CONCRETE PAVEMENT STUDY

For Walden Section Seven

Job No. 13222

PREPARED FOR

Walden Townhouse Association

PREPARED BY

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1) Introduction

The Walden Townhouse Association (WTA) has directed Bleyl Engineering (Bleyl) to prepare a pavement study for Walden Section Seven. Section Seven is a townhouse development with four private concrete streets. The subdivision was platted in 1973 and is comprised of approximately 135 lots within 20 blocks (per the original plat). The area abuts Lake Conroe on three sides. It is accessed from Walden Road onto Emerson Road and then cross Melville Road to enter Section Seven. The development is in the eastern and northern area within the Walden development. Section Seven water, sewer, and storm facilities fall under the jurisdiction of Montgomery County MUD No. 8. All streets are privately owned and maintained by the WTA.

The roadway in Section Seven is aging and has many issues that need attention. This report covers damaged areas that appear to be the most critical. Additional areas that previously appeared to be in acceptable condition could develop issues in the future due to forces such as natural ground movement in expansive soils, infiltration, heavy traffic volume, or heavy loads.

Bleyl has examined the roadway and is providing recommendations for pavement repairs and maintenance items that will help rehabilitate the streets. The following report contains detailed descriptions and pictures of our findings in the field.

2) Service Area of Walden Townhouse Association

The WTA comprises the internal area of Walden Section Seven boundary as recorded in Montgomery Plat Records in Cabinet A, Sheets 113A.001 and 113A.002. The WTA owns and maintains the common areas running between the privately owned townhouses. The WTA also maintains the four private streets: Lakewood Drive, Knollcrest Drive, Glencrest Drive, and Trail Hollow Drive. There is also one unnamed connector street with parking spaces near the north end of the subdivision. Melville Drive along the south boundary of Section Seven is not in the WTA service area.

The length of each street varies. Knollcrest Drive is nearly 1,040 linear feet measured from Melville Drive to the north end of the development. Lakewood Drive is approximately 1,070 linear feet and runs from Melville Drive to Lakewood Drive at the north end of the subdivision. The crossing streets between Knollcrest Drive and Lakeview Drive are Glenview Drive, which is approximately 750 feet, and Trail Hollow Drive, being approximately 400 feet long. The unnamed connector street is approximately 90 feet. This totals 3,350 total linear feet of concrete roadway. The streets are 25 feet wide which calculates to over 83,750 square feet of pavement to maintain.

3) Factors Affecting Concrete Pavement Lifecycle

Please refer to the **Exhibit 1** Pavement Repair Location Map which pinpoints the areas described in **Exhibit 2** Paving Inspection Pictures, Description of Current Conditions, And Recommendations which also has a section with definitions for terms used in the report.

The Section Seven streets have issues that derive from several factors. Not all factors affect each location, however, each location identified can be affected by more than one factor identified below.

Age is the first factor. Age can be a factor because of Texas heat, freeze and thaw cycles, etc. but does not by itself determine the current health of concrete paving.

Soil type is another factor. This area of Texas has non-cohesive soils (sandy) and expansive soils (clay). Sandy soil can erode easily with storm runoff. The Clay type soils can expand in rainy seasons and shrink during drought periods, causing a significant ground movement. This action can cause concrete to crack. Even with concrete streets being poured with expansion joints, contraction joints, and steel reinforcement, the ground movement can still cause cracking at any location. The movement of the soil can widen the joints or create cracking, which can allow water to soak down under the pavement to the subgrade.

Infiltration and subgrade failure are factors. Water soaking down to the subgrade is called infiltration and is one of the biggest factors affecting roadway life. The subgrade is a chemically altered layer (using cement, fly ash, or lime) that is compacted to a hard surface that supports the pavement. Concrete is a strong material, but it requires the subgrade to remain a hard, compacted surface to handle the heavy loads applied to it. A soft or failed subgrade will allow the concrete to flex, or bend resulting in cracks or breaks if the force exceeds the limits of the concrete and steel reinforcement.

Pumping is a major factor. When infiltration occurs and the subgrade is softened, then the pavement can experience pumping. Applying heavy loads over these areas when water is saturating the subgrade can create a pump-type action where water that has infiltrated under the paving is forced out and brings with it some subgrade material that washes away. As the load is removed (vehicle tire rolls off), more water rushes back down under the paving. Each cycle of the pumping action makes the subgrade softer, expels more subgrade, and creates a void resulting in subgrade failure. Concrete will crack, settle, and break without a stable subgrade. The condition will continue to degrade and possibly affect other concrete panels if left unattended. Sealing joints and maintaining the seals properly helps prevent this issue.

Heavy loads are a factor. Heavy vehicles or heavy volumes of passenger cars can create cracking and breaking of concrete due to the infiltration and softening of the subgrade. Lakewood Drive and Knollcrest Drive tend to have high volumes of traffic each day. Daily traffic can also include heavy loads from delivery vehicles, trash trucks, and concrete trucks which can worsen cracks and breaks. Trail Hollow Drive and Glenview Drive have similar issues but to a lesser degree since these streets have fewer cars traveling on them per day.

Wear can be a factor. It leads back to age but can also affect newer concrete with high traffic volumes. Over time the portland cement surface can wear away and expose the aggregate. Tires can begin to dislodge the rock aggregate from the concrete pavement. Although some wear is apparent, it did not appear to be a primary issue in Section Seven.

Cracking and chipping can be factors. Concrete is an excellent material to withstand heavy loads referred to as compression loads, however, if the roadway does not have a solid subgrade, the concrete can bend and crack. Some cracks have minimal impact on the life of a roadway, other cracks in conjunction with infiltration and subgrade failure can continue to crack in other directions or an applied force downward on the crack can cause the two sides of the crack to press hard against each other and chip away. This action can be found on the surface of the road where there is material missing along the crack.

Concrete strength can be a factor. Concrete mix design can be devised to have different strengths which is typically noted in pounds per square inch or PSI. Roadways and driveways usually call for a strength of 3,500 to 4,000 PSI. Texas can be very hot in the summer months. Concrete being hauled in concrete trucks can suffer from the water content being evaporated out before the concrete is poured due to the heat. Some contractors may add water to the concrete in the field to help make the concrete more workable. Adding water at that point can produce a concrete strength that is less than the original mix design and is more susceptible to damage from loads, infiltration, etc.

Freeze and Thaw cycles can be a factor. Although Texas does not have freeze-and-thaw cycles like northern states experience, the condition does occur occasionally and can cause existing issues to worsen. Infiltration of water that freezes and expands can create cracking and breaking of the concrete. This condition is another reason to ensure the joints remain sealed.

Storm Issues can be a factor. Large storms can cause damage to any structure that may not be controlled by a major event, but if a roadway has an issue with infiltration, failed subgrades, and failed seals around pipes and inlets, then a storm can worsen issues below the pavement. In rare cases, stormwater can eventually create an underground stream that can wash sandy soils into a pipe or inlet at a failed joint or joint seal. Glenview at Lakewood has such an issue. Storm runoff currently can flow freely into a failed joint, which has led to an eroded subgrade to create a large void, and the water flows around the outside of the storm pipe and into the inlet. Soil and subgrade material slowly wash away to create a void under the pavement. The void will become larger over time and could collapse with a heavy enough load.

4) Overview of Concrete Street Conditions

The streets within Section Seven are 50 years old. Many areas are still holding up structurally. The goal of this report is to provide opinions and recommendations to extend the life of the concrete and restore the failed pavement to a condition that provides a smooth ride throughout the development that will last for many years to come. Although many areas of the roadway are still in good condition, many areas need repairs to prevent

the good areas from developing future issues and damage. Refer to **Exhibit 1** Pavement Repair Location Map and the Paving Inspection Pictures, Description of Current Conditions, And Recommendations as reference.

