AGENDA
BLOOMINGTON TRANSPORTATION COMMISSION
SPECIAL MEETING
TUESDAY, AUGUST 27, 2019 4:00 P.M.
COUNCIL CHAMBERS, CITY HALL
109 EAST OLIVE STREET
BLOOMINGTON, ILLINOIS

1. CALL TO ORDER

2. ROLL CALL and INTRODUCTION OF NEW MEMBERS

3. PUBLIC COMMENT

4. MINUTES: Review and approve the minutes of the April 19, 2019 regular meeting of the Bloomington Transportation Commission.

5. REGULAR AGENDA

A. **Election of Chairman and Vice-Chairman**
B. **Information:** August 2019 Citizen Comments/Complaints Summary
C. **TC-2019-02:** Downtown Main Street Parking Configuration
D. **TC-2019-03:** Annual Street Maintenance Program

6. OLD BUSINESS

A. Any old items brought back by the Commission

7. NEW BUSINESS

A. Any new items brought up by the Commission

8. COMMISSIONER COMMENTS

9. ADJOURNMENT

For further information contact:
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MINUTES
BLOOMINGTON TRANSPORTATION COMMISSION
REGULAR MEETING
TUESDAY, APRIL 16, 2019 4:00 P.M.
COUNCIL CHAMBERS, CITY HALL
109 EAST OLIVE STREET
BLOOMINGTON, ILLINOIS

MEMBERS PRESENT: Ms. Angela Ballantini, Mr. Rob Ballantini, Ms. Jill Blair (@4:05 pm), Ms. Maureen (Reenie) Bradley, Ms. Katherine Browne, Mr. Michael Gorman

MEMBERS ABSENT: Ms. Elizabeth Kooba

OTHERS PRESENT: Mr. George Boyle, City Attorney; Assistant Chief Greg Scott, Police Department; Mr. Kevin Kothe, City Engineer; Mr. Philip Allyn, City Traffic Engineer; and members of the public.

1. CALL TO ORDER: Mr. Gorman called the meeting to order at 4:01 pm.

2. ROLL CALL: Mr. Allyn called the roll. With six members in attendance, a quorum was established.

3. PUBLIC COMMENT:
There were no public comments.

4. MINUTES: Reviewed and approved the minutes of the February 19, 2019 regular meeting of the Bloomington Transportation Commission. Mr. Rob Ballantini motioned to approve the minutes. Ms. Angela Ballantini seconded the motion. The motion was approved by the Transportation Commission unanimously via voice vote.

5. REGULAR AGENDA:

A. **Information:** Proposed 2019 Construction Season Resurfacing Program Public Information

Mr. Allyn indicated that he clarified and added some additional details to the information from last month. The intent is to have the information relating to the resurfacing decision process on either the Public Works website or the new website set up for Bloomington Streets. He indicated that this packet includes information as to why certain streets were selected for resurfacing in 2019, such as pavement ratings. He also reiterated that it would not be feasible to detail why all other specific streets were not chosen but anyone is welcomed to contact the Public Works Department with specific questions and they will do their best to answer them.

Ms. Bradley asked if this was the final list and if there would be any changes to it. Mr. Allyn indicated that the bids came in higher than expected so there will be no additions and they are trying to figure out how to get all streets on current list completed, indicating that new money from Local Motor Tax Fund may be used cover gap. Ms. Bradley asked if they have a concern about why a street is not on the list, should they go to the city website and submit a question. Mr. Allyn said yes, or if they have a question about specific street, they could call Public Works and they will work to get appropriate answers.

Mr. Gorman referred to last month's meeting about transparency and acknowledged that not all information in the internal GIS has been added to the public GIS, specifically the year until a street will be resurfaced. Mr. Allyn explained that this information is very fluid because conditions change for different streets so there is a concern that the public would believe this schedule was more definitive than it is. Mr. Gorman referenced IDOT's Multi-Year Program that is also fluid and changes every year but it gives Illinois residents a general idea of when a street will be repaired. Mr. Allyn said that staff will look into publishing a more general list of streets that are planned for resurfacing sometime within a 2-5 year

window. Mr. Gorman indicated it is hard to have conversations with citizens about how the City is using funds without a general idea of how much it costs to repair city roads. It would also be easier for the public to support additional taxes such as the recently increased Local Motor Fuel Tax if they know when their street will be paved and how the additional tax will decrease the wait. There doesn't seem to be a tangible connection between the taxes they pay and the pavement quality on their street.

Ms. Bradley commented that transparency is important and she understands there are variables that impact when a street needs to be paved and it's importation that residents have the opportunity to report damage to their street. She asked for clarification about how much money we have to repair streets. Mr. Allyn indicated with the new LMTF added to the previous LMFT and a portion of the city sales tax, we have about $7 million each year to use on streets, sidewalks, and pavement preservation. The council is exploring creating an enterprise fund to control the spending of these funds and will define the eligibility criteria for projects. Ms. Bradley commented that the LMFT increase was done too quickly and there was not enough time for Council members to adequately discuss with their constituents prior to voting. Mr. Allyn indicated that the Council asked potential sources of revenue, the City Manager mentioned this as a possibility, and the Council opted to move forward with it as part of the budget.

Mr. Rob Ballantini asked if sidewalks would be repaired when the streets are resurfaced. Mr. Allyn indicated that all non-complaint ADA ramps are required to be fixed when streets are resurfaced. However, we try to view the sidewalk work independently and repair the worst areas first. We have ratings for all the sidewalk in the City broken down by property parcel. We do try to coordinate work, such as on Front St. where we replaced damaged sidewalks at the same time as we resurfaced the road. However, if sidewalk along a resurfacing project is still serviceable, it will likely not be replaced with a pavement resurfacing until the failed sidewalk in other parts of the City is all replaced. Mr. Rob Ballantini then asked about a specific location along Main St. Mr. Allyn indicated that we are just getting started on the year's sidewalk work and this section should be included, but he isn't sure where it falls in the schedule for the year. Mr. Gorman asked Mr. Allyn about the responsibility for sidewalks along a State road. Mr. Allyn explained that the City is generally responsible for the sidewalks with the exceptions being ADA ramps that cross the State roads and locations where the sidewalk and curb and poured together.

Mr. Gorman asked for an update on the city's Sidewalk Master Plan and how sidewalks differ from streets as far as longevity. Mr. Allyn indicated that most sidewalks last longer that streets, but it depends on how well it was constructed (most sidewalk in newer parts of town was constructed by developers or home owners), what material were used, when it was made, and whether there are trees that will lift up panels at they grow. The Master Plan is progressing as we are in year 3 or 4 of the plan that would get us to a good state within 10 years. We have been increasing funding and making good progress, but he can not speak specifically on whether we are ahead or behind of where the Plan indicated we should be.

Mrs. Blair indicated the information on each of the streets to be resurfaced was helpful, especially the photos. It really helps explains why those streets are in need of repair. Mr. Allyn explained that they are working to add this information and pictures to the BloomingtonStreets.com website, along with progress update info and time-lapse videos. Mrs. Bradley asked what type of rollout the city is planning to get information out about the new website and suggested that we need to celebrate the work that is being done rather than focusing on what isn't being done.

B. Information: April 2019 Citizen Comments/Complaints Summary

Ms. Bradley asked about the Irving School Crossing Guard warrant, (#40). Mr. Allyn indicated that the data gathering is underway, but has not yet been completed.

6. OLD BUSINESS:

A. Ms. Bradley asked for an update with the Post Office move. Mr. Allyn indicated that we have been gathering crash and traffic data but believes there is a noticeable drop in accidents once the post office moved away and we hope that will lead to the cul-de-sac option. Ms. Bradley ask for a timeline on the move and Mr. Allyn said there is nothing specific from them beyond the late summer move they indicated when they first announced it last year. We have not yet received any site plans for approval. Mr. Gorman asked if the City could install a cul-de-sac, even if the Post Office does not want it. Mr. Allyn indicated that we could without the Post Office. We would need to get approval from IDOT as it is in their Right-of-Way, but they understand there is a problem and would likely welcome that change. There are other considerations beyond that including if that money would be better spent elsewhere in the city. We will watch and if problems develop after the move, we will address them as efficiently as possible. Mr. Ballantini mentioned that he had heard from employees they were looking at moving in June.

   Mr. Gorman asked if the Post Office was still considering using the west side parking lot as a customer entrance. Mr. Allyn indicated that there have been no more discussions since last November or December but that at that time they had some safety concerns about mixing the operations aspects (loading and unloading) with customer operations in that park lot.

7. NEW BUSINESS:

A. None

8. COMMISSIONER COMMENTS:

A. Ms. Blair commented that this would be her last meeting as she took another job out of town and she has appreciated serving on the Commission.

B. Mr. Boyle shared on behalf of Staff a thank you to all the Commissioners that are leaving and for the ones staying.

C. Mr. Gorman also commented that this would be his last meeting as he was moving to Chicago for graduate school.

9. ADJOURNMENT: The meeting adjourned at 4:32 pm unanimously by voice vote; motioned by Ms. Blair and seconded by Mr. Rob Ballantini.

Respectfully,

Philip Allyn
City Traffic Engineer

CITY OF BLOOMINGTON
REPORT FOR THE TRANSPORTATION COMMISSION
AUGUST 27, 2019

CASE NUMBER:	SUBJECT:	ORIGINATING FROM:
INFORMATION	Summary of Citizen Comments/Complaints Received August 2019	Philip Allyn, PE, PTOE City Traffic Engineer
REQUEST:	Item submitted as information for the Transportation Commission. Any feedback or comments are welcome.	

STAFF RECOMMENDATION: N/A

Staff submits the following information to the Commission. Any comments or feedback is appreciated.

1. ATTACHMENTS:

a. None

2. BACKGROUND AND SUPPLEMENTAL INFORMATION:

The following comments were received by the Engineering Department between April 11, 2019 and August 22, 2019 or are updates of previous comments (additions to previous updates are **Bold-Underlined**):

1) Received request to review restricting parking to one side of street and install traffic calming on Tanner between Park Lake and Springfield. Reviewed file and location has been reviewed several times in past years with no findings of excessive speeding. **Counters placed to gather speed and traffic data. Data is being evaluated.**

2) Received Request to replace faded parking restriction signs along Washington Street. Need to visit site and submit work order to sign crew.

3) Received complaint of speeding on E. Oakland east of Hershey, especially around Watford. Due to hill east of Watford, can be worrisome turning from Watford onto Oakland and being overtaken. Request reduction from 40 mph to 30 mph. Completed field check. There is a hill to the east of Watford limiting the view of the intersection from westbound Oakland. There is also an existing "intersection warning" sign with a 30 mph plaque. Could consider speed reduction, but would need speed study. 85th percentile likely closer to 40 mph than 30 mph. Speed data collected. Need to review results.

4) Received request for increased pedestrian warnings at US 51 (Madison) and Front Street. To be reviewed following completion of Front Street work and likely referred to IDOT for consideration. May modify crosswalks with new ADA ramps.

5) Received request for clearly marked drop-off at the Arena on US 51 (Madison). To be reviewed and responded to but likely unable to provide due to moving lanes of traffic and IDOT jurisdiction. Passenger loading and unloading zone is currently posted on Front Street west of Madison.

6) Received request for crosswalk warnings at East and Locust for crossing from BCPA to/from north parking lot. To be reviewed and responded to after updating crosswalk policy.

7) Received request to relocate "CT" to Front Street by Arena. Need to contact submitter and clarify.

8) Received four coordinated requests for an all-way stop or other pedestrian warning enhancements at Stone Mountain and College for pedestrians walking north and south to/from Tipton Park. Due to close proximity to Northpoint Elementary School, will be reviewed and data collected when school resumes in the fall. Traffic counting completed. Traffic signal warrants not met. All-way stop warrants not met. Sent work order to mark crosswalk across College and install pedestrian warning signs at the crosswalk and in advance. Crosswalk has been marked. Warning signs have been installed. Need to evaluate sign indicating school crossing is further west at the school.

9) Received complaint about truck traffic on Fort Jesse Road. **Observed a large number of trucks using Fort Jesse and traveling to and from properties along Fort Jesse. Need to follow up with requestor and discuss.**

10) Received request for traffic signals at Fort Jesse Road and Airport Road. Intersection currently 4-way stop with plans to signalize in near future. Traffic counting and data collection completed; traffic signal warrants are met. Next step is to discuss funding options. **Requestor notified. Item Considered Closed.**

11) Received complaint of speeding and request for "Children at Play" signs on Gill Street at pass-through-cul-de-sac west of Airport. Need to evaluate "Yield" sign usage for clarity.

12) Received complaint of Park Drive on Chestnut being blocked by park traffic. **Discussed issues with resident and clarified the concern is with people parking on the street and blocking his driveway. Informed him this should be reported to the Police Department who can issue a ticket. Item Considered Closed.**

13) Received request for traffic calming on Eastport Drive between Clearwater and Empire. **Speed data collected. Need to review results and compare to traffic calming policy.**

14) Received request for traffic calming on Gloucester Circle between Hersey and Dover. Collected speed and traffic volume data. Does not qualify for traffic calming under Traffic Calming Policy (excessing speeding threshold not met). Need to formalize report and respond to resident.

15) Received request for traffic calming on W. Oakland between Livingston and Euclid. **Speed data collected. Need to review results and compare to traffic calming policy.**

16) Received request to add flashing yellow arrows at Emerson and Towanda due to confusion of eastbound left turn drivers and non-90-degree angle of intersection. Contacted requester and indicated flashing yellow arrows are beginning to be incorporated as other signal maintenance work is completed at an intersection. This particular location will be reviewed closer due to unique geometry for higher priority of flashing yellow arrow implementation.

17) Received report of missing no parking sign at McGregor and Oakland. Need to visit site and review. **Determined location of missing sign, completed work order for reinstallation, verified sign was installed. Item Considered Closed.**

18) Received request to remove school zone on southbound Center Street by Thornton's for Corpus Christi is no longer needed due to school closing. Confirmed that this zone was just for Corpus Christi and not also Bent Elementary and that there are no longer school activities at old Corpus Christi building. **Began coordination with IDOT on removal of school zone limits. Need to follow-up on completion.**

19) Received request for school crossing sign added at Washington and Darrah. Need to determine which intersection leg is being requested and evaluate request. **Contacted requestor and discussed. Determined request is in response to needing area for children drop off for Heartland Head-start. Identified location and completed work order for sign installation. Need to verify completion and update Code.**

20) Received concern about an increase in collisions on GE Road between Golden Eagle and Towanda Barnes Road. Need to pull accident data, review for trends and evaluate options.

21) Received two separate concerns about commercial parking on residential portion of Norma Drive. Need to contact residents and discuss.

22) Received request for stop or yield sign at Ark Dr. and Matthew Dr. ("Tee" intersection). Need to visit site and review.

23) Received request for no parking in front of a residence on Colton due to constant blocking of driveway. Need to visit site and review.

24) Received complaint of landscaping creating a sight obstruction at Peirce and Mercer. Need to visit site and review when landscaping is in full bloom.

25) Received complaint of out of town school buses parking and blocking alley behind Elmwood Road and the BHS football/baseball fields during school sports activities. Need to visit site and review.

26) Received complaint about new power poles at Hershey and Jumer causing a sight obstruction. Visited site to review. Contacted Ameren to discuss poles. Ameren agreed at least one of the poles may not be necessary; they are reviewing internally.

27) Received request for street light at College and Stone Mountain. Evaluating options to add a street light to the southeast quadrant to light the south leg and the bike path crosswalk. **Submitted request to contractor for an estimate to install; waiting for price.**

28) Received complaint of speeding on GE Road between Towanda Barnes and Airport Road with numerous accidents on a consistent basis. Request study of adding traffic signals and/or stop signs. Contacted and will gather speeding and crash data.

29) Received request to limit parking on Beecher between Fell and Horenberger due to sight distance reasons. Visited site for preliminary evaluation. Need to contact requestor and discuss further.

30) Received complaint of stop sign obstructed by a tree limb at westbound Raspberry and Woodbine. Sent work order to Parks Dept. for trimming when weather allows. **Verified trimming completed. Item considered closed.**

31) Received notification of missing No Parking signs on S. Williamsburg and Yorktown. Existing signs have severely faded. Visited site and identified missing and faded signs needing replacement. Completed work order for replacement of faded sign. **Verified replacement completed. Item considered closed.**

32) Received concern about no turn on red at Six Points Road and S. Morris. Need to contact to clarify.

33) Received request for explanation on why parking not being allowed on Elmwood between Colton and Towanda. During football games many cars park on Colton, creating unsafe conditions, when they should be able to park on Elmwood. Need to research and evaluate.

34) Received complaints of bicyclists blowing stop sign at Bunn / Buchanan and Buchanan / Clayton. Request to evaluate options for additional signage and increased enforcement.

35) Received request for stop sign on Baker at Roosevelt (T intersection). Will review accident history and evaluate sight distance.

36) Received concern about inadequate school zone signage for Corpus Christi School. Requested multiple blinking lights. Complained of cars extending out onto Lincoln during pickup and drop-offs. Need to visit site and review school zone signage and

discuss modifications to drop-off and pickup routing on school site with school. Met with the Principal and Facilities Manager and reviewed current signage. School zone appears to be correctly signed currently. Observed pick-up and drop-offs, which appear to minimize impacts to surrounding area as much as possible. Need to determine options for increased signage, if any.

37) Received concern about speeding and stop sign running in neighborhoods surrounding Corpus Christi School during school drop-off and pickup to avoid all-way stop at Lincoln and Mercer. Need to discuss modifications to drop-off and pickup routing on school site with school. Observed pick-up and drop-offs, which appear to minimize impacts to surrounding area as much as possible. Met with the Principal and Facilities Manager and reviewed. Provided information for school to share with parents relating to avoiding using the neighborhood streets to the north when possible. Need to evaluate installing stop signs at "T" intersections in the neighborhood area.

38) Received concern about parking availability in neighborhoods surrounding Sarah Raymond School during school drop-off, pickup, and special events. Need to evaluate parking in area and discuss with school.

39) Received request for school crossing guard at Irving. **Completed data gathering, working on analysis.**

40) Received request for curb painting at Summerfield and Hershey.

41) Received multiple requests for arrows to be painted on Evans Street indicating direction of travel. **Repainted the arrows, will monitor effectiveness over coming months and will explore other potential options if needed. Item Considered Closed.**

42) Received complaint of cars not stopping for stopped school bus at Harvest Pointe and Dry Sage Circle. Request 4-way stop, reduced speed limit or Children at Play sign. Contacted and discussed issues with submitter. There are several repeat offenders. Encouraged them to contact the school to request the bus driver submit a report of failure to stop when it occurs. Encouraged them to take photos and document and submit to the police department for enforcement. Contacting the school district to inquire about revising bus pickup locations to eliminate the need for children to cross Harvest Pointe. Need to research posted 35 mph speed limit on Harvest Pointe.

43) Received request for stop sign at corner of Sugarberry and Winterberry in the Grove ("T" intersection). Need to complete work order for sign installation.

44) Received request for street light on Cottage between Perry and Graham. Need to visit site and evaluate lighting levels.

45) Received request for handicap markings to be repainted on Clayton at 614 E. Grove Street following resurfacing. **Work order submitted and verified work completed. Item Considered Closed.**

46) Received request to consider changing speed limit on Streid Drive and Oakland between Hershey and Streid to reduce the speed of vehicles on these roads. Speed data currently being gathered and analyzed.

47) Received request for removal of handicap parking spot on 700 block of N. McLean due to person no longer living there. Need to verify, complete work order for removal, and update City Code.

48) Received notification of missing street name sign at East Street and Empire. Contacted requestor, need to evaluate location for new sign.

49) Received complaint of missing street name signs for Ashley Drive and Eric Court. **Completed work order for replacement and verified completed. Item Considered Closed.**

50) Received request for removal of handicap parking spot on 600 block of W. Chestnut due to person no longer there. **Completed work order for removal and verified completed. Need to update City Code.**

51) Received request for stop or yield signs at Matlock and Dorset Ct., Matlock and Yorkshire Ct., and Matlock and Cumbria Dr. Need to evaluate and complete work order if signs are warranted.

52) Received request to remove "End of School Speed Zone" signage on Center Street between Mulberry and Locust since Central Catholic moved many years ago and signs are no longer needed. Reviewed location: signage remained after the High School moved due to Corpus Christi school on the west half of this block. Met with the Principal and Facilities Manager and confirmed there are no longer school activities being held at the old location. Need to put together a work order for the removal of the school zone signage. **Began coordination with IDOT on removal of school zone limits. Need to follow-up on completion.**

53) 1/17/19 – Received a request to limit the parking on Ridgewood Terrace to only one side of the street. Letters notifying residents of the potential removal of parking on the north side, including the cul-de-sac, and requesting comments were hand delivered on 4/3/19. **Vote was not supportive of restricting parking. Need to review for adequate turning room in cul-de-sac for garbage trucks.**

54) 2/4/19 – Received a request to re-mark and re-sign two handicap parking spaces near the intersection of East and University. Completed work order for sign replacements and verified they have been installed. **Checked paint markings and verified they have recently been repainted. Item Considered Closed.**

55) 2/13/19 – Received new complaint of speeding and wrong-way traffic on Evans between Oakland and Front. **Repainted the previous arrows at intersections, will monitor effectiveness over coming months and will explore other potential options if needed. Item Considered Closed.**

56) 2/21/19 – Received request for "Deer Crossing" warning signs on W. Washington Street between Caroline and I-74 after witnessing 5 hit deer within the last year and seeing a large heard of deer several times along the road.

57) 2/25/19 – Received a request to limit the parking along Williamsburg Drive. Discussed with requestor: sight issues pulling out of daycare. Sign crews replaced faded signs, work order completed for additional sign restricting parking immediately north of the daycare exit. Verified signs for new parking restriction installed; will monitor until Sept 15, 2019; if no issues, will update Code.

58) 3/5/19 – Received request for a Loading Zone on Mission Drive. Visited site to review with requestor. Completed work order for sign and markings to add a Loading Zone in this area. **Verified work completed. Will monitor until 10/15/19; if no issues, will update Code.**

59) 3/7/19 – Received a request for stops signs at Maizefield Drive and Harbord Drive. Currently stop signs on Maizefield. Need to contact and clarify request.

60) 3/8/19 – Received a request for additional no parking signs along Northbound Black Oak to help control parents during pickup and drop-offs. **Visited and met with school staff. Completed work order for additional No Parking sign just north of school entrance. Need to verify completed.**

61) 3/12/19 – Received a complaint about speeding on Woodruff from Colton to Linden and on Linden. Will evaluate for traffic calming.

62) 3/13/19 – Received concerns about the speed of traffic on Beich Road presenting a hazard to drivers entering and exiting the Nestle plant. An employee inadvertently pulled onto Beich and was involved in a collision. The interstate presents an optical distraction. Need to review crash data and potentially gather speed data. Posted speed on this rural road is currently 45 mph. Contacted IDOT to inquire about replacing old and missing visual barrier panels in the existing ROW fence between Beich Road and the Interstate. Discussed additional options with requestor. Entrance owner plans to upgrade the stop sign to a higher-visibility sign and add "cross traffic does not stop". IDOT informed that they will not replace the visual barrier panels. Fence too short to adequately block view of traffic on the interstate that drivers are confusing for traffic on Beich Road. Original requestor asked for "Plant Entrance" sign on southbound Beich Road. Need to explore other options for sight barrier.

63) 3/24/19 – Received a request for a new street light at an entrance on the 500 block of E. Bell Street and for a stop or yield at the curve from S. McLean to E. Bell. Notified requestor that stop/yield sign not appropriate since there is no intersection and lighting of an entrance/doorway is the responsibility of the property owner. **Verified there is an existing light at this corner that is completed blocked due to an overgrown tree. Contacted Ameren about trimming the tree.**

64) 3/25/19 – Received request for removal of handicap parking spot at 107 Packard St. due to person no longer living there. **Verified spot is no longer needed. Completed**

work order for removal and verified removal completed. Need update City Code.

