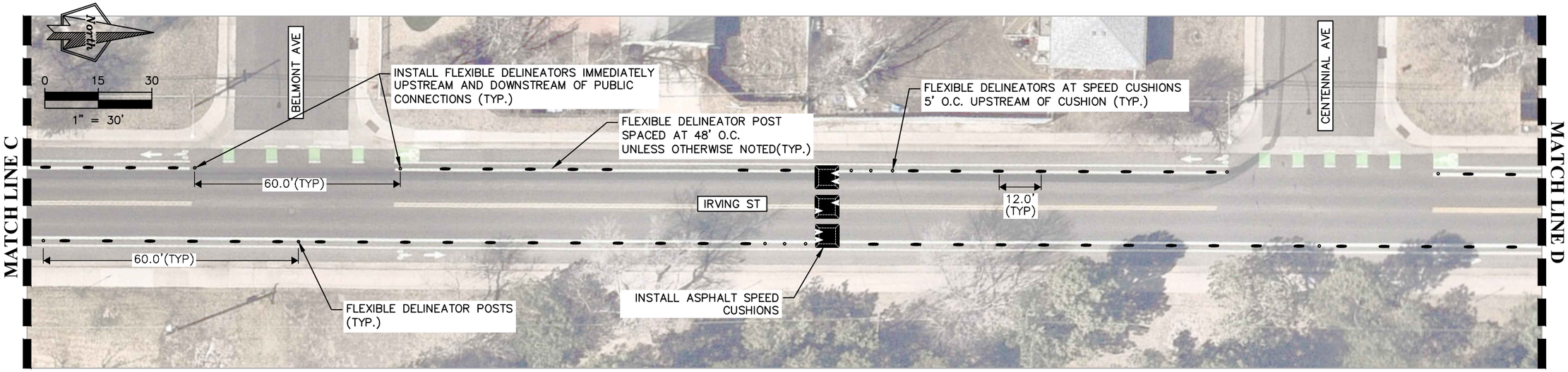

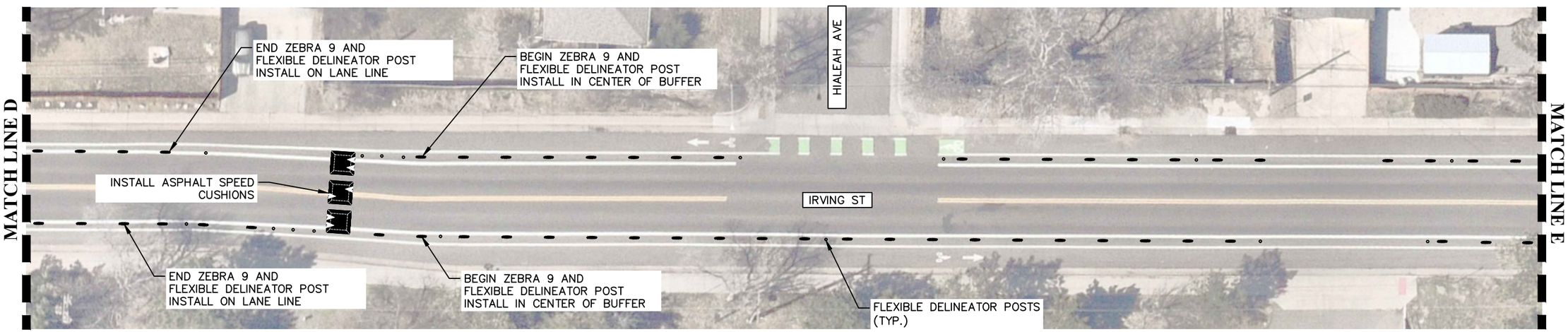

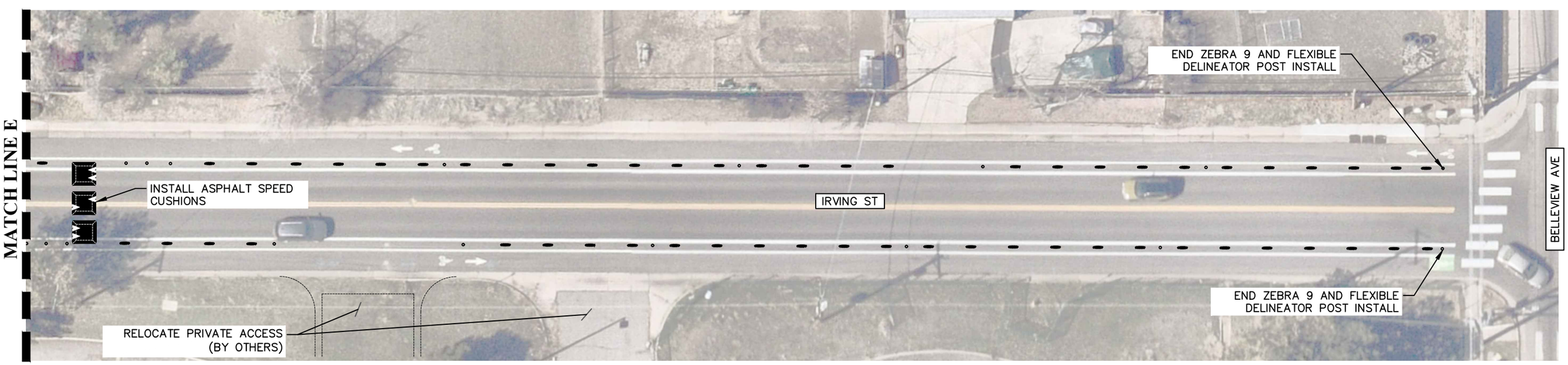

PROJECT NUMBER
25-02

2026 CITY OF LITTLETON SURFACE SEAL
IRVING ST

Designer	KDM
Detailer	KDM
Checked	

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TYPICAL FEATURES:
- 5' BIKE LANES
- 3' MINIMUM BUFFER
- 10' TRAVEL LANES
- 11' TURN LANES AT BELLEVIEW INTERSECTIONS
- STRIPED BIKE LANE BUFFERS THROUGHOUT
- PRTOECTED BIKE LANES FROM SHERI LN TO LAYTON AVE
  - ZICLA ZIPPER - 16' SPACING (TYP), 8' SPACING AT BELLEVIEW INTERSECTION APPROACHES
  - WHITE 36" FLEX POSTS, SPACED AT 64'
-REMOVAL OF NORTH AND SOUTHBOUND RIGHT TURN LANES AT BELLEVIEW AVE

- ALL STRIPES: MODIFIED EXPOXY
- ALL SYMBOLS AND CROSSWALKS: THERMOPLASTIC

North

0 10 60

1" = 60'

WINDERMERE ST

PRENTICE AVE

MATCH LINE A

SHERI LN

WINDERMERE ST

MATCH LINE A

MATCH LINE B

CORNERSTONE PARK

W BELLEVIEW AVE

MATCH LINE B

WINDERMERE ST

CORNERSTONE PARK

MATCH LINE C

PROJECT NUMBER

25-02

2026 CITY OF LITTLETON SURFACE SEAL
WINDERMERE ST

Designer	KDM
Detailer	KDM
Checked	MMM

Littleton Colorado
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2255 West Berry Avenue
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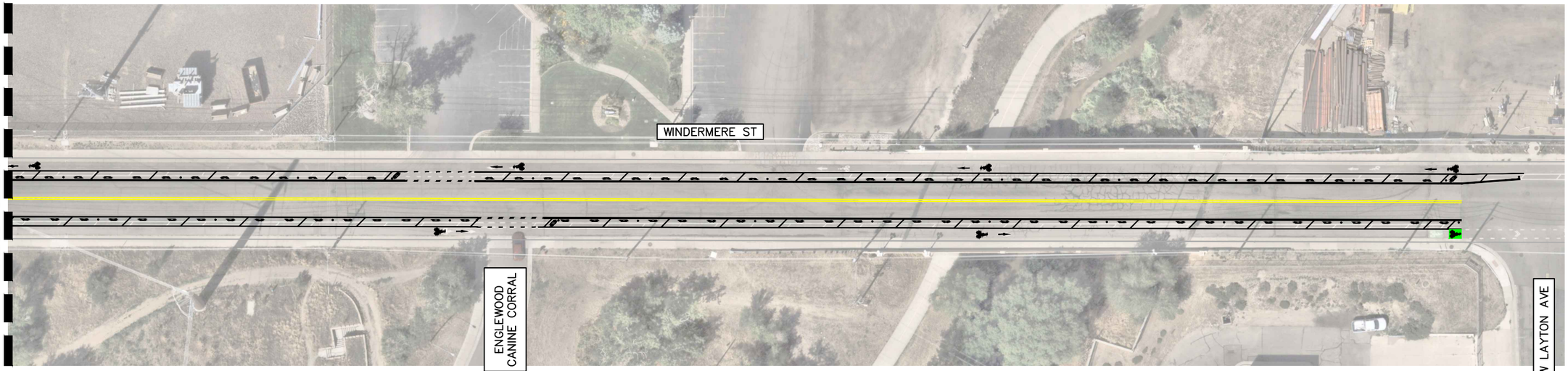
- ALL STRIPES: MODIFIED EXPOXY
- ALL SYMBOLS AND CROSSWALKS: THERMOPLASTIC

North

0 10 60

1" = 60'



PROJECT NUMBER
25-02

2026 CITY OF LITTLETON SURFACE SEAL
WINDERMERE ST

Designer	KDM
Detailer	KDM
Checked	MMM

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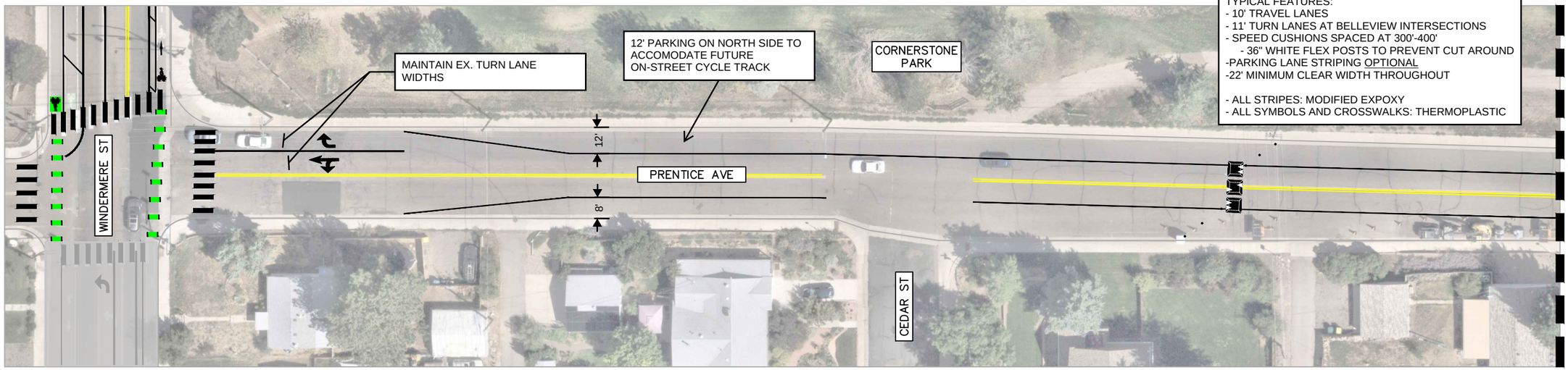