Cracking is prominent throughout all streets. Some cracks are minor with no gaps in them. Other cracks have developed into wide gaps and need to be sealed or have the concrete repaired. All pictures show cracking but if the cracks are not maintained they could deteriorate to a condition as seen in areas 2, 4, 7, and 19 as a few examples.

Sealant on joints is missing or no longer effective. There are visual signs that an asphaltic seal was applied in years past, but the seals have been missing for a long time which allows infiltration that leads to other problems. Areas 6, 8, 10, 12, and 14 lists a few examples where joint sealant could have prolonged the life of the paving by preventing infiltration.

Pavement settling was found in numerous areas. Areas 2, 3B, 7, 8, 11, 12, 13, 16, 18, and some others are settling to varying depths between panels (3/4" to 3"). Once the condition has begun, it will continue to worsen over time. The only solution is to make a proper repair by removing and replacing the concrete and subgrade, reestablishing all joints, and installing the sealant material along all joints.

Broken concrete in the corners or within the panels was observed. Areas 9, 11, 13, 15, 16, 17, 20, 21, 22, and others show examples of broken panels that require proper repair and joint sealant to rehabilitate these areas.

Other issues that derive from infiltration and failed subgrade are chipping at the surface along the cracks. Potholes can occur from damaged areas being driven over by tires making an impact where the pavement is chipping and loosening more material to form a void on the surface as seen in Areas 10, 20, 21, and 22.

Trees and roots that grow under pavement can be a problem. Roots can lift pavement which will lead to cracking, breaking, and infiltration that can create more issues. Trees did not appear to be a major issue in Section 7, however, trees near the roadway on Lakewood Drive between Melville and Glenview hold the potential to damage concrete streets. The trees are healthy and well-established. The aesthetics created by the trees is desirable for the neighborhood. These areas need to be monitored and considered for repairs on a case-by-case basis if the tree roots are causing damage.

5) Typical Repair of Concrete and Recommendations

The goal of the recommendations is to help guide repair work to the failed areas of concrete and restore the concrete pavement to its original or good condition. The following are detailed descriptions of the work needed to be performed as noted in **Exhibit 2.** Read through Exhibit 2 after Section 6 to learn about each problem area and the recommendation for each repair.

JOINTS AND CRACKS

Crack Fill. If cracks have a gap that will allow a piece of paper to be inserted in the crack then a small amount of sealant is recommended. Tool clean and blow out the crack. Larger cracks need

to follow the Preparation for Joint and crack repair to be cleaned and use a backer rod to seal the crack.

Preparation for Joint and crack repair. The area in the joint or crack must be a clean surface, dry, and void of all loose debris. Old expansion joints may have decayed redwood boards between the panels. The old materials need to be removed to leave at least 2 inches in depth. The gap should be tool cleaned to pull up any debris. A wire brush could be used to clean the surfaces, but this process may be slow in large-scale projects. In some cases, the joint may only need to be blown out with a high-pressure air gun after loosening any dirt and debris, but if the surfaces are covered with muddy soil residue, then power washing is required to provide a clean surface. Let the joint dry out thoroughly and then install the backer rod at a depth to create a sealant bridge that is about 1/2" deep for a joint that has a 3/4 to 1-inch gap.

Backer rod. Any joint or crack wider than 1/4 of an inch may need to use a backer rod. The backer rod is a foam material that is very flexible and pliable and comes in many different diameters to cross any joint/crack size. The rod material is sold in small packages or a box with large linear footage and is cut-to-fit by the installer. All new and existing expansion joints and cracks exceeding 1/4 inch will need a backer rod. Use a backer rod that is 1/8" larger than the width of the joint to allow it to be set at the desired depth to allow about a 1/2" thick layer of sealant.

Sealants. The recommended material to use for sealing cracks and joints is a polyurethane elastomeric product. One brand is Sika, the manufacturer of Sikaflex (there are others that are also very good; consult with a paving specialist). The typical joint width-to-depth ratio is 2 to 1 and the thickness should be 1/2" thick for pavement. The backer rod helps ensure this ratio is achieved. Polyurethane sealant be purchased in premixed caulking tubes for small areas or a 5-gallon two-part mix that can be used in commercial equipment for larger projects. A non-sag formula that can stretch up to 50% is recommended for all areas. A self-leveling (SL) formula is not recommended unless the area is very flat because the material will freely flow to the lowest point and puddle up where it is not wanted or can flow deeper into a crack causing the need for extra sealant. The non-sag formula can span the 1/4" gaps without the backer rod and will span larger gaps with the backer rod to ensure the proper thickness.

CONCRETE REMOVAL AND REPLACEMENT

Refer to **Exhibit 4** for a detailed drawing on repaving an area where concrete was saw cut and removed.

Saw cutting and removal of old concrete. For the replacement of a concrete panel or a smaller area, saw cutting full depth of the concrete is necessary. Saw cutting provides a smooth, clean surface for restoring expansion joints or concrete butt joints (non-expandable joints). The area to be replaced should be defined and chalk lines snapped on the concrete to create a straight line to follow with the saw. Full-depth saw cut is what the name implies and cuts down through the slab and steel to the bottom. The removal areas will need to be jackhammered out by hand or by a large hammer mounted on a skid steer machine. The debris should then be hauled off and legally disposed of.

Subgrade replacement. Once the broken-up concrete is removed, the subgrade must be restored to a hard compacted surface. Removal of the failed subgrade is required. It is recommended to remove the old subgrade to a depth of 6" below the bottom of adjacent concrete paving. At

locations that have settling pavement, remove some subgrade under the adjacent slab to form an undercut area where the subgrade has failed. Fill the area with cement stabilized sand (CSS) comprised of a 2-sack Portland cement per ton of sand mixture. Compact the CSS into place to 95% standard proctor density which is a measure of the compaction to achieve a solid base for paving. Compact the CSS under the adjacent panel anywhere the subgrade was undercut before compacting the area as a whole. The CSS should be added and compacted until the final surface meets the bottom surface of adjacent concrete.

Steel reinforcement. Steel reinforcement must be added to all concrete repairs. Number 4 deformed bars (also called #4 bars or #4 rebar) spaced at 24" on center each way (maximum spacing) should be used in all replacement areas. No. 3 bars at an 18" spacing is allowable and may be a better option for smaller repairs. The following is for adding reinforcing steel and does not include expansion joints which will be described separately. The repair steel shall be installed by drilling into the existing adjacent concrete slab approximately **3 to 4 inches below the surface of the concrete**. Drill depths must be a minimum of 6" into the existing concrete and the deformed dowel epoxied into the hole. Continue this on all sides. Opposite side holes should line up so the steel form a straight line gridded pattern. All crossing steel must be tied together with wire ties. The steel should be supported by plastic chairs or brick pavers (can be half a brick) which keep the steel suspended into the new concrete and prevents the steel from sagging to the bottom and not providing the reinforcement required.

Expansion Joints. If an expansion joint is being reestablished, then a 3/4" hole must be drilled into the existing slab 12" deep. The expansion joint material can be redwood, polypropylene, or a bituminous fiberboard with holes aligning with the drilled holes to allow the dowel to protrude through the board. An 18" long dowel bar must be epoxied into the hole with 9" of smooth bar exposed into the area where new concrete will be poured and leaving 3" of concrete cover over the dowel. The smooth bar must have a plastic sleeve that will be cast into the new concrete to create a slidable channel for the dowel during expansion and contraction of the concrete slab. A manufacturer named SureBuilt Concrete Forms and Accessories sells plastic dowel sleeves and is one example.