65) 4/9/19 – Received a request to remove or relocate Governor's Cup Winner sign at Washington and Davis. **Reviewed history of sign: was an award won by the David Davis Mansion; it has been in place past the committed timeframe and can be removed. Contacted David Davis Mansion and provided removed sign to them. Item Considered Closed.**

66) 4/9/19 – Received a request to evaluate the parking in front of 613 E. Mill Street (corner of Mill and Evans intersection) to allow garbage trucks to be able to turn without running over the curb and sidewalk. **Reviewed in field and confirmed narrow streets combined with allowed parking cause garbage trucks to have to driver over curve and sidewalk ramps (less than 2 year old ramp is now severely cracked). Need to complete work order to restrict parking in front of 613 E. Mill Street and modify City Code.**

67) 4/10/19 – Received request for additional lighting on Orchard. **Evaluated existing street lighting: fixtures are older style, submitted request to Ameren to upgrade to newer, brighter, LED heads. Will evaluate further once upgrades are complete.**

68) 4/10/19 – Received a complaint about speed humps on Eddy Road needing to be rebuilt with new paint markings as they have become very unsightly. **Notified pavement marking crew and verified new markings have been placed. Item Considered Closed.**

69) **NEW:** 4/13/19 – Received a comment that a street name sign replaced last year at Linden and Monroe Dr. was installed as Monroe St. **Confirmed wrong sign, completed work order to replace with the correct sign, verified complete. Item Considered Closed.**

70) **NEW:** 4/12/19 – Received a complaint about speed on Vladimir and motorcycles and mopeds driving on the sidewalks.

71) **NEW:** 4/15/19 – Received a request to repaint the crosswalk crossing Veterans Parkway at Washington Street. Responded: this is an IDOT crosswalk and IDOT is currently working on construction drawings to re-mark all of the IDOT streets in the City anticipated to be put out for bid later this year. Item Considered Closed.

72) **NEW:** 4/17/19 – Received request to check left turn detection at Oakland/Regency and Oakland/Four Seasons. Referred to electricians to check and repair if needed. Item Considered Closed.

73) **NEW:** 4/22/19 – Received a request for No Parking signs to be posted in North/South Alley adjacent to 504 E. Locust. Vehicles from apartment building park in alley rather than the building's parking lot and block the driveway.

74) **NEW:** 4/30/19 – Received request for "Deer Crossing" warning signs by 1608 Six Points Road. Deer regularly cross in this location.

75) **NEW:** 5/2/19 – Received concern about speeding in the alley between White Place and Constitution Trail north of Empire. Requested increased speed limit signage, No Through Traffic signage and speed bumps.

76) **NEW:** 5/6/19 – Received notification of signal heads at Hershey and Lincoln have tuned and are facing the wrong direction. Notified electricians who adjusted the heads. Item Considered Closed.

77) **NEW:** 5/20/19 – Received request to check left turn detection at Washington/Hershey, Empire/Eastport, Hershey/Ireland Grove, and Washington/Towanda/State. Referred to electricians to check and repair if needed. Item Considered Closed.

78) **NEW:** 5/26/19 – Received report of left turn red traffic signal light out on Fox Creek at Veterans. Referred to electricians to check and replace. Item Considered Closed.

79) **NEW:** 5/31/19 – Received report of bad signal detection at Market Street and I-55 exit ramp. Referred to electricians to check and repair if needed. Item Considered Closed.

80) **NEW:** 5/31/19 – Received report of bad signal detection at Market Street and JC Parkway. Referred to electricians to check and repair if needed. Item Considered Closed.

81) **NEW:** 6/5/19 – Received report that the signal timings at Hershey and College need to be adjusted. Referred to electricians to verify detection equipment working properly. Item Considered Closed.

82) **NEW:** 6/7/19 – Received request for stop signs at Shaunessey/Casey and Shaunessey/Connemara.

83) **NEW:** 6/9/19 – Received report of red traffic signal light out on westbound GE at Airport. Referred to electricians to check and replace. Item Considered Closed.

84) **NEW:** 6/12/19 – Received request for removal of handicap parking spot at 506 E. Douglas due to person no longer living there. Need to verify, complete work order for removal, and update City Code.

85) **NEW:** 6/20/19 – Received request to disallow left turns into Walgreens from westbound Oakland since entrance is too close to Veterans Parkway. Responded that we are looking for ways to better control this location with raised median when the next resurfacing is completed in 3-5 years. Item Considered Closed.

86) **NEW:** 6/20/19 – Received report of northbound turning green with no vehicle present at Colton and Locust traffic signal. Referred to electricians to check detection equipment. Item Considered Closed.

87) **NEW:** 6/24/19 – Received report of "WALK" indication not working at Main and Locust. Referred to electricians to check and repair if needed. Item Considered Closed.

88) **NEW:** 6/25/19 – Received complaint about sight distance at Lutz and Morris. Referred to Parks Dept. to trim back landscaping and brush. Item Considered Closed.

89) **NEW:** 6/25/19 – Received request to limit parking on one side of the street on Forrest between Cottage and the dead-end west of Hinshaw. Letters notifying residents of the potential removal of parking and requesting comments to be written and delivered. After receiving resident feedback, a determination will be made on whether to implement the parking restriction.

90) **NEW:** 6/26/19 – Received request to prohibit left turns from Oakland into the parking lot entrance just west of Veterans Parkway. Stopped vehicles waiting to turn are backing up into Veterans. Responded that we will be looking at the access and median at this location when the street is resurfaced in the next several years if not before. Item Considered Closed.

91) **NEW:** 7/10/19 – Received request for handicap sign and markings at 604 W. Chestnut. Requestor submitted required paperwork; Work orders for sign and pavement markings submitted to crews; Need to verify when complete, and update City Code.

92) **NEW:** 7/15/19 – Received request for street light at entrance to church on Ft. Jesse Road. Indicated entrance lights are the responsibility of the owner of the entrance. Item Considered Closed.

93) **NEW:** 7/28/19 – Received request for additional signage and bike lane markings at on Fairway, especially at the Empire intersection. Responded that this work has not yet been completed by the contractor. Indicated that once updated signs and the bike lane markings are complete, if there are still questions or concerns, the please contact us. Item Considered Closed.

94) **NEW:** 7/30/19 – Received complaint about large number of vehicles traveling down Maysel St. (dead end) only to turn around at the end and speed back out. Requested additional or more visible dead-end signs.

95) **NEW:** 7/30/19 – Received complaint about large number of vehicles exiting new restaurant at Airport and Empire going west on Empire and making u-turns at Airport to travel back east. Passed concern onto IDOT since this is a State Road. Item Considered Closed.

96) **NEW:** 8/8/19 – Received complaint about speeding on Baywood east of Towanda Barnes. Requested additional speed limit sign or relocation of the existing sign further from the intersection to be more visible.

97) **NEW:** 8/11/19 – Received report of missing speed limits signs along Towanda Avenue between Empire and Vernon. Investigated and found one sign missing. Need to completed work order for replacement and evaluate if additional signs are needed.

98) **NEW:** 8/16/19 – Received report of several missing signs and broken posts Ireland Grove Road. Need to complete work order for replacement.

99) **NEW:** 8/19/19 – Received request for stop or yield signs at Piney Run and Fiddlestix.

100) **NEW:** 8/20/19 – Received report of missing No Parking signs on north side of Beecher between Main and East.

101) **NEW:** 8/20/19 – Received request for No Parking signs on south side of Beecher between Main and East by mid-block driveway.

102) **NEW:** 8/22/19 – Received complaint of speeding on Vladimir between Gill and Rainbow and requested traffic calming.

103) **NEW:** 8/22/19 – Received request for all-way stop control at Allin and Monroe and additional One Way signage due to drivers traveling the wrong way on Monroe (It's one way westbound).

3. STAFF RECOMMENDATION:

Staff submits the above information to the Commission. Any comments or feedback is appreciated.

Respectfully submitted,

Philip Allyn, PE, PTOE
City Traffic Engineer

CITY OF BLOOMINGTON
REPORT FOR THE TRANSPORTATION COMMISSION
AUGUST 27, 2019

CASE NUMBER:	SUBJECT:	ORIGINATING FROM:
TC-2019-02	Downtown Main Street Parking Configuration	Philip Allyn, PE, PTOE City Traffic Engineer
REQUEST:	Review and approval by the Transportation Commission of proposed pavement markings for Main Street in Downtown Bloomington.	

STAFF RECOMMENDATION: Approval

Staff requests approval of maintaining the current pavement marking configuration along Main Street between Washington Street and East Street consisting of a combination of angled and parallel parking.

1. ATTACHMENTS:

a. **Proposed Plan Based on the Current Configuration**
b. **Proposed Plan Incorporating Angled Parking on Both Sides of Main**
c. **Proposed Plan Incorporating Angled Parking on Both Sides of Main with Loading Zones**
d. **City Code §44-1206 Parking Design Standards**

2. BACKGROUND AND SUPPLEMENTAL INFORMATION:

Main Street in the heart of Downtown Bloomington was resurfaced earlier in 2019. Staff was requested at that time to explore the possibility of changing the parking configuration along the street with the intent of gaining additional on-street parking through the business area. Prior to resurfacing, Main Street typically had two driving lanes, with angled parking on one side and parallel parking on the other side. The exception is the block between Washington and Jefferson, which is approximately 5 feet narrower than the other blocks and thus only had one driving lane.

Exhibits are attached showing the three alternates developed for the parking configuration for these blocks. The first alternate is based largely on the current configuration. Minor changes were made to comply with current code and laws, such as widening handicap stalls to the minimum legal width and maintaining the proper distance from cross walks.

The second two configurations were developed by changing parallel parking into angled parking and eliminating a driving lane. Because angled parking along both sides of a street is uncommon, and standard dimensions are not readily available, the aisle and parking stall dimensions specified in City Code for off-street parking lots were used. For reference, a copy of this section of Code is attached. The existing angled street parking is set at 60°; however, this requires a minimum aisle width of 16 feet. To fit angled parking on both sides of the street within the

existing street width, the parking angle needed to be changed to 45° (12-foot minimum aisle width), which reduced the number of spaces along the length of the block.

In evaluating reducing the street to one 12'-8" driving lane rather than two driving lanes totaling over 26 feet, several potential negative factors were identified:

- A significantly narrower buffer between the two banks of parked cars may increase the number of crashes by drivers backing out of a parking spot.
- Parking lot aisle dimensions are based on a lower speed environment in which drivers are actively monitoring the parking spaces and have an expectation that a vehicle will back into the aisle. Conversely, while driving down a street, drivers are typically driving at a faster speed and less focused on vehicles that may be backing out of parking spaces. By reducing the driving area to a single driving lane, a driver loses the ability to veer out of the way of a backing car, which could result in more crashes.
- There are a significant number of businesses along this section of Main Street that receive deliveries from the street. Current City ordinance allows a delivery truck to park in a travel lane for a short duration if there are at least two travel lanes. By eliminating the second travel lane, businesses will struggle to receive their deliveries, or the trucks (or any stalled vehicles) will block the only travel lane, effectively shutting down the entire street. This could also block First Responders (Police, Fire, Ambulance), delaying the ability to access an emergency situation.
- From an aesthetic stand point, a change in parking angle will result in parking no longer matching the existing curb bumpouts.

In order to mitigate the blockage due to delivery vehicles the third alternate was developed that provided a dedicated loading zone on each block. Note that these locations are conceptual and while locations were logically chosen, there would likely be pushback from business owners whose customers can no longer park in front of their business.

A comparison of the number of parking spaces in each alternate is shown below in Table 1. The blue rows represent the total within a given block, including both sides of the street. The yellow and orange rows provide the number of spaces on each side of the street. The Net Change columns show the net change in relation to the 2-lane Alternate. In all three alternates, the 200 Block of Main Street is the same. Since this block is approximately 5 feet narrower than the other blocks as mentioned above, there is not enough street width to allow angled parking on both sides of the street.

In the 300 and 400 Blocks of Main Street, the necessary change from 60° parking to 45° parking results in either the same or fewer number of parking spaces. In order to actually increase the number of parking spaces, 60° parking must be used with the aisle width (12 feet) for 45° parking. This is shown on the layout provided in the 500 Block. While either 9 or 5 spaces are gained, the ability to back a vehicle out of a space without hitting parked cars on the opposite side of the street is dramatically decreased since the aisle width would be 4 feet narrower than Code, likely leading to an increase in traffic crashes.

Main Street Parking	2-Lane	1 Lane No Loading Zones		1 Lane With Loading Zones	
	# of Spaces	# of Spaces	*Net Change*	# of Spaces	*Net Change*
200 Block (Washington-Jefferson)	**25**	**25**	***0***	**25**	***0***
East Side	16	16	***0***	16	***0***
West Side	9	9	***0***	9	***0***
300 Block (Jefferson-Monroe)	**26**	**24**	***-2***	**21**	***-5***
East Side	17	13	***-4***	13	***-4***
West Side	9	11	***2***	8	***-1***
400 Block (Monroe-Market)	**39**	**39**	***0***	**33**	***-6***
East Side	13	19	***6***	19	***6***
West Side	26	20	***-6***	14	***-12***
500 Block (Market-Mulberry)	**36**	**45**	***9***	**41**	***5***
East Side	11	20	***9***	16	***5***
West Side	25	25	***0***	25	***0***
Total All 4 Blocks	**126**	**133**	***7***	**120**	***-6***
East Side	57	68	***11***	64	***7***
West Side	69	65	***-4***	56	***-13***

Table 1: Comparison of Number of Parking Spaces

Since the goal of a potential parking change is to increase the number of available parking spaces, and this can not be accomplished without noticeably decreasing the safety and usability of the street and/or violating City Code, Staff recommends keeping the current configuration with a combination of angled and parallel parking and two driving lanes when Main Street is repainted.

3. STAFF RECOMMENDATION:

Staff recommends maintaining the current pavement marking configuration along Main Street between Washington Street and East Street consisting of a combination of angled and parallel parking and two driving lanes.

Respectfully submitted,

Philip Allyn, PE, PTOE
City Traffic Engineer

City of Bloomington ILLINOIS

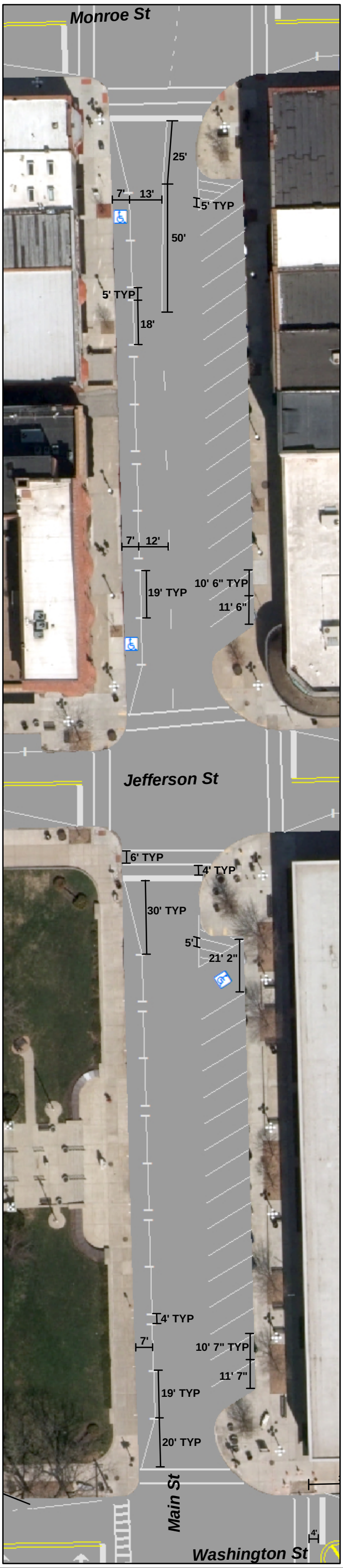
Public Works Department

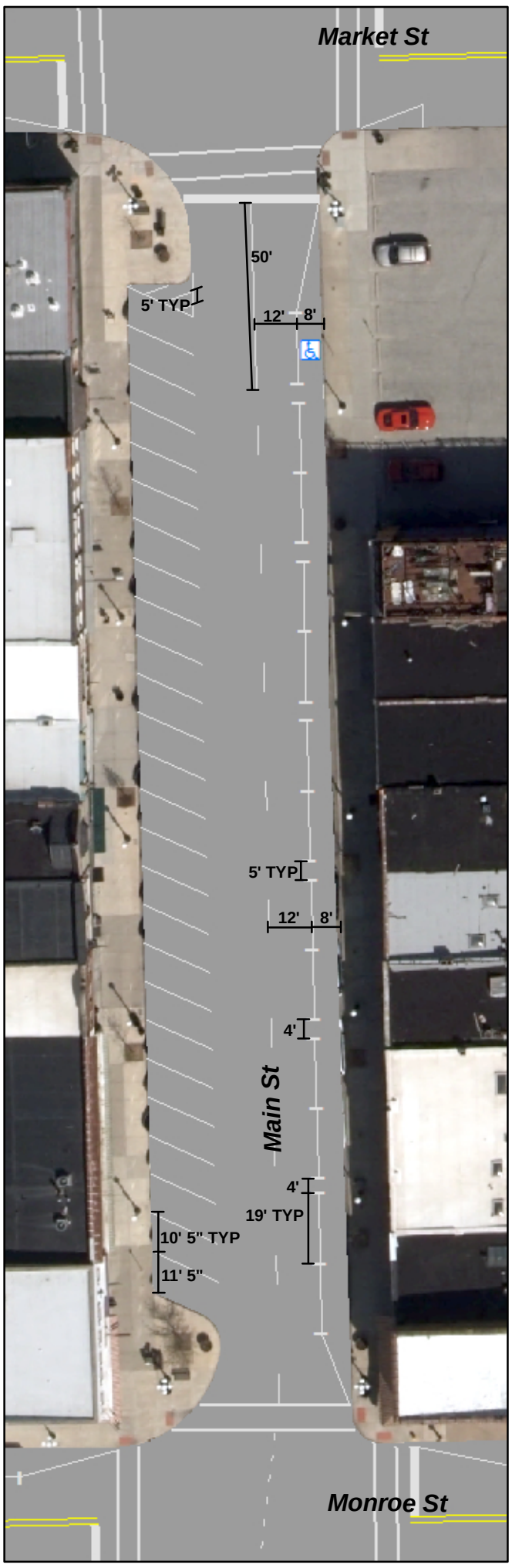
Main St.
Washington to East

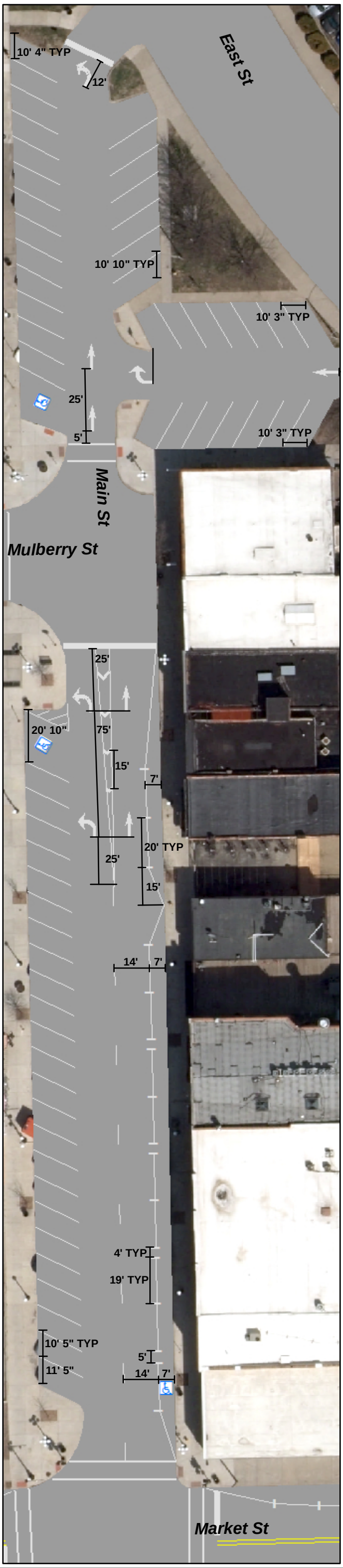
Current and Recommended Mix of Angled and Parallel Parking

N

0 12.5 25 50 75 100 Feet







City of Bloomington ILLINOIS

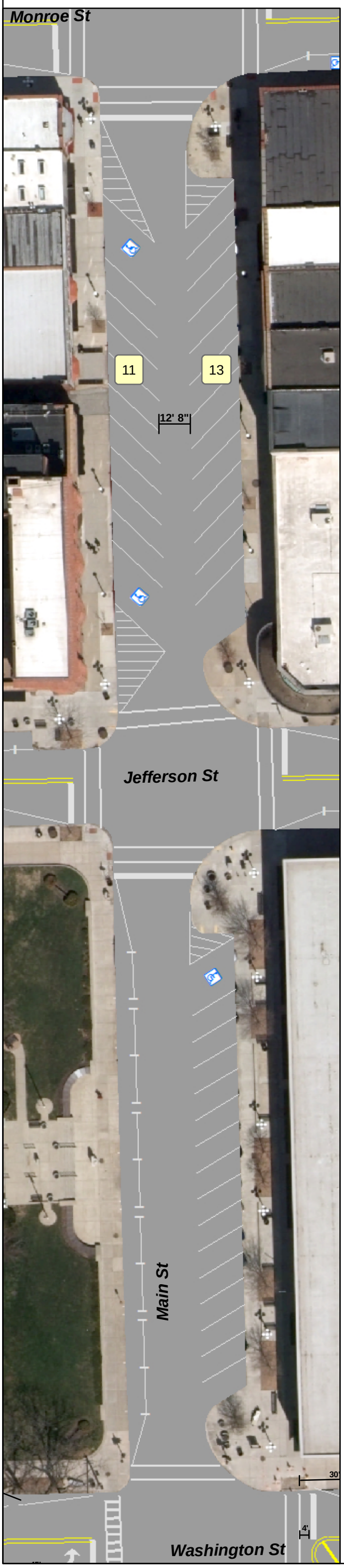
Public Works Department

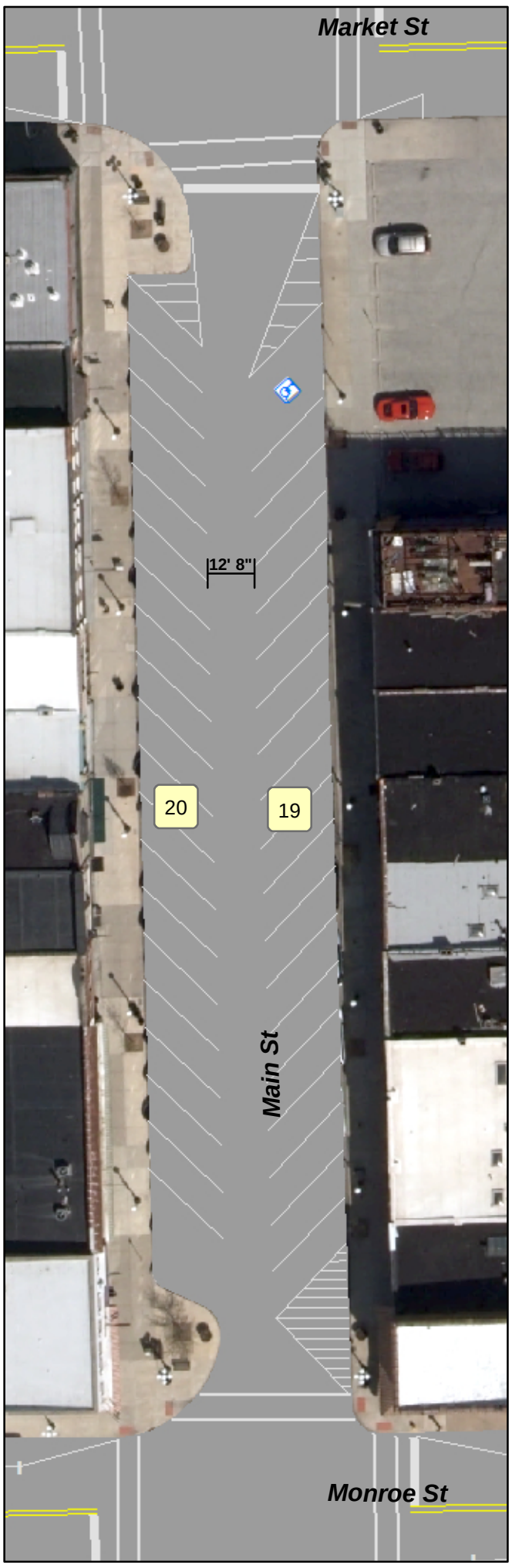
Main St.
Washington to East

All Angled Parking
No Loading Zones

N

0 12.5 25 50 75 100 Feet





City of Bloomington ILLINOIS

Public Works Department

Main St
Washington to East

N

0 12.5 25 50 75 100 Feet

All Angled Parking
Added Loading Zones

Bistro

Beck's

Red Raccoon

12' 8"

8

13

Jefferson St

Main St

Washington St

30'

4'

Market St

Wilson Cycle

12' 8"

14

19

Coffee Hound

Neighborhood Thrift Store

Main St

Coffee Hound

Von Champs: Won't want to lose spaces

Monroe St

East St

19' 4"

Main St

Mulberry St

Multiple BARS

25

16

Common Ground

12' 8"

Fat Jacks

Market St

§ 44-1206. [Ch. 44, 12-6] Parking design standards.