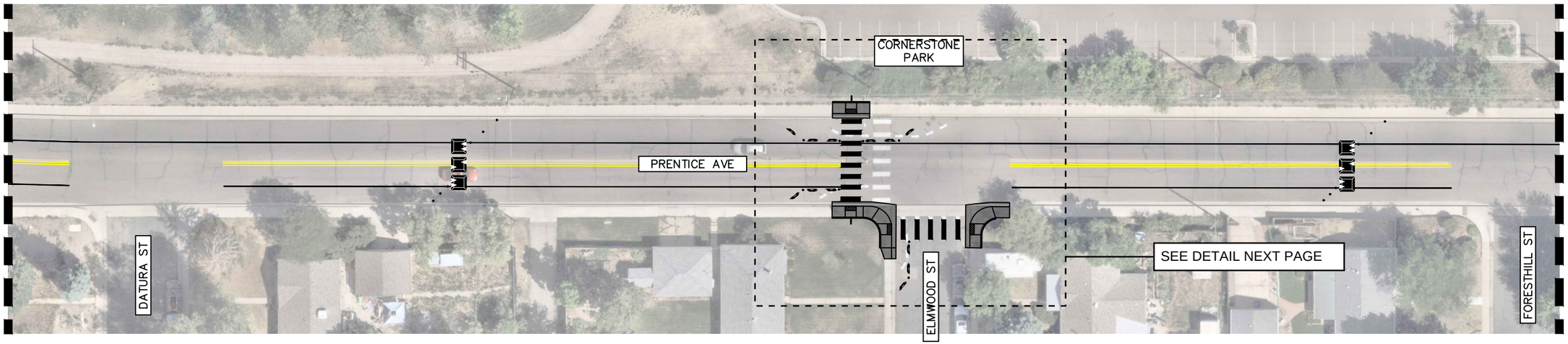

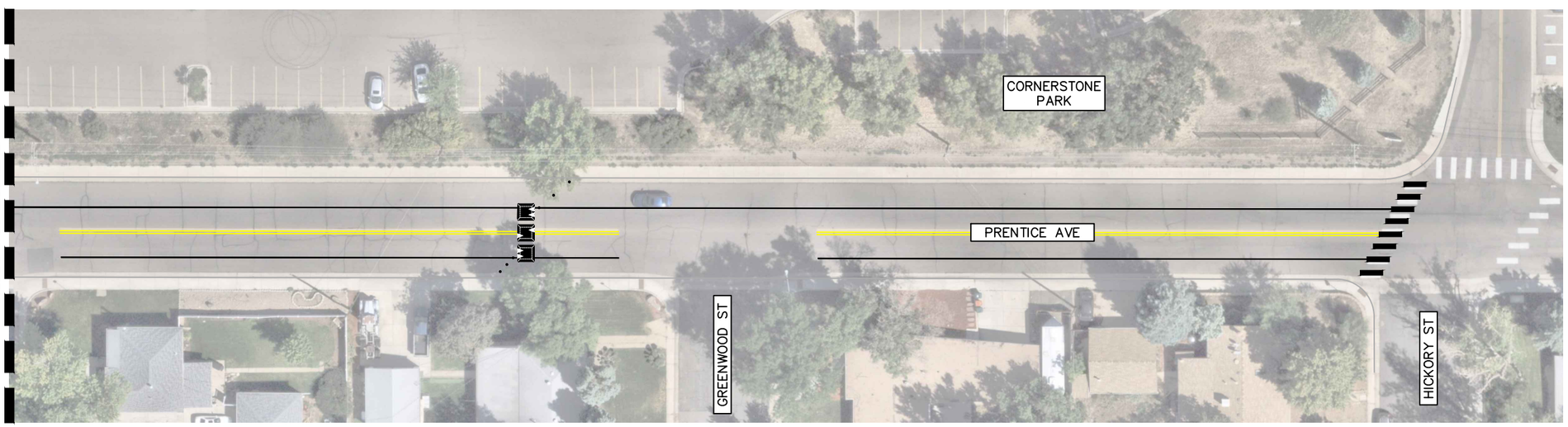

North

0 10 50

1" = 50'

PROJECT NUMBER
25-02

2026 CITY OF LITTLETON SURFACE SEAL
PRENTICE AVE

Designer	KDM
Detailer	KDM
Checked	MMM

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ENGINEERING & UTILITIES DIVISION
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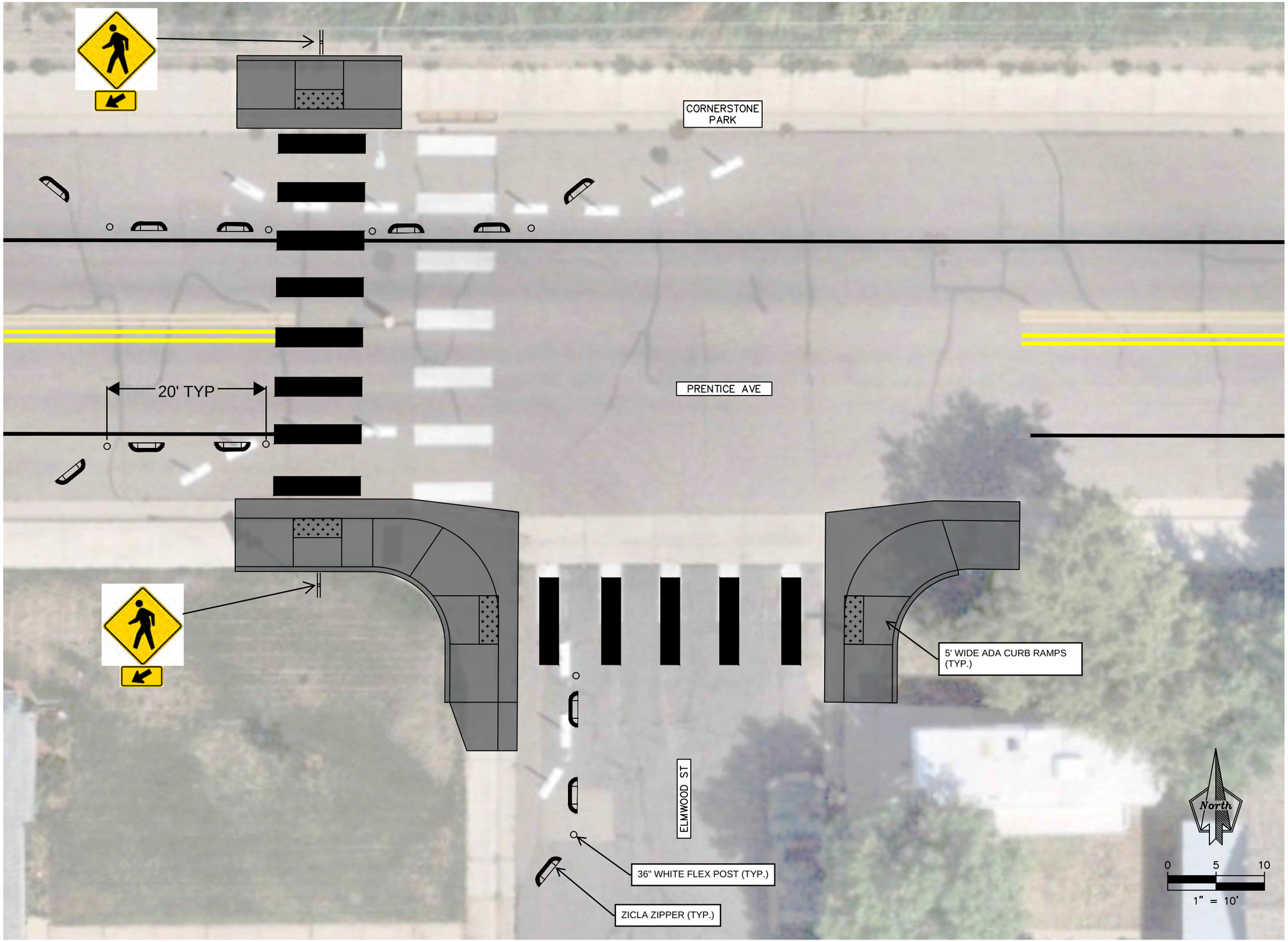

PROJECT NUMBER
25-02

2026 CITY OF LITTLETON SURFACE SEAL
PRENTICE AVE AT ELMWOOD ST

Designer	KDM
Detailer	KDM
Checked	MMM

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2255 West Berry Avenue
Littleton, CO 80120 (303) 795-3865
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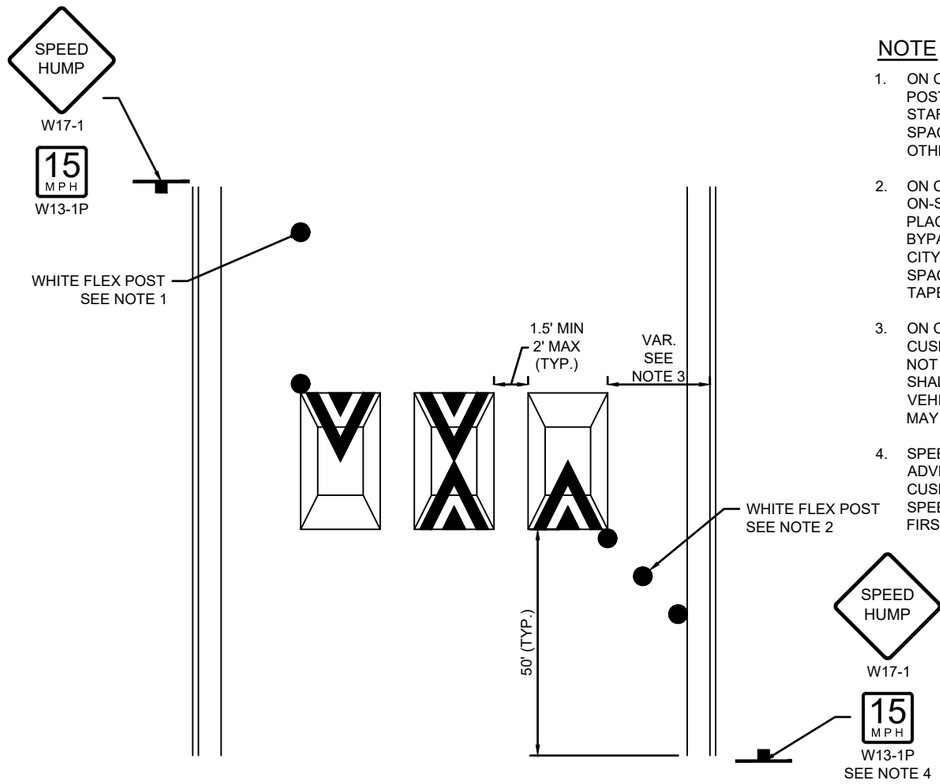
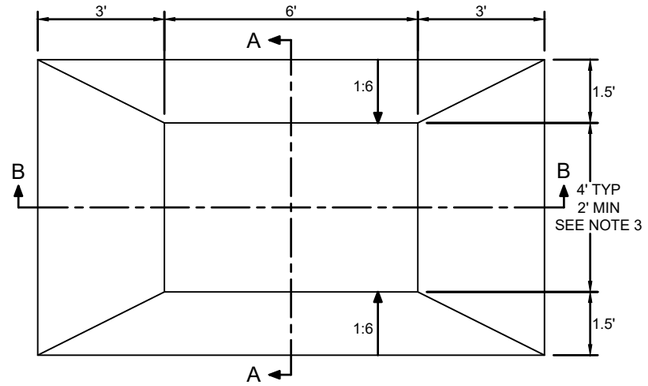


NOTE

1. ON CORRIDORS WITH ON-STREET BIKE LANES, FLEX POSTS SHOULD BE PLACED ON THE APPROACH STARTING 50' PRIOR TO SPEED CUSHIONS AT 10' SPACING, AVOIDING DRIVEWAYS, CROSSINGS, AND OTHER ACCESSES.
2. ON CORRIDORS WITH ON-STREET PARKING BUT NO ON-STREET BIKE LANES, FLEX POSTS SHOULD BE PLACED IN A WAY TO PREVENT VEHICLES FROM BYPASSING SPEED CUSHIONS, AS APPROVED BY THE CITY ENGINEER, WITH A RECOMMENDED MAXIMUM SPACING OF 5 FEET, EQUALLY SPACED OVER A 2:1 TAPER RATIO.
3. ON CORRIDORS WITH ON-STREET BIKE LANES, SPEED CUSHION WIDTH AND SPACING SHALL BE DESIGNED TO NOT EXTEND INTO BIKE LANE. CENTER SPEED CUSHION SHALL MATCH STANDARD TO ALLOW EMERGENCY VEHICLES TO TRAVERSE. OUTSIDE SPEED CUSHIONS MAY NARROW AT TOP TO A MINIMUM WIDTH OF 2 FEET.
4. SPEED HUMP SIGN SHOULD BE SUPPLEMENTED WITH ADVISORY SPEED PLAQUE. IF A SERIES OF SPEED CUSHIONS EXISTS IN CLOSE PROXIMITY, ADVISORY SPEED PLAQUE MAY BE ELIMINATED ON ALL BUT THE FIRST SPEED CUSHION IN THE SERIES.