Butt Joints. Butt joints are the location where the new and old slabs of concrete join. Steel will be added as per the steel reinforcement instructions above. The butt joint has either an existing vertical side of a concrete slab or one created by a saw cut. The joint needs to be free of all dust and debris. Pour the new concrete up against the existing concrete and finish the concrete surface with a broom finish (or other acceptable finish to provide a non-slip texture). When the concrete has cured long enough to handle saw cutting without raveling (6 to 18 hours max), saw cut 1" deep and 1/4" wide. The saw cut must be sealed with a polyurethane sealant squeezed into the gap. Consult the joint sealant manufacturer for the earliest the joints can be sealed for new concrete (ranging from a few days to 28 days).

Contraction joints. The contraction joint will provide a controlled location for concrete to crack below the saw cut. Contraction joints should be added where long pavement replacement sections have been done. These joints are simply 1/4" wide and 1-1/2" to 2" deep saw cuts from the center of the road to the gutter and spaced a maximum of 20 feet from expansion joints or other contraction and butt joints. These should be cut after the surface finish work is complete (6 to 18 hours max) as long as the concrete has set to a proper condition to allow saw cutting. The saw

cut gap must be filled with sealant after the proper curing time has been achieved as per the sealant manufacturer's recommendation.

Additional Considerations. Walden Section Seven has a "rollover" style curb. This means it is a concrete curb typically formed monolithically with the driving surface. The rollover curb is only 3 to 4 inches tall in relation to other curbs. The curb design does not require any length of it to be removed to tie in a new driveway, rather the driveway is constructed to meet the top of the rollover curb. The curb must be replaced in all locations where it was removed to repair the area. Do not allow this curb type to be poured separately from the replacement concrete pavement like some 6" tall curbs are constructed. The thinner layer of concrete will be susceptible to cracking and breaking from automobile weight if poured as a separate unit. The curb must be poured monolithically with the pavement. The contractor must restore the established grades between panels and form a flush surface with all surrounding concrete surfaces but must ensure positive drainage is achieved. As noted, the surface must be finished with a non-skid broom finish

6) Costs of Repairs

Exhibit 3 is the Engineer's Opinion of Cost. The inspection identified 22 areas that need attention. The areas were approached with the idea that the most problematic areas be included in an initial repair phase, while other areas that can wait would be repaired in the near future. The areas were given a status of Priority 1, Priority 2, and Priority 3. Budgeting is a consideration and may require some areas to be pushed back or may allow others to be done sooner. Refer to the Engineer's Preliminary Opinion of Cost for Priories 1, 2, and 3 for reference. Individual areas' costs can be easily seen and calculated from the cost estimate. Costs are calculated by grouping many repairs into a larger project to get the best prices for the rehabilitation of the paving. One single area may cost more if done individually. The distance to the project site and the distance to haul off debris was considered in the estimated cost. Mobilization for a contractor was considered but is included with the unit cost by doing many repairs in one phase.

Priority 1 areas include Areas 1, 3B, 4, 6, 7, 8, 12, 13, 14, 16, 17, and 19. Areas called EXTRA is work to apply a joint sealant to all the expansion, contraction, or butt joints along all streets. The joint length is calculated from the length of the street and assuming a joint crossing the street (25 feet long each) at a 40-foot interval. The estimated cost to repair these areas is $69,460. The board could shift a few items from Priority 1 to a future repair phase such as some of the extra joint sealing work if limited by the current budget. The damage in any area can become more serious if repairs are postponed for a long period.

Priority 2 areas include Areas 1(sealant), 2, 3A, 9, 10, 11, 15, 17, 18, 20, 21, and 22. These were considered to be included in a future phase due to having less current damage and assumed can be done with a following repair phase due to annual budgeting. Although considered to be less problematic as priority 1, these areas need to be repaired as recommended as soon as possible. The estimated cost for Priority 2 repairs is $44,625.

Priority 3 areas are the remaining areas that need repair and may be acceptable to repair last. Some of these areas may have sealant applied in Priority 1 or 2 to help halt any damage and allow the repairs to be done relatively soon. Priority 3 work may be included

with Priority 1 or 2 work if the budget allows and the Board deems it appropriate to get the repairs completed sooner. The Priority 3 repairs are estimated to be $3,115.

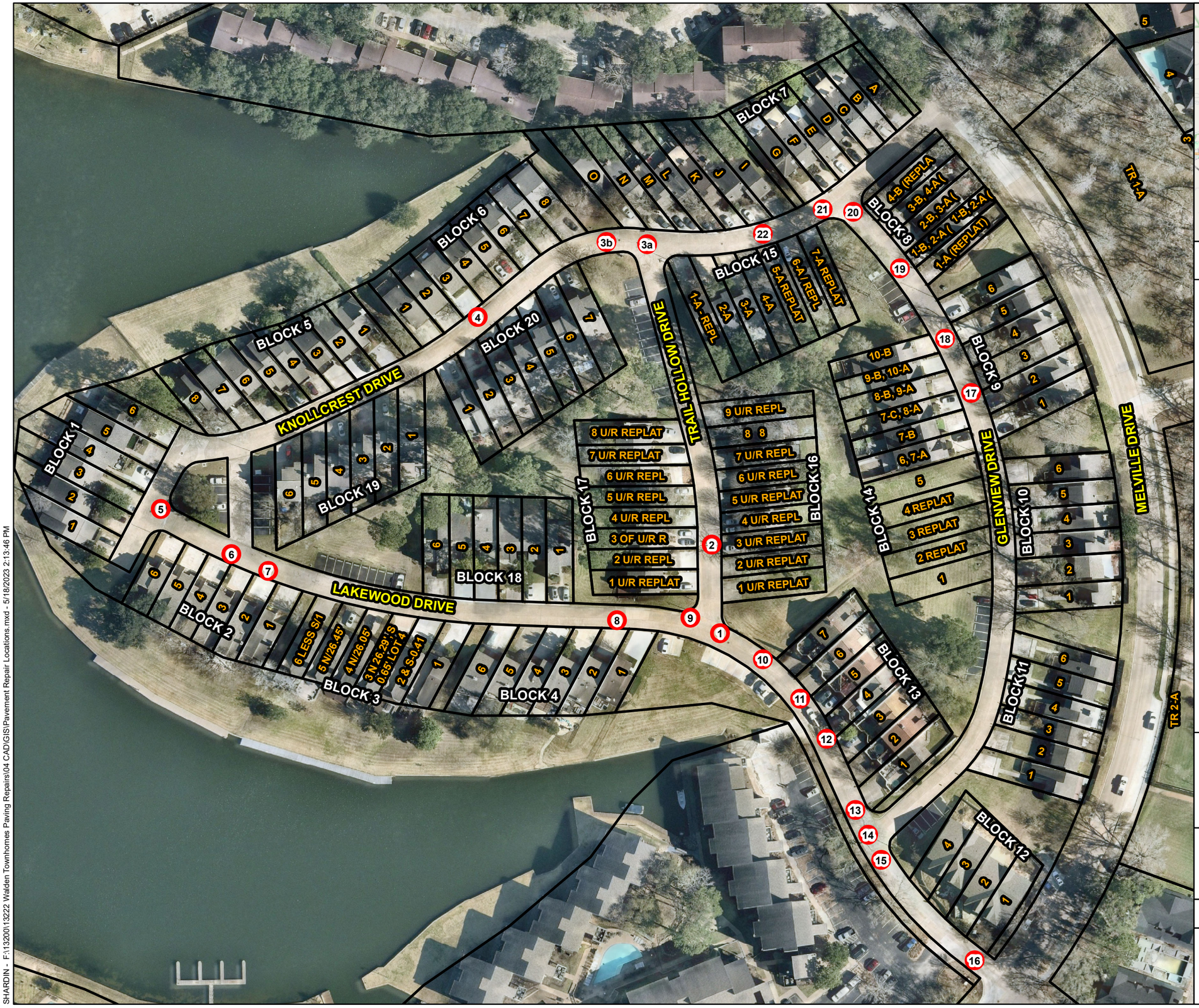
Additionally**,** The MUD 8 Engineer was contacted and was sent photos of the storm manhole aprons that are damaged, cracked paving near the storm manholes, and the inlet and pipe with the failed seal at Glenview Drive and Lakewood Drive. A separate cost estimate has been created but the costs were not subtracted from any of the priorities listed above. The MUD may be receptive to assisting with the cost of repairs or providing reimbursement, but the Walden Townhouse Association will need to have that discussion with the MUD 8 Board. The costs for the repairs directly related to the manholes, inlets, or underground piping are estimated to be $12,400.