A. Access.

(1) All off-street parking, stacking, and loading areas shall be arranged for convenient access and safety of pedestrians, bicyclists, and vehicles.

(2) Each required parking space shall open directly upon an aisle, or driveway of such width and design as to provide safe and efficient means of vehicular access and egress. Except for driveways serving single-family and two-family dwelling units, access to a parking space shall not require backing across a street property line or re-entering a public right-of-way.

(3) Off-street parking areas with three or more required spaces shall be configured so that a vehicle may enter and leave a parking space without moving another vehicle. Tandem parking may be approved for valet parking and similar purposes pursuant to Site Plan Review procedures.

(4) Access to an off-street parking area that serves a nonresidential use shall not be permitted across lots that are residential in use or located in a Residential District.

(5) Where the parking area of a corner lot abuts an alley or a corner side street, access to the parking area shall be obtained from the alley or corner side street. Alternate access from a primary street may be approved through Site Plan Review procedures if a determination is made that it is infeasible to fulfill this standard.

(6) On any parcel, curb cuts for access to the right-of-way shall be approved by the City Engineer. In residential areas, only one driveway opening will be allowed if the lot width is less than 100 feet.

B. Large parking lots (200 or more parking spaces).

(1) Primary drive aisles shall be located across from streets or driveways to avoid conflicting traffic movements and facilitate the safe flow of traffic.

(2) Large off-street parking lots shall be designed to simulate a grid pattern through the placement of landscape islands, buildings, and drive aisles.

(3) Block lengths within the grid should not exceed 600 linear feet between the center lines of intersecting streets or primary drive aisles. In cases where a block length exceeds 600 feet due to topography, natural features or other physical constraints, sidewalks shall be provided mid-block to connect parallel streets or drive aisles.

C. Curbs and vehicle stops.

(1) All off-street parking lots, access drives and aisles, and other vehicle maneuvering areas shall provide perimeter curbs.

(2) Off-street parking stalls shall provide curbs, vehicle stops or similar devices to prevent vehicles from overhanging on or into public right-of-way or adjacent property, structures, fences, or screens.

(3) Vehicle stops shall be located 2.5 feet from a fence or wall.

(4) When a parking space abuts a landscaped area, the front two feet of the parking space may overhang a landscaped area.

(5) A parking space may overhang a walkway by up to two feet, provided that curbs or vehicle stops are installed to ensure that a minimum five-foot walkway clearance is maintained.

D. Defined areas. Off-street parking areas of three or more spaces and off-street loading areas shall include painted lines, curbs, vehicle stops or other similar identifiers to delineate parking and loading areas.

E. Accessible parking. Parking lots shall provide accessible parking spaces and accessible access routes for persons with disabilities in compliance with the State Building Code and the Americans with Disabilities Act (ADA), as applicable. The provision of accessible parking shall count toward fulfillment of off-street parking requirements.

F. Surfacing requirements.

(1) Parking lots. All off-street parking, stacking, and loading areas shall be surfaced with asphalt, concrete, brick, stone, pavers, or an equivalent material as approved by the City Engineer. Surfaces such as pervious asphalt, pervious concrete, or turf blocks are permitted; subject to the requirements of this chapter and other City policies pertaining to stormwater management.

(2) Driveways.

(a) Driveways leading to parking lots of 10 parking spaces or more shall conform to the requirements of § 44-1206D(1) of this Code.

(b) Aprons on all driveways shall conform to the following standards:

[1] A 1 1/2 inch bituminous concrete surface on a four-inch base of bituminous aggregate mix; or

[2] A two-inch bituminous concrete surface on an eight-inch base of crushed gravel or crushed stone; or

[3] A six-inch Portland cement concrete or five-inch reinforced with wire mesh or structural equivalent of any of the foregoing as determined by the Community Development Director.

G. Drainage.

(1) All parking lots shall be sloped and/or drained to prevent surface water from such lots from running onto adjoining property in unreasonable volumes.

(2) All ramped parking lots and un-ramped parking lots containing 10 or more parking spaces shall provide flood routes to direct excess water in a way that results in the least amount of harm to adjoining properties and shall dispose of surface water in one of the following methods when approved by the City Engineer:

(a) Surface drainage across sidewalks, if any, onto adjacent public right-of-way, unless such drainage would either:

[1] Cause flooding of the adjacent public right-of-way; or

[2] Flow longitudinally along any sidewalk adjacent to such lot or otherwise impair pedestrian use of such sidewalk;

(b) Use of inlets and storm sewer facilities capable of draining the lot from a storm of five year magnitude or greater;

(c) Retention of water on the premises;

(d) Underground drainage across other private property to an approved outlet;

(e) And permeable pavers as approved by the City Engineer.

H. Dimensional standards.

(1) Off-street parking spaces shall be designed in accordance with Table 1206I: Dimensional Standards for Parking Spaces and Aisles.

(2) All parking spaces shall have a minimum vertical clearance of seven feet.

(3) Compact spaces. Up to 30% of all provided parking spaces may be compact vehicle parking spaces. Dimensions for compact spaces are shown in Table 1206X.

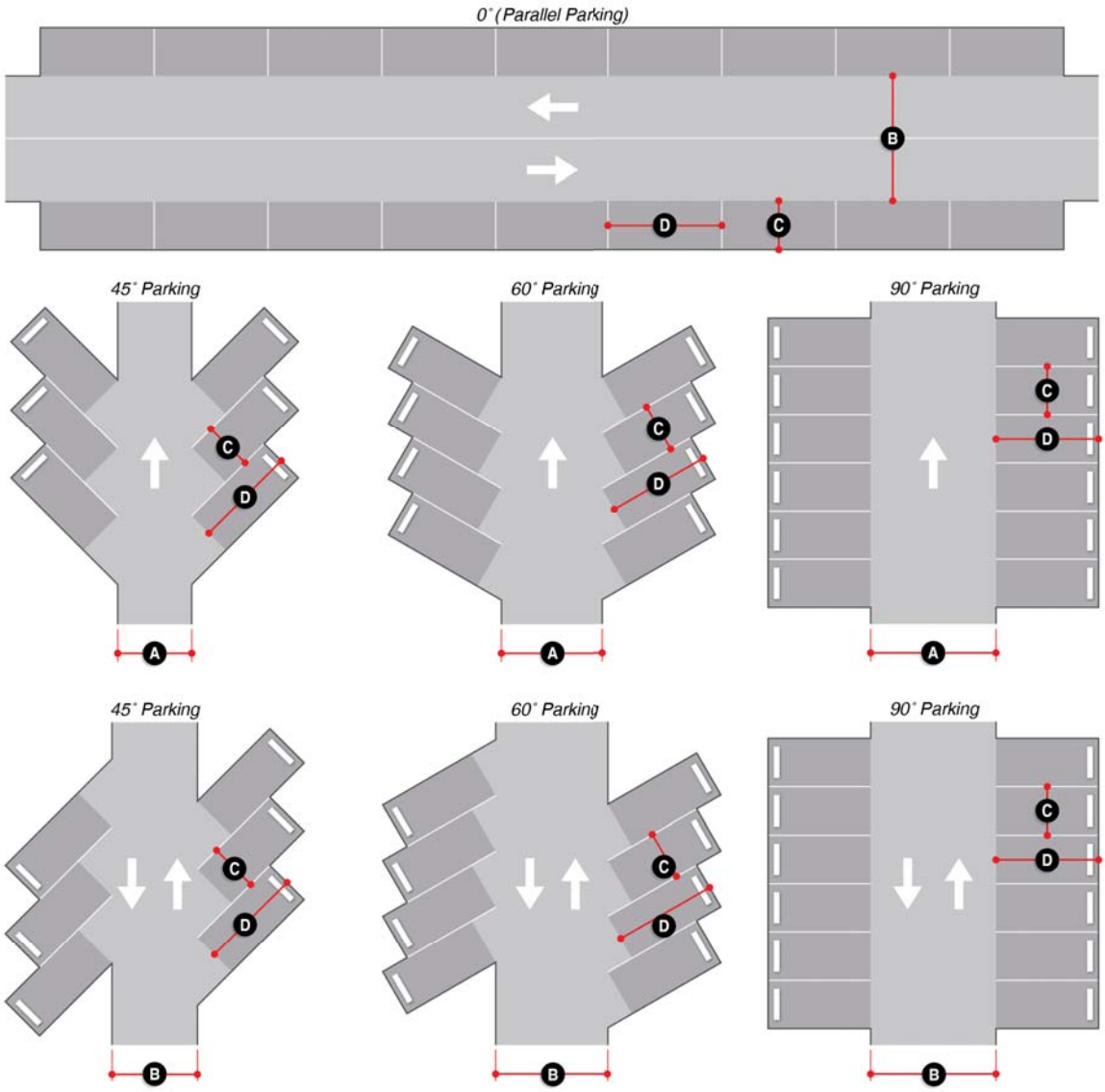
(4) All parking spaces and aisles shall comply with the following minimum requirements.

Table 1206I: Dimensional Standards for Parking Spaces and Aisles

	0° (Parallel)		45°		60°		90°	
	Typical	**Compact**	**Typical**	**Compact**	**Typical**	**Compact**	**Typical**	**Compact**
A - Width of Aisle: One-Way	11 feet	11 feet	12 feet	12 feet	16 feet	16 feet	20 feet	20 feet
B - Width of Aisle: Two-Way	12 feet	12 feet	20 feet	19 feet	20 feet	19 feet	24 feet	23 feet
C - Width of Space	8.5 feet	8 feet	8.5 feet	8 feet	8.5 feet	8 feet	8.5 feet	8 feet
D - Depth of Space	20 feet	19 feet	19 feet	18 feet	20 feet	19 feet	18 feet	17 feet

Diagram 1206

Dimensional Standards for Parking Spaces and Aisles



CITY OF BLOOMINGTON
REPORT FOR THE TRANSPORTATION COMMISSION
AUGUST 27, 2019

CASE NUMBER:	SUBJECT:	ORIGINATING FROM:
TC-2019-03	Annual Street Maintenance Program	Philip Allyn, PE, PTOE City Traffic Engineer
REQUEST:	Review and approval of Upcoming 5-Year Annual Street Maintenance Program	

STAFF RECOMMENDATION: Table for Further Discussion
Staff recommendations will be made at a later meeting.

1. **ATTACHMENTS:**
   a. **Background information available on the City Website (Commission documents page):**
      i. **March 2018 Meeting Agenda Packet and Minutes – Overview information on the various types of funding available for transportation projects**
      ii. **August 2018 Meeting Agenda Packet and Minutes – Historical Information on past street resurfacing and funding levels and ratings**
   b. **Council Memo for purchase of DOT (Decision Optimization Technology) Roads Software**
   c. **PASER Hot Mix Asphalt Manual**

2. **BACKGROUND AND SUPPLEMENTAL INFORMATION:**

Public Works is changing the way that various infrastructure maintenance work is planned and completed to be more efficient with available resources and better coordinate between the different divisions and types of work. This Commission meeting item is intended to provide a general overview of the process so that Commissioners can prepare for the planning and guidance discussions at upcoming meetings. Commissioners are encouraged to review the background information listed above prior to these subsequent meetings.

In the past, Staff has planned out individual work efforts on an annual basis. Moving forward, 5-year work plans are being completed for water, sewer and street maintenance work. With staff from the various areas of responsibility working together, we can better ensure that underground work on sewers or water main is moved up or resurfacing delayed so that underground work can be completed before a roadway gets repaved. Similarly, pavement work can be shifted forward or back to immediately follow a known necessary underground project, thereby reducing patching and restoration efforts. While there has always been general coordination along these

lines, this additional effort to schedule projects for specific years within the upcoming 5-year window rather than just for the next fiscal year allows allocation of staff time and financial resources to be more easily managed.

The 5-year plan for the street work will be generated by the Engineering Division initially using GIS based DOT (Decision Optimization Technology) Roads Software from Infrastructure Solutions Inc. This software runs complex algorithms to determine a schedule for not just street resurfacing, but also other less-involved maintenance work such as CRF applications for pavement preservation, pavement patching, and/or fog seals. We have completed the compilation of the required initial street data (lengths, widths, material types, traffic volumes, roadway classification, etc.) and are now working to calibrate the software for our local conditions. A copy of the Council memo with an overview of this software is attached.

The 5-year plan will be updated each season, so that there will always be 5-years of planning laid out. It's important to note that while we expect that years 2-5 will not change significantly, the schedule will be somewhat fluid further out from the current year. Some streets may deteriorate faster or slower than expected and there are always unknown factors that can arise.

One of the driving criteria the software uses is the current pavement condition. The City uses a pavement rating system to monitor the condition of our streets. Streets are reviewed regularly, and the pavement is assigned a value between 10 (excellent) and 1 (Failed). This system is based upon the PAvement Surface Evaluation and Rating (PASER) System developed by the Transportation Information Center of the University of Wisconsin – Madison. For reference and additional information, the PASER Hot-Mix Asphalt Manual is attached. While we in practice have assigned the ratings slightly different from the official PASER descriptions (e.g. we rate a new overlay as a 10 rather than a 9), the photos and descriptions provided in the Manual should generally convey what pavement condition is associated with a given rating.

There are a number of other priority-based variables that the program will use to determine which street segments will receive maintenance work sooner. The Transportation Commission will be providing direction at and upcoming meeting on these factors. Some potential items that may be considered are the following:

- Whether functional classifications (Arterial, Collector, Local Street, Alley) are given the same priority or ranked in importance for being resurfaced sooner
- What is the minimum condition rating that should be maintained for each classification
- Should some streets be given higher priority based on location factors such as:
    - Is the street part of a fire lane
    - Proximately to a hospital or school
    - Surrounding land use (commercial versus residential)
    - Is the street on a bike route or bus route
- There are likely some variables in the program that will need to remain as unadjusted default values if that data is unable to be reasonably obtained

At this time, the process moving forward is anticipated to follow this general schedule:

1. Staff will complete the setup and calibration of the software and determine the various priority variables that require feedback and develop an initial recommendation.
2. At an upcoming Commission meeting, Staff will present these recommendations for each of the priority variables for concurrence by the Commission.

3. Staff will run the program using the priority criteria set by the Commission and develop an initial 5-year street maintenance plan. This initial plan will be coordinated with the water and sewer staff for potential adjustments. In addition, “flex” segments will be identified. These “flex” segments will consist of one or two sections of roadway for each future year that can be delayed a year if higher than anticipated bids are received or moved forward a year if lower bids are received. This will allow for a more balanced funding amount from year to year.
4. The recommended 5-year Street Maintenance Program will be presented to the Commission as the first step of a public rollout. A Council presentation will be made similar to past years. A summary sheet for each street to be resurfaced will be developed as was done for the resurfacing work this year. This summary sheet will include sample photographs showing the current condition of the street. The new website (www.bloomingtonstreets.com), press releases, social media, signage, and flyers as appropriate will be utilized to share information with the public.
5. During the upcoming year, pavement ratings and other data will be updated and the process will start over with another software run, coordination with water and sewer staff, and any adjustments to the 5-year plan to be reviewed again by the Commission in early fall of next year.

The current street ratings, regular updates on construction progress, information on the Local Motor Fuel Tax receipts and expenditures as well as general information related to asphalt and concrete project will continue to be provided to the public on the City website.

3. STAFF RECOMMENDATION:

Staff requests this item be tabled until a subsequent meeting for additional discussion.

Respectfully submitted,

Philip Allyn, PE, PTOE
City Traffic Engineer

CONSENT AGENDA ITEM NO. 7E

FOR COUNCIL: January 28, 2019

SPONSORING DEPARTMENT: Public Works

SUBJECT: Consideration of a Resolution Waiving the Formal Bidding Process to approve a Contract with Infrastructure Solutions, Inc. to provide Decision Optimization Technology Roads Software and Associated Services, in the amount of $33,700, with future annual maintenance license costs in the amount of $12,500 (renewable annually for an additional two (2) years), as requested by the Public Works Department.

RECOMMENDATION/MOTION: The Resolution Waiving the Formal Bidding Process to approve the Contract with Infrastructure Solutions, Inc. be approved, the Mayor and Interim City Clerk be authorized to execute the Resolution, and the City Manager and Interim City Clerk be authorized to execute any necessary documents.

STRATEGIC PLAN LINK: Goal 1. Financially Sound City Providing Quality Basic Services; Goal 2. Upgraded City infrastructure

STRATEGIC PLAN SIGNIFICANCE: Objective 1a. Budget with adequate resources to support defined services and levels of services; Objective 1 d. City services delivered in the most cost-efficient manner; and Objective 2a. Better quality roads and sidewalks.

BACKGROUND: Public Works is recommending the approval of a Resolution waiving the formal bidding process so that the Department can contract with Infrastructure Solutions, Inc. (ISI) of Mississauga, Ontario for Decision Optimization Technology Roads (DOT Roads) software and associated services and execute a purchase of the software, in the amount of $33,700, to develop an optimized, multi-year plan to address street maintenance needs for the City of Bloomington. The Contract, which is renewable for up to two additional years, has an Annual Software Maintenance License, in the amount of $12,500, for years two (2) and three (3) should the City decide to renew the agreement. The agreement would have no other costs beyond the Annual Software Maintenance License after year one (1).

Pay Item	**Year 1 Fees**
Commercial Road Network Optimization Software License	$19,000.00
Database Review, Organization, and Upload	$3,000.00
Initial Client Training	$2,500.00
GIS Mapping	$4,200.00
Analysis Modeling and Default Scenario Setup	$5,000.00
TOTAL	**$33,700.00**

Pay Item		Year 2 and 3 Fees
Annual Software Maintenance License (Year 2)		$12,500.00
Annual Software Maintenance License (Year 3)		$12,500.00
	TOTAL	**$25,000.00**

Why DOT Roads?

Public Works currently utilizes in-house expertise to evaluate, rate, and prioritize City streets for inclusion in upcoming resurfacing and pavement preservation projects. Though this method is utilized by many municipalities, it lacks the benefits of incorporating current software technology in the process.

Commercially-available pavement management software systems provide various roadway network analysis and optimization features. These systems often provide municipalities with features and scenario analysis that would not be efficient for staff to perform without the assistance of the software.

Public Works staff has been reviewing industry available software and performed an evaluation to determine the best solution for our roadway system and associated capital planning efforts. Staff conducted due diligence through review of industry research, attending presentations at conferences, reviewing State of Illinois Department of Transportation information, discussing features and capabilities with vendors, reviewing letters of recommendation, and participating in multiple on-line software demonstrations. Staff evaluated providers based on software capabilities and features, including, but not limited to, the following:

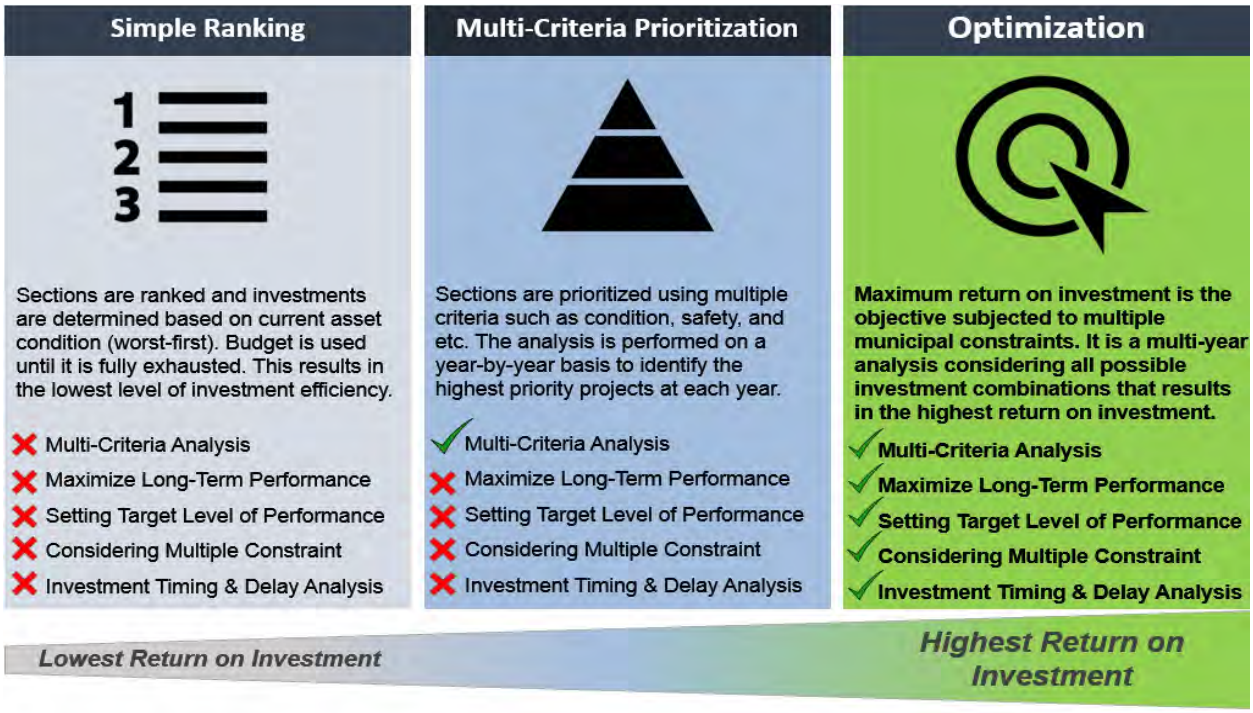
- Data storage options and location
- Pavement rating method supported
- Community benefit factors
- Preservation treatment types
- Specific segment inclusion
- Capital planning and budgeting
- Prioritization and optimization
- Reporting, mapping, graphing output
- GIS interface
- Operational efficiency analysis
- Degradation curve availability
- Roadway condition rating flexibility
- Network priority factors
- Scenario building and evaluation
- Scenario comparison

In addition, Pubic Works discussed the effort with the Information Systems Department to ensure any concerns regarding system integration and security were incorporated into the evaluation process. Software solutions evaluated by Public Works staff includes the following vendors:

- Infrastructure Solutions, Inc.
- Cartegraph
- Cityworks
- Roadsoft
- Deighton
- StreetSaver
- AgileAssets
- PAVER
- MicroPAVER
- Utah LTAP-TAMS

Proposal

Public Works staff has identified DOT Roads from ISI as the software that will most appropriately meet the needs of the city. ISI provided Public Works a proposal for DOT Roads (see attached) that explains the benefits of the software and how it can be used for planning. Highlights of this proposal are included in this section.



Road network capital planning requires that the most cost-effective and realistic decisions are made regarding the maintenance, rehabilitation and reconstruction of its infrastructure assets. Capital planning also involves strategic prioritization to obtain the best decision-making concerning the timing and utilization of investments, which includes a comprehensive and achievable financial strategy.

Building a credible and implementable road network prioritization and optimization program requires both civil engineering and financial planning. ISI is an "accountineering" company, half civil engineers, half long range financial planners, that is able to provide their experience, through DOT Roads software, required to assist the City's delivery of quality roadway network capital planning.

ISI's capital planning tool with optimization capability will maximize the overall performance of a network in terms of physical condition (or any other criteria) over a multi-year analysis horizon. It will provide the City with the best possible course of action in terms of timing and selection of different maintenance, rehabilitation, or reconstruction treatments considering all municipal goals and constraints. The DOT Roads optimization technology provides:

- A technology to achieve the highest level of asset performance;
- An optimizer engine utilizing next generation mathematical programming;
- An extremely powerful, robust, and fast data analysis;
- An architecture to attain maximum speed while performing multiple optimizations for scenario comparison;
- Upload through Excel or Shapefiles;
- Protected user identity and login process for different levels of authority;
- Continual data backup at Microsoft data center;
- Operational efficiency analysis / gap analysis;
- Comprehensive road network treatments for maximum life cycle gain;
- Unique community benefit settings including a wide variety of social, environmental, and economic policies;
- Ability to conduct multiple scenario setting and comparisons;
- Comprehensive target setting and budget recommendations;
- Robust capital planning reports;

- Easy-to-manage asset repository to safely store, maintain, add, and analyze data;
- Multi-year and multi-constraint analysis;
- Reporting, mapping, and graphical output for analysis and presentations.