CUSHION PLAN VIEW



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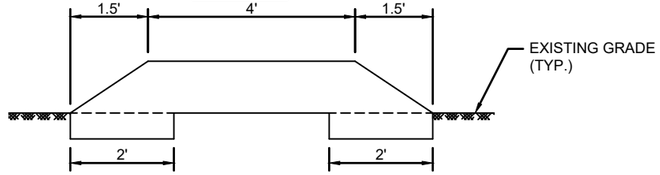

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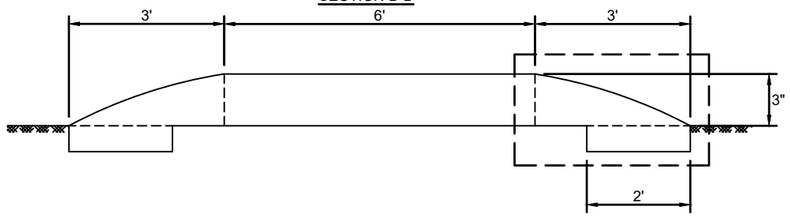
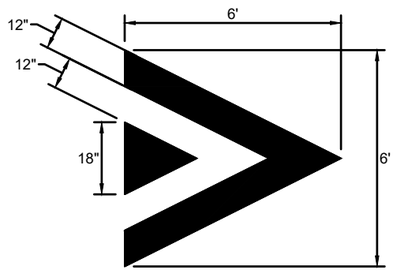
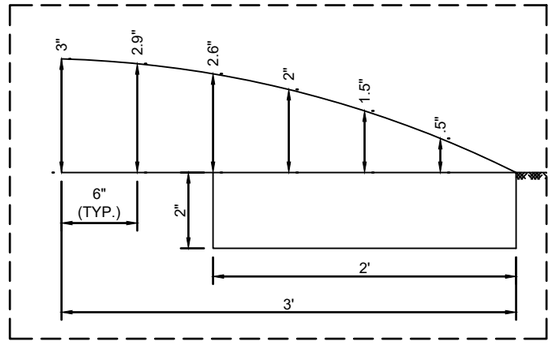


PAVEMENT MARKING DETAIL





DIMENSIONS IN DETAIL ABOVE ONLY APPLICABLE TO CONCRETE AND ASPHALT SPEED CUSHIONS

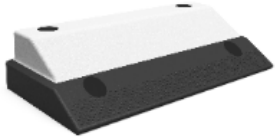
SPEED CUSHION

Littleton Colorado

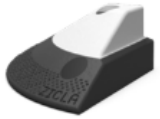
DAVID EVANS AND ASSOCIATES INC.
1600 Broadway Street Suite 800
Denver Colorado 80202
Phone: 720.946.0969

LITTLETON TRAFFIC CALMING DESIGN GUIDANCE

SHEET 1



Zipper® Double A

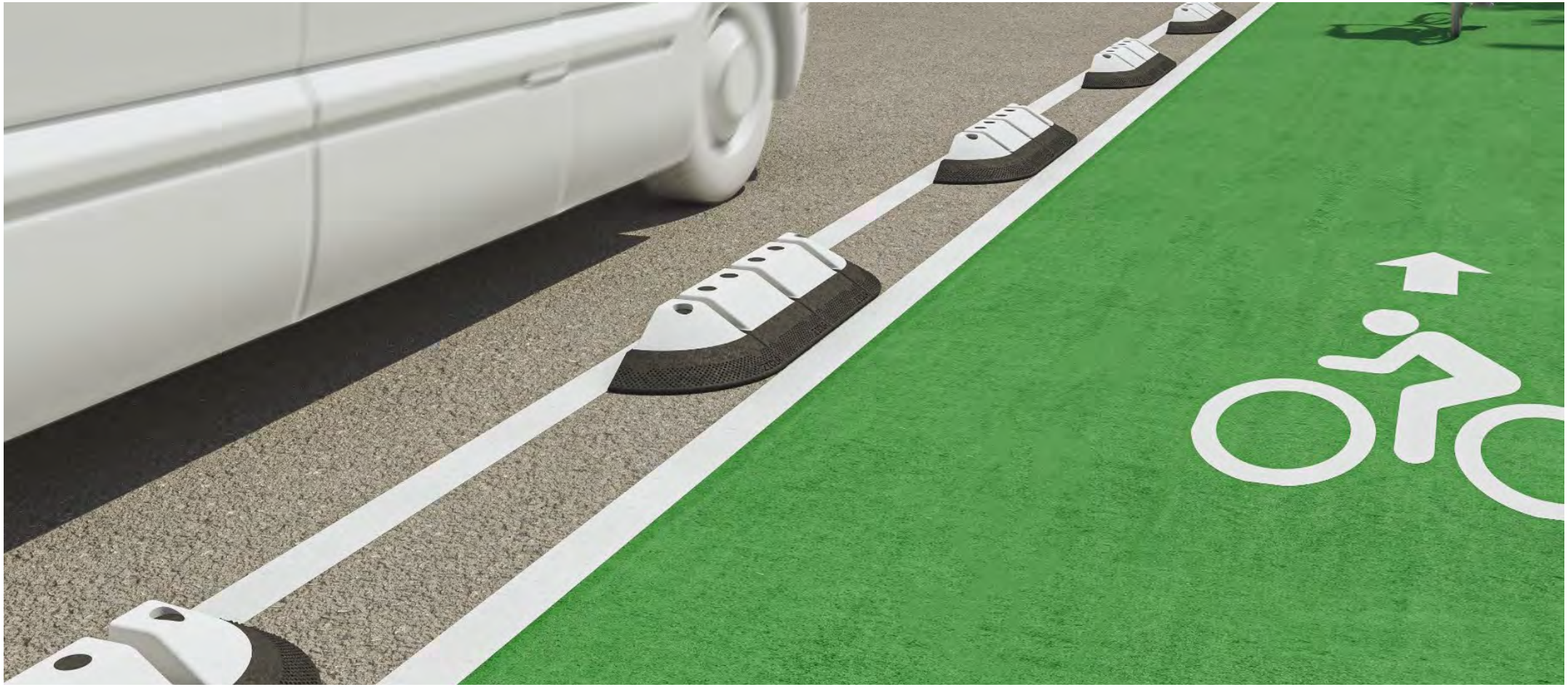


Zipper® B

Zipper®

B-2A-B configuration

This configuration consists of one Double A module or two A modules from the Zipper® system in the center and a B module at each end. The distance between each B2AB set can be shortened to make the cycle lane more resilient to intrusion, thereby increasing safety in areas with heavy traffic or near intersection.

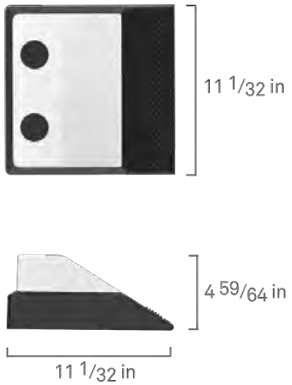


ZICLA

Zipper® A

11 lb 7 oz

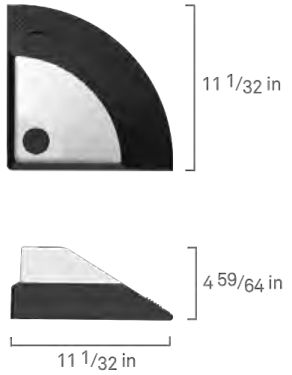
18 lb 2 oz of CO_2 equiv/u



Zipper® B

7 lb 15 oz

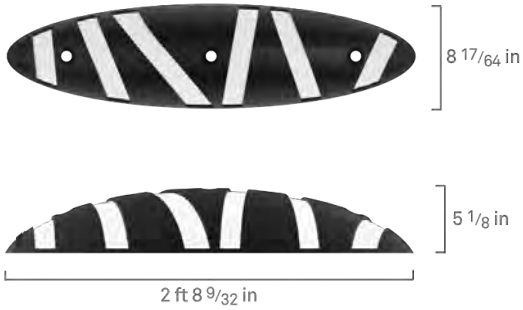
14 lb 915oz of CO_2 equiv/u



Zebra® 13

18 lb 12 oz

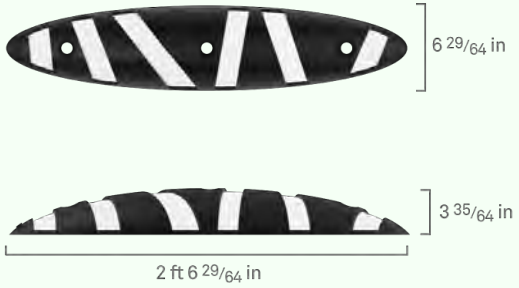
19 lb 13 oz of CO_2 equiv/u



Zebra® 9

9 lb 15 oz

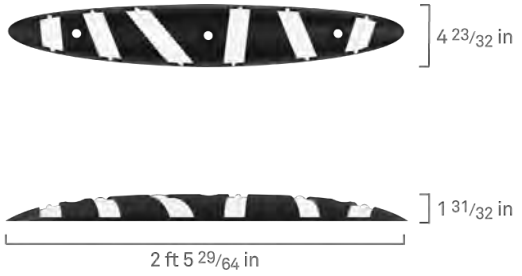
12 lb 9 oz of CO_2 equiv/u



Zebra® 5

4 lb 3 oz

7 lb 2 oz of CO_2 equiv/u



SHUR-FLEX® SURFACE MOUNT WHITE
36" POST W/ 7X7 WHITE BASE
#EW7C36WP3 (AS CONFIGURED)