7) Conclusion

The goal for paving rehabilitation is to restore the streets within Walden Section 7 to a good condition and create flush surfaces that provide a smooth ride quality, and prolong the life of the roadway. This report examined the most prominent locations needing repair. The onsite inspection did not identify and number every minor crack but does note to seal any crack that appears to be separating as part of the Priority 1 work.

Following the recommendations per **Exhibit 2** (Paving Inspection Pictures, Description of Current Conditions, And Recommendations) the streets can be brought up to the desired condition for creating a smooth ride and longer-lasting pavement. In this region of Texas with clay soils, natural expansion and contraction of the soils is unavoidable, and is almost impossible to keep it from affecting paved surfaces. Proper repairs and construction standards should be followed to minimize that effect and control cracking. Expansion joints and contraction joints are necessary to provide relief points in the paved surface to offset the movement. Sealing of the joints is also critical because as the earth moves the concrete, or the concrete expands or contracts, the joints can become locations for stormwater to penetrate down to the subgrade and begin causing issues. This infiltration can cause the subgrade to soften and fail, which causes pavement cracking, breaking, or sagging. Sealing the joints is the key to preventing infiltration that will lead to damage to the concrete pavement. Being proactive to monitor and replace missing concrete sealants on joints is one of the most overlooked but very necessary preventative measures to lengthen the life of the concrete pavement.

Exhibit 1 – Pavement Repair Location Map



VICINITY MAP

Note:
This exhibit by itself does not represent final complete work. It is presented to contextually illustrate pertinent information related to the subject matter of the exhibit.

LEGEND

- Pavement Repair Areas
- Parcels

PAVEMENT REPAIR LOCATION MAP

WALDEN TOWNHOMES PAVING REPAIRS

N

0 50 100 150 200 Feet

1 in = 100 ft

Date: 5/18/2023	Author: SBH	Job No. 13222

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Exhibit 2 – Paving Inspection Pictures, Description of Current Conditions, and Recommendations

Paving Inspection Pictures, Description of Current Conditions, and Recommendations

Walden Townhouse Association. Concrete Pavement Study.

Note: See the location Map for corresponding areas numbered 1 through 22.

Definitions for terms used in the report and recommendations:

Priority 1: Most critical area. Repairs are needed in the current budget or as soon as possible.

Priority 2: Needs attention but can be postponed for the next budget cycle for repairs.

Priority 3: Needs future attention. Monitor condition. Include in future budget repair cycles.

Backer Rod is an important item for sealing expansion joints and large cracks. It is a foam material that comes in various diameters used to fill small or large joints before the application of a sealant. The backer rod must be large enough to touch both sides of a concrete panel or a large crack. The backer rod will fill some of the voids to help reduce the amount of sealant needed (saves money), prevents the seal from sagging into the joint, and helps the sealant material to stretch during paving contraction and expansion cycles.

Butt Joint is a type of construction joint where freshly place concrete butts up to an existing concrete edge. The edges must be smooth from a form or saw cut and then filled with a sealant.

Expansion Joint is a type of construction joint that has a material such as redwood boards or a bituminous material that will allow the concrete to expand during hot sunny weather. The joints must be sealed to prevent infiltration.

Infiltration is a process by which rain and or stormwater runoff flows/absorbs from the ground surface to the lower subsurface of soil. This can occur between concrete panels and is a major source of damage over time.

Pond or Ponding is when stormwater does not drain away and remains in a low-lying area after a rain event. This can occur on paved surfaces (sometimes called bird baths) or on natural soil or grassy surfaces. Ponding over joints of concrete that are not sealed will lead to infiltration through the joint and softening of the subgrade will most likely occur.

Pumping is the ejection of material by water through joints or cracks, caused by deflection of the slab under passing loads. As water is ejected, it carries particles of gravel, sand, clay, or silt, resulting in a progressive loss of pavement support.

Tool Cleaning is a process of using hand and power tools (blower, vacuum, pressure washer) to remove debris from the cracks and joints for sealing. The crack or joint must be dry and clean for good adhesion of the sealer material. Power washing may be required with this process to expel dirt, mud, and debris and help provide a clean surface. A strong power blower or a vacuum is required to expel dirt (after tool and power wash) and prepare every surface for the sealant. (See Backer Rod)

Settling is a problematic condition where the pavement settles and sags down due to a failed subgrade, typically accompanied by cracking or breaking of the pavement.

Subgrade as used in this report is the soil or material under the concrete street that supports the concrete paving which needs to remain a hard, compacted material. Often called the “stabilized subgrade” by contractors and engineers, it is the native soil or a material hauled in that has been mechanically compacted, chemically altered to change the soil properties (such as adding Portland cement, lime, or fly ash) and compacted, or replaced with suitable material and compacted to support the concrete paving. If the subgrade begins to fail or has failed due to infiltration, concrete paving will also begin to fail as seen with large cracks, broken area, and settling that allow settling. Note that some cracking is due to expansive soils (clay soils) in this area of Texas which can expand and contract during heavy rain periods and very dry periods.

Seal as noted in this report is a material used to fill joints and cracks. The recommended material for concrete is a polyurethane elastomeric sealant material. There is a self-leveling type or “SL” that is good for very flat surfaces because it will level out by gravity. It is not recommended for use on slopes because it will try to flow to the lowest point. The type recommended for these repairs is a non-sag or “NS” type for all surface slopes (even vertical). For sealants to be effective. (See Backer Rod)

Area 1 Lakewood Dr. & Trail Hollow Dr. Intersection **(Priority 2)**.

Concrete around the storm MH in the center of Lakewood Drive has cracked in panels on the north side but no areas have significant settling and poses no urgent need for repair next to the MH. Stormwater appears to drain away quickly from this area to the nearby inlet and does not appear to pond. If the broken area begins to settle then removing and replacing the concrete would be recommended. **Currently, it is recommended to tool clean and seal all cracks and joints at this location to prevent infiltration and future damage.**

Area 1: Cracking around storm MH and inlet

Area 2 Trail Hollow Dr. **(Priority 1 -Seal) (Priority 2-Repair)**

Near Block 16, Lot 3. The concrete has cracks exceeding 1/4" wide. There is a small area where the concrete has broken and has settled 1" from water infiltrating down to the subgrade. The pavement settling (sag) appears to have occurred in previous years (Trail Hollow has a lower cars per day average). **Recommend tool cleaning and blow out debris and seal cracks (Priority 1) to prevent further damage. Saw cut full depth to remove and repair a 4'x4' area in the future (Priority 2). Seal all joints after repair.**

Area 2 broken concrete with 1" settled pavement.