COMMUNITY GROUPS/INTERESTED PERSONS CONTACTED: N/A

FINANCIAL IMPACT: Funds in the amount of $33,700 are included in the Engineering Administration-Engineering Services (10016210-70050) account. Stakeholders can locate this in the FY 2019 Adopted Budget Book titled "Budget Overview & General Fund" on pages 331 and 333. If approved, Public Works will budget $12,500 for annual maintenance licensure costs in future year budgets.

COMMUNITY DEVELOPMENT IMPACT: The City's Comprehensive Plan 2035 (Adopted August 24, 2015) includes goals and objectives related to this item:

UEW-1 Provide quality public infrastructure within the City to protect public health, safety and the environment
UEW-1.1 Maintain the existing City operated infrastructure in good condition by prioritizing maintenance over building new and implementing fees to cover costs

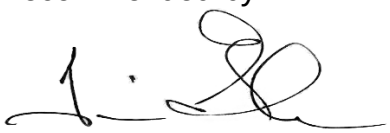
TAQ-1 A safe and efficient network of streets, bicycle pedestrian facilities and other infrastructure to serve users in any surface transportation mode
TAQ-1.2 Data-driven transportation infrastructure policy and management

FUTURE OPERATIONAL COST ASSOCIATED WITH NEW FACILITY CONSTRUCTION: N/A

Respectfully submitted for Council consideration.

Prepared By:	Michael Hill, Miscellaneous Technical Assistant Robert Yehl, PE, Asst. Director of Public Works
Reviewed By:	Jim Karch, P.E., MPA, Director of Public Works
Finance & Budgetary Review By:	Chris Tomerlin, Budget Manager Scott Rathbun, Finance Director
Water/Community Dev. Review By:	Katie Simpson, City Planner
Legal Review By:	Jeffrey R. Jurgens, Corporation Counsel

Recommended by:



Tim Gleason
City Manager

Attachments:

- PW 1B RESOLUTION
- PW 1C CONTRACT
- PW 1D PROPOSAL

RESOLUTION NO. 2019- _____

A RESOLUTION AUTHORIZING WAIVING THE FORMAL BIDDING REQUIREMENTS AND APPROVING A CONTRACT WITH INFRASTRUCTURE SOLUTIONS, INC. TO PROVIDE DECISION OPTIMIZATION TECHNOLOGY ROADS ROAD SOFTWARE AND ASSOCIATED SERVICES

WHEREAS, the City desires to purchase pavement management software to assist the Public Works Department with analysis and optimization of roadway resurfacing and pavement preservation projects; and

WHEREAS, City staff from the Public Works Department identified top providers of pavement management software and has identified Decision Optimization Technology Roads Road Network Capital Planning Software from Infrastructure Solutions, Inc. as the software that will most directly meet the needs of the City; and

WHEREAS, as software solutions are unique and difficult to bid, City staff requests the formal bidding process be waived and the Procurement Manager be authorized to issue a Purchase Order to Infrastructure Solutions, Inc. for Decision Optimization Technology Roads Road Network Capital Planning Software.

NOW THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF BLOOMINGTON, ILLINOIS:

That the recitals set forth above are incorporated herein, the formal bidding requirements waived, and City Manager, or designated representatives, are authorized to purchase and secure Decision Optimization Technology Roads Road Network Capital Planning Software from Infrastructure Solutions, Inc. in the amount of $33,700.00 with future annual maintenance license costs in the amount of $12,500.00, and are authorized to execute any necessary documents to effectuate the purchase, including the contract with Infrastructure Solutions, Inc.

PASSED this 28th day of January 2019.

APPROVED this ____day of January 2019.

CITY OF BLOOMINGTON **ATTEST**

_____ _____

Tari Renner, Mayor Leslie Yocum, Interim City Clerk

CITY OF BLOOMINGTON
CONTRACT WITH
Infrastructure Solutions (Software) Inc.
FOR
DOT Roads Road Network Capital Planning Software

THIS AGREEMENT, dated this 28th day of January, 2019, is between the City of Bloomington (hereinafter "CITY") and Infrastructure Solutions (Software) Inc. (hereinafter "CONTRACTOR").

NOW THEREFORE, the parties agree as follows:

Section 1. **Recitals.** The recitals set forth above are incorporated into this Section 1 as if specifically stated herein.

Section 2. **Description of Services**. CONTRACTOR shall provide the services/work identified on Exhibit A.

Section 3. **Payment.** For the work performed by CONTRACTOR under this Contract, the CITY shall pay CONTRACTOR: ☐ a lump sum amount of $_____; or ☑ the amount(s) set forth in Exhibit B. Invoices shall be due and payable within 45 days of submission.

Section 4. **Default and Termination**. Either party shall be in default if it fails to perform all or any part of this Contract. If either party is in default, the other party may terminate this Contract upon giving written notice of such termination to the party in default. Such notice shall be in writing and provided thirty (30) days prior to termination. The non-defaulting party shall be entitled to all remedies, whether in law or equity, upon the default or a violation of this Contract. In addition, the prevailing party shall be entitled to reimbursement of attorney's fees and court costs.

Section 5. **Indemnification.** To the fullest extent permitted by law, CONTRACTOR shall indemnify and hold harmless CITY, its officers, officials, agents and employees from claims, demands, causes of action and liabilities of every kind and nature whatsoever arising out of or in connection with CONTRACTOR's operations performed under this Contract, except for loss, damage or expense arising from the sole gross negligence or willful misconduct of the CITY or the CITY's agents, servants or independent contractors who are directly responsible to CITY. This indemnification shall extend to claims occurring after this Contract is terminated as well as while it is in force. The indemnity shall apply regardless of any concurrent negligence, whether active or passive, of the CITY or CITY's officers, officials, agents, employees, or any other persons or entities. The indemnity set forth in this section shall not be limited by insurance requirements or by any other provision of this Contract.

~~**Section 6.** **General Liability Insurance.** CONTRACTOR shall maintain general liability insurance for bodily injury and property damage arising directly from its negligent acts or omissions, with general limits shall be less than $2,000,000.00. Certificates of insurance shall be provided to CITY and CITY shall be named as an additional insured under the policy. Umbrella liability coverage must also be provided in the amount of $4,000,000 for each occurrence, $4,000,000 in aggregate.~~ Section 6 deleted per coordination with City of Bloomington Legal Department. RDY 01.11.2019

Section 7. **Representations of Vendor.** CONTRACTOR hereby represents it is legally able to perform the work that is subject to this Contract.

Section 8. **Assignment.** Neither party may assign this Contract, or the proceeds thereof, without written consent of the other party.

Section 9. Compliance with Laws. CONTRACTOR and all work by CONTRACTOR shall at all times comply with all laws, ordinances, statutes and governmental rules, regulations and codes.

Section 10. **Prevailing Wage.** The following shall apply to this contract:

☑ This contract is not for a "public work" and therefore Prevailing Wage does not apply. ***Initial*:** _____ (City) _____ (CONTRACTOR)

☐ This contract calls for the construction of a "public work," within the meaning of the Illinois Prevailing Wage Act, 820 ILCS 130/.01 et seq. ("the Act"). The Act requires contractors and subcontractors to pay laborers, workers and mechanics performing services on public works projects no less than the current "prevailing rate of wages" (hourly cash wages plus amount for fringe benefits) in the county where the work is performed. The Department publishes the prevailing wage rates on its website at http://labor.illinois.gov/. The Department revises the prevailing wage rates and the contractor/subcontractor has an obligation to check the Department's web site for revisions to prevailing wage rates. For information regarding current prevailing wage rates, please refer to the Illinois Department of Labor's website. All contractors and subcontractors rendering services under this contract must comply with all requirements of the Act, including but not limited to, all wage requirements and notice and record keeping duties.
Initial: _____ (City) _____ (CONTRACTOR)

Section 11. Compliance with FOIA Requirements. CONTRACTORfurther explicitly agrees to furnish all records related to this Contract and any documentation related to CITY required under an Illinois Freedom of Information Act (ILCS 140/1 et. seq.) ("FOIA") request within five (5) business days after CITY issues notice of such request to CONTRACTOR. CONTRACTOR agrees to not apply any costs or charge any fees to the CITY regarding the procurement of records required pursuant to a FOIA request. CONTRACTOR agrees to defend, indemnify, and hold harmless CITY, and agrees to pay all reasonable costs connected therewith (including, but not limited to reasonable attorney's and witness fees, filing fees, and any other expenses) for CITY to defend any and all causes, actions, causes of action, disputes, prosecutions, or conflicts arising from CONTRACTOR actual or alleged violation of the FOIA, or CONTRACTOR failure to furnish all documentation related to a request within five (5) days after CITY issues notice of a request. Furthermore, should CONTRACTOR request that CITY utilize a lawful exemption under FOIA in relation to any FOIA request thereby denying that request, CONTRACTOR agrees to pay all costs connected therewith (such as reasonable attorney's and witness fees, filing fees and any other expenses) to defend the denial of the request. The defense shall include, but not be limited to, challenged or appealed denials of FOIA requests to either the Illinois Attorney General or a court of competent jurisdiction. CONTRACTOR agrees to defend, indemnify, and hold harmless CITY, and agrees to pay all costs connected therewith (such as reasonable attorney's and witness fees, filing fees and any other expenses) to defend any denial of a FOIA request by CONTRACTOR request to utilize a lawful exemption to CITY.

Section 12. **Governing Law.** This Agreement shall be governed by and interpreted pursuant to the laws of the State of Illinois.

Section 13. Joint Drafting. The parties expressly agree that this agreement was jointly drafted, and that both had opportunity to negotiate its terms and to obtain the assistance of counsel in reviewing it terms prior to execution. Therefore, this agreement shall be construed neither against nor in favor of either party, but shall construed in a neutral manner.

Section 14. Attorney Fees. In the event that any action is filed in relation to this agreement, the unsuccessful party in the action shall pay to the successful party, in addition to all the sums that either party may be called on to pay, a reasonable sum for the successful party's attorneys' fees.

Section 15. Paragraph Headings. The titles to the paragraphs of this agreement are solely for the convenience of the parties and shall not be used to explain, modify, simplify, or aid in the interpretation of the provisions of this agreement.

Section 16. Term. The term of this Contract shall be:

☐ Until all of the services and/or deliverables required to provided within this Contract are completed.

☑ From one (1) year from the date of execution.

☐ From two (2) years from the date of execution.

☐ Other:_____

_____

The Contract shall also be subject to the following renewal terms, if any:City may purchase additional annual maintenance license for amount in proposal for 2 additional 12 month periods on same terms & conditions upon giving notice 30 days prior to expiration.

Notwithstanding anything herein, the provisions in Sections 5 and 11 shall survive termination.

Section 17. Counterparts. This agreement may be executed in any number of counterparts, each of which shall be deemed to be an original, but all of which together shall constitute the same instrument.

CITY OF BLOOMINGTON

By: _____
Its City Manager

ATTEST:

By: _____
City Clerk

Infrastructure Solutions (Software) Inc.

By: _____
Its_____

By: _____
Its_____

EXHIBIT A
SCOPE OF SERVICES / WORK PROVIDED

A. SERVICES. ISI shall provide the following application to the City of Bloomington:

1. **DOT (Decision Optimization Technology) Roads software:** A robust software application delivered over the internet, which will provide a City with a capital plan for its road network to attain its highest community benefit and return on investment over a 10-year period.
2. **Gravel Network Management Optimizer**
3. **Extensive GIS Mapping capability**

B. SERVICES DESCRIPTION. ISI shall provide, and commit to, services in accordance with the following specifications:

1. Designated account management and technical support resources;
2. All online client training requirements as agreed to between the Client and ISI;
3. All updates and enhancements to the Road Network Optimizer, as they become available;
4. Proactive support assistance with prescriptive advice and guidance on IT issues;
5. Online information services for your IT staff to remain up to date on latest enhancements;
6. Problem resolution support designed to provide rapid response and solutions for operational problems anytime they arise by telephone and e-mail during business hours of 8:00 AM to 5:00 PM, Monday through Friday (not including statutory holidays), Eastern Standard Time. Pager support is provided outside regular business hours.

C. SPECIAL CONSIDERATIONS.

1. ISI acknowledges that the City of Bloomington stores its GIS data in polygon format and will demonstrate that the DOT Roads application can upload and fully utilize this polygon format in its application.
2. ISI acknowledges that the City of Bloomington utilizes a PASER system in determining road condition. ISI primarily utilizes Pavement Condition Index (PCI in its analytical process, as well as a wide range of other indices. ISI will demonstrate to the City of Bloomington how the PASER data can be fully utilized through the optimization process.

D. ISI PROPOSAL. ISI will provide all other services and products as set forth in its proposal, dated October 3, 2018, for DOT (Decision Optimization Technology) Road Network Capital Planning Software, which is incoroprated herein.

EXHIBIT B
FEES / COMPENSATION

The costs for the services are as follows:

Commercial Road Network Optimization Software License: $19,000
Database Review, Organization and Upload: $3,000
Initial Client Training: $2,500
GIS Mapping: $4,200
Analysis Modeling and Default Scenario Setup: $5,000
Total Fees: $33,700

Notes
1. Annual Maintenance License in the amount of $12,500, paid annually in advance, includes ongoing customer support, post-setup training, hosting, data storage, data backup, client service, upgrades, and all technology enhancements for DOT (Decision Optimization Technology) Roads including a separate module for gravel road management
2. Annual Maintenance fees allow for unlimited user licenses.
3. Initial training and all subsequent training covered by the Annual License will be provided to the client by webinar and is free. Onsite training is available on request but is billed at an hourly rate of $100/hr. plus travel and expenses.
4. All funds are in US dollars, and there are no hidden fees

Proposal for:

DOT (Decision Optimization Technology) Roads
Road Network Capital Planning Software

Prepared for:

Kevin Kothe, City Engineer
Jim Karch, Director of Public Works
Public Works Department
115 E. Washington Street
Bloomington, IL 61702-3157
P 309-434-2225

Prepared by:

Neil Roberts
President
Infrastructure Solutions (Software) Inc.
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www.infrasol.ca

Date of Issue: October 3, 2018
Expiration Date: February 15, 2019

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Appendix A – ReNew Canada Magazine Nov 2016 – Saving Public Roads

Appendix B – ReNew Canada Magazine Apr 2018 – Saving Public Roads II

Appendix C – Municipal World Magazine Jan 2017 – The Road Less Travelled

1. INTRODUCTION

Infrastructure Solutions (Software) Inc. (ISI) is pleased to present the City of Bloomington with a proposal for our DOT Road Network Capital Planning Optimization Software. Road network capital planning requires that the most cost effective and realistic decisions are made regarding the maintenance, rehabilitation and reconstruction of its infrastructure assets. The City requires an in depth understanding of the characteristics and condition of its road network, as well as the cost and strategy for attaining the service levels they are expected to meet. Capital planning also involves strategic prioritization to obtain the best decision-making concerning the timing and utilization of investments, which includes a comprehensive and achievable financial strategy. ISI brings the experience and capability required to deliver quality capital planning, as follows:

1.1 "Accountineering" Capability

Building a credible and implementable road network prioritization and optimization program requires both civil engineering and financial planning expertise. Civil Engineers are generally challenged when it comes to making long range financial projections. Accounting firms have minimal understanding of degradation curves, lifecycle gains, and condition assessments. Infrastructure Solutions is an "accountineering" company, half civil engineers, half long range financial planners.

1.2 Capital Planning Expertise

We are recognized leaders in the field of municipal capital planning:

2018

- Featured in the July 2018 American Public Works Association Magazine, Page 72/73, https://www.apwa.net/MyApwa/Apwa_Public/Resources/APWA_Reporter_Magazine-issue_index.aspx?year=2018&month=07&an=5795
- Invited to do a podium presentation, "**Maximizing Investment Efficiency in Municipal Pavement Preservation Programs**", National Conference on Transportation Asset Management, Transportation Research Board (TRB), San Diego, CA, US;
- Featured in ReNew Canada article (March/April Issue), "**Saving Public Roads II**", including interviews with Town of Tillsonburg and City of Sarnia regarding the positive impact of preventive maintenance and optimization software; As attached, **Appendix B**
- Invited to present, "**Defining Needs for Optimized Road Asset Management for Gravel Road Networks**", Transportation Association of Canada (TAC) Conference, Saskatoon
- Invited to present, "**Managing Paved and Unpaved Roads at Minimum Cost**", at the Canadian Network of Asset Managers Annual Conference, Windsor, ON;

2017

- Introduced DOT (Decision Optimization Technology) Roads software, based on input from Golder Associates engineering team and contributions from municipal clients across Canada
- Presented, "**Unleashing the Cost Savings of Optimized Road Asset Management to Municipalities"**, at the Canadian Society for Civil Engineering (CSCE) AGM, Vancouver, BC;
- Presented, "**Substantial Road Capital Budget Savings**" at the Canadian Network of Asset Managers Annual Conference, Calgary, AB;
- Featured in Municipal World magazine (Jan. 2017) that published "**The Road Less Travelled**", and headlined ISI's work to build better capital planning tools for Canadian municipalities; As attached, **Appendix C**

2016

- Featured in ReNew Canada magazine (Nov. 2016), that published "**Saving Public Roads**", which described the work done by ISI, supported by Dr Maher at Golder Associates. As attached, **Appendix A**
- Presented, "**Optimized Pavement Capital Planning**", Municipal Engineer Association of Ontario (MEA) Annual Fall Workshop, St. Catharines, ON;
- Presented, "**Optimized Pavement Capital Planning**", Transportation Association of Canada (TAC) Conference, Toronto, ON;

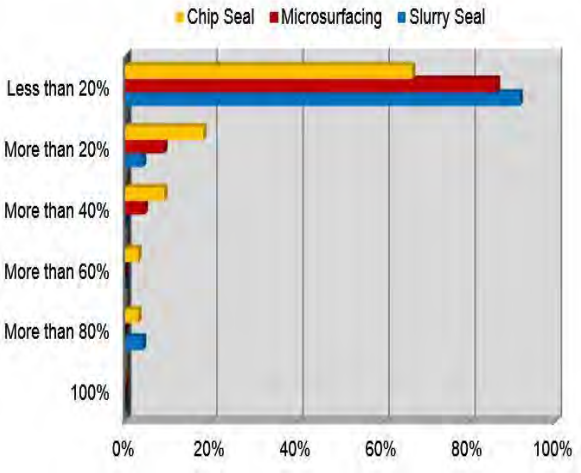
- Conducted the most comprehensive survey of road maintenance practices ever undertaken in Canada;
- Forged a strategic alliance with Golder Associate Ltd. to refine and rigorously verify and validate our software models through detailed engineering analysis;

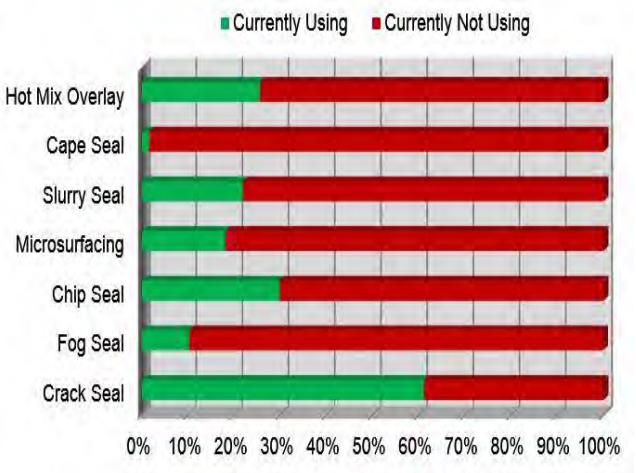
1.3 We Understand Municipalities

Working with municipalities is our only business. We understand that every City is unique with its objectives and priorities. The DOT Roads software gives you a capital plan that is implementable, something that your Public Works and Treasury will concur with, your Council can embrace, and your community will support. The software recommendations are reasonable and attainable because they take into consideration what is achievable, what your engineers require, what are best practices and how to attain the highest return on investment from **both** a financial and community benefit perspective.

In 2015, we completed a comprehensive survey to determine which non-financial factors influenced road network capital planning. In 2016, we completed the most comprehensive survey of paved road maintenance practices ever undertaken in Canada, with 171 municipalities participating representing 15% of Canada's population. Municipalities report that only 20% or less of their road network is currently maintained based on what respondents perceive to be best practices for preventive maintenance.

This contradiction between the clearly appreciated benefits of preventive maintenance and the inadequate application of preventive treatments in practice has deep roots. Municipalities may be overly reactive to community requests. Councils surely follow the advice of Roads Condition Assessments, where engineering companies recommend repairing worst roads first for safety and other reasons, assuming an unlimited municipal budget. Deteriorated water or wastewater lines might necessitate road reconstruction for line replacement and take precedence over maintenance. Municipalities often use Excel or simplistic pavement management programs which typically recommend projects based on a simple ranking process. More comprehensive solutions used dated information when it comes to degradation curves and lifecycle gains or provide an "optimized" solution based on dated optimization strategies. Whatever the circumstance, tax dollars are being poured into pot holes unnecessarily.





In 2017, we completed an extensive survey of Gravel Road Management and Best Practices to build an extension to the DOT (Decision Optimization Technology) Roads program with the objective of improving gravel road management. Municipalities spend millions of dollars every year on various gravel road maintenance and rehabilitation activities. In some more remote communities, a comprehensive gravel road management system can have a significant positive impact on an operating and capital budget.

Based on the survey results, any gravel management system requires simplicity in updating historical information and can provide value and cost savings without a current pavement condition. The ability to determine a City's strategy is built by utilizing the local knowledge of road managers and maintenance operators in combination with supplementary gravel deterioration models within a road management system. Such an approach helps road mangers to manage inventory data of their road network, visualize and determine the overall performance of the network and individual road sections, determine short-term and long-term needs, establish network priorities, and evaluate the impact of different managerial decisions to find the best possible course of action. The DOT Roads Gravel Module gives you that.

1.4 ISI History

In 2013/2014, ISI completed 60 Asset Management Plans for municipal governments. In presenting our AMP work, we got frustrated telling Councils that they had big deficits, an over-taxed population, and no hope of getting their infrastructure deficits under control without tapping into grant programs. To promote municipal self-sufficiency, we decided that better capital planning tools were needed to help municipalities spend money more wisely.

In 2014, we conducted over 40 webinar interviews with companies from across the world who claimed they could help municipalities do better capital planning… including those solutions offered to Canadian municipalities. I personally flew to Australia, England and into the US to meet with those companies who appeared to have a solution. We found software that was either very expensive, very complicated, too simplistic, not suitable for harsher climates, applied questionable engineering methodology and/or did not incorporate optimization for highest return on investment. No software system had incorporated community benefit into the analysis.

Early 2015, our extensive research led us to a white paper published by Dr. Roozbeh Rashedi at the University of Waterloo, defining 10 years of doctorate level research on optimization algorithms which could be used for building municipal capital plans. We immediately met with staff at the University to better understand their requirements for utilizing optimization on a City's largest single asset, its road network. Since then, we have worked creatively and effectively to build the most advanced road capital planning prioritization and optimization software in the marketplace.

The lack of quality capital planning is a world-wide problem, for all sizes of municipalities. Today, over 50 municipalities have stepped forward as beta clients to help building capital planning software fit for our climate, using best maintenance, rehabilitation and reconstruction practices. Our objective, now successfully reached, has been to build an affordable, easy to use, yet rich and comprehensive analytical tool.

To design and program a comprehensive tool, our surveys and research provided critical information. We identified the lack of and need for preventive maintenance, the importance of being able to include community benefit in the capital planning process and set up a process of network prioritization driven by both macro and micro considerations prior to optimization. The response to our DOT (Decision Optimization Technology) Roads road capital planning initiative has been substantial, and we are getting significant support from our clients, and both federal and provincial grants to support continued development of the applications.

We are now partnered with Ryerson University's Institute for Infrastructure Innovation to build out DOT Water, Wastewater and Storm Water, and this development is well underway. Our beta clients will receive this software in 2018. We project that the DOT program will provide advanced analytical capability for all municipal asset types by Y/E 2019, with the ability to do cross-departmental optimization at that time.

2 ISI COMPANY BACKGROUND, EXPERIENCE AND QUALITIFICATIONS

2.1 Mission Statement

Our mission at Infrastructure Solutions (Software) Inc. is to provide high quality engineering and consulting services focused on assisting municipal governments manage the lifecycle of their assets including the capture, maintenance, and analysis of data and decision support for effective and realistic asset management. We have built a substantial reputation for a high level of Client service and quality work. Additionally, we offer a wide range of software, reasonably priced IT, financial consulting services, and civil engineering specifically tailored to municipal government needs. Our objective is to provide municipalities with a range of solutions to improve accuracy, efficiency and integration.