Post Type:	
X	Round Top
	Flat Top

Post Colors:	
X	(W) White
	(Y) Yellow
	(O) Orange
	(B) Black

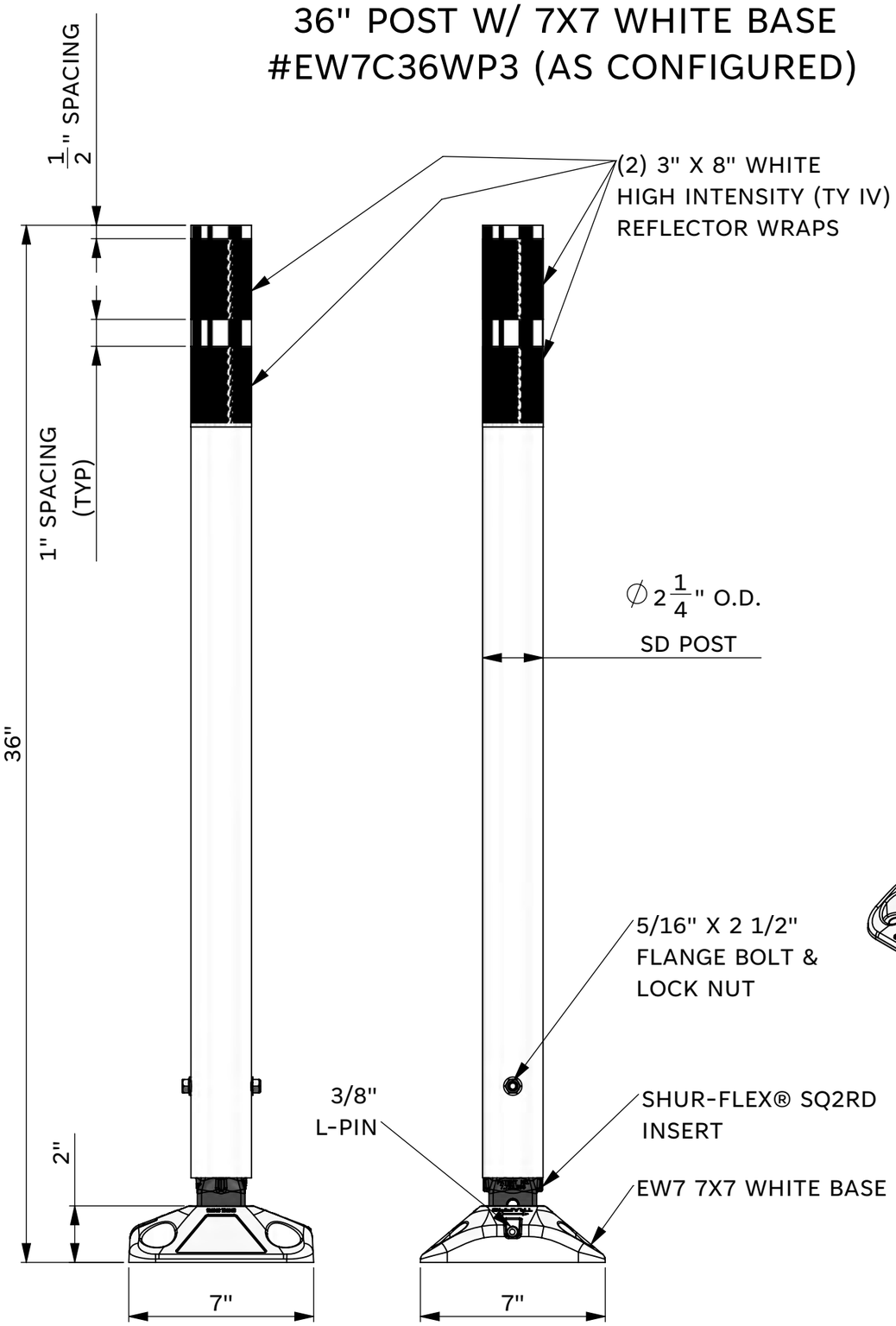
Base Colors:	
X	(W) White
	(Y) Yellow
	(O) Orange
	(B) Black

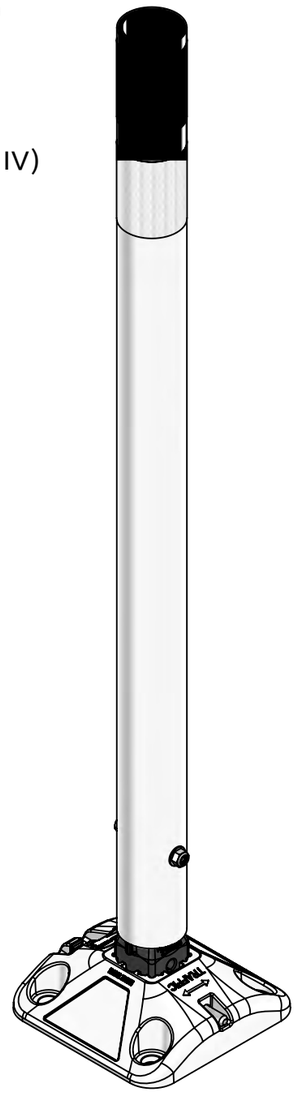
Post Height:	
	18"
	24"
	28"
X	36"
	42"
	48"
	54"
	60"

Sheeting Type:	
X	Type III/IV High Intensity
	Type V AR1000
	Type XI Diamond Grade

Sheeting Size:	
	3" X 3"
	3" X 4"
X	3" X 8" (Wraps)
	3" X 9"
	3" X 12"

Sheeting Colors:	
X	(W) White
	(Y) Yellow
	(O) Orange
	(R) Red
	(G) Green
	(B) Blue





SHUR-TITE® PRODUCTS
(512) 218-9500
www.shur-tite.com

Title:

SHUR-FLEX® SURFACE MOUNT
36" WHITE POST

Date:	Item #:
09/12/23	EW7C36WP3

Exhibit F

PROJECT SPECIAL PROVISIONS
MODIFICATIONS TO COLORADO DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS

The technical specifications for this project shall be the Colorado Department of Transportation 2025 Standard Specifications for Road and Bridge Construction, Littleton Engineering Design Standards (LEDS) and the most current version of the Metropolitan Government Pavement Engineers Council (MGPEC) standards. The following special provisions supplement or modify the Standard Specifications and Supplemental Specifications and take precedence over the Standard Specifications, Supplemental Specifications, and plans.

PROJECT SPECIAL PROVISIONS

Table of Contents

NOTICE TO BIDDERS

Pursuant to subsections 102.04 and 102.05, it is recommended that bidders on this project review the work site and plan details prior to submitting a bid.

All inquiries and questions must be submitted in writing to the City of Littleton Procurement Manager (IFB Designated Contact). From the date of issuance of the IFB through completion of the selection process, any proposer who contacts City employees other than the Designated Contact may be disqualified from further participation in the selection process, at the City's sole discretion. This supersedes any other subsections containing conflicting instructions regarding who to contact during the bid process.

The City will not be responsible for any oral instructions or interpretations given by or to anyone. It shall be conclusively presumed that the proposer did, before submitting a bid, closely review the IFB, all exhibits/attachments, and other items relevant to the IFB. The above-referenced individual is the only City representative with authority to provide any information, clarification, or interpretation regarding the plans, specifications, and any other contract documents or requirements.

COMMENCEMENT AND COMPLETION OF WORK

The Contractor shall commence work under the Contract within seven (7) calendar days after date of the "Notice to Proceed" work shall be completed within **90 Calendar Days**. Minimum Salient features to be shown on the Contractor's Progress Schedule are:

1) ROW Use Permit
2) Traffic control setup per the approved MHT's for each phase of work.
3) Public Notification
4) Erosion Control
5) Removal of Existing Pavement Markings
6) Sweeping/Cleaning of Road Surface
7) Application of Surface Seal – Slurry Seal and Chip Seal
   a) Sweeping (Chip Seal)
   b) Fog Coat (Chip Seal)
8) Signing
9) Installation of Pavement Markings
10) Installation of Traffic Calming Devices
11) Clean Up
12) Landscape/Irrigation Repair (as necessary).
13) Final Acceptance

All work on the streets stated below are within a highly trafficked area of a school, therefore shall be completed prior to **August 11, 2026, between the hours of 7am and 7pm**. Completion shall include all slurry or chip seal activities. If work is not completed prior to the milestone date, then working hours will be reduced to the hours of 8:00 a.m. to 4:00 p.m. on residential and arterial streets with the roadway available to traffic at 4:00 p.m., and 9:00am to 3:00pm in school zones with the roadway available to traffic at 3:00pm. Anticipated schools to be impacted at this time include:

- John Wesley Powell Middle School
- Little Raven Elementary School
- Littleton High School

REVISION OF SECTION 101
GENERAL PROVISIONS

SECTION 101 of the Standard Specifications is hereby revised for this project as follows:

101 DEFINITIONS & TERMS

Technical Specifications related to construction materials and methods for the work embraced under this Contract shall consist of the Colorado Department of Transportation *Standard Specifications for Road and Bridge Construction* dated 2025.

Certain terms utilized in the Specifications referred to in the paragraph above shall be interpreted to have different meaning within the scope of this Contract. A summary of redefinitions follows:

Subsection 101.28 **Department** shall mean the City of Littleton, Colorado.

Subsection 101.29 **Chief Engineer** shall mean the City Engineer, Littleton, Colorado, or designated representative.

Subsection 101.39 **Laboratory** shall mean Littleton, Colorado or their designated representative.

Subsection 101.51 **Project Engineer** or **Project Manager** shall mean the City Engineer, Littleton, Colorado, or their designated representative.

Subsection 101.76 **State** shall mean Littleton, Colorado (where applicable).

REVISION OF SECTION 105
CONTROL OF WORK

SECTION 105 of the Standard Specifications is hereby revised for this project as follows:

Subsection 105.17 Removal of Unacceptable Work and Unauthorized Work shall include the following:

Existing condition or damage to any adjacent infrastructure and/or structures shall be the responsibility of the Contractor to fully document prior to any work. The Contractor shall notify the Engineer of any existing damage and to confirm the various locations, and their limits, of existing damage prior to any work.

REVISION OF SECTION 107
LEGAL RELATIONS & RESPONDSIBILITY TO THE PUBLIC

SECTION 107 of the Standard Specifications is hereby revised for this project as follows:

107.02 PERMITS, LICENSES, AND TAXES

Delete subsection 107.02 and replace with the following:

Unless otherwise specified, the Contractor shall procure all required permits and licenses; pay all charges, fees, and taxes, including permits procured for this project by others; and give all notices necessary and incidental to the due and lawful prosecution of the work. The costs of these permits will not be paid for separately, but shall be included in the work.

Prior to beginning work, the Contractor shall furnish the Engineer with a written list of all permits required for the proper completion of the contract. The list shall clearly identify the types of permits that must be obtained before work on any particular phase or phases of work can be started. Copies of the fully executed permits shall be furnished to the Engineer upon request.

The Contractor shall obtain at a minimum, but not limited to, the following permits:

1. City of Littleton Right-of-Way Permit (No cost to the Contractor)

107.07 Public Convenience and Safety Shall include the following:

All construction activities shall be completed Monday through Friday between the hours of 7:00 am and 7:00 pm. If work is not completed prior to **August 11, 2026,** then working hours will be reduced to the hours of 8:00 a.m. to 4:00 p.m. on residential and arterial streets with the roadway available to traffic at 4:00 p.m., and 9:00am to 3:00pm in school zones with the roadway available to traffic at 3:00pm.

The Contractor shall not perform any work on Saturdays, Sundays, Holidays and non-working hours on all other days, unless approved by the Engineer. A change in the working hours must be submitted 48 hours in advance for approval by the Engineer.

Work that interferes with traffic on holidays or the day before any holiday or holiday weekend will not be permitted. Holidays on which this restriction applies shall be those holidays recognized by the City of Littleton.

The Contractor shall provide the following services on an ongoing basis throughout the duration of the project:

a. A contact person for the project shall be designated by the Contractor at the preconstruction conference. This individual shall be primarily responsible for maintaining communications with the Engineer and impacted residents/businesses; provide information on a regular basis to private individuals, local organizations interested in the project and the affected agencies.

b. The following agencies shall be coordinated with on an ongoing basis:

- City of Littleton
- South Metro Fire Rescue
- City of Littleton Police Department
- Adjacent Businesses/Residents
- Adjacent Schools and Littleton Public Schools
- RTD

c. A letter of introduction and notice of work shall be delivered to all affected landowners and tenants at least five (5) business days and no more than ten (10) business days prior to mobilization and the commencement of work for each project site.

d. Updates shall be on a weekly basis after mobilization and one (1) week prior to any major traffic switches.

e. The letter shall include the following as a minimum:

Contractor – Name, Address, Direct Phone Number
Field Superintendent – Name, Mobile Phone Number
Schedule (commencement date and duration) and description of work, including the approximate length of time operations will restrict use of roadway.
Information regarding private property and repair procedures

f. The contractor shall notify each adjacent property owner in writing a minimum of forty-eight (48) hours prior to the commencement of construction activities at the corresponding address or location.

g. Payment for the above requirements will not be made separately, but shall be included in the work.