Area 3A Knollcrest Dr. at Trail Hollow Dr. **(Priority 2)**

The Storm Manhole at the intersection has an apron that is cracked and a large piece of concrete is missing. The MUD has been contacted to see if they will help with repairs and pour a larger apron that extends out 12" minimum on all sides. The road has cracking and chipping damage around the apron that could be from freeze-thaw cycles or heavy loads applied over the cracked apron. **The recommendation is to saw cut out damaged concrete and install a larger apron around the manhole (Approx 6'x6' apron), and repair adjacent paving damage Approx area measuring northward 8' from the road expansion joint for the full road width of 25 feet (Approx. 22 SY: 18 SY Paving, 4 SY manhole apron). Seal all joints.**


Area 3A with broken Apron around MH

Area 3B Knollcrest Dr. north of Trail Hollow Dr. **(Priority 1)**

The storm manhole and roadway in this area have damage consisting of concrete settling below other panels, snapped-off edges, cracks, and chipping. The settling appears to be due to water infiltration and pumping from heavy loads and traffic volumes. The area appears to have had concrete replaced previously without using standard repair methods. The reason for prior repairs is not clear but may have been made due to a storm pipe issue based on the patch location. The pavement has settled 2" on the east side of the manhole. The repair will require cutting out and replacing concrete to provide a flush surface. The apron appears to be in good condition with one minor corner chip. **Recommend saw cutting full depth from the centerline of the roadway east to the curb, measured 2 feet south of the MH apron. Then saw cut full depth from the centerline of the roadway east to the curb measured 8' north of the MH apron. Remove and replace 18 SY paving on the east panel. Do not disturb the MH apron. Seal all joints. This is a minimum repair. The replacement of concrete for the full road with should be considered and will require an additional 18 SY of concrete on the west panels (ALTERNATE ITEM).**


Area 3B with damage around storm manhole. Pavement has settled 2" which requires replacement.

Area 4 Knollcrest Dr. near Block 6, Lot 3 **(Priority 1)**

The roadway has a significant 3/4" wide crack. There are signs that the paving is settling due to water infiltration through the crack that softens the subgrade and heavy traffic allows the concrete panel to settle. Ponding water is infiltrating down to the subgrade and can be seen as a waterline that is apparent 4 feet out into the roadway (dark area by the curb). **Recommend tool cleaning and sealing the crack to prevent further infiltration and halt settling.**

Area 4 has a 3/4" wide crack in concrete on Knollcrest Dr.

Area 5 Knollcrest Dr. near Block 2, Lot 6 **(Priority 3)**

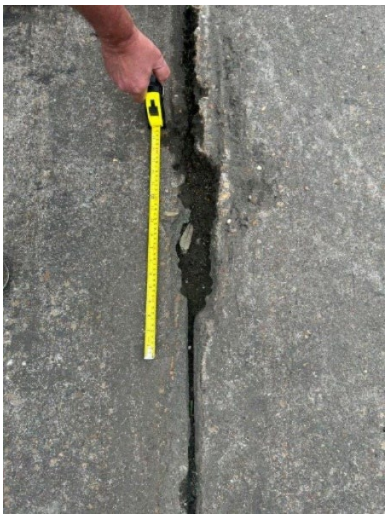
The concrete roadway previously was chipped out to install conduit under the paving for streetlights. The removal and repair were done by breaking and chipping out the concrete. The repair was done without saw cutting to create a smooth butt joint. The edges do have some cracking and chipping, but the area does not appear to need immediate repair but the edge will continue to degrade from. This area should be monitored and re-evaluated in a couple of years and can be considered for repair in future repair phases. **Recommend cutting out an area approximately 4 feet wide (3 inches outside of the jagged joint minimum) for the full width of the street. Provide saw cut butt joints on both sides and seal the joints. Approx. 12 SY.**

Area 5. Concrete chipped out and replaced without saw cutting at northern end of Knollcrest.

Area 6 Lakewood Drive: West Joint of Unnamed Connector Street **(Priority 1)**

The concrete expansion joint in this area needs to be sealed. The original seal is gone and water can infiltrate below the concrete. The joint has a couple of areas where the edge of the concrete has chipped and has created a larger crack/void for water to infiltrate through. Water appears to pond/stand in the joint after any type of runoff (rain, sprinklers, washing cars). The paving currently has not settled between panels and concrete patching in the chipped areas will not hold up. **Recommend tool cleaning to remove all dirt and debris and seal this joint in the first repair cycle to halt any infiltration. A backer rod should be used with the sealant to fill in the lower areas of the joint. Approximately 50 LF of joint sealant is required.**





Area 6 is an expansion joint that has deteriorated and allows infiltration. A sealant in the joint is needed to stop infiltration.

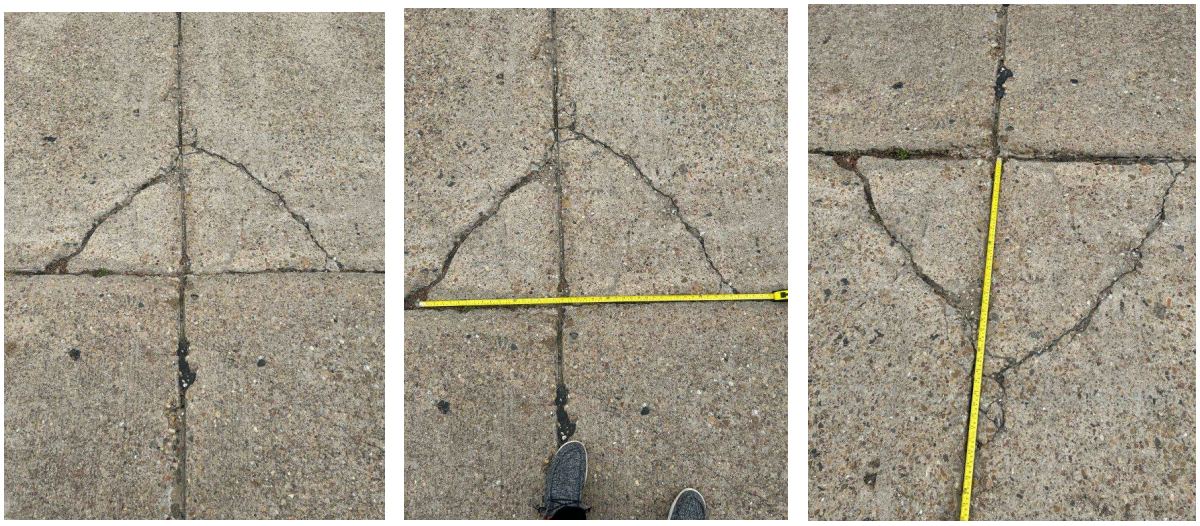
Area 7 Lakewood Drive at Block 2, Lot 2 **(Priority 1)**

The concrete at this location has a substantial crack across the full road width. The western panel has settled 3/4” measured at the centerline of the street. The ponding area is apparent from the watermark. **Recommend tool cleaning the cracks and centerline joint and sealing all joints and cracks in the area to prevent infiltration that can lead to continued future damage**.


Area 7 has a substantial crack that should be sealed to prevent further damage.