2.2 Corporate Values

As a company, and as individuals, we value integrity, honesty, openness, personal excellence, constructive self-criticism, continual self-improvement and mutual respect. We are committed to our Clients and have a passion for technology. We take on big challenges and pride ourselves on seeing them through. We hold ourselves accountable to our Clients and fellow employees by honouring our commitments, providing results, and striving for the highest quality.

2.3 The ISI Organization

Infrastructure Solutions Inc. has been operating as an incorporated company in the Province of Ontario for 10 years. Its key employees include team members who are responsible for client support delivery to the City. Further expertise can be drawn from other departments.

Dr. Roozbeh Rashedi, **Vice-President of Technology and Software Development**

Roozbeh has received his Ph.D. and Master's degree in civil engineering from the University of Waterloo with a focus on developing municipal decision support tools using computational intelligence and advanced mathematical programming. He is the author of numerous technical articles on decision support tools using computational intelligence and advanced mathematical programming. He has been directly involved in the development of University of Waterloo's optimization technology over the past 7 years.

Hans-Juergen Hens, Director of Project and Program Management

Hans holds an MBA from Richard Ivey School of Business, a Master's degree in civil engineering from M.I.T., and a Bachelor's degree in civil engineering from University of Waterloo. He brings more than two decades of general management experience and has a reputation for effective organizational management, integrity in business, and meeting/exceeding Client expectations.

Hemendra Sharma, Financial Analyst
Hemendra holds an MBA (Finance), and Advanced Management Program (Finance & Strategy and Business Management) from Ohio State's Fisher College of Business. He has experience in corporate strategy and planning, efficiency models, advanced corporate finance, financial modeling, annual planning and budgeting review and forecasting. His focus is on data intelligence and financial analysis.

3 DOT (Decision Optimization Technology) ROADS SOFTWARE

A capital planning tool with optimization capability can maximize the overall performance of a network in terms of physical condition (or any other criteria) over a multi-year analysis horizon. It will provide a City with the best possible course of action in terms of timing and selection of different maintenance, rehabilitation, or reconstruction treatments considering all municipal goals and constraints. The DOT Roads optimization technology provides you with:

- A technology to achieve the highest level of asset performance at minimum cost with the assurance that public funds are spent wisely and effectively;
- An optimizer engine utilizing next generation mathematical programming;
- An extremely powerful, robust, and fast data analysis as, substantially advance beyond excel-based models;
- An architecture to attain maximum speed while performing multiple optimizations for scenario comparison;
- Current upload through Excel or Shapefiles (automated GIS upload under development);
- Protected user identity and login process for different levels of authority;
- Continual data backup at Microsoft data center;
- Comprehensive road network treatments for maximum life cycle gain;
- Unique community benefit settings enabling you to include a wide variety of social, environmental, and economic policies in your decision-making process;
- Ability to control cross-departmental project alignment (e.g. water/wastewater;
- Ability to conduct multiple scenario setting and comparison online;
- Comprehensive target setting and budget recommendations
- Robust capital planning reports;
- Easy-to-manage asset repository to safely store, maintain, add, and analyze your data;
- Multi-year and multi-constraint analysis & handles "Big Data";
- Optimized capital plan reviewed and approved by Golder Associates (optional)

3.1 Software Architecture

We provide a SaaS service hosted at a data center with the most comprehensive list of security certifications of any cloud service provider, fully complying with Canadian Privacy Laws. The capital planning optimization software has been designed with the latest user experience and interface design technologies. It has a user-friendly design despite the very sophisticated and complex analytical back-end. The software is designed in such way to be able to serve less sophisticated users as well as large and complex municipalities). The software is designed to work from a minimum amount of data and inputs, all the way to utilizing extensive data and advanced settings for a more refined analysis, depending on the needs of the user.

3.2 Microsoft Partner

As a Microsoft partner, our software has been developed using the latest and most secure cloud-based technologies and platforms provided by Microsoft. Microsoft provides cloud services for a wide range of enterprise and government customers. Microsoft, with its unique experience and scale, delivers these services to many of the world's leading enterprises and government agencies. Today, the Microsoft cloud infrastructure supports over 1 billion customers across enterprise and consumer services in 140 countries. Drawing on this history and scale, Microsoft has implemented software development with enhanced security, operational management, and

threat mitigation practices, helping it to deliver services that achieve higher levels of security, privacy, and compliance than most customers could achieve on their own. Microsoft shares best practices with government and commercial organizations and engages in broad security efforts through the creation of centers of excellence, including the Microsoft Digital Crimes Unit, Microsoft Security Response Center, and Microsoft Malware Protection Center.

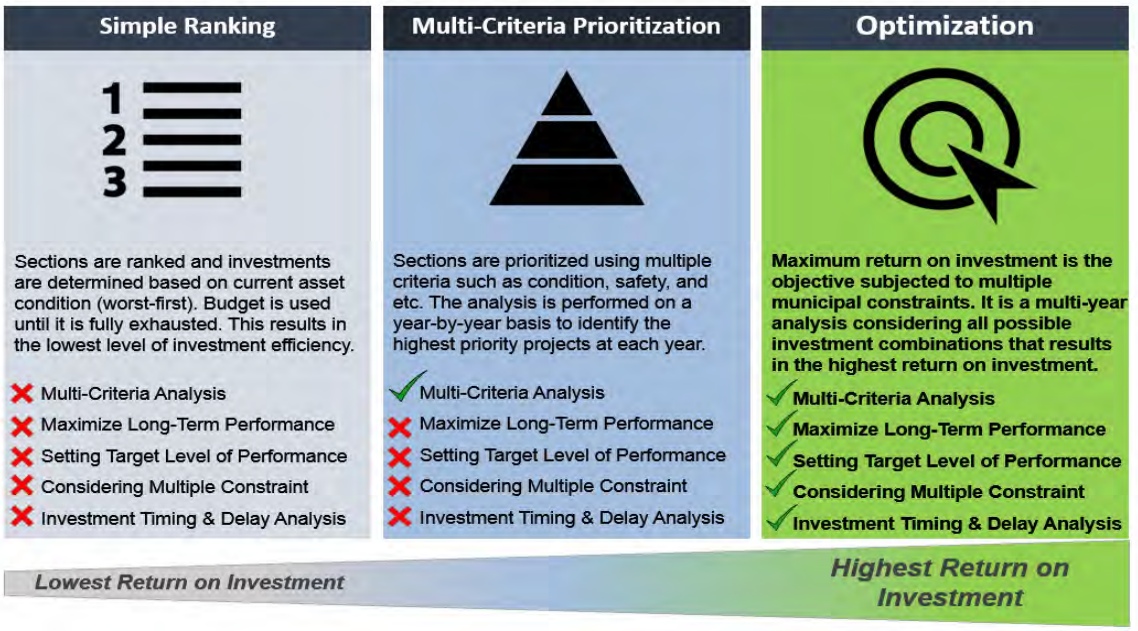
3.3 Underlying Engineering Models

Extensive decision trees, performance models, cost models, life cycle gain and condition improvement matrices have been developed covering a wide spectrum of road classifications based on traffic, surface type, subgrade, environment, and maintenance history. These models are developed by the Infrastructure Solution (Software) Inc. with the help of Golder Associates, Miller Paving, and other experts from municipalities and industry. The DOT Roads software currently uses over 30 different degradation curves and a complex matrix of lifecycle gains based on road treatment type and road condition and distresses at the time of treatment.

3.4 Prioritization vs. True Optimization

Many people do not appreciate the huge difference between prioritization and optimization. A priority listing is nothing more than a ranking. In pavements, it is often a "worst-first" list which starts out with the most distressed pavement and ranks them in terms of their distress level to the best pavement section. Some Pavement Management Systems (PMS) use this list to fund the first 10, 20, etc. items on the ranked list. Some software may combine two or three factors like roughness and distress and then loosely call their priority ranking "optimization." There are also PMS systems that provide what is called an incremental benefit analysis, which is one step better than prioritization methods. In it each pavement section is examined and tested for the incremental benefit that will be added to your network for the same cost. The section that provides the biggest incremental benefit is then selected for work to be done.

Neither prioritization and incremental benefit analysis will give the City of Bloomington the best possible capital plan. For the City's road network, the DOT optimizer starts with a network-wide prioritization process. A unique community benefit capability ensures that roads of higher service to the community receive greater attention by way of an incremental benefits analysis, Finally, the DOT Roads application conducts a true multi-constraint, multi-year (10 years) optimization. The advantages are demonstrated below.



4 USER FRIENDLY SOFTWARE WITH POWERFUL ANALYTICS

The DOT (Decision Optimization Technology) Roads software first provides you with a network overview, a detailed and editable list of assets, and a data verification process. When you are satisfied that you have all of your assets accurately portrayed, the system walks you through a macro-prioritization process, where you establish the respective importance of higher volume traffic, commercial/industrial over residential, urban over rural, paved over surface treated roads, etc. Next, you are led through a micro-prioritization, where you can increase or decrease the priority of individual roads based on their community benefit, safety, alignment with water/waste water projects, wishes of Council, access to services or facilities, etc. Prior to running your optimization, you will need to confirm available treatments and costs in your geographic area.

Finally, when you have set up a base "scenario", you can run your optimization with the objective of determining your best possible spend, the cost of attaining a level of service for each road classification, determining the overall network condition over time, and a range of other statistical information. The optimization software gives a user the capability to run multiple scenarios with different policy and budget strategy setting to analyze both the short-term and long-term impact of various strategies. The optimization software has other advanced features that let a City to minimize its life cycle cost and recommends budget strategies to achieve a target level of performance or to eliminate infrastructure backlog. Please refer to the following graphics:

4.1 DOT Software Screen Shots

Figure 1: NETWORK OVERVIEW DASHBOARD

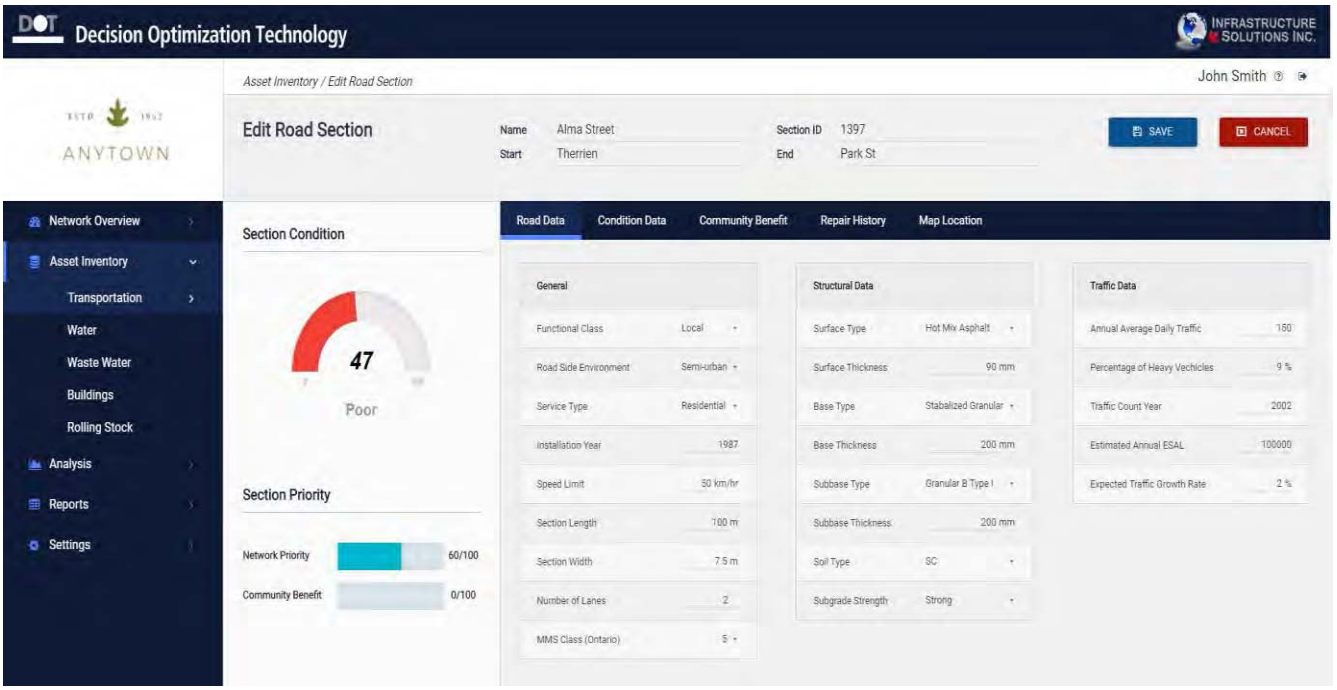


Figure 2: INDIVIDUAL ROAD MANAGEMENT

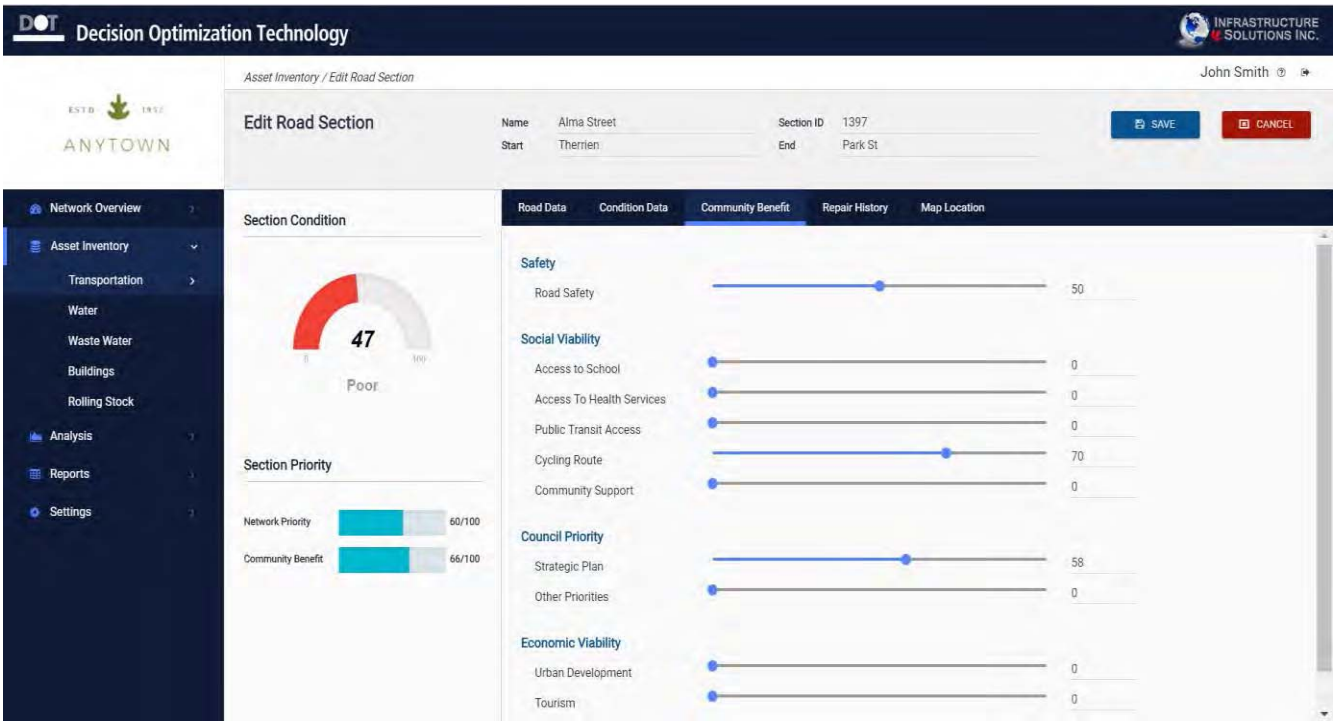


Figure 3: COMMUNITY BENEFITS ASSIGNMENT

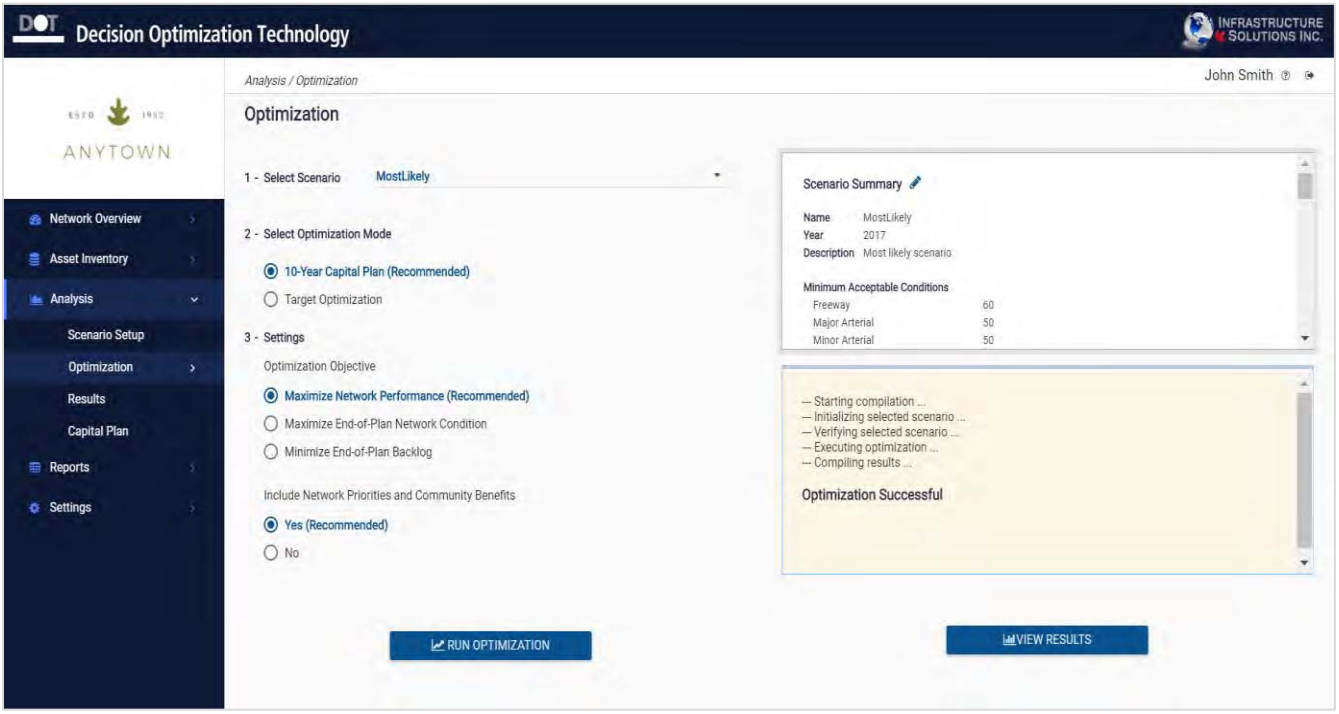


Figure 4: OPTIMIZATION ENGINE

Figure 5: SCENARIO COMPARISON, GRAPHS, CHARTS AND REPORTS

Figure 6: SCENARIO COMPARISON, GRAPHS, CHARTS AND REPORTS

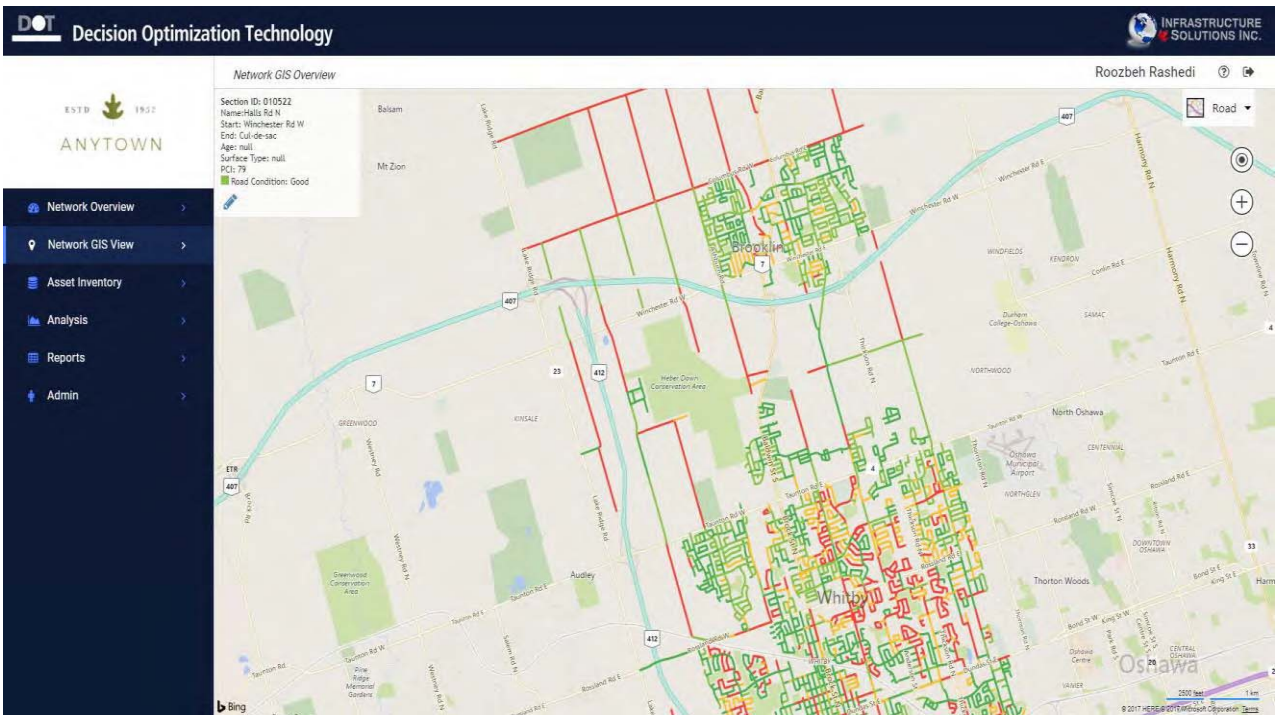


Figure 7: GIS ROAD NETWORK CONDITION

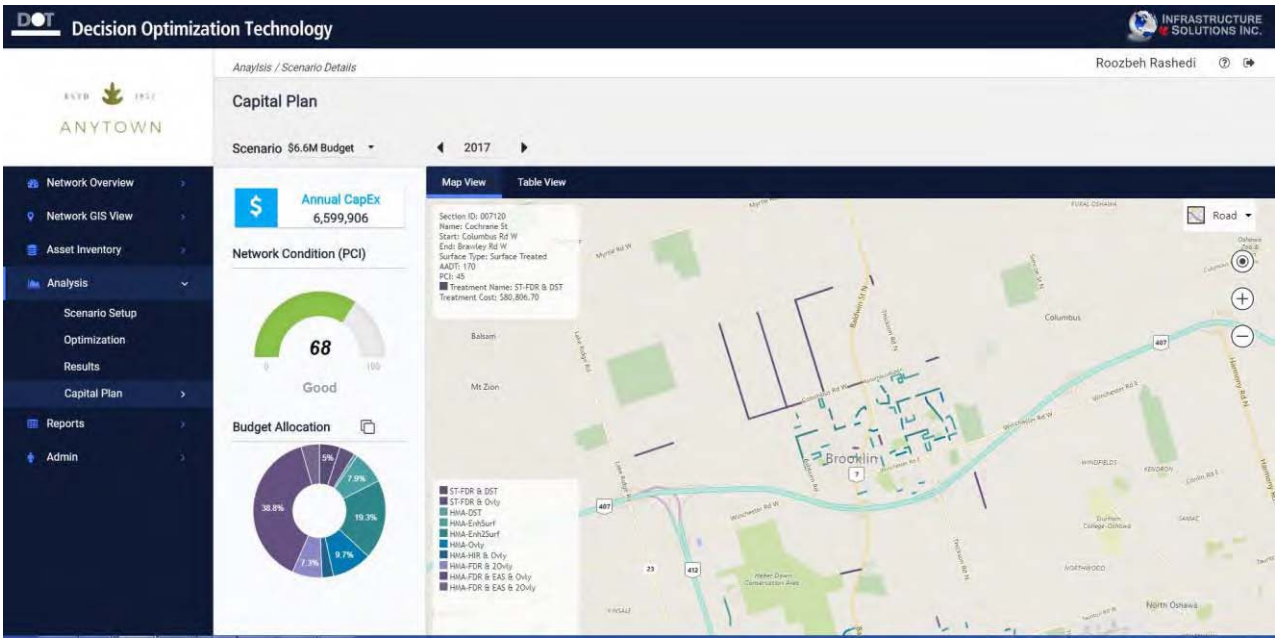


Figure 8: DOT ROADS GIS ROAD NETWORK TREATMENT RECOMMENDATION

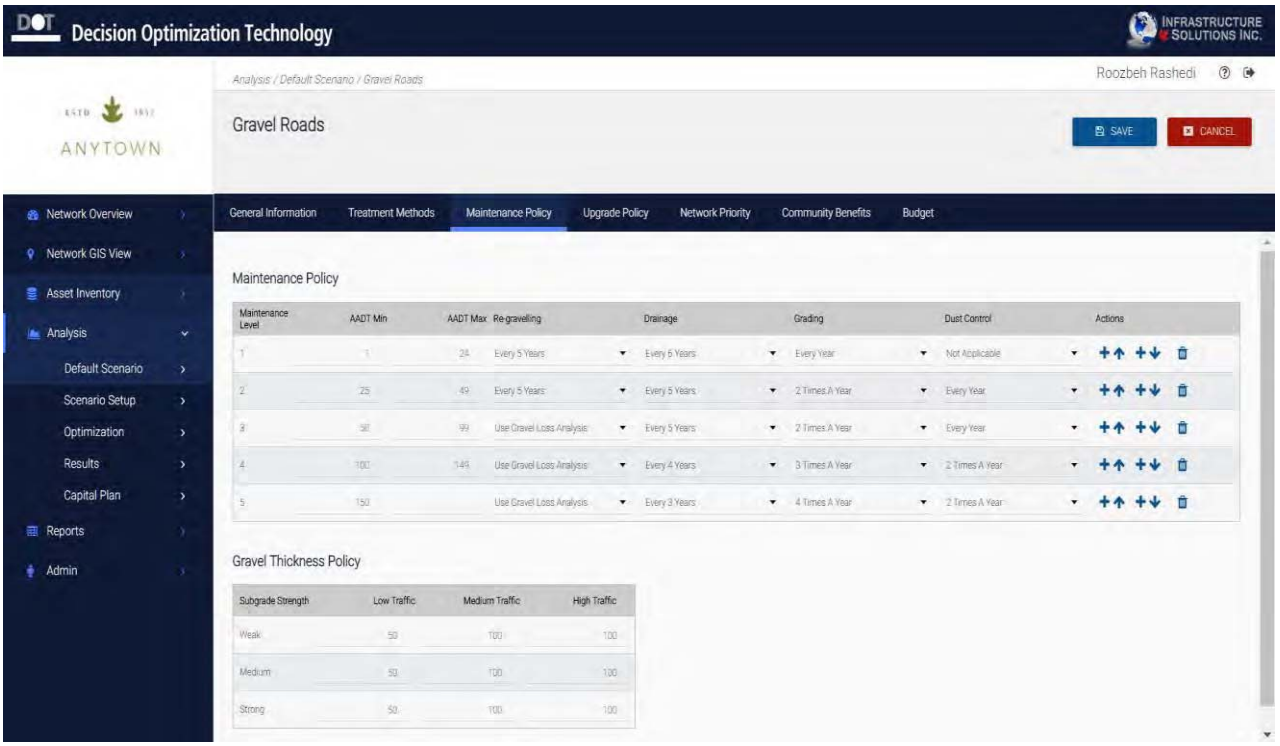


Figure 9: DOT ROADS GRAVEL MANAGEMENT MODULE - MAINTENANCE POLICY

5 SERVICES

ISI shall provide the following application to the City of Bloomington:

☑ **DOT (Decision Optimization Technology) Roads software:** A robust software application delivered over the internet, which will provide a City with a capital plan for its road network to attain its highest community benefit and return on investment over a 10-year period.