REVISION OF SECTION 108
PROSECUTION AND PROGRESS

SECTION 108 of the Standard Specifications is hereby revised for this project as follows:

108.03 Schedule shall include the following:

The contractor shall provide a construction schedule at the pre-construction meeting for review by the Engineer. The schedule shall accommodate the milestone of completion of all work within one block of a school as outlined in the Commencement and Completion Section.

108.05 Limitation of Operations shall include the following:

In residential areas, the Contractor shall limit hours of operation to **7:00 a.m. to 7:00 p.m. Monday thru Friday,** or as otherwise approved in writing by the Engineer.

In non-residential areas, the Contractor is encouraged to perform work activities outlined in the Commencement and Completion section.

108.09 Failure to complete work on time shall include the following:

A daily charge will be made against the Contractor for each calendar day that work is performed outside the working times listed in 108.05, Limitation of Operations. A penalty of $500 per occurrence will be applied as Liquidated Damages.

REVISION OF SECTION 208
EROSION CONTROL

SECTION 208 of the Standard Specifications is hereby revised for this project as follows:

208.01 Description shall include the following:

The Contractor shall install and maintain storm drain inlet protection at all inlets within the project work area and as directed by the Engineer. This shall be applicable when removing pavement markings and when distributing aggregate for chip seal. Inlet protection shall remain in place until completion of the fog seal and following sweeping of excess aggregate. All sediment and aggregate from operations on this project shall be removed from inlets as soon as feasible after discovery.

208.02 Description shall include the following:

Materials used for inlet protection shall be Storm Drain Inlet Protection Type II.

208.11 Method of Measurement and 208.12 Basis of Payment shall include the following:

Storm Drain Inlet protection on this project shall be incidental to the work and no direct compensation will be paid therefore.

REVISION OF SECTION 250
ENVIRONMENTAL, HEALTH AND SAFETY MANAGEMENT

SECTION 250 of the Standard Specifications is here by revised for this project as follows:

250.03 General shall include the following:

Job materials and equipment may be stockpiled and stored at locations near the job site. A list of sites to be used for this purpose and written permission from the property owner shall be submitted to the Engineer for approval at least ten (10) days prior to any use. The proposed truck route for ingress and egress to such sites shall also be submitted to the Engineer for approval. Using such job-site storage requires the following:

1. Obtaining written permission from the property owner, which shall include a brief description of the area of the property to be used, the length of time the property will be used for this purpose, any access restrictions (i.e. times of day), and the name and phone number of the property owner. A copy of the written permission shall be submitted to the Project Manager at least ten (10) days prior to any use.

2. Keeping stockpiles and equipment confined to the approved area.

3. Providing security for job materials and equipment and for public safety at the site.

4. Keeping all access roads clean and in good condition.

5. Returning site to original condition.

Precautions shall be taken to ensure that stockpiles are carefully mixed just prior to use to ensure uniform distribution of the moisture, and that they do not become contaminated with over-sized seed rock, clay, silt or excessive amounts of moisture. The stockpile shall be kept in areas that drain readily. Segregation of the aggregate will not be permitted.

When surface treatment work is performed by contract, the Contractor shall be responsible for compliance with all requirements of this section. The Contractor shall hold the City and all its employees and representatives harmless from any injury or damage to property occurring as a result of Contractor's operations on property used for this purpose.

REVISION OF SECTION 403
HOT MIX ASPHALT

SECTION 403 of the Standard Specifications is hereby revised for this project as follows:

403.02 Materials add the following:

Materials shall conform to the CDOT standards for Hot Mix Asphalt (HMA), Section 403. Mix Type: Grading SX.

403.03 Construction Requirements add the following:

This work shall consist of furnishing all labor, materials, and equipment necessary to construct asphalt Speed Cushions at the locations and details shown on the plans or as directed by the Engineer. Work shall not begin until the layout has been approved by the Engineer.

The existing pavement shall be clean of dirt, dust, oil, and debris. The surface shall be dry at the time of tack coat application. A tack coat shall be applied in accordance with Section 407 to ensure proper bonding. Asphalt shall be placed and compacted to achieve the specified shape and dimensions. Handwork will be required to form the specified geometry. The finished surface shall be smooth and free of segregation, cracking, or surface irregularities. Compaction shall be using hand tampers, plate compactors, or rollers as appropriate to ensure a uniform density and bonding with existing pavement.

403.04 Method of Measurement and 403.05 Basis of Payment add the following:

Speed Cushion will be measured per each speed cushion installed.

Asphalt materials and tack coat will not be measured or paid for separately, but will be included in the cost of the speed cushion.

Installation of traffic control devices, signing, and pavement markings will be paid under separate bid items.

PAY ITEM	**UNIT**
Install Speed Cushion	EA

REVISION OF SECTION 408
JOINT AND CRACK SEALANT

SECTION 408 of the Standard Specifications is hereby revised for this project as follows:

Work consists of cleaning, filling, and leveling longitudinal and transverse cracks with asphalt repair mastic material. Mastic is a hot-applied polymer modified asphalt mixed with engineered aggregates and modifiers designed to fill wide cracks and defects to prevent water infiltration and restore ride quality.

408.02 Materials, add the following:

Materials for mastic crack sealant shall meet the following:
ASTM D8260 Type 2

The Contractor shall submit manufacturer's product information to the Engineer for approval prior to beginning work.

408.03 Construction Requirements, add the following:

Mastic crack sealant shall be applied in the locations as identified in the field by the Engineer.

Surface preparation, mastic material application shall be in accordance with the manufacturer's recommendations.

REVISION OF SECTION 409
SEAL COAT

SECTION 409 of the Standard Specifications is hereby revised for this project as follows:

409.06 Preparation of Surface replace the current paragraph with the following:

All sweeping and cleaning of the street before Surface Seal applications will be the Contractor's responsibility. Immediately prior to applying any surface treatment, the street surface and gutters shall be cleaned of all loose material, silt spots, oil spots, vegetation, and other objectionable material for the full width of the area to be treated which could prevent proper adhesion of the asphalt coating. Dust and other material in depressions or other places not removed by mechanical sweepers or other approved methods shall be swept with hand brooms or removed by use of flushers. The Engineer may require washing of the pavement where other methods of cleaning do not provide an acceptable surface. Material removed from the surface shall not be mixed with the cover aggregate. Bituminous material shall not be spread until the area to receive a surface treatment application has been cleaned to the satisfaction and approval of the Engineer.

All vegetation shall be removed from the area to receive a surface treatment prior to placement of any surface treatment. This work shall be performed within two weeks of the surface treatment. All dead or remaining vegetation shall be removed prior to sweeping of the area and application of surface treatment. Vegetation may not be removed by burning.

409.08 Application of Cover Coat Material shall include the following:

Protection and Cleaning: Non-asphalt surface features including, but not limited to, manholes, valve boxes, survey monuments, and inlets shall be protected and covered in a suitable manner prior to application of any surface treatment. This covering shall be removed by the Contractor after the surface treatment is applied or as specified for each surface treatment or as directed by the Engineer. All covering material shall be disposed of by the Contractor in a lawful manner and at no additional cost to the City. All manholes, valve boxes, survey monuments, inlets, etc., shall be cleaned to the satisfaction of the Engineer prior to the acceptance of the work.

All manholes, valve boxes, and survey monuments within the project area shall be located prior to construction to the satisfaction of the Engineer. All appropriate utilities and representatives shall be contacted and met as necessary to fully identify and locate all such items within the work area. Work shall not commence until all such items have been located to the satisfaction of the Engineer. When surface treatment work is performed by subcontract, Contractor shall comply with this section at no additional cost to the City.

The fog seal armor coating shall be applied within two (2) days of the application of the Chip Seal. The Contractor shall sweep all excess aggregate from the roadway and adjacent areas prior to application of the fog seal armor coat.

409.09 Method of Measurement and 409.10 Basis of Payment are hereby deleted in their entirety and replace with the following:

Seal coat will be measured by the number of square yards of the designated type of cover coat aggregate.

Asphalt materials, including the asphalt material used for fog seal, will not be measured or paid for separately, but will be included in the cost of the seal coat material.

PAY ITEM	**UNIT**
¼" Chip Seal w/ Fog Coat	SY

ADDITION OF SECTION 410
SLURRY SEAL COAT

Section 410 is hereby added to the Standard Specifications as follows:

410.01 DESCRIPTION

The bituminous slurry surface shall consist of properly proportioned and mixed mineral aggregate and filler, asphalt emulsion and water, spread evenly on the surface, as specified herein and as directed by the Engineer. The slurry, when cured, shall have a homogeneous appearance, fill all cracks, adhere firmly to the adjacent surface, and have friction resistance texture.

Slurry Material	Emulsion to Use
Type II Material	CQS1H (3% Latex Polymer)

410.02 APPLICABLE SPECIFICATIONS

General:

The following agencies' specifications and test methods form a part of this guideline.

AASHTO – American Association of State Highway and Transportation Officials.

ASTM – American Society for Testing Materials.

ISSA – International Slurry Seal Association.

Aggregate and Mineral Filler:

AASHTO T-2	ASTM D-5	Sampling Aggregates
AASHTO T-27	ASTM C-132	Sieve Analysis of Aggregates
AASHTO T-11	ASTM C-117	Materials finer than No. 200 Sieve mineral aggregate
AASHTO T-176	ASTM D-2419	Sand Equivalent value for soils and finer aggregate
AASHTO T-19	ASTM C-29	Unit weight of aggregate
AASHTO T-96	ASTM C-131	Resistance to abrasion of small size coarse aggregate by use of the Los Angeles Test Method
AASHTO T-37	ASTM D-546	Sieve analysis of mineral filler
AASHTO T-104	ASTM C-88	Soundness of aggregates by use of sodium sulfate or magnesium sulfate

Emulsified Asphalt:

AASHTO T-40	ASTM D-140	Sampling Bituminous Materials
AASHTO T-59	ASTM D-244	Testing Emulsified Asphalt
AASHTO M-140	ASTM D-977	Specification for Emulsified Asphalt
AASHTO M-208	ASTM D-2397	Specification for Cationic Emulsion
	ASTM D-3910	Design, Testing and Construction for Slurry Seal

SLURRY SEAL TEST METHODS:

ISSA T-100	Test Method for Wet Track Abrasion of Slurry Seals, 6 Day Soak
ISSA T-106	Measurement of Slurry Seal Consistency

ISSA T-109	Test Method for Measurement of Excess Asphalt in Bituminous Mixtures by use of Loaded Wheel Tester and Sand Adhesion
ISSA T-111	Optimum Emulsion Content by Graphical Determination
ISSA T-113	Trial Mix Procedures for Slurry Seal Design
ISSA T-114	Wet Stripping Test for Cured Slurry Seal Mixes
ISSA T-115	Determination of Slurry Seal Compatibility
ISSA T-139	Test Method to Classify Emulsified Asphalt/Aggregate Mixture Systems by Modified Cohesion Tester Measurement of Set and Cure Characteristics
ISSA T-144	Classification of Bitumen-Aggregate compatibility by Schulze, Breur, and Ruck Procedures

410.03 MATERIALS

410.03.01 Asphalt Emulsion:

The emulsified asphalt shall be quick setting latex polymer modified and conformed to the requirements of the ASTM specification for type CQS-1HhL (3% Latex Polymer) Quick Setting Emulsified Asphalt. Slow setting emulsions will not be allowed. The minimum amount and type of polymer modifier shall be determined by the laboratory performing the mix design. Minimum 3% Latex Polymer to be added to the conventional slurry as specified in the bid tab.