Area 8 Lakewood Drive at Block 4, Lot 2 **(Priority 1 -Seal) (Priority 3-Repair)**

The corners of the concrete at two adjacent panels have cracked at the centerline of the road. This indicates infiltration that has weakened the subgrade. Enough weight from many vehicles has cracked the corners and allowed the pieces to settle 3/4" below the adjacent panels. The general dimensions are 42" x 32" which will require a minimum repair area to patch of 48"x 48" or 2 SY. **Recommend sealing the cracks to stop infiltration and then monitoring (Priority 1). Include the location in a future concrete repair phase (Priority 3).**



Area 8 has broken corners due to infiltration and failed subgrade

Area 9 Lakewood Drive at the intersection of Trail Hollow Drive (northern area) **(Priority 2)**

The northern area of the intersection has cracked into a triangular section measuring 6' x 2'. It appears the area has cracked to a soft subgrade and excess weight. This area will continue to degrade over time due to infiltration and softening of the subgrade and the frequency of heavy loads over the area. The area does look poor but the top surfaces are flush. This area should have a rectangular repair patch that is 3 to 6 inches outside of all cracked lines. The estimated repair area is 4'x8' min (4 SY). **Recommend saw cutting full depth to remove the damaged concrete. Remove and replace 4 SY of concrete in a rectangular shape (avoid acute/sharp angles).**

Area 9. A triangular cracked area on Lakewood Drive at the intersection of Trail Hollow Drive.

Area 10 Lakewood Drive near Parking Area **(Priority 2)**

The concrete joint at this location has edge cracking that appears to be due to infiltration and softening of the subgrade under the joint and heavy loading on the joint over time. The surface of the paving is still flush except for the broken edges and should be considered for repair soon. **Recommend saw cutting full depth two feet from the joint on the damaged panels for the width of each 12.5-foot wide panel (centerline to gutter). Reestablish the expansion joint. Remove and replace 6 SY concrete pavement and seal all joints.**

Area 10. Damage at the edge of the joint needs repair to prevent more damage.

Area 11 Lakewood Drive near Parking Area **(Priority 2)**

The concrete in this area has cracked on both sides of a storm manhole and the apron around the manhole. The damage appears to be due to infiltration which has caused softening of the subgrade and heavy loads applied at this location. There is a previous area of concrete that was replaced adjacent to the manhole. It appears no joint sealant was used around the previous repair. **Recommend removing and replacing the concrete apron around the manhole (~70"x 60" = 3 Y). Saw cut full depth 5 feet north of the MH apron for the full street width and approximately 5 feet south of the MH apron for an area of 16'x12.5' or 20 SY (not including conc apron). Replace 23 SY concrete in total for all repairs. Seal all joints including the previous repair area.**

Area 11. Damage around storm MH.

Area 12 Lakewood Drive near Block 13, Lot 4 **(Priority 1)**

The concrete at this location has settled in the west panel. Infiltration and softening of the subgrade along with heavy loads being applied have led to a 3" of settling between panels. The edge of the higher panel is black from tires rubbing the edge. This area needs immediate repair to provide a flush surface between panels. **Recommend saw cutting full depth beginning at the joint of a previous repair area to a location approximately 35 feet south of that joint to remove all broken, cracked, and settled concrete. The approximate area is 35'x12.5' wide (49 SY). Seal all new and existing joints.**

Area 12 on Lakewood Drive has settled 3" as measured relative to the adjacent panel.

Area 13 Lakewood Drive near Block 13, Lot 4 **(Priority 1)**

The concrete at this location has settled 2" in the panels east of the centerline. Infiltration has led to softening of the subgrade. Over time heavy loads over the soft subgrade have caused settling, cracking, and broken concrete. The west panel has also developed cracks due to the soft subgrade. **Recommend saw cutting full depth and removing all broken concrete on the eastern panels from a previous repair patch to a location approximately 19 feet north (measured along the centerline). Saw cut perpendicular to the curb, remove and replace all damaged concrete (~30 SY). Install an expansion joint to replace the existing joint. Seal all joints and seal the cracks and joints on the adjacent western panels.**

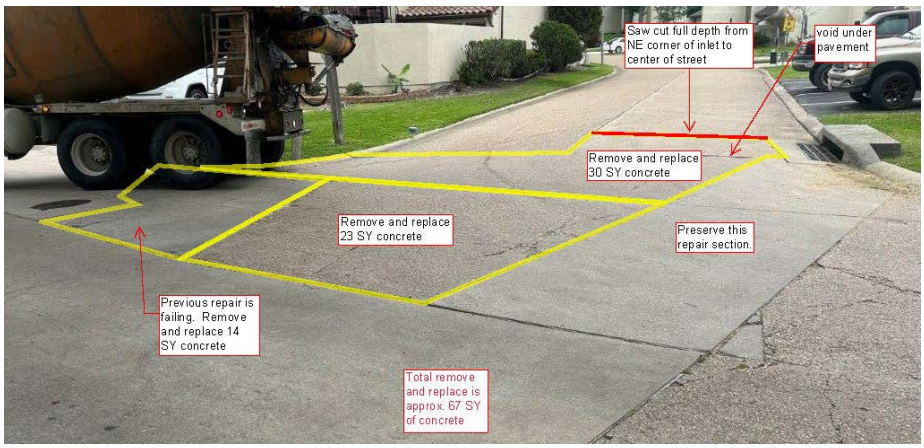
Area 13 on Lakewood Drive has settled 2" at the centerline of the street.

Area 14 Lakewood Drive at the intersection of Glenview Drive **(Priority 1)**

This area has several issues to address. Infiltration has led to the softening of the subgrade which has allowed the concrete to settle 2" between surfaces. The area has had previous repairs and appears the joints were not sealed and allowed infiltration. A previous storm pipe repair between inlets on Glenview to the west side of Lakewood Drive has a failed seal around the pipe in the inlet on Glenview. The failed seal has allowed stormwater to flow under the paving beside the pipe which over time has created a large void under the concrete. The concrete panel is slowly crumbling at the joint from heavy vehicles applying press at the top edge. The dowel bars between the panels appear to be the main support across the void and the western panel has stress fractures at the doweled location due to heavy loads. **It is recommended to saw cut full depth from the NW corner of the Glenview Inlet to the center of the roadway. Remove all damaged concrete. Seal around the storm pipe with non-shrink grout at Glenview. Reestablish all existing joints. Repair the subgrade. Repour all concrete areas. Seal all joints and any cracks on adjacent concrete panels. Approx. 67 SY concrete.**

Area 14. Concrete is cracked, broken, and settling at the intersection.

Area 14. A failed seal around the storm pipe has led to voids under the paving and chipping off material at the edges.



Area 14 Replacement Panels

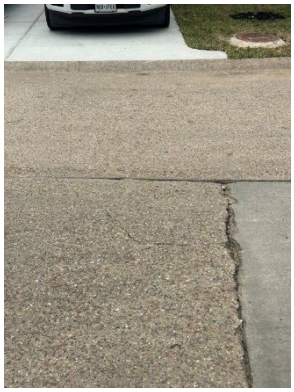
Area 15 Lakewood Drive at the south side intersection of Glenview Drive **(Priority 2)**

The concrete at this location has many cracks running in all directions. Infiltration has softened the subgrade and repeated heavy loads on the pavement have cracked up the concrete. Some minor patches have been filled in small areas. The area requires replacement, however, it can be included in the second phase of improvements. **It is recommended to remove and replace the concrete in this area between previously repaired areas. Reestablish expansion joints and seal joints. This area varies from 10 to 12 feet wide by the full width of the road of 25 feet for an approximate area of 30 SY.**


Area 15. Replacement of Panels required.