☑ **Gravel Network Management Optimizer**

☑ **Extensive GIS Mapping capability**

6 SERVICES DESCRIPTION

ISI shall provide, and commit to, services in accordance with the following specifications:

1. Designated account management and technical support resources;
2. All online client training requirements as agreed to between the Client and ISI;
3. All updates and enhancements to the Road Network Optimizer, as they become available;
4. Proactive support assistance with prescriptive advice and guidance on IT issues;
5. Online information services for your IT staff to remain up to date on latest enhancements;
6. Problem resolution support designed to provide rapid response and solutions for operational problems anytime they arise by telephone and e-mail during business hours of 8:00 AM to 5:00 PM, Monday through Friday (not including statutory holidays), Eastern Standard Time. Pager support is provided outside regular business hours.

7 FEES

We have run numerous road network scenarios internally at ISI for many existing clients. We are consistently proving 7-17% capital cost savings as compared to prioritization or incremental benefits analysis.

	Fee Schedule
Commercial Road Network Optimization Software License	$19,000
Database Review, Organization and Upload	$3,000
Initial Client Training	$2,500
GIS Mapping	$4,200
Analysis Modeling and Default Scenario Setup	$5,000
Total Fees	**$33,700**

Notes

1. **Annual Maintenance License** in the amount of **$12,500, paid annually in advance,** includes ongoing customer support, post-setup training, hosting, data storage, data backup, client service, upgrades, and all technology enhancements for DOT (Decision Optimization Technology) Roads including a separate module for gravel road management
2. Annual Maintenance fees allow for unlimited user licenses.
3. Initial training and all subsequent training covered by the Annual License will be provided to the client by webinar and is free. Onsite training is available on request but is billed at an hourly rate of $100/hr. plus travel and expenses.
4. All funds are in US dollars, and there are no hidden fees

8 SPECIAL CONSIDERATIONS FOR THE CITY OF BLOOMINGTON

1. ISI acknowledges that the City of Bloomington stores its GIS data in polygon format and will demonstrate that the DOT Roads application can upload and fully utilize this polygon format in its application.
2. ISI acknowledges that the City of Bloomington utilizes a PASER system in determining road condition. ISI primarily utilizes Pavement Condition Index (PCI in its analytical process, as well as a wide range of other indices. ISI will demonstrate to the City of Bloomington how the PASER data can be fully utilized through the optimization process.

9 CONFIDENTIALITY

ISI acknowledges their position of trust and confidence regarding the Customer's data. ISI acknowledges and agrees that:

(a) All Confidential Information which is provided to ISI by or with the concurrence of Customer will be kept by ISI in the strictest confidence.

(b) ISI shall only disclose the Confidential Information to those of its employees and its professional advisors who will be involved in the optimization process, or assisting those who will be involved in the optimization process, and all such persons shall be instructed to maintain the Confidential Information in the strictest of confidence;

(c) Upon Customer's request, ISI shall immediately return all Confidential Information furnished to it by Customer or its agents, without retaining any copies (all such copies having to be destroyed), and shall destroy such of the Confidential Information as may be contained in a computer memory or data storage device maintained by or on behalf of ISI;

(d) ISI specifically agrees and understands that the Confidential Information is and shall remain the exclusive property of Customer.

10 CONCLUSION

The vast majority of municipal governments are facing significant infrastructure deficits and need to build a strategy for self-sufficiency. By working together, administrators, politicians and members of the community can collectively endorse practical and implementable asset management plans, stem their infrastructure deficit, maintain a quality of life and plot a course for the future with confidence.

Today, many municipalities undertake capital planning utilizing Excel spreadsheets, or have acquired asset management software with limited analytical capability. We respect these systems and the service they continue to provide to municipalities as asset repositories, integrators between various programs like accounting and GIS. We also recognize their limitations. It is impossible to build an asset management plan without a depth of engineering and serious consideration to preventive maintenance. Because every tax dollar needs to be allocated as efficiently as possible, optimization algorithms are needed to provide you with your highest return on investment. A capital plan which includes community benefit in the analytical process properly represents how a municipality makes its decisions and stays true to your primary objective, that of maintaining or improving the level of service you deliver to your community.

ISI's DOT (Decision Optimization Technology) Roads capital planning software represents the next generation in capital planning capability. We are the "icing on the cake" to any asset repository currently in use. Our applications incorporate current engineering research and analytical depth, 10 years of doctorate level research in the development of true multi-constraint, multi-year optimization, and socio-economic considerations in one sophisticated, yet easy-to-use software.

As a company, we started out as consultants helping municipalities to build asset management plans. We became social entrepreneurs when we recognized how serious municipal infrastructure deficits were and decided to do something about it. Working collectively with a wide range of municipalities, we have now built faster, smarter, and friendlier software. A small investment for the DOT Roads software will provide you with a capital plan you can believe in, a comprehensive, implementable program, and a powerful tool for justifying your long-range transportation network management strategy.

With the trust and support of our many municipal beta clients, we are now building DOT Water, Wastewater and Storm Water capital planning software in partnership with Ryerson University's Institute for Infrastructure Innovation. We invite you to participate in our quest to build the highest quality of capital planning software. Like you, we want to protect our communities and way of life.

Appendix A

"Saving Public Roads I"

Dr. Michael Maher, Golder Associates

ReNew Canada Magazine (July 2018)

Credit: Actual Media

SAVING PUBLIC ROADS

How technology can save tax dollars and improve the quality of our municipal roads.

Dr. Michael Maher

Data from the Association of Municipalities of Ontario (AMO) indicates that 67 per cent of the roads in the province are under municipal jurisdiction, amounting to 140,000 km of public roads. It is estimated that the combined operating budget for these municipalities is in the range of $40 billion per year. Transportation is the single largest item, accounting for approximately 23 per cent of the budget. If we conservatively assume that of this 23 per cent, 15 per cent is spent on road maintenance, then each one per cent in savings attained provides an extra $60 million to be re-invested into our roads or other municipal assets. When determining the cleverest way to spend an annual road budget, consideration must be given to the full toolbox of road preservation and rehabilitation treatments, in conjunction with capital planning optimization strategies. Beyond financial savings, a good road capital plan can simultaneously deliver a higher level of service to the community and a safer road network.

The value of preventive maintenance for any expensive asset is well understood, and we would never dream of running our cars without periodic oil changes and other regular maintenance. In this context, it is disturbing to learn the results of a recent Canada-wide survey of municipal road maintenance practices. The 171 municipalities that responded to the survey represented 45,000 km of paved road, 15 per cent of Canada's population, and a wide range of municipalities by region and population. The survey established that while 98 per cent of respondents perceive preventive maintenance as an important and cost-effective approach to extend the service life of their pavements, a majority of the municipalities do not apply preventive maintenance treatments and have no clear understanding of when these treatments should be applied.

The policy of reconstructing "worst roads first" appears ingrained in our capital planning process, with serious cost consequence. Watching a municipality pour capital into its worst roads while allowing preventive maintenance to lapse is like watching a dog chase its tail. While the worst roads are being reconstructed at huge expense, the good roads are rapidly deteriorating due to lack of maintenance and will become the worst roads in a few years. It is clear that the vast majority of municipal councils have insufficient funds to do everything, but the overriding question is why they would give road reconstruction a priority over preventive maintenance. In some cases, councils respond to public pressure for road reconstruction and to not have an effective communication strategy to defend why they would work on good roads while bad roads continue to deteriorate. Even within my own profession, engineers need to take some of the responsibility for the current situation. As engineers we like to design things, and most preservation treatments don't require any engineering design. It should also be noted that there is inertia within every industry and many practitioners have failed to keep up to date with the extent of new road preservation treatments that have been introduced within the last 10 to 15 years and their proven efficacy in extending pavement life.

We can illustrate the financial folly of the pervasive road management practices with a simplified example. If we assume that it costs about $1 million to build one kilometer of road. Without any maintenance it will probably last about 20 years. At that stage it will need major rehabilitation, costing about $500,000. Thus by year 20, the municipality has spent $1.5 million in providing this one-kilometre of road. If we consider an alternative scenario where timely preservation treatments are applied, we again start with the same initial cost of $1 million. Then in years five, 10, 15 and 20 we

Page D-33

apply out pavement preservation treatments comprising, for example, crack sealing and microsurfacing.

A municipal asset is not solely based on its intrinsic value, but also on its ability to deliver a cost effective service to the public. In Scenario 1 above, after about year 12, the road condition is in rapid decline with extensive cracking, rutting, and probably potholes. The more frequent renewal of a road surface, also improves safety and reduces accidents, especially in wet weather. Studies have also shown that vehicle operating costs increase significantly as road condition deteriorates. Preservation maintenance treatments can be applied very quickly and can even be done overnight without significant disruption to traffic flows whereas major rehabilitation requires lane closures and detours that are highly disruptive. From an environmental perspective, a study by the Ministry of Transportation Ontario (MTO) also demonstrated that thin preservation treatments, such as microsurfacing and seal coats, use only about 15 per cent of the energy and produce only 15 per cent of the carbon emissions of more expensive rehabilitation treatments involving conventional hot mix asphalt.

For municipal governments to achieve the greatest possible financial and socio-economic benefit, a reorientation in favour of preventive maintenance is only part of the equation. Municipalities need better capital planning tools which recognize the vast array of preservation and rehabilitation treatments currently available, model the full complexity of any road network from the point of view of age and condition and realistically predict how each potential treatment will perform under those conditions. Exciting and groundbreaking research undertaken at the University of Waterloo's civil engineering department over the past 10 years, now provides linear and non-linear optimization and a patent-pending process for analyzing "big data." The process uses non-linear algorithms, powerful computing processes that can find optimized solutions for complex problems involving a large volume of data. Alan Turing of "The Imitation Game" fame, pioneered the concept in the 1950s and called it a "learning machine".

Recently, a strategic alliance has been forged between the University of Waterloo, Golder Associates Ltd., Miller Paving, and Infrastructure Solutions Inc. (ISI), to employ this technology to advance development of a municipal road network capital planning tool. For such a tool to be widely adopted, it needs to incorporate advanced mathematics, and be based on sound engineering principles and real-world road construction expertise. ISI, having completed some 60 asset management plans for Ontario municipalities, is building the user-friendly interface for the University's optimizer and defining user requirements. Fifty Canadian municipalities have stepped forward as beta clients to assist in the evolution of this road network capital planning tool.

Golder Associates was drawn to this initiative by the prospect of helping to develop a revolutionary approach to road capital planning and ensuring that its planning incorporated robust models of how road preservation and rehabilitation treatments perform in practice, based on variable road condition, traffic mix and past performance history. Miller Paving, with 75 years of construction experience, is providing data on geographic price variations and preventive maintenance treatment availability as input to the optimizer's decision tree. From trial applications using real municipal data, the optimizer is proving able to

identify 7-17 per cent in capital savings when a municipality is already engaged in preventive maintenance strategies. If a municipality is still trapped in a "worst roads first" approach, the savings can be substantially higher.

The University of Waterloo's optimization engine is now fully functional. The resulting capital planning tool provides a robust decision-making process, identifying the best possible course of action, and considering both the short-term needs and the long-term goals of a municipality. It includes an advanced decision-making process called optimization or prescriptive modelling, which is the most powerful and effective way of finding the best possible solution to a decision-making problem. A capital planning tool with optimization capability can maximize the overall performance of a network in terms of physical condition (or any other criteria) over a multi-year analysis horizon and provides municipalities with the best possible course of action in terms of timing and selection of different maintenance, rehabilitation, or reconstruction treatments considering all municipal goals and constraints. The improvements achieved through an optimized solution, which highlights the critical importance of preventive maintenance, can be translated into substantial savings or increased socio-economic benefit or both.

Within the context of a comprehensive capital planning methodology, the results of periodic condition assessment and data collection will be used by engineers to develop adequate models of time-dependent pavement performance. These engineering models alongside long-range financial and socio-economic analyses are used to perform a multi-year and multi-constraint optimization that provides municipalities with the most cost-effective capital plan possible considering their budget limits and organizational policies. The optimized plan is then verified through rigorous engineering analysis to confirm practicality and adequacy of the selected treatments. The implementation of the optimized plan is also monitored to ensure municipalities achieve maximum benefits and to record data for model calibration in subsequent years.

We believe that the worst-first approach to road capital planning has significantly magnified our Canadian road network infrastructure deficit, and will continue to do so without corrective action. As Canadian municipalities build asset management plans which assist in attaining financial self- sufficiency, a focus on road preventive maintenance over reconstruction will provide significant savings. The University of Waterloo's new and powerful analytical tools will also help cash-strapped municipalities to achieve practical, implementable and defensible road network capital plans based on the municipality's budget, and service level objectives. The objective of our asset management strategic alliance is to help our communities gain control over their infrastructure deficit, improve prospects for municipal self-sufficiency by spending road maintenance dollars more wisely, and protect the safety and life quality of our citizens.

Dr. Michael Maher is a principal and specialist pavement and materials engineer with Golder Associates Ltd., based in their Greater Toronto Area office in Whitby, Ont.

Appendix B

"Saving Public Roads II"

Dr. Michael Maher, Golder Associates

ReNew Canada Magazine (July 2018)

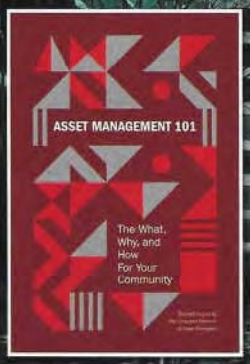
March/April 2018

ReNew CANADA

The Infrastructure Magazine

+ Are All P3s Created Equal?
+ Valuing Natural Assets
+ Top100 Projec Celebrating $199 Billion

Managing Climate Infrastructure Financial RISK



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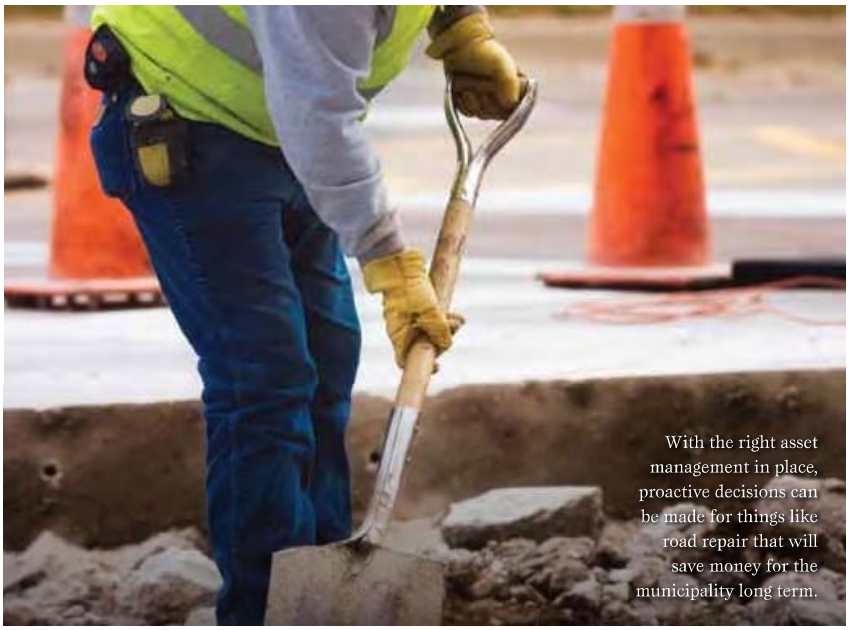
SAVING PUBLIC ROADS II

Capital planning tool pays off for municipalities.

By Michael Maher



With the right asset management in place, proactive decisions can be made for things like road repair that will save money for the municipality long term.

A recent Canada-wide survey of municipal road maintenance practices found that while 98 per cent of respondents perceive preventive maintenance as an important and cost-effective approach to extend the service life of their pavements, a majority of the municipalities do not apply preventive maintenance treatments, and have no clear understanding of when these treatments should be applied.

Infrastructure Canada is providing grants through the Federation of Canadian Municipalities to assist Canadian municipalities in improving their asset management expertise and process. It is a much-needed program. Municipalities have limited sources of revenue to work with, and need to build strategies around attaining the highest return on investment. In the Nov./Dec. edition of ReNew Canada, I wrote an article on the long-term consequence of ignoring road network preventive maintenance, the pervasive practice of 'worst first' roadway rehabilitation, and the need for better capital planning tools based on sound engineering and the latest in decision optimization technology. Providing an implementable, defensible road network capital plan can stretch dollars, removes politics from the equation, and maximizes the level of service to the community.

As a social entrepreneurial project to help municipalities build road network capital plans, Golder Associates Ltd. and Infrastructure Solutions Inc. (ISI) formed a strategic partnership to develop a capital planning tool, built on a depth of engineering research and analysis. The resulting road deterioration models, life cycle gains and inventory of available road maintenance treatments are weighted in favour of preventive maintenance. A major component of the challenge of building a better road capital planning tool was to incorporate the latest research in optimization algorithms that could quickly determine the best spend from a financial and community benefit perspective. The result is the creation of DOT (Decision Optimization Technology) Roads. DOT Roads was built with the support of 50 Canadian municipal beta clients, Natural Sciences and Engineering Research Council of Canada (NSERC), and Ontario Centres of Excellence grants.

The DOT Roads software can maximize the overall performance of a road network in terms of physical condition (or any other criteria) over a multi-year analysis horizon, and provides municipalities with the best possible course of action in terms of timing and selection of different maintenance, rehabilitation, or reconstruction treatments considering all municipal goals and constraints. The improvements achieved can be translated into substantial savings or increased socio-economic benefit or both.

Tillsonburg

"The town was looking for a technology solution that would aid in the selection of asset management best practices for road renewal," explains Anthony Tomlin, asset management technologist for the Town of Tillsonburg, a two-hour drive southwest of Toronto. "In the past, road segments were selected by the municipalities' institutional knowledge or fueled by concerns from the public. This method resulted in some segments being selected for maintenance that did not fully maximize a cost-benefit ratio. As a municipality that adheres to asset management best practices, we were intrigued by the idea of a software program that removed a large portion of the subjective nature of selecting the right treatment method for the right road segment at the right time in its lifecycle.

It is known that during the lifecycle of a roadway, there are certain trigger points that call for preventative and/or routine maintenance to help extend and fully maximize the lifecycle of the road. This is what asset management is all about: managing your municipality's assets in the most cost-effective way, to fully maximize their lifecycles and maintain a level of service designated by the municipality. Using the DOT software, municipalities can run multiple optimization cases with different objectives and policy settings to perform a detailed 'what-if' scenario analysis. For example, a municipality can use the software to determine the minimum cost required to maintain the current level of service or to achieve a certain performance level based on long-term community objectives. At the same time, a user can define multiple constraints, such as minimum serviceability criteria or annual budget limits to run an optimization analysis with the objective of maximizing network overall performance. This enables municipalities to run multiple scenarios and perform a detailed comparison using various visual outputs to arrive at the best possible solution that satisfies their objectives and policy considerations.

Utilizing this software has helped the town achieve its road asset management goals. Decisions made are now optimized and we are confident that the road segments selected and the applied treatment methods have the greatest cost-benefit to the town and its residents.

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"We still look at our own data spreadsheets regarding the condition of our roadways and cross-reference our data with the software. More often than not, many of the roads we've selected for maintenance are also selected by the software. This is valuable evidence that the software is working by looking at the same factors that we, and most municipalities look for when determining which roads should be prioritized for maintenance. Having software to determine which preventive maintenance method to use on which roadway really maximizes the cost-benefit of allocating funds to these segments."

Tillsonburg has been using the software for about two years, during which they have witnessed its evolution, including the addition of the GIS road segment visualization capability. "We have experienced the strength and versatility of this tool," said Tomlin. "The software really helps stretch the dollar to keep a good level of service or Pavement Condition Index (PCI) which is used to rate the condition of a paved road surface. Tillsonburg likes to maintain a PCI of 75 or above. We can give the software parameters, such as how much money we have to spend this year, and run the scenario. The software identifies the best places to allocate these funds to maximize the road lifecycle and the value. The software really helps us make sound decisions."

Sarnia's solution

"The challenge has always been to determine what rehabilitation strategy do we need to apply to fix the road," explains Lydia Fisher, municipal engineering specialist for the City of Sarnia.

"One person can look at a road and might think we can patch it, others say it's best to crack seal it, another point of view says completely replace it. However, when it comes to important infrastructure decisions, only science can truly tell us the best approach for the safety and cost-benefit."

The software provides something that has never been available before: a system that considers all of the factors a municipality has to work with, plus the road asset management science. Based on user input, the software models a scenario for each point in a road's life and tells what needs to be done in five years, 10 years, and so on. It can take into consideration factors including soil conditions, road conditions, traffic, etc., and generate a highly specific action plan based on science plus a municipality's unique needs and budget.

"I really appreciate that it provides an accurate cost-per-meter for the suggested maintenance activities," said Fisher. "It's […] saving Sarnia time and money, while pointing us in the right direction for road asset management. Being able to identify different kinds of technology solution that we can apply to our roads that are cheaper or last longer, is extremely beneficial."