CQS-1hL shall be an emulsified blend of asphalt, water, styrene-butadiene rubber (SBR) latex and emulsifiers. The emulsion shall be pumpable and suitable for use in slurry seal mixing and spreading equipment and suitable for application through a distributor truck. The emulsion shall contain a minimum of 3% by weight of styrene-butadiene rubber (SBR) polymer solids based on weight of residual asphalt. The polymer shall be added as SBR latex by high shearing mixing by co-milling or post milling.

Property	Min.	Max.	Test Method
Viscosity, Saybolt Furol, 77 Deg. F	20	50	ASTM D88
Storage stability test, 24-h, %[A]		1	ASTM D244(82 to 88)
Partial Charge Test		Positive	ASTM D244(28 to 33)
Sieve test, %[A]	0.1		ASTM D244 (58 to 63)
Distillation [B]; Residue, %	60		ASTM D@$$ (11 to 15)
Test on residue from oven evaporation test ASTM D244 (21 to 27)B			
Penetration 77F, 110g, 5s	40	90	ASTM D5
Ductility, 77F	40		ASTM D113
Solubility in trichloroethylene, %	97.5		ASTM D2042
Elastic recovery, 77F, 10cm, 1h, %	40		ASTM D6084

[A]-This test requirement or representative samples is waived if successful application of the material has been achieved in field.
[B]-distillation to 550F (d244 11 to 15) shall be the reference method for percent distillate and percent residue by evaporation and percent residue. Residue by evaporation at 325F (D244 21 to 27) shall be referenced method to obtain material for test on residue. Residue from distillation shall not be used for test on residue due to polymer degradation at 500F.

The minimum amount required will be based on the bitumen weight content and will be certified by the emulsion supplier. In general, a three percent (3%) polymer solids, based on weight, is considered minimum.

410.03.02 Aggregate:

The mineral aggregate used shall consist of natural or manufactured sand, stone, slag, crusher fines, and others, or a combination thereof and shall be gray in color. (Note: Alternate aggregates may be submitted.) The aggregate shall be 100% crushed smooth-textured sand of less than 1.25% water absorption and shall not exceed 50% of the total combined aggregate, Grading Type II.

The aggregate shall be clean and free from organic matter and other deleterious substances. The aggregate shall meet the following:

TEST		QUALITY	SPECIFICATION
AASHTO	ASTM		
T-176	D-2419	Cleanness	Sand Equivalent 65 min.
T-104	C-88	Soundness	15% max. (NA2SO4) or 25% max. (MGSO4)
T-96	C-131	Abrasion Wear (Hardness)	30% max.

Mineral fillers such as Portland cement, limestone dust, lime fly ash and others shall be considered as part of the blended aggregate, and shall be used in the minimum amount required and be manufactured in the project year. They shall meet the gradation requirements of AASHTO M-17 or ASTM D-242. Mineral fillers shall be used for one or more of the following reasons only:

1. To improve the gradation of the aggregate.
2. To control the time of break of the emulsion.
3. To provide improved stability and workability of the slurry.
4. To increase the durability of the cured slurry.

The total aggregate, including mineral filler, shall conform to the following gradations when tested by AASHTO T-17 or ASTM C-136:

PERCENT PASSING

Sieve Size	Type II	Stockpile Tolerance

3/8"	100	+ or - 4%
No. 4	90 - 100	+ or - 4%
No. 8	65 - 90	+ or - 4%
No. 16	45 - 70	+ or - 4%
No. 30	30 - 50	+ or - 4%
No. 50	18 - 30	+ or - 4%
No. 100	10 - 21	+ or - 4%
No. 200	5 - 15	+ or - 4%

Pure Asphalt required %		
Of Dry Aggregate	Type II	12% - 16%

(Actual value to be determined by mix procedure)

The job mix Target Gradation shall be within the gradation band for the desired type of material. After the Target Gradation, based on the job mix design, has been submitted, the percent passing each sieve shall not vary by more than the stockpile tolerance and still remain within the gradation band. The percent passing shall not go from the high to the low end of the range for any two consecutive screens.

The aggregate will be accepted at the job site stockpile or when loading the aggregate into the support units for delivery to the lay-down machine. The stockpile shall be accepted based on five gradation tests in accordance with AASHTO T2 (ASTM D75). If the average of the five tests is Within the gradation tolerances, then the materials will be accepted. If the tests show the material to not meet the gradation tolerances, the Contractor will be given the choice to either remove the material from the job site or blend other aggregate with the stockpiled material to bring it into gradation tolerances. Materials used in the blending must meet the quality tests prior to blending and shall be blended in a manner to produce a consistent gradation. This may require a new mix design. Screening shall be required at the stockpile prior to delivery to the paving machine.

410.03.03 MIX DESIGN

At least two weeks prior to commencement of work, the Contractor shall submit, at no cost to the City, a signed job mix design for current construction year covering the specific material to be used on the project.

This design shall be performed by a qualified independent laboratory. Once the materials are approved, no substitution will be permitted unless first tested and approved by the laboratory preparing the mix design.

All materials to be applied throughout the course of this project shall be in strict accordance with these specifications. If required by the Engineer, the Contractor shall provide documentation verifying the compliance with the mix design specifications.

***Mix Design Specifications*:**

The qualified laboratory shall develop the job mix design and present certified test results for approval.

Compatibility of the aggregate and emulsion shall be verified by the mix design. Once the materials are approved, no substitutions will be permitted, unless first tested and approved by the laboratory preparing the mix design. Mix design shall be submitted two (2) weeks prior to commencement of work.

The Engineer shall approve the design mix and all slurry seal materials and methods prior to use. The component materials shall be within the following limits:

Residual Asphalt	7.5% to 18% by dry weight of aggregate
Mineral Additive	0.5% to 3% by dry weight of aggregate
Additive	As required to provide the specific mixing and setting properties
Water	As required to produce proper mix consistency and cohesion. All water used in making slurry shall be potable and free of dissolved ingredients that may prove harmful. The effect of moisture content on the specific weight of the aggregate, and the moisture content of the aggregate being used, shall be taken into account in calibrating the machine to deliver asphalt in the correct proportion.
Laboratory Testing	Sources of all material shall be selected and identified prior to the pre-construction meeting. All materials shall be pre-tested by the Contractor at their expense in a qualified independent laboratory, as to their suitability for use in slurry seal and conformance with the project specifications.
Laboratory Report	The laboratory report will show the results of tests performed on the individual materials, comparing their values to those required by this specification. The report will provide the following information on the slurry seal mixture:

Test Purpose	Method	Spec.
Slurry Seal Consistency	ISSA T106	2-3 cm
Wet Stripping Test	ISSA T114	90-100% Coated Surface
Compatibility	ISSA T115	*Pass Excess Asphalt Loaded
Wheel	ISSA T109	50 gms/sq. ft. max.
Wet Track Abrasion	ISSA T102	75 gms/sq. ft. max. 6-day Soak
Cohesion Test	ISSA T139	12 kg/cm at 30 minutes & 20 kg/cm at 3hrs
Schulze-Breuer & Ruck Test	ISSA T144	9 grade points (optional and may be minimum required)

* Mixing tests must pass at the maximum expected air temperature of 100 degrees F.
** Using job aggregate only.

The laboratory shall further report the quantitative effects of moisture content on the unit weight of the aggregate (bulking effect). The laboratory report must clearly show the proportions of aggregate, mineral filler (min. & max.), water (min. & max.), additive(s) (usage), and asphalt based on the dry

aggregate weight.

A complete laboratory analysis and test report accompanied by abraded and un-abraded slurry seal samples (ISSA 100) shall be submitted by the Contractor before the job starts. The Engineer shall be allowed to observe all testing.

The City reserves the right to have an independent laboratory perform testing on materials and on the mix design for this project. Independent testing will be at the expense of the City. The Contractor shall supply material samples at no expense to the City.

410.03.04 STOCKPILING OF AGGREGATE

Precautions shall be taken to ensure that stockpiles are carefully mixed just prior to use to ensure uniform distribution of the moisture, and that they do not become contaminated with over-sized seed rock, clay, silt or excessive amounts of moisture. The stockpile shall be kept in areas that drain readily. Segregation of the aggregate will not be permitted.

410.03.05 STORAGE

The Contractor shall provide suitable storage facilities for the asphalt emulsion, using containers equipped to prevent water from entering the emulsion. If necessary, suitable heat shall be provided to prevent freezing. All valves shall be locked or handles removed when the stockpile site is unoccupied.

410.04 TESTING & SAMPLING

Samples of materials and of the finished slurry / seal coat surface will be furnished by the Contractor as directed by the Engineer prior to and during progress of the work at no expense to the City. The Contractor will submit certificates of compliance with each shipment of material to be used upon the project. The City may contract with an independent testing lab to verify compliance with material specifications. Initial testing costs will be paid by the City, but costs of additional testing due to failure of material to meet specifications will be the responsibility of the Contractor. Test reports, such as gradations, oil content, certificates of compliance, etc., will be required from the Contractor as additional materials arrive on the project. Materials determined not to meet job specifications will not be paid for regardless of if they are installed or not. The Engineer will perform testing as required during the project. Emulsion samples will be delivered with certificate of testing or compliance with each delivery.

410.05 EQUIPMENT

All equipment, tools and machines used in the performance of this work shall be maintained in satisfactory working condition at all times to ensure a high-quality product. Descriptive information on the slurry mixing and applying equipment to be used shall be submitted for approval prior to work commencing at the pre-construction meeting.

410.05.01 SLURRY MIXING EQUIPMENT

The slurry mixing machine shall be a continuous flow mixing unit, capable of delivering accurate pre-determined proportions of aggregate, water and asphalt emulsion to a revolving spiraled multi-blade mixer tank, and of discharging the thoroughly mixed product on a continuous basis. The aggregate shall be pre-wetted immediately prior to mixing with the emulsion. The mixing unit shall be capable of thoroughly blending all ingredients together without violent action. The mixing machine shall be equipped with suitable means of accurately metering each individual material being fed into the mixer. The units shall be equipped with approved devices so that the machine can be accurately calibrated and the quantities of materials used during any one period estimated.

The mixing machine shall be equipped with a water pressure system, and fog type spray bar adequate for completely fogging the surface with up to 0.55 gallons per square yard, immediately ahead of the spreading equipment. The machine shall be capable of mixing materials at pre-set proportions regardless of the speed of the machine engine and without changing machine settings.

PROPORTIONING DEVICES

Individual volume of weight controls for proportioning each material to be added to the mix; i.e., aggregate, emulsified asphalt, mineral and field control additives, and water shall be provided and properly marked. These proportioning devices are usually revolution counters or similar devices and are used in material calibration and determining the materials output at any time.

CALIBRATION

Each slurry mixing unit to be used in performance of the work shall be calibrated in the presence of the City Representative prior to construction.

Documentation shall be provided by the Contractor, which includes an individual calibration of each material at various settings, which can be related to the machine's metering device(s).

No machine will be allowed to work on the project until the calibration has been completed and/or accepted. Previous calibration documentation covering the exact materials to be used may be accepted provided they were made during the calendar year. Calibration of all units to be used on the project will be required in project year. Calibration shall be submitted two weeks prior to work commencing or at the pre-construction meeting.

VERIFICATION

Test strips will be made by each machine after calibration and prior to construction. Samples of the slurry seal will be taken and verification made as to mix consistency and proportioning. Verification of rate of application will also be made. Upon failure of any of the tests, additional test strips, at no cost to the City, will be required until each unit is authorized to work. Any unit failing to pass the tests after the third trial will not be permitted to work on the project. Test strips must be accepted or rejected within 24 hours after application.