Area 16 Lakewood Drive at the intersection of Melville Drive **(Priority 1)**

The concrete at this location was replaced in more recent years but is failing again. Picture 1 indicates this repair joint did not have a smooth saw cut joint on the north end where it meets up with the existing concrete. It also has a large corner of the existing concrete broken off that needs to be repaired. Previous repairs did include some expansion joints along the centerline and at the existing joint locations, however, the joints were not sealed and allowed infiltration, pumping, and settling. This area was inspected after a rainfall event. Picture 3 shows the 2" settled pavement and broken corners. When storm runoff flows to this location, the water ponds where the pavement has settled (lowest point). As vehicles roll over the concrete (heavy loads), the water is forced out from under the concrete (pumping). The saturated and softened subgrade fails and the subgrade material is forced out with each pumping action leading to the settling and broken edges. Failure to repair this area can lead to adjacent panels cracking and breaking and creating a larger repair area. **It is recommended to remove concrete at the next butt joint north of the jagged joint to capture all broken corners and cracked concrete (approx. 10 feet to the joint). This will be all the concrete west of the centerline to the north side of Melville Drive. Replace all expansion joints at previous locations. The area is approximately 45 feet long, 25 feet wide, plus the radius return area. Approximately 75 SY of Concrete. Seal all joints.**



Area 16 with a jagged edge butt joint, 2" settled area, cracks, and broken corners.

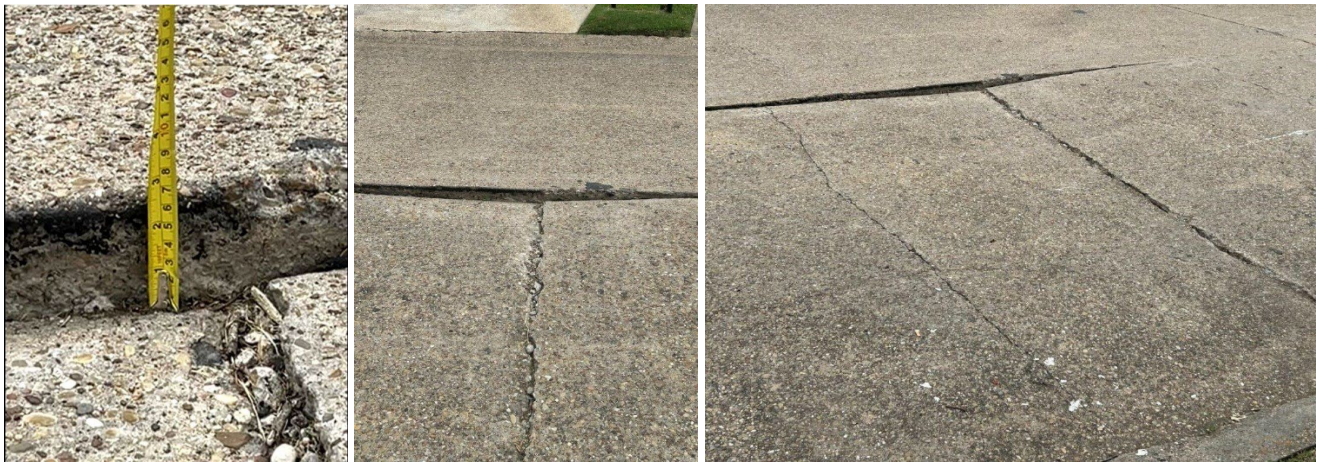
Area 17 Glenview Drive near Block 9, Lot 3 **(Priority 1 seal cracks) (Priority 2 repair)**

Area 17 has cracked corners at a butt joint where a newer section of concrete was joined up with this existing slab. The new concrete joints were not sealed and the existing seals along the centerline have been missing for many years. Infiltration has softened the subgrade and heavy loads have snaped the corner off near the center of the roadway. The adjacent south panel has settled approximately one inch. Glenview is a less traveled crossroad in Section Seven. The location appears to have a good grade to let water flow away and is considered not critical for immediate repair. **It is recommended to include this area in a future repair phase. Saw cut, remove, and replace approximately 3 feet (min) of concrete north of the centerline adjacent to the newer concrete panel for the full width of the north panel (4 SY). Seal all joints after repair (Priority 2). Temporary crack fill is recommended to help prevent any further settling or damage (Priority 1).**

Area 17 with broken corners and a settled portion of a panel

Area 18 Glenview Drive near Block 9, Lot 5 **(Priority 2)**

Area 18 has pavement that has settled 3 inches on the south panel measured at the centerline of the road. Infiltration has softened the subgrade and the panel has cracked in three places. Heavy loads from vehicles have slowly allowed this area to "pump" and slowly remove subgrade material, leading to the settling as shown in the pictures below. This area needs repair as soon as possible but can be considered with a second phase of repairs. Note in Picture 3 below, there is a concrete joint to the right of the picture (near the top). **It is recommended to saw cut approximately 20 feet (west) of the existing expansion joint, remove, and replace all concrete for the full width of the south panel (30 SY). Seal all joints after the repair.**



Area 18. Three-inch settled and cracked panel. The panel has 3 significant cracks in the pavement.

Area 19 Glenview Drive near the East Parking Area **(Priority 1)**

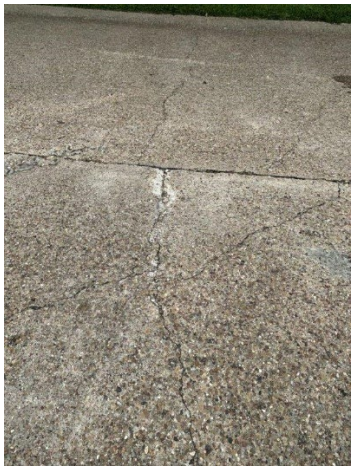
Area 19 is near the far east end of the parking area. There is a large crack with a 3/4" wide opening. **It is recommended to tool clean the crack and fill the void with a sealant to prevent infiltration, which can lead to future repairs.**


Area 19 on Glenview has a significant crack that will allow infiltration.

Area 20 Glenview Drive near the intersection of Knollcrest Drive **(Priority 2)**

Area 20 is a panel on the south side of Glenview that has severe cracking. There is no remaining joint seal which has allowed infiltration and softening of the subgrade. The soft subgrade with heavy loading has caused the cracking over time. As seen in the pictures below, the vehicular loads press down on the surface at the crack and force the top edges to press hard against each other and chip the concrete away at the top. Freshly chipped concrete was observed during the inspection. **It is recommended to remove and replace the south panel of concrete from (but not including) the concrete apron at the intersection of Knollcrest (the area with curved curb return will remain) and measured back approximately 44 feet to encompass all of the worst cracked areas. Saw cut full depth for the 12.5-foot wide south panel. Seal all joints after concrete repair and seal all adjacent cracks to deter further issues. Approximately 62 SY.**






Area 20 on Glenview near Knollcrest has a significant area of cracking which has led to surface damage.

Area 21 Knollcrest Drive just north of Glenview Drive **(Priority 2)**

Area 21 has an existing storm manhole with an irregularly shaped apron surrounding the MH cover and frame. No sealant exists along expansion or butt joints and the apron was made without a saw cut and joint sealant. Although the surface has remained mostly flush, the concrete has broken and chipped from a soft subgrade near the joints and cracks due to infiltration and should be considered for repair in an upcoming repair phase. **It is recommended to locate the extent of the cracks, saw cut the full depth of concrete, then remove and replace the concrete in this area. Create a new square apron around the manhole (5'x5' min). Reestablish all expansion joints at existing locations and seal all joints. Butt joints should be saw cut and sealed when the concrete can withstand saw-cutting. The repair area is estimated to be approx. 10' long measured down the centerline and the full width of the west panel at 12.5'. The repair area will cross an expansion joint 3 feet south of the manhole. The apron is approximately 3 SY and the concrete paving is approximately 12 SY. Seal all expansion and butt joints and large cracks northward near the inlet on the east panel.**





Area 21 on Knollcrest. Irregularly shaped manhole apron with concrete cracking and chipping around the perimeter.

Area 22 Knollcrest Drive near Block7, Lot J (Replat) **(Priority 1-Seal) (Priority 2-Repair)**

Area 22 is an area that has cracked and is chipping away near the centerline of the street where two cracks merge and form is small acute angle. The subgrade appears to be softened due to infiltration through the joints. Fresh chipping from vehicular loads and tires hitting the weak point was observed during an inspection as shown by the lighter-colored concrete where the two cracks merge. **Recommend saw cutting full depth a minimum of one foot beyond the worst cracked areas, remove the broken and cracked concrete on this western panel, and replace the concrete pavement. The area will be the full width of the west panel (12.5 feet) and an estimated length of 12 feet to remove the failed material (17 SY). Reestablish the centerline expansion joint. Create butt joints at each end to tie into existing concrete. Seal all butt joints and expansion joints. Interim repairs should include tool cleaning of the cracks and sealing the cracks to help prevent infiltration and future damage.**

Area 22 on Knollcrest has merging cracks leading to chipping away from frequent vehicular loads and impact from tires.

Exhibit 3 – Engineer's Preliminary Opinion of Cost (Cost Estimate)

BLEYL ENGINEERING
PLANNING • DESIGN • MANAGEMENT

100 Nugent Street
Conroe, Texas 77301
Phone (936) 441-7833
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Engineer's Preliminary Opinion of Cost
Priority 1 Recommendations
Walden Townhouse Association
Walden Section 7 Concrete Pavement Study
Bleyl Project No. 13222
June 22, 2023

Walden Section 7 Concrete Repairs

Area	*DESCRIPTION*	*QTY.*	*UNIT*	*UNIT COST*	*COST*
1.	Seal cracks around Area 2 - Approx 30 LF	30	LF	$3.00	$90.00
3B	Sawcut, remove, and replace concrete on **EAST** Panel	18	SY	$200.00	$3,600.00
3B	Seal all joints from repairs on East panel	50	LF	$3.00	$150.00
3B	Sawcut, remove, and replace concrete on **WEST** Panel-**ALT.**	18	SY	$200.00	$3,600.00
3B	Seal all joints from repairs on **WEST** Panel-**ALT.**	25	LF	$3.00	$75.00
4.	Tool clean and seal large crack	30	LF	$3.00	$90.00
6.	Tool clean and seal large failed joint	50	LF	$3.00	$150.00
7.	Tool clean and seal large crack	30	LF	$3.00	$90.00
8.	Tool clean and seal cracks around sag and across street	30	LF	$3.00	$90.00
12.	Sawcut, remove, and replace concrete on **west p**anel	49	SY	$200.00	$9,800.00
12.	Seal all joints from repairs	60	LF	$3.00	$180.00
13.	Sawcut, remove, and replace concrete on **west p**anel	30	SY	$200.00	$6,000.00
13.	Seal all joints from repairs	45	LF	$2.00	$90.00
14.	Sawcut, remove, and replace concrete at intersection	67	SY	$200.00	$13,400.00
14.	Grout fill around inlet pipe to stop water flowing and erosion	1	LS	$500.00	$500.00
14.	Seal all joints from repairs	110	LF	$3.00	$330.00
16.	Sawcut, remove, and replace concrete on **west p**anel	75	SY	$200.00	$15,000.00
16.	Seal all joints from repairs	75	LF	$3.00	$225.00
17.	Tool clean and seal cracks around sag and across street	20	SY	$3.00	$60.00
19.	Tool clean and seal large crack near parking area	13.3	LF	$3.00	$40.00
EXTRA	Tool clean and seal all expansion joints, butt joints, and cracks along Knollcrest. Estimated length	1675	LF	$3.00	$5,025.00
EXTRA	Tool clean and seal all expansion joints, butt joints, and cracks along Lakewood. Estimated length	1750	LF	$3.00	$5,250.00
EXTRA	Tool clean and seal all expansion joints, butt joints, and cracks along Glenview and Trail Hollow. Estimated length	1875	LF	$3.00	$5,625.00

TOTAL PROJECT COSTS

TOTAL **$69,460.00**

NOTES:

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6-22-2023

BLEYL ENGINEERING
PLANNING • DESIGN • MANAGEMENT

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Engineer's Preliminary Opinion of Cost
Priority 2 Recommendations
Walden Townhouse Association
Walden Section 7 Concrete Pavement Study
Bleyl Project No. 13222
June 22, 2023

Walden Section 7 Concrete Repairs

Area	*DESCRIPTION*	*QTY.*	*UNIT*	*UNIT COST*	*COST*
1.	Seal cracks around Area 1 - Approx 80 LF	80	LF	$3.00	$240.00
2.	1" Sag. Replace 4'x4' min area	2	SY	$200.00	$400.00
3A	Storm MH apron replacement (~6'x6')	4	SY	$200.00	$800.00
3A	Sawcut, remove, and replace concrete paving.	18	SY	$200.00	$3,600.00
3A	Seal joints	80	LF	$3.00	$240.00
9.	Sawcut, remove, and replace concrete paving.	4	SY	$200.00	$800.00
9.	Seal all butt joints	30	LF	$3.00	$90.00
10.	Sawcut, remove, and replace concrete paving.	6	SY	$200.00	$1,200.00
10.	Seal all expansion and butt joints	42	LF	$3.00	$125.00
11.	Sawcut, remove, and replace concrete paving.	20	SY	$200.00	$4,000.00
11.	Sawcut, remove, and replace concrete paving of MH Apron	3	SY	$200.00	$600.00
11.	Seal all expansion and butt joints	55	LF	$2.00	$110.00
15.	Sawcut, remove, and replace concrete paving.	30	SY	$200.00	$6,000.00
15.	Seal all expansion and butt joints	70	LF	$3.00	$210.00
17.	Sawcut, remove, and replace concrete paving.	4	SY	$200.00	$800.00
17.	Seal all expansion and butt joints	35	LF	$3.00	$105.00
18.	Sawcut, remove, and replace concrete paving.	30	SY	$200.00	$6,000.00
18.	Seal all expansion and butt joints	50	LF	$3.00	$150.00
20.	Sawcut, remove, and replace concrete near intersection	61	SY	$200.00	$12,200.00
20.	Seal all expansion joints, butt joints, and cracks	70	LF	$3.00	$210.00
21.	Sawcut, remove, and replace concrete at intersection	12	SY	$200.00	$2,400.00
21.	Sawcut, remove, and replace concrete at apron	3	SY	$200.00	$600.00
21.	Seal all expansion joints, butt joints, and cracks	75	LF	$3.00	$225.00
22.	Sawcut, remove, and replace concrete paving.	17	SY	$200.00	$3,400.00
22.	Seal all expansion joints, butt joints	40	LF	$3.00	$120.00
TOTAL PROJECT COSTS					
				TOTAL	**$44,625.00**

NOTES:

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6-22-2023

BLEYL ENGINEERING
PLANNING • DESIGN • MANAGEMENT

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Engineer's Preliminary Opinion of Cost
Priority 3 Recommendations
Walden Townhouse Association
Walden Section 7 Concrete Pavement Study
Bleyl Project No. 13222
June 22, 2023

Walden Section 7 Concrete Repairs					
Area	*DESCRIPTION*	*QTY.*	*UNIT*	*UNIT COST*	*COST*
2.	Seal cracks around Area 2 - Approx 30 LF	30	LF	$3.00	$90.00
5.	Sawcut, remove and replace concrete from old repair	12	SY	$200.00	$2,400.00
5.	Seal butt joints	55	LF	$3.00	$165.00
8.	Saw cut, remove and repair 1" sag in concrete.	2	SY	$200.00	$400.00
8.	Seal butt joints	20	SY	$3.00	$60.00
TOTAL PROJECT COSTS					
				TOTAL