"All municipalities want to know how much money is needed to keep roads at a certain quality level. We can run those scenarios through the software and quickly get the answers we're looking for."

Thanks to technological developments such as the solution we have helped to create, municipalities across Canada are afforded better opportunities to spend their limited resources on the right maintenance for the right projects at the right time.

Dr. Michael Maher is a principal and specialist pavement and materials engineer with Golder Associates Ltd., based in their Greater Toronto Area office in Whitby, Ont.

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Appendix C

“The Road Less Travelled”

Dr. Roozbeh Rashedi

Municipal World Magazine

January 2016

Municipal World

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DECEMBER 2016

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by Dr. Roozbeh Rashedi

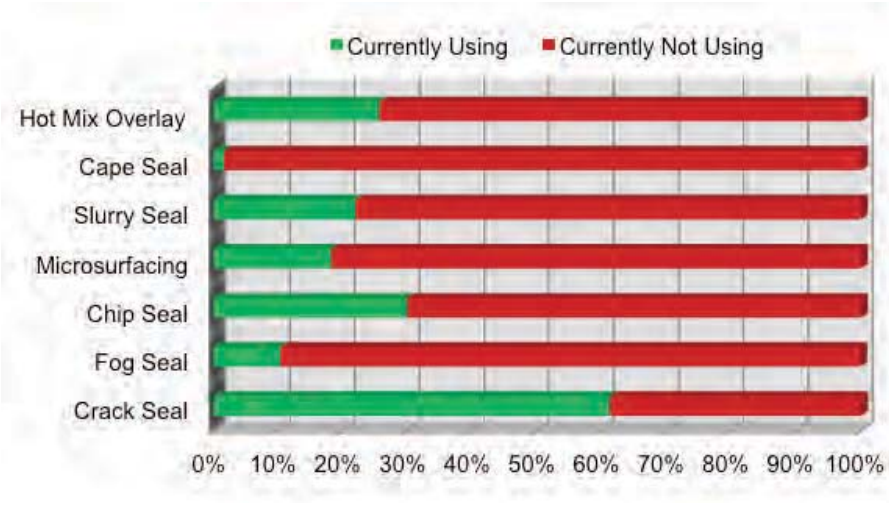
The Road Less Travelled

Road Network Preventive Maintenance and Optimized Capital Planning

This year saw the completion of the most comprehensive Canadian survey of municipal road maintenance practices ever undertaken. The 171 survey participants represented 45,000 kilometres of paved road, 15 percent of Canada's population, and a wide range of municipalities by region and population. The survey was designed to identify the extent to which municipalities apply preventive maintenance treatments, to attain practical observations about treatment options and lifecycle gains, and clarify user perceptions about what constitutes best road maintenance practices. The results are truly disturbing.

Figure 1

Current application of preventive maintenance across Canadian municipalities



Preventive Maintenance State of Practice in Canada

The survey established that 98 percent of respondents perceive preventive maintenance as an important and cost-effective approach to extend the service life of their pavements and to save the municipality significant capital investment in the long term. The survey further established that a majority of the municipalities do not apply preventive maintenance treatments (as shown in Figure 1) and have a widely varied understanding of when these treatments should be applied.

Respondents were asked what percentage of their municipality they believe is currently being maintained according to best practices. Figure 2 shows the survey's cumulative response on the application of chip seal, microsurfacing, and slurry seal to paved roads. For every major surface treatment type, less than 20 percent of municipal road networks are maintained in accordance with what respondents believe to be best practices.

This contradiction between the clearly appreciated benefits of preventive maintenance and the inadequate application of preventive treatments in practice has deep roots. Municipalities may be overly reactive to community requests. Councils surely follow the advice of roads needs studies, where engineering companies recommend repairing worst roads first for safety and other reasons, assuming an unlimited municipal budget. Deteriorated water or wastewater lines might necessitate road reconstruction for line replacement and take precedence over maintenance. Smaller municipalities often use spreadsheets or simplistic pavement management programs that typically recommend projects based on a simple ranking process. Finally,

DR. ROOZBEH RASHEDI is the Vice-President of Technology and Software Development at Infrastructure Solutions Inc. (ISI). He received his Ph.D. and Master's degree in civil engineering from the University of Waterloo, with a focus on developing municipal decision support tools using computational intelligence and advanced mathematical programming. He can be reached at <roozbeh@infrasol.ca>.

The analytical models used in the system are flexible, able to adjust to regional variances, and reflect the behaviour of assets verified through a rigorous engineering analysis.

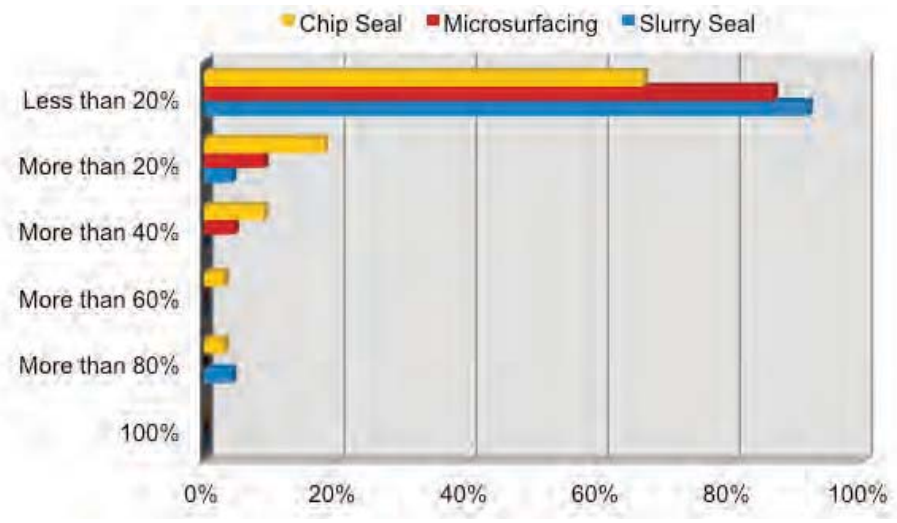
many municipalities still operate on an "ad hoc" basis, arbitrarily selecting roads that need rehabilitation or reconstruction work without undertaking any analytical process whatsoever. Whatever the circumstance, tax dollars are being poured into pot holes unnecessarily.

Without a capital planning tool to determine optimum allocation of capital, some municipalities will continue to use a "worst roads first" approach, or struggle with an ineffective ranking process. Ranking or prioritization analyses are typically done on a yearly basis, dismiss the time dimension of the analysis, and do not have the capability to analyze the impact of time delays on the overall allocation of budget and network performance. Another key limitation of ranking (or cost-benefit analysis) is its inability to incorporate multiple constraints into the analysis. In reality, municipalities deal with fluctuating annual budgets, shifting strategic objectives, minimum levels of service objectives, safety considerations, services access, a requirement for alignment with water/wastewater projects, and many other factors. Financial return on investment is only one component of an analytical process that needs to take into consideration a wide range of socio-economic factors.

Working with the University of Waterloo, Infrastructure Solutions Inc. has forged a strategic alliance with Golder Associates Ltd. as a social entrepreneurial undertaking to create greater awareness around the advantages of preventive maintenance and to advance development of a municipal road network capital planning tool. Miller Paving is also providing input into this initiative.

Figure 2

Application of preventive treatments according to best practices



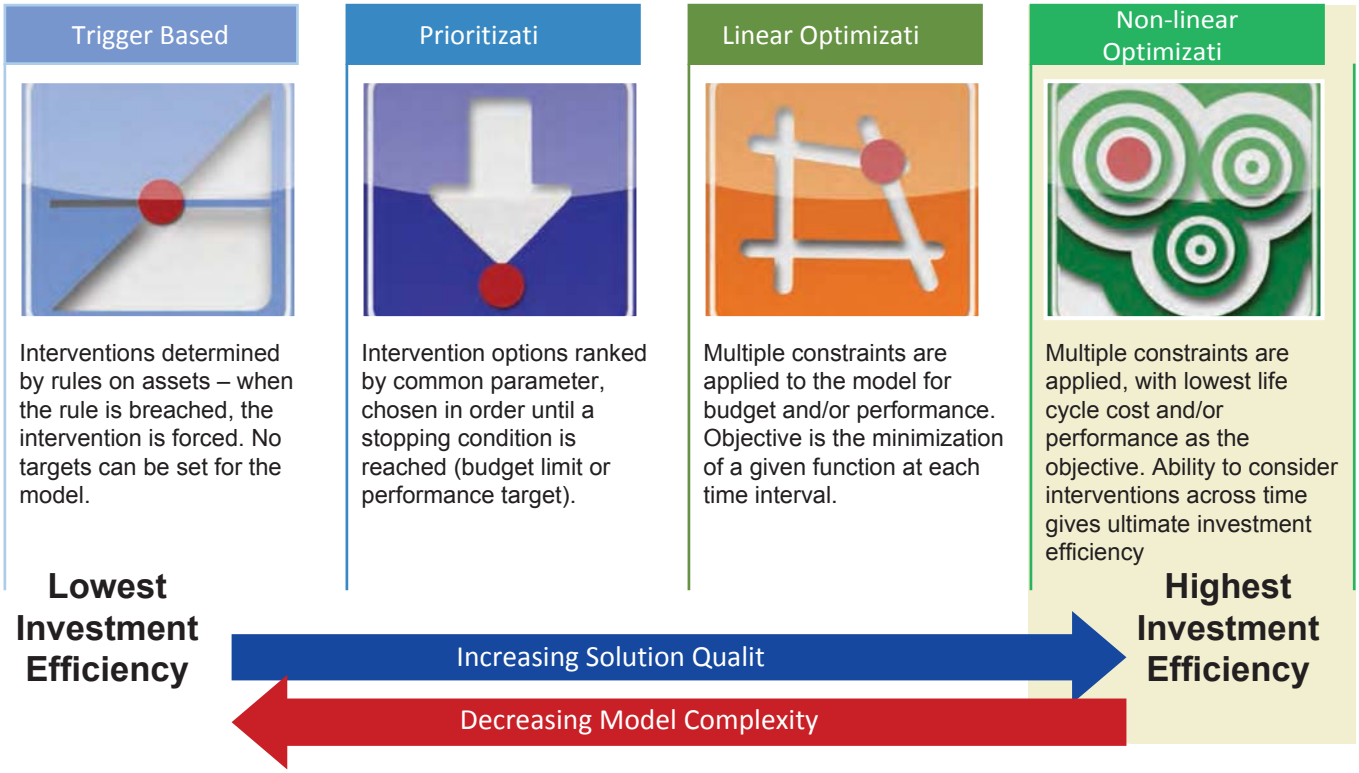
Packaging an effective capital planning tool requires advanced mathematics, in-depth civil engineering knowledge, road construction expertise, the flexibility to handle regional variances, and strategic capital planning expertise. The University of Waterloo's civil engineering department brings 10 years of research into linear and non-linear optimization and a patent-pending process for analyzing "big data"; Golder Associates, one of Canada's best known consulting engineering companies, brings a depth of knowledge around degradation curves and road lifecycles by axle weight, traffic volume, and construction process. Miller Paving, with 75 years of construction experience, is providing geographic price variations and preventive maintenance treatment availability into the optimizer's decision tree. ISI, having completed 60 asset management plans for Ontario municipalities, is defining user requirements and building the user-friendly interface for the university's optimizer.

Road Network Optimized Capital Planning

The resulting capital planning tool provides a robust decision-making process, identifies the best possible course of action, and considers both the short-term needs and the long-term goals of a municipality. It includes an advanced decision-making process called optimization or prescriptive modelling, which is the most powerful and effective way of finding the best possible solution to a decision-making problem. A capital planning tool with optimization capability can maximize the overall performance of a network in terms of physical condition (or any other criteria) over a multi-year analysis horizon and provides municipalities with the best possible course of action in terms of timing and selection of different maintenance, rehabilitation, or

Figure 3

Capital planning methodology and solution quality



reconstruction treatments considering all municipal goals and constraints (see Figure 3 for a visualization). The improvements achieved through an optimized solution, which inevitably highlights the critical importance of preventive maintenance, can be translated into substantial savings or increased socio-economic benefit – or both.

Combining advanced optimization capabilities with robust engineering models and socio-economic considerations provides municipalities with a fully implementable and defensible road network capital plan. The analytical models used in the system are flexible, able to adjust to regional variances, and reflect the behaviour of assets verified through a rigorous engineering analysis.

Case Study – Town of Fort Erie, ON

The University of Waterloo's optimization engine is now fully functional and is proving able to attain a seven to 17 percent capital savings on a municipal capital budget. Fort Erie, an Ontario municipality with an infrastructure deficit of $23 million and a roads capital budget of $2 million, was experiencing a continued deterioration of their network using a "worst roads first" approach. Under new infrastructure management, and using the advanced capital planning optimization tool, Fort Erie can now maintain a consistently high network performance with 18 percent improvement by the end of the plan without additional expenditures. This improvement on network performance can be translated into $10 million in cost savings over the 10-year planning horizon. In other words, if Fort Erie had maintained its previous capital planning approach, it would have had to spend $10 million more to be able to achieve the same level of performance the optimized capital plan produced.

It is important to note that, as declining networks using conventional capital planning strategies reach their accelerated deterioration phase, performance improvement and cost saving implications grow significantly. The "worst-first" or simple ranking process has significantly magnified Canada's road network infrastructure deficit, and will continue to do so without corrective action (as shown in Figure 4).

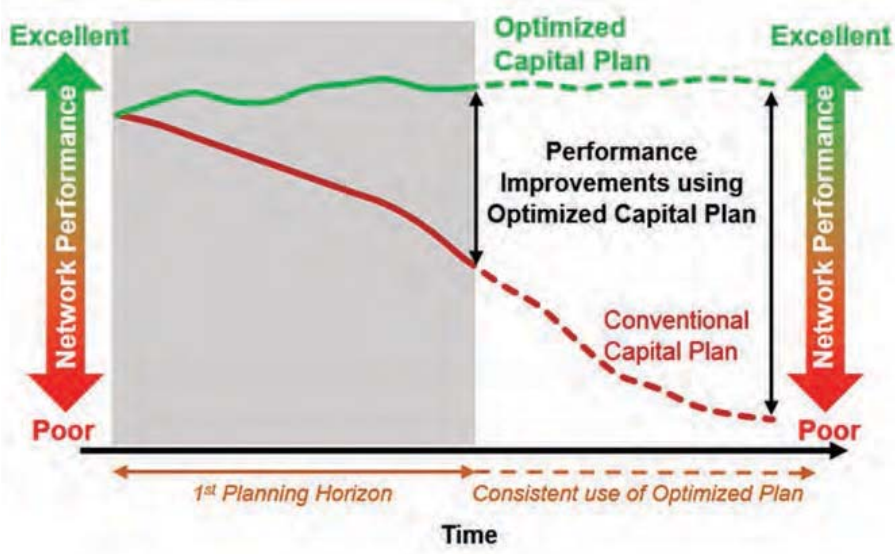
Concluding Remarks

The vast majority of smaller Canadian municipalities do not currently have a sufficient tax base to gain control over their infrastructure deficit. Without corrective action over the next 10 years, these communities will see a significant deterioration in the level of service being offered to their residents. Increased taxes and/or deteriorating levels of service will trigger a migration to larger municipalities, further undermining the smaller community's tax base. Although provincial and federal governments are now committing to substantially increased investment in infrastructure, much of it ends up in major urban centres where the greatest number of citizens are served.

Smaller municipalities need to build a strategy for self-sufficiency.

Figure 4

Optimized versus conventional capital planning



Better capital planning should be high on that priority list. As it pertains to road networks, a municipal council's first order of business should be to capitalize on the significant cost savings and lifecycle gain associated with road preventive maintenance. A second initiative would be to use advanced analytical tools to attain the highest possible return, both from a financial and socio-economic perspective, on road capital expenditures. Only by gaining stakeholder buy-in on a practical and implementable capital plan can communities stem their infrastructure deficit, maintain a quality of life, and plot a course for the future with confidence. *MW*

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Pavement Surface Evaluation and Rating

PASER Manual

Asphalt Roads

Transportation Information Center
University of Wisconsin–Madison

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This manual is intended to assist local officials in understanding and rating the surface condition of asphalt pavement. It describes types of defects and provides a simple system to visually rate pavement condition. The rating procedure can be used as condition data for the Wisconsin DOT local road inventory and as part of a computerized pavement management system like PASERWARE.

The PASER system described here and in other T.I.C. publications is based in part on a roadway management system originally developed by Phil Scherer, transportation planner, Northwest Wisconsin Regional Planning Commission.

Produced by the T.I.C. with support from the Federal Highway Administration, the Wisconsin Department of Transportation, and the University of Wisconsin-Extension. The T.I.C., part of the nationwide Local Technical Assistance Program (LTAP), is a Center of the College of Engineering, Department of Engineering Professional Development, University of Wisconsin–Madison.

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Pavement Surface Evaluation and Rating

PASER Manual

Asphalt Roads

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Pavement Surface Evaluation and Rating

Asphalt PASER Manual

A local highway agency's major goal is to use public funds to provide a comfortable, safe and economical road surface—no simple task. It requires balancing priorities and making difficult decisions in order to manage pavements. Local rural and small city pavements are often managed informally, based on the staff's judgment and experience. While this process is both important and functional, using a slightly more formalized technique can make it easier to manage pavements effectively.

Experience has shown that there are three especially useful steps in managing local roads:

1. Inventory all local roads and streets.
2. Periodically evaluate the condition of all pavements.
3. Use the condition evaluations to set priorities for projects and select alternative treatments.

A comprehensive pavement management system involves collecting data and assessing several road characteristics: roughness (ride), surface distress (condition), surface skid characteristics, and structure (pavement strength and deflection). Planners can combine this condition data with economic analysis to develop short-range and long-range plans for a variety of budget levels. However, many local agencies lack the resources for such a full-scale system.

Since surface condition is the most vital element in any pavement management system, local agencies can use the simplified rating system presented in this ***Asphalt PASER Manual*** to evaluate their roads. The PASER ratings combined with other inventory data (width, length, shoulder, pavement type, etc.) from the WisDOT local roads inventory (WISLR) can be very helpful in planning future budgets and priorities.

WISLR inventory information and PASER ratings can be used in a computerized pavement management system, PASERWARE, developed by the T.I.C and WisDOT. Local officials can use PASERWARE to evaluate whether their annual road budgets are adequate to maintain or improve current road conditions and to select the most cost-effective strategies and priorities for annual projects.

PASER Manuals for gravel, concrete, and other road surfaces, with compatible rating systems are also available (page 29). Together they make a comprehensive condition rating method for all road types. PASER ratings are accepted for WISLR condition data.

Asphalt pavement distress

PASER uses visual inspection to evaluate pavement surface conditions. The key to a useful evaluation is identifying different types of pavement distress and linking them to a cause. Understanding the cause for current conditions is extremely important in selecting an appropriate maintenance or rehabilitation technique.

There are four major categories of common asphalt pavement surface distress:

Surface defects
Raveling, flushing, polishing.

Surface deformation
Rutting, distortion—rippling and shoving, settling, frost heave.

Cracks
Transverse, reflection, slippage, longitudinal, block, and alligator cracks.

Patches and potholes

Deterioration has two general causes: environmental due to weathering and aging, and structural caused by repeated traffic loadings.

Obviously, most pavement deterioration results from both environmental and structural causes. However, it is important to try to distinguish between the two in order to select the most effective rehabilitation techniques.

The rate at which pavement deteriorates depends on its environment, traffic loading conditions, original construction quality, and interim maintenance procedures. Poor quality materials or poor construction procedures can significantly reduce the life of a pavement. As a result, two pavements constructed at the same time may have significantly different lives, or certain portions of a pavement may deteriorate more rapidly than others. On the other hand, timely and effective maintenance can extend a pavement's life. Crack sealing and seal coating can reduce the effect of moisture in aging of asphalt pavement.

With all of these variables, it is easy to see why pavements deteriorate at various rates and why we find them in various stages of disrepair. Recognizing defects and understanding their causes helps us rate pavement condition and select cost-effective repairs. The pavement defects shown on the following pages provide a background for this process.

Periodic inspection is necessary to provide current and useful evaluation data. It is recommended that PASER ratings be updated every two years, and an annual update is even better.

SURFACE DEFECTS

Raveling

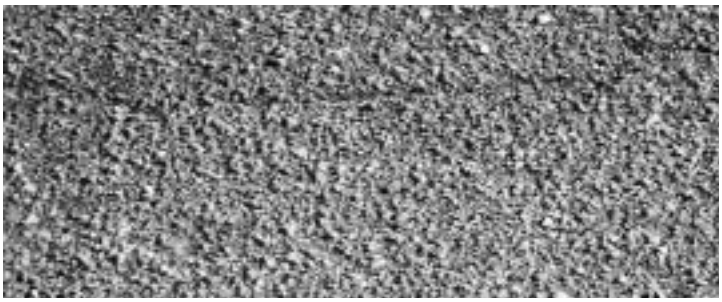
Raveling is progressive loss of pavement material from the surface downward, caused by: stripping of the bituminous film from the aggregate, asphalt hardening due to aging, poor compaction especially in cold weather construction, or insufficient asphalt content. Slight to moderate raveling has loss of fines. Severe raveling has loss of coarse aggregate. Raveling in the wheelpaths can be accelerated by traffic. Protect pavement surfaces from the environment with a sealcoat or a thin overlay if additional strength is required.

Flushing

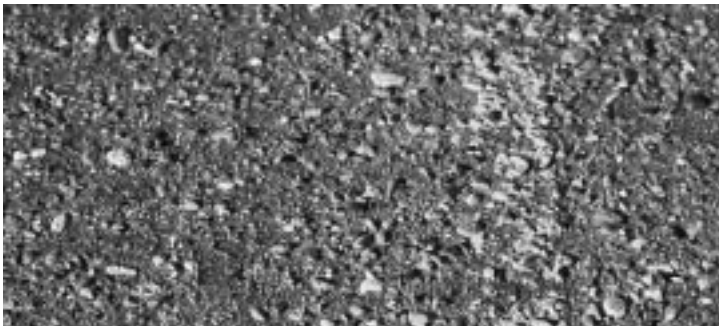
Flushing is excess asphalt on the surface caused by a poor initial asphalt mix design or by paving or sealcoating over a flushed surface. Repair by blotting with sand or by overlaying with properly designed asphalt mix.

Polishing

Polishing is a smooth slippery surface caused by traffic wearing off sharp edges of aggregates. Repair with sealcoat or thin bituminous overlay using skid-resistant aggregate.



◄ **Slight raveling. Small aggregate particles have worn away exposing tops of large aggregate.**

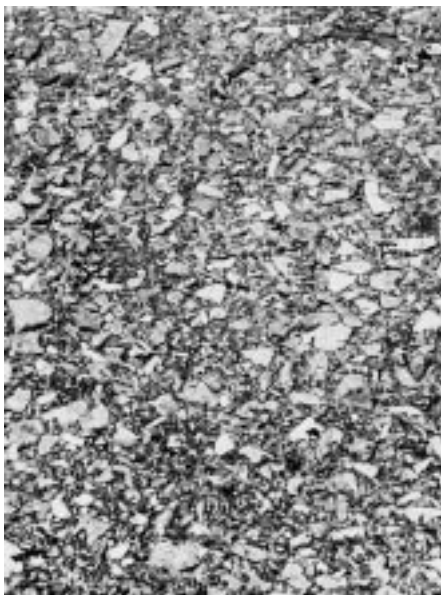


◄ **Moderate to severe raveling. Erosion further exposes large aggregate.**

◄ **Severe raveling and loss of surface material.**

Polished, worn aggregate needs repair. ▼

► **Flushing. Dark patches show where asphalt has worked to surface.**



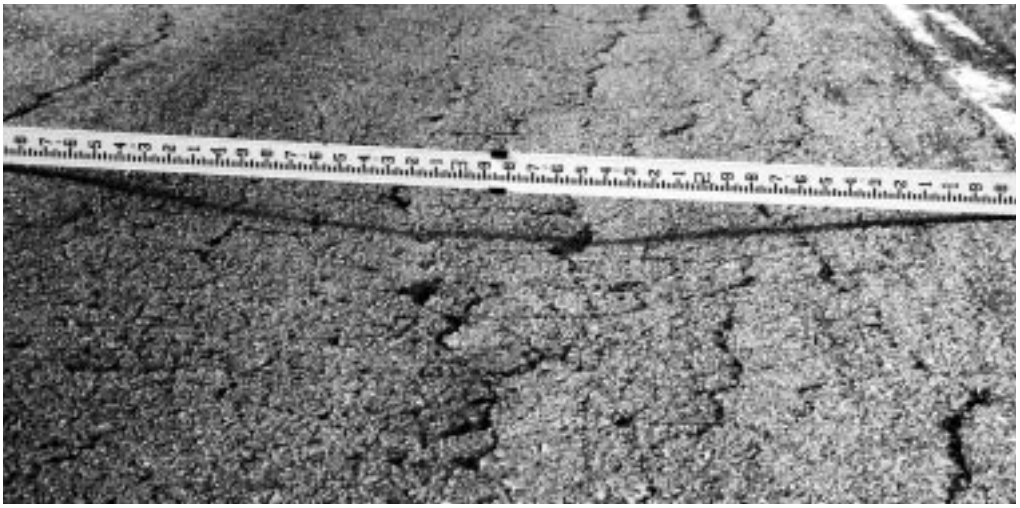
SURFACE DEFORMATION

Rutting

Rutting is displacement of material, creating channels in wheelpaths. It is caused by traffic compaction or displacement of unstable material. Severe rutting (over 2") may be caused by base or subgrade consolidation. Repair minor rutting with overlays. Severe rutting requires milling the old surface or reconstructing the roadbed before resurfacing.