410.05.02 SLURRY SPREADING EQUIPMENT

The surfacing mixture shall be spread uniformly by means of a mechanical type spreader box attached to the mixer equipped with paddles to agitate and spread the materials throughout the box. A front seal shall be provided to ensure no loss of the mixture at the road contact point. The rear seal shall act as final strike off and shall be adjustable. The mixture shall be spread to fill cracks and minor surface irregularities and leave a uniform skid resistant application of material on the surface. The spreader box and rear strike off shall be so designed and operated that a uniform consistency is achieved to produce a free flow of material to the rear strike off. The longitudinal joint where two passes join shall be neat appearing, uniform and lapped. All excess material shall be removed from the job site prior to opening the road at no cost to the City. The spreader box shall have suitable means provided to side shift the box to compensate for variations in pavement width, longitudinal alignment, and pavement geometry.

410.05.03 JOINTS

Longitudinal joint overlap shall not exceed six inches (6”) over the previously placed slurry unless approved by the Engineer.

Only burlap overlap drags will be permitted. Other types of drags/strike-offs will be permitted only with written approval of the Engineer.

When burlap drags are used, they must be kept relatively clean, free of excessive build up, tears, and replaced a minimum of twice daily or at the discretion of the Engineer.

410.05.04 CLEANING EQUIPMENT

Pick-up type street sweepers shall be used to clean the pavement. Power blowers, air compressors, water flushing equipment and hand brooms may also be required to clean the surface and cracks prior to slurry seal being placed.

410.05.05 AUXILIARY EQUIPMENT

Suitable crack and surface cleaning equipment, traffic control equipment, hand tools, and any support equipment shall be provided as necessary to perform the work.

410.06 CONSTRUCTION

410.06.01 PREPARATION OF SURFACES

Immediately prior to applying the slurry, the Contractor shall be responsible for insuring that the surface is cleaned of all loose material, split spots, vegetation, and other objectionable material.

Oil spots shall be cleaned to the satisfaction of the Engineer. Cleaning methods shall be submitted at pre-construction meeting. The Contractor shall supply all labor, equipment, and material necessary to complete the work in accordance with these specifications. Labor, equipment, and materials required to clean oil spots will not be measured and paid for separately but shall be included in the work.

The Engineer shall give final approval that the surface has been prepared properly. Contractor must remove all weeds from all pavement surfaces and from the interface of the concrete curb and asphalt prior to the application of any slurry seal. Costs associated with these requirements shall be included in the unit price of the slurry seal work and shall not be paid for separately. The City will perform concrete repair, and crack sealing on the streets to be surfaced prior to the application of the slurry seal.

410.06.02 COMPOSITION AND RATE OF APPLICATION OF THE SLURRY MIX

The amount of asphalt emulsion to be blended with the aggregate shall be determined in the laboratory, subject to final adjustment in the field to allow for absorption by the existing surface. The amount of water added must be controlled accurately to ensure production of readily spreadable, yet completely stable slurry.

Proper water content shall be determined by an appropriate consistency test on freshly made slurry.

The slurry shall be a homogeneous mixture, sufficiently stable during the entire mixing/spreading period so that the emulsion does not break; and that there is no segregation of fines from the coarser aggregate and the liquid portion of the mix does not float to the surface. Total time of mixing, from introduction of emulsion to spreading shall be 2 minutes or less.

The weight of dry aggregate applied per unit area shall be determined by mix design(s) submitted and approved. Final calibration of dry aggregate will be used for quality control verification. The Contractor shall place a test strip of 100 square yards in the area designated by the Engineer. The test section shall be placed using the same equipment and methods to be used on the job. Slurry mixtures placed in test strips shall conform to design mix with minor variations to obtain crack filling, bond to pavement and desired skid resistance texture. In the event the materials do not meet the requirements for fluidity, non-segregation, or surface texture, a new job mix shall be formulated and tested.
Work shall not proceed before approval of a design mix and acceptance following the placing of a test strip.

410.06.03 WEATHER LIMITATIONS

No slurry shall be applied:

1. When there is any danger that the finished product will freeze before it cures completely.
2. When the pavement or air temperature is 50 degrees F or below and falling.
3 In the period following a rain while puddles of water remain on the surface to be coated.
4. Slurries that cure by evaporation shall not be laid during periods of within four (4) hours of rain. Slurries shall not be laid during periods of high humidity above 40%.

410.06.04 APPLICATION OF THE SLURRY SURFACES

General:

The surface shall be uniformly fogged with water directly preceding the spreader. The slurry mixtures shall be of the desired consistency as it leaves the mixer, and no additional elements shall be added. A

sufficient amount of slurry shall be carried in all parts of the spreader at all times so that complete coverage is obtained. No lumping, balling, unmixed, or oversized aggregates shall be permitted. No segregation of the emulsion and aggregate fines from the coarse aggregate will be permitted. If the coarse aggregate settles to the bottom of the mix, the slurry will be removed from the pavement. No excessive breaking of the emulsion will be allowed in the spreader box. No longitudinal streaks caused by oversized aggregate or transverse rippling will be left in the finished pavement.

Hand Work:

Approved methods shall be agreed upon at pre-construction meeting for hand work. Lutes and squeegees shall be used to spread slurry in areas not accessible to the slurry mixer.

Care shall be exercised to leave a pleasing appearance. The use of building paper or an approved equal shall be required at beginning and ending points or as requested by the Engineer.

Mix Stability:

The mixture shall possess sufficient stability so that premature breaking of the material in the spreader box or pug mill does not occur. The mixture shall be homogenous during and following mixing and spreading, it shall be free of excess water or emulsion and free of segregation of the emulsion and aggregate fines from the coarser aggregate.

410.06.05 LINES

Care shall be taken to ensure straight lines along curbs and shoulders. No runoff onto these areas will be permitted. Lines at intersections or beginning and ending points shall be kept straight to provide a suitable appearance.

410.06.06 ROLLING

The roadway shall be rolled by a self-propelled 10-ton pneumatic roller with a tire pressure of 50 psi (3.4 atms.) and equipped with a water spray system. The surfaced areas shall be subjected to a minimum of two full coverage passes by the roller.

410.06.07 FINISH

No streaks, such as those caused by oversized aggregate, will be left in the finished surface. No ripples or chatter marks will be allowed. If these conditions develop, the job will be stopped until the Contractor proves to the Engineer that the situation has been corrected.

After the lay-down work is completed and before final acceptance by the Engineer, spot application of slurry seal material may be required to correct any deficiencies; such as, streaking, scuff marks, tire tracks, gaps, etc. to improve the ride quality and overall appearance. Slurry seal material required to repair deficiencies due to unsatisfactory workmanship shall not be paid for but shall be placed entirely at the Contractor's expense.

410.06.08 CURING

Slurry treated areas shall be allowed to cure until the Engineer permits their opening to traffic. Cure time must be in 1-3 hours.

410.06.09 APPLICATION RATES - TOLERANCES

Application rates shall be as follows per street:

Type II Slurry	18 - 22 pounds per square yard
Type III Slurry	28 -30 pounds per square yard
Micro surfacing	30 - 34 pounds per square yard

Rut filling as determined in field.

410.07 MANHOLES AND VALVES

Manholes and valves including concrete rings on streets to be slurry sealed shall be clean when the work is completed. They shall be covered in a suitable manner prior to sealing, and the covering shall be removed immediately after the street is sealed. A method for covering manholes and water valves shall be approved by the Engineer prior to construction.

410.08 METHOD OF MEASUREMENT

Slurry seal will be measured by the square yard of surface area covered, complete in place. Asphalt emulsion, aggregates, fillers and water required to complete the work will not be measured and paid for separately, but shall be included in the work.

Amount below Minimum:

Application Rate Aggregate, Emulsion or Mineral Filler	Percent Reduction in Final Payment for Aggregate, Emulsion or Mineral Filler
1-3%	10%
3-5%	15%
5-7%	20%
7-10%	to be negotiated
10+%	No Pay

The City will continually be checking quantities. The Contractor is encouraged to also check quantities to avoid the penalties as described above. It is solely the Contractor's responsibility to ensure proper spread rates and material proportions.

	Variation Amount	**Unit Price Reduction**
Application rate	5% - 10%	5%
	10% - 20%	10%
	20% +	20%

410.09 BASIS OF PAYMENT

The accepted quantity will be paid for at the unit bid price for the slurry seal item.

PAY ITEM	**PAY UNIT**
Slurry Seal, Type II	Square Yard

REVISION OF SECTION 612
DELINEATORS AND REFLECTORS

Section 612 of the Standard Specifications is hereby revised for this project as follows:

Subsection 612.02 Materials shall include the following:

36" Vertical Flex Posts shall be Shur-Flex Surface Mount White Post with 7" x 7" Fixed Base as shown in the drawings included with the project plans.

"Zipper" and "Zebra" delineators shall be the in the sizes and configurations as identified with the bid schedule, and as manufactured by Zicla. No other manufacturer will be approved for these products.

Subsection 612.03 shall include the following:

Installation of Vertical Flex Posts shall be in accordance with the manufacturer's recommendations. Additional materials noted as a bid item for "furnish only" shall be provided to the City. Layout and installation of the proposed location shall be coordinated and approved by the Engineer.

Installation of Zicla Zipper and Zebra delineators shall be only using Screw Anchors as shown in the installation instructions included with the project plans. No other installation method shall be used without approval from the Engineer. Layout and installation of the proposed location shall be coordinated and approved by the Engineer. Additional materials noted as a bid item for "furnish only" shall be provided to the City.

Subsection 612.04 Measurement and 612.05 Basis of Payment shall include the following:

Pay Item	**Pay Unit**
36" SHUR-FLEX VERTICAL FLEX POST (WHITE)	Each
36" SHUR-FLEX VERTICAL FLEX POST (WHITE)(FURNISH ONLY)	Each
36" SHUR-FLEX VERTICAL FLEX POST (GREEN)	Each
36" SHUR-FLEX VERTICAL FLEX POST (GREEN)(FURNISH ONLY)	Each
ZICLA ZIPPER (B+AA+B)	Each
ZICLA ZIPPER (B+AA+B) (FURNISH ONLY)	Each
ZICLA ZEBRA 13	Each
ZICLA ZEBRA 13 (FURNISH ONLY)	Each
ZICLA ZEBRA 9	Each
ZICLA ZEBRA 9 (FURNISH ONLY)	Each

All anchors, hardware and other incidental materials necessary for the proper installation of the item, will not be measured and paid for separately, but shall be included in the cost of the pay item. All hardware associated with the "furnish only" bid items shall be provided to the City.

REVISION OF SECTION 614
SIGNS AND SIGN POSTS

Section 614 of the Standard Specifications is hereby revised for this project as follows:

Subsection 614.02 shall include the following:

Sign posts and bases shall be steel galvanized perforated square tubing as supplied by Unistrut, or approved equal.

Signs shall use sign posts with 2-inch x 2-inch tube, with bases of 2.25-inch x 2.25-inch tube.

Bases shall be 3 feet long, embedded with 2 inches to 4 inches exposed above the ground, and the post inserted 18 inches to 24 inches into the base.

Subsection 614.09 shall include the following:

Sign panels shall be mounted to sign posts with oversized washers.

Subsection 614.14 shall include the following:

Pay Item	**Pay Unit**
Signpost Anchor Assembly (2.25x 2.25 Inch Tubing)	Each
Steel Sign Post (2 x 2 Inch Telespar Tubing)	Linear Foot

Sign post anchors, hardware and other incidental materials necessary for the proper installation of the item, will not be measured and paid for separately, but shall be included in the cost of the steel sign post.

REVISION OF SECTIONS 627 AND 713
PREFORMED THERMOPLASTIC PAVEMENT MARKING

Section 627 of the Standard Special Provisions is hereby revised for this project as follows:

Subsection 627.09 (a) *shall include the following:*

(a) *Application.* An epoxy resin primer shall be applied to any existing surface (concrete, asphalt, existing markings, etc.) prior to the application of any new preformed thermoplastic, plastic pavement marking. The epoxy resin primer shall conform to CDOT Standard Specifications subsection 708.07. Primer shall be required for all markings used including markings that manufacture does not require a primer. Primer and application will not be measured and paid for separately, but shall be included in the work.

Surface shall be dry and free of dirt, dust, chemicals, and/or significant oily substances. Application procedures for Portland concrete pavement shall be as described above except a compatible primer sealer shall be applied before application of marking to assure proper adhesion.

Subsection 627.09 *shall include the following:*

(c) *Inlaid Preformed Thermoplastic Pavement Marking.* Shall be done for crosswalks, stop lines and symbols. The grooved width shall be the pavement marking width plus 1 inch, with a tolerance of ± ¼ inch. The depth of the grooves shall be 130 mils ± 5 mils. Groove position shall be a minimum of 2 inches from the edge of the pavement marking to the longitudinal pavement joint. Grinding of existing preformed thermoplastic pavement marking and the inlaying of proposed preformed thermoplastic pavement marking shall not be measured and paid for separately, but shall be included in the work.

Grooving shall not be performed on bridge decks.

The preformed thermoplastic pavement marking shall be inlaid on new and existing pavements as shown in the Contract. The material shall be capable of use for patching worn areas of the same type according to the manufacturer's recommendations.

The following shall be included in subsection 627.13:

Payment will be made under:

Pay Item	**Pay Unit**
Preformed Thermoplastic Pavement Marking (Xwalk-Stop Line)	Square Foot
Preformed Thermoplastic Pavement Marking (Word-Symbol)	Square Foot

Removal and application of temporary preformed thermoplastic pavement marking associated with wet-cutting of pavement shall be at the Contractor's expense.

Subsection 713.14 (a) *shall include the following:*

(a) General. Material such as lines, legends, or symbols shall be capable of being affixed to HMA or PCC pavements. Marking shall be capable of conforming to pavement contours, breaks, and faults etc. by the use of the normal heat of a propane torch. Marking shall be capable of withstanding the actions of traffic at normal pavement temperatures. Marking shall have resealing characteristics such that it is capable of fusing with itself and previously applied thermoplastic pavement markings when heated with the torch.

Subsection 713.14 *shall include the following:*

(c) Performance. Marking, when applied in accordance with manufactures recommendations shall demonstrate a uniform level of sufficient night time retro-reflection when tested in accordance to ASTM E1710-97. The applied material must have an initial minimum intensity reading of 500 $mcd \cdot m^{-2} \cdot 1x^{-1}$ for white and 300 $mcd \cdot m^{-2} \cdot 1x^{-1}$ for yellow as measured with a retro-reflectometer.

The top surface of the stencils (the same side as the factory applied surface beads) shall have an indicator system for the contractor to properly gauge the correct amount of heat to apply during installation. The indicator system shall have a positive visual indication, such as beads changing color or indents closing together, when the material has reached the correct installation temperature. The indicator system must also provide a positive, visual indication if the material has not reached the correct installation temperature.

REVISION OF SECTION 630
CONSTRUCTION ZONE TRAFFIC CONTROL

Section 630 of the Standard Specifications is hereby revised as follows:

Subsection 630.01 is revised to include the following:

1. Working hours shall be as outlined in the Commencement and Completion of work, or as otherwise approved in writing by the Engineer.
2. The use of alternate one-way traffic may be approved on a case-by-case basis.
3. All work done outside the times above must be approved by the Engineer in writing.

As required by, in descending order of precedence, these plans and special specifications, the current Standard Specifications, as augmented by the Colorado Department of Transportation M and/or S standards, and the current version of the Manual on Uniform Traffic Control Devices (MUTCD) for Streets and Highways.

Subsection 630.10 through 630.11 shall be modified to read:
Traffic control throughout the construction area is the responsibility of the Contractor. Before starting construction, the Contractor shall submit, in writing, the proposed Method of Handling Traffic (MHT) for the initial phase of construction. When a different MHT is required for a subsequent construction phase, it must be submitted two weeks prior to starting that phase. All proposed methods of handling traffic shall be approved, in writing, by the Engineer. No phase of construction shall start until an acceptable MHT has been received and approved by the Engineer. The proposed methods shall include, as a minimum, the following:

A detailed diagram which shows the location of all sign placements, including advance construction signs (if not previously approved) and speed limit signs; method length and time duration for lane closures; and location of flag persons.

A tabulation of all traffic control devices shown in the detailed diagram including, but not limited to: construction signs, vertical panels; vertical panels with lights; Type 1 and Type 2 barricades; cones and drum channelizing devices; concrete barrier (temporary); advance warning flashing or sequencing arrow panels.

Approval of the proposed MHT is intended to indicate all devices to complete the project safely. Such approval does not relieve the contractor of liability specifically assigned to him under the contract. The Contractor shall erect and maintain warning lights, signs, barricades, and sufficient safeguards around all excavations, embankments, stockpiles, equipment, and obstructions.

Non-metallic drums may be substituted for vertical panel channelizing devices if site dimensions allow.

The Contractor shall, at the preconstruction conference, designate one of their employees, other than the Superintendent, to be responsible for traffic control management. This responsibility shall include management for the contractor’s signing and all other details covered by the specifications which contribute to the convenience, safety, and orderly movement of traffic and to the comfort of the

traveling public. The designated employee will have the Certification of the Traffic Control Supervisor as a Worksite Traffic Supervisor by the American Traffic Safety Services Association (ATSSA) in lieu of completion of the CDOT minimum training requirements.

Traffic control managements shall be maintained on a 24-hour per day basis. The contractor shall make arrangements so that the Traffic Control supervisor or their approved representative will be available on every working day, "on call" at all times and available upon the Engineer's request at other than normal working hours. The Traffic Control Supervisor shall have an up-to-date copy of Part VI of the MUTCD, pertaining to traffic controls for street and highway constructions, and the approved MHT available at all times.

The contractor shall apply for and receive a City of Littleton right-of-way use permit (at no cost to the contractor) prior to commencing operations.

Due to the mobility of the operation, the contractor will need to provide traffic control consistent with the MUTCD. For sweeping operations, the contractor will need to provide an MHT.

The flagger's STOP/SLOW sign paddle shall be 18 inches with letters six inches high.

Construction traffic control signs or devices not in use shall be removed from the roadway and pedestrian walkway (sidewalk & trails). Laying the sign down in a horizontal position or turning the sign parallel is not permitted on the sidewalk and/or within private property such as residential yards.

Variable Message Boards (VMB) shall contain the following information at a minimum: type of work, the scheduled week of work, and the phrase "LOCAL TRAFFIC ONLY".

Any missing or defaced signs shall be replaced within twenty-four (24) hours.

"NO PARKING" signs shall be placed a minimum of twenty-four (24) hours in advance of any surface treatment operations on all streets to be treated where on-street parking is permitted.

"Fresh Oil" and "Loose Gravel" signs shall be posted in sufficient number and proper locations to adequately notify the public of such roadway conditions.

Any other signs as required by the Traffic Engineer shall be placed.

When surface treatment work is performed by contract, Contractor shall supply and maintain all signs at Contractor's expense.

For locations that do not have sufficient right-of-way available to store the sign(s) or device(s), they must be picked up or moved to an approved storage area. Signs that are placed in the medians must be dismantled, laid down, or relocated to the approved storage area.

Subsection 630.13 ***is revised to include the following:***

Towing

Vehicles shall be identified by the Engineer and shall be limited to any class of vehicle that is upright and on wheels. 'No Parking' signs shall have been in-place and maintained for a minimum of forty eight (48) hours along the proposed street segment prior to towing a vehicle.

The Contractor shall make every reasonable attempt as determined by the Engineer, including but not limited to door-to-door investigation, to locate the owner/operator of the vehicle prior to initiating the towing process.

Towing shall be limited to towing a vehicle conflicting with the current or proposed work activities. Vehicles shall be towed using techniques that do not damage the towed vehicle or the roadway, adjacent structures, or other public property or assets. Vehicles shall be towed to a location designated by the Engineer at the time of towing, typically to an adjacent street beyond the proposed work area. **Towed vehicles shall be positioned in a legal parking space within a public roadway in a manner that permits through traffic.**

Immediately after towing a vehicle, the Contractor shall affix a notice to the windshield or other appropriate place on the motor vehicle, stating "This vehicle was parked within a Temporary Construction Work Zone. It was moved to this location by order of the City of Littleton Public Works.", or similar language approved by the Engineer.

The City shall not grant additional time or compensation for any resulting delays or loss of production because of failure to comply with the requirements of the Contract Documents including posting of notices and identifying and towing vehicles.

Towing Tickets

The Contractor shall deliver a towing ticket identifying the following information:

- Date and time towing request received,
- Make, model, and license number of vehicle towed,
- Locations vehicle towed from and to, and
- Signature of an authorized City Representative with time and date work performed.

Towing Equipment Requirements

Towing equipment shall, at a minimum, be equipped with a power winch, two-way radio, ten-pound dry fire extinguisher, motorcycle sling, dollies or flatbed equipment, and other modern towing and safety devices. All equipment shall be in good working condition when reporting for use.

630.17 METHOD OF MEASUREMENT and 630.16 BASIS OF PAYMENT are hereby deleted in their entirety and replaced with the following:

Traffic control shall be paid on a lump sum basis to be paid for as follows: 50 percent of the Schedule amount upon first utilization and the remaining 50 percent of the Schedule amount when 75 percent of the original schedule amount has been earned.

In the event towing services are required, the Contractor shall furnish certified invoices for

reimbursement through the Force Account Item for Minor Contract Revisions. Reimbursement of invoiced amount shall be considered full compensation for coordination, mobilization, towing vehicles, mechanical work, fees, fuel, maintenance, and for furnishing all materials, labor, equipment, tools, and incidentals or related services necessary to complete the work. Any towing performed without required signage or pre-authorization will not be paid for.

PAY ITEM	**UNIT**
Traffic Control	Lump Sum

FORCE ACCOUNT ITEMS

DESCRIPTION

This special provision contains the City's estimate for force account items included in the Contract. Such estimated amounts will be added to the total bid to determine the Project Commitment Amount and the amount of the performance and payment bonds. Force Account work shall be performed as directed by the Engineer.

BASIS OF PAYMENT

Payment will be made in accordance with subsection 109.04. Payment will constitute full compensation for all work necessary to complete the item.

Force account work valued at $5,000 or less, that must be performed by a licensed journeyman in order to comply with federal, state, or local codes, may be paid for after receipt of an itemized statement endorsed by the Contractor.

Force Account Item	**Quantity**	**Estimated Amount**
F/A Minor Contract Revisions	EA	$30,000.00

PROJECT DESCRIPTION

The City of Littleton Public Works is concentrating on maintaining and preserving the condition of existing roadway infrastructure throughout the City. This project consists of furnishing all labor, materials, and equipment necessary to complete in place the application of emulsified asphalt and aggregate cover coat to those streets listed on the Location Schedule.

It is anticipated that the project will require approximately 258,000 SY of Slurry Seal, Type II and 102,000 SY of ¼" Chip Seal w/ Fog Coat. Other anticipated work includes temporary traffic control, cleaning of manholes and valves, removal of existing pavement markings, installation of signs, furnishing and installing traffic calming devices, and pavement marking. The City will be performing all required pavement patching with its own City staff in advance of the project.

LOCATION SCHEDULE

See attached maps.

CONSTRUCTION NOTES

Alternative construction sequences may be submitted but are subject to approval by the Engineer. Acceptance of alternatives will be based upon impacts to the public and cost.

Stockpiling location of material must be approved by the Engineer, or a written approval from property owner submitted.

All excess material will be disposed of off-site, or at an approved site by the Engineer.

Due to budget limitations, the City reserves the right to increase or decrease the total quantity to meet their needs. Repricing of the items will not be permitted due to a change in the planned quantity.