◄ **Even slight rutting is evident after a rain.**

◄ **Severe rutting over 2" caused by poor mix design.**



◄ **Severe rutting caused by poor base or subgrade.**

Distortion

Shoving or rippling is surfacing material displaced crossways to the direction of traffic. It can develop into washboarding when the asphalt mixture is unstable because of poor quality aggregate or improper mix design. Repair by milling smooth and overlaying with stable asphalt mix.

Other pavement distortions may be caused by settling, frost heave, etc. Patching may provide temporary repair. Permanent correction usually involves removal of unsuitable subgrade material and reconstruction.

▼ **Heavy traffic has shoved pavement into washboard ripples and bumps.**

► **Severe settling from utility trench.**

► **Frost heave damage from spring break-up.**

▼ **Widely spaced, well-sealed cracks.**

CRACKS

Transverse cracks

A crack at approximately right angles to the center line is a transverse crack. They are often regularly spaced. The cause is movement due to temperature changes and hardening of the asphalt with aging.

Transverse cracks will initially be widely spaced (over 50'). Additional cracking will occur with aging until they are closely spaced (within several feet). These usually begin as hairline or very narrow cracks; with aging they widen. If not properly sealed and maintained, secondary or multiple cracks develop parallel to the initial crack. The crack edges can further deteriorate by raveling and eroding the adjacent pavement.

Prevent water intrusion and damage by sealing cracks which are more than ¼" wide.

◄ **Sealed cracks, a few feet apart.**

▲ **Tight cracks less than ¼" in width.**

▲ **Open crack – ½" or more in width.**

▲ **Water enters unsealed cracks softening pavement and causing secondary cracks.**

▲ **Pavement ravels and erodes along open cracks causing deterioration.**

Reflection cracks

Cracks in overlays reflect the crack pattern in the pavement underneath. They are difficult to prevent and correct. Thick overlays or reconstruction is usually required.

► **Concrete joints reflected through bituminous overlay.**

Slippage cracks

Crescent or rounded cracks in the direction of traffic, caused by slippage between an overlay and an underlying pavement. Slippage is most likely to occur at intersections where traffic is stopping and starting. Repair by removing the top surface and resurfacing using a tack coat.

► **Crescent-shaped cracks characteristic of slippage.**

► **Loss of bond between pavement layers allows traffic to break loose pieces of surface.**

Centerline crack (still tight). ►

Edge cracking from weakened subbase and traffic loads. ▼

Longitudinal cracks

Cracks running in the direction of traffic are longitudinal cracks. Center line or lane cracks are caused by inadequate bonding during construction or reflect cracks in underlying pavement. Longitudinal cracks in the wheel path indicate fatigue failure from heavy vehicle loads. Cracks within one foot of the edge are caused by insufficient shoulder support, poor drainage, or frost action. Cracks usually start as hairline or vary narrow and widen and erode with age. Without crack filling, they can ravel, develop multiple cracks, and become wide enough to require patching.

Filling and sealing cracks will reduce moisture penetration and prevent further subgrade weakening. Multiple longitudinal cracks in the wheel path or pavement edge indicate a need for strengthening with an overlay or reconstruction.

► First stage of wheelpath cracking caused by heavy traffic loads.

Load-related cracks in wheel path plus centerline cracking. ▼

Multiple open cracks at center line, wheelpaths and lane center. ▼

Block cracks

Block cracking is interconnected cracks forming large blocks. Cracks usually intersect at nearly right angles. Blocks may range from one foot to approximately 10′ or more across. The closer spacing indicates more advanced aging caused by shrinking and hardening of the asphalt over time. Repair with sealcoating during early stages to reduce weathering of the asphalt. Overlay or reconstruction required in the advanced stages.

► **Large blocks, approximately 10′ across.**

► **Intermediate-size block cracking, 1′-5′ across with open cracks.**

▲ **Extensive block cracking in an irregular pattern.**

► **Severe block cracking – 1′ or smaller blocks. Tight cracks with no raveling.**

Alligator cracks

Interconnected cracks forming small pieces ranging in size from about 1" to 6". This is caused by failure of the surfacing due to traffic loading (fatigue) and very often also due to inadequate base or subgrade support. Repair by excavating localized areas and replacing base and surface. Large areas require reconstruction. Improvements in drainage may often be required.

◄
Alligator crack pattern. Tight cracks and one patch.

◄
Characteristic "chicken wire" crack pattern shows smaller pavement pieces and patching.

◄
Open raveled alligator cracking with settlement along lane edge most likely due to very soft subgrade.

PATCHES AND POTHOLES

Patches

Original surface repaired with new asphalt patch material. This indicates a pavement defect or utility excavation which has been repaired. Patches with cracking, settlement or distortions indicate underlying causes still remain. Recycling or reconstruction are required when extensive patching shows distress.

► **Typical repair of utility excavation. Patch in fair to good condition.**

► **Edge wedging. Pavement edges strengthened with wedges of asphalt. Patch is in very good condition.**

► **Extensive patching in very poor condition.**

Potholes

Holes and loss of pavement material caused by traffic loading, fatigue and inadequate strength. Often combined with poor drainage. Repair by excavating or rebuilding localized potholes. Reconstruction required for extensive defects.

◄
Small pothole where top course has broken away.

◄
Multiple potholes show pavement failure, probably due to poor subgrade soils, frost heave, and bad drainage.

◄
Large, isolated pothole, extends through base. Note adjacent alligator cracks which commonly deteriorate into potholes.

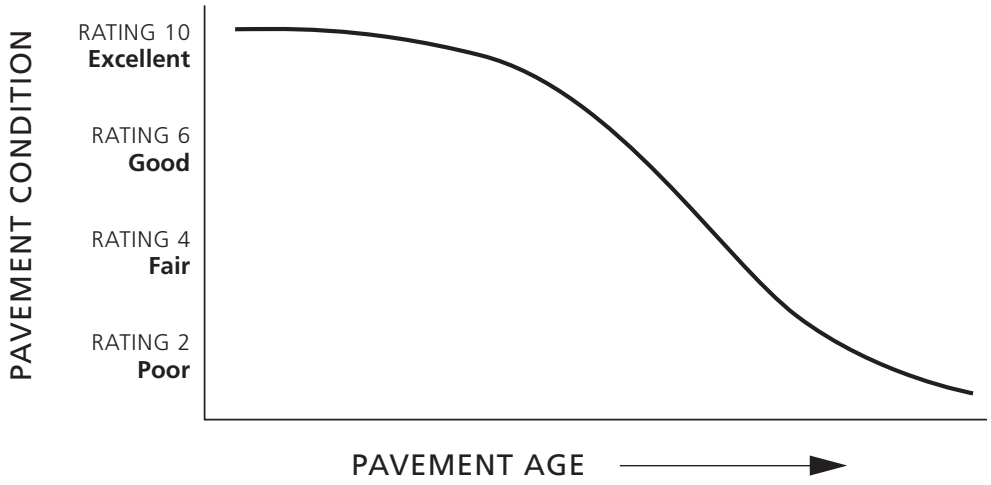
Rating pavement surface condition

With an understanding of surface distress, you can evaluate and rate asphalt pavement surfaces. The rating scale ranges from **10–excellent** condition to **1–failed**. Most pavements will deteriorate through the phases listed in the rating scale. The time it takes to go from excellent condition (10) to complete failure (1) depends largely on the quality of the original construction and the amount of heavy traffic loading.

Once significant deterioration begins, it is common to see pavement decline rapidly. This is usually due to a combination of loading and the effects of additional moisture. As a pavement ages and additional cracking develops, more moisture can enter the pavement and accelerate the rate of deterioration.

Look at the photographs in this section to become familiar with the descriptions of the individual rating categories. To evaluate an individual pavement segment, first determine its general condition. Is it relatively new, toward the top end of the scale? In very poor condition and at the bottom of the scale? Or somewhere in between? Next, think generally about the appropriate maintenance method. Use the rating categories outlined below.

Finally, review the individual pavement distress and select the appropriate surface rating. Individual pavements will ***not*** have all of the types of distress listed for any particular rating. They may have only one or two types.



In addition to indicating the surface condition of a road, a given rating also includes a recommendation for needed maintenance or repair. This feature of the rating system facilitates its use and enhances its value as a tool in ongoing road maintenance.

RATINGS ARE RELATED TO NEEDED MAINTENANCE OR REPAIR

Rating 9 & 10	No maintenance required
Rating 8	Little or no maintenance
Rating 7	Routine maintenance, cracksealing and minor patching
Rating 5 & 6	Preservative treatments (sealcoating)
Rating 3 & 4	Structural improvement and leveling (overlay or recycling)
Rating 1 & 2	Reconstruction

Rating system

Surface rating	*Visible distress**	*General condition/ treatment measures*
10 Excellent	None.	New construction.
9 Excellent	None.	Recent overlay. Like new.
8 Very Good	No longitudinal cracks except reflection of paving joints. Occasional transverse cracks, widely spaced (40′ or greater). All cracks sealed or tight (open less than ¼″).	Recent sealcoat or new cold mix. Little or no maintenance required.
7 Good	Very slight or no raveling, surface shows some traffic wear. Longitudinal cracks (open ¼″) due to reflection or paving joints. Transverse cracks (open ¼″) spaced 10′ or more apart, little or slight crack raveling. No patching or very few patches in excellent condition.	First signs of aging. Maintain with routine crack filling.
6 Good	Slight raveling (loss of fines) and traffic wear. Longitudinal cracks (open ¼″–½″), some spaced less than 10′. First sign of block cracking. Sight to moderate flushing or polishing. Occasional patching in good condition.	Shows signs of aging. Sound structural condition. Could extend life with sealcoat.
5 Fair	Moderate to severe raveling (loss of fine and coarse aggregate). Longitudinal and transverse cracks (open ½″) show first signs of slight raveling and secondary cracks. First signs of longitudinal cracks near pavement edge. Block cracking up to 50% of surface. Extensive to severe flushing or polishing. Some patching or edge wedging in good condition.	Surface aging. Sound structural condition. Needs sealcoat or thin non-structural overlay (less than 2″)
4 Fair	Severe surface raveling. Multiple longitudinal and transverse cracking with slight raveling. Longitudinal cracking in wheel path. Block cracking (over 50% of surface). Patching in fair condition. Slight rutting or distortions (½″ deep or less).	Significant aging and first signs of need for strengthening. Would benefit from a structural overlay (2″ or more).
3 Poor	Closely spaced longitudinal and transverse cracks often showing raveling and crack erosion. Severe block cracking. Some alligator cracking (less than 25% of surface). Patches in fair to poor condition. Moderate rutting or distortion (1″ or 2″ deep). Occasional potholes.	Needs patching and repair prior to major overlay. Milling and removal of deterioration extends the life of overlay.
2 Very Poor	Alligator cracking (over 25% of surface). Severe distortions (over 2″ deep) Extensive patching in poor condition. Potholes.	Severe deterioration. Needs reconstruction with extensive base repair. Pulverization of old pavement is effective.
1 Failed	Severe distress with extensive loss of surface integrity.	Failed. Needs total reconstruction.

** Individual pavements will not have all of the types of distress listed for any particular rating. They may have only one or two types.*

RATING 10 & 9

EXCELLENT —
No maintenance required

Newly constructed or recently overlaid roads are in excellent condition and require no maintenance.

► **RATING 10**
New construction.

► **RATING 9**
Recent overlay, rural.

► **RATING 9**
Recent overlay, urban.

RATING 8

VERY GOOD —
Little or no maintenance required

This category includes roads which have been recently sealcoated or overlaid with new cold mix. It also includes recently constructed or overlaid roads which may show longitudinal or transverse cracks. All cracks are tight or sealed.

◄ **Recent chip seal.**

◄ **Recent slurry seal.**

▲ **New cold mix surface.**

▼ **Widely spaced, sealed cracks.**

RATING 7

GOOD —
Routine sealing recommended

Roads show first signs of aging, and they may have very slight raveling. Any longitudinal cracks are along paving joint. Transverse cracks may be approximately 10′ or more apart. All cracks are ¼″ or less, with little or no crack erosion. Few if any patches, all in very good condition. Maintain a crack sealing program.

► **Tight and sealed transverse and longitudinal cracks. Maintain crack sealing program.**

► **Tight and sealed transverse and longitudinal cracks.**

► **Transverse cracks about 10′ or more apart. Maintain crack sealing program.**

RATING 6

GOOD —
Consider preservative treatment

Roads are in sound structural condition but show definite signs of aging. Seal-coating could extend their useful life. There may be slight surface raveling. Transverse cracks can be frequent, less than 10′ apart. Cracks may be 1/4–1/2″ and sealed or open. Pavement is generally sound adjacent to cracks. First signs of block cracking may be evident. May have slight or moderate bleeding or polishing. Patches are in good condition.

◄ **Slight surface raveling with tight cracks, less than 10′ apart.**

◄ **Transverse cracking less than 10′ apart; cracks well-sealed.**

▼ **Large blocks, early signs of raveling and block cracking.**

▼ **Open crack, 1/2″ wide; adjoining pavement sound.**

▼ **Moderate flushing.**

RATING 5

FAIR —
Preservative maintenance treatment required

Roads are still in good structural condition but clearly need sealcoating or overlay. They may have moderate to severe surface raveling with significant loss of aggregate. First signs of longitudinal cracks near the edge. First signs of raveling along cracks. Block cracking up to 50% of surface. Extensive to severe flushing or polishing. Any patches or edge wedges are in good condition.

▼ **Block cracking with open cracks.**

► **Moderate to severe raveling in wheel paths.**

▼ **Severe flushing.**

▲ **Wedges and patches extensive but in good condition.**

Severe raveling with extreme loss of aggregate. ▼

Load cracking and slight rutting in wheel path. ▼

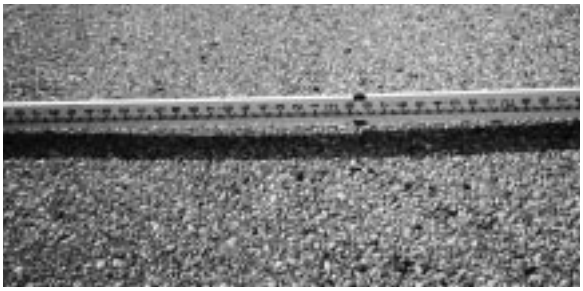
RATING 4

FAIR —
Structural improvement required

Roads show first signs of needing strengthening by overlay. They have very severe surface raveling which should no longer be sealed. First longitudinal cracking in wheel path. Many transverse cracks and some may be raveling slightly. Over 50% of the surface may have block cracking. Patches are in fair condition. They may have rutting less than ½" deep or slight distortion.

◄ Longitudinal cracking; early load-related distress in wheel path. Strengthening needed.

▼ Slight rutting; patch in good condition.



▼ Extensive block cracking. Blocks tight and sound.

◄ Slight rutting in wheel path.

RATING 3

POOR—
Structural improvement required

Roads must be strengthened with a structural overlay (2" or more). Will benefit from milling and very likely will require pavement patching and repair beforehand. Cracking will likely be extensive. Raveling and erosion in cracks may be common. Surface may have severe block cracking and show first signs of alligator cracking. Patches are in fair to poor condition. There is moderate distortion or rutting (1-2") and occasional potholes.

► **Many wide and raveled cracks indicate need for milling and overlay.**

► **2" ruts need mill and overlay.**

► **Open and raveled block cracks.**

RATING 3

POOR — (continued)
Structural improvement required

◄ **Alligator cracking. Edge needs repair and drainage needs improvement prior to rehabilitation.**

▼ **Distortion with patches in poor condition. Repair and overlay.**

RATING 2

VERY POOR—
Reconstruction required

Roads are severely deteriorated and need reconstruction. Surface pulverization and additional base may be cost-effective. These roads have more than 25% alligator cracking, severe distortion or rutting, as well as potholes or extensive patches in poor condition.

► **Extensive alligator cracking. Pulverize and rebuild.**

▲ **Severe rutting. Strengthen base and reconstruct.**

▲ **Patches in poor condition, wheelpath rutting. Pulverize, strengthen and reconstruct.**

► **Severe frost damage. Reconstruct.**

RATING 1

FAILED —
Reconstruction required

Roads have failed, showing severe distress and extensive loss of surface integrity.

◄
Potholes from frost damage. Reconstruct.

◄
Potholes and severe alligator cracking. Failed pavement. Reconstruct.

◄
Extensive loss of surface. Rebuild.

Practical advice on rating roads

Inventory and field inspection

Most agencies routinely observe roadway conditions as a part of their normal work and travel. However, an actual inspection means looking at the entire roadway system as a whole and preparing a written summary of conditions. This inspection has many benefits over casual observations. It can be helpful to compare segments, and ratings decisions are likely to be more consistent because the roadway system is considered as a whole within a relatively short time.

An inspection also encourages a review of specific conditions important in roadway maintenance, such as drainage, adequate strength, and safety.

A simple written inventory is useful in making decisions where other people are involved. You do not have to trust your memory, and you can usually answer questions in more detail. Having a written record and objective information also improves your credibility with the public.

Finally, a written inventory is very useful in documenting changing roadway conditions. Without records over several years it is impossible to know if road conditions are improving, holding their own, or declining.

Annual budgets and long range planning are best done when based on actual needs as documented with a written inventory.

The Wisconsin DOT local road inventory (WISLR) is a valuable resource for managing your local roads. Adding PASER surface condition ratings is an important improvement.

Averaging and comparing sections

For evaluation, divide the local road system into individual segments which are similar in construction and condition. Rural segments may vary from ½ mile to a mile long, while sections in urban areas will likely be 1-4 blocks long or more. If you are starting with the WISLR Inventory, the segments have already been established. You may want to review them for consistent road conditions.

Obviously, no roadway segment is entirely consistent. Also, surfaces in one section will not have all of the types of distress listed for any particular rating. They may have only one or two types. Therefore, some averaging is necessary.

The objective is to rate the condition that represents the majority of the roadway. Small or isolated conditions should not influence the rating. It is useful to note these special conditions on the inventory form so this information can be used in planning specific improvement projects. For example, some spot repairs may be required.

Occasionally surface conditions vary significantly within a segment. For example, short sections of good condition may be followed by sections of poor surface conditions. In these cases, it is best to rate the segment according to the worst conditions and note the variation on the form.

The overall purpose of condition rating is to be able to compare each segment relative to all the other segments in your roadway system. On completion you should be able to look at any two pavement segments and find that the better surface has a higher rating.

Within a given rating, say 6, not all pavements will be exactly the same. However, they should all be considered to be in better condition than those with lower ratings, say 5. Sometimes it is helpful in rating a difficult segment to compare it to other previously rated segments. For example, if it is better than one you rated 5 and worse than a typical 7, then a rating of 6 is appropriate. Having all pavement segments rated in the proper relative order is most important and useful.

Assessing drainage conditions

Moisture and poor pavement drainage are significant factors in pavement deterioration. Some assessment of drainage conditions during pavement rating is highly recommended. While you should review drainage in detail at the project level, at this stage simply include an overview drainage evaluation at the same time as you evaluate surface condition.

Urban drainage.

RATING: Excellent

Good rural ditch and driveway culvert. Culvert end needs cleaning.

RATING: Good

High shoulder and no ditch lead to pavement damage. Needs major ditch improvement for a short distance.

RATING: Fair

No drainage leads to failed pavement.

RATING: Poor

Consider both pavement surface drainage and lateral drainage (ditches or storm sewers). Pavement should be able to quickly shed water off the surface into the lateral ditches. Ditches should be large and deep enough to drain the pavement and remove the surface water efficiently into adjacent waterways.

Look at the roadway crown and check for low surface areas that permit ponding. Paved surfaces should have approximately a 2% cross slope or crown across the roadway. This will provide approximately 3" of fall on a 12' traffic lane. Shoulders should have a greater slope to improve surface drainage.

A pavement's ability to carry heavy traffic loads depends on both the pavement materials (asphalt surfacing and granular base) and the strength of the underlying soils. Most soils lose strength when they are very wet. Therefore, it is important to provide drainage to the top layer of the subgrade supporting the pavement structure.

In rural areas, drainage is provided most economically by open ditches that allow soil moisture to drain laterally. As a rule of thumb, the bottom of the ditch ought to be at least one foot below the base course of the pavement in order to drain the soils. This means that minimum ditch depth should be about 2' below the center of the pavement. Deeper ditches, of course, are required to accommodate roadway culverts and maintain the flow line to adjacent drainage channels or streams.

You should also check culverts and storm drain systems. Storm drainage systems that are silted in, have a large accumulation of debris, or are in poor structural condition will also degrade pavement performance.

The T.I.C. publication, ***Drainage Manual: Local Road Assessment and Improvement,*** describes the elements of drainage systems, depicts them in detailed photographs, and explains how to rate their condition. Copies are available from the Transportation Information Center.

Planning annual maintenance and repair budgets

We have found that relating a normal maintenance or rehabilitation procedure to the surface rating scheme helps local officials use the rating system. However, an individual surface rating should not automatically dictate the final maintenance or rehabilitation technique.

You should consider future traffic projections, original construction, and pavement strength since these may dictate a more comprehensive rehabilitation than the rating suggests. On the other hand, it may be appropriate under special conditions to do nothing and let the pavement fully deteriorate, then rebuild when funds are available.

Summary

Using local road funds most efficiently requires good planning and accurate identification of appropriate rehabilitation projects. Assessing roadway conditions is an essential first step in this process. This asphalt pavement surface condition rating procedure has proved effective in improving decision making and using highway funds more efficiently. It can be used directly by local officials and staff. It may be combined with additional testing and data collection in a more comprehensive pavement management system.

Transportation Information Center Publications

Pavement Surface Evaluation and Rating (PASER) Manuals

Asphalt PASER Manual, 2002, 28 pp.

Brick and Block PASER Manual, 2001, 8 pp.

Concrete PASER Manual, 2002, 28 pp.

Gravel PASER Manual, 2002, 20 pp.

Sealcoat PASER Manual, 2000, 16 pp.

Unimproved Roads PASER Manual, 2001, 12 pp.

Drainage Manual
Local Road Assessment and Improvement, 2000, 16 pp.

SAFER Manual
Safety Evaluation for Roadways, 1996, 40 pp.

Flagger's Handbook (pocket-sized guide), 1998, 22 pp.

Work Zone Safety, Guidelines for Construction, Maintenance, and Utility Operations, (pocket-sized guide), 1999, 55 pp.

Wisconsin Transportation Bulletins

#1 Understanding and Using Asphalt
#2 How Vehicle Loads Affect Pavement Performance
#3 LCC—Life Cycle Cost Analysis
#4 Road Drainage
#5 Gravel Roads
#6 Using Salt and Sand for Winter Road Maintenance
#7 Signing for Local Roads
#8 Using Weight Limits to Protect Local Roads
#9 Pavement Markings
#10 Seal Coating and Other Asphalt Surface Treatments
#11 Compaction Improves Pavement Performance
#12 Roadway Safety and Guardrail
#13 Dust Control on Unpaved Roads
#14 Mailbox Safety
#15 Culverts-Proper Use and Installation
#16 Geotextiles in Road Construction/Maintenance and Erosion Control
#17 Managing Utility Cuts
#18 Roadway Management and Tort Liability in Wisconsin
#19 The Basics of a Good Road
#20 Using Recovered Materials in Highway Construction
#21 Setting Speed Limits on Local Roads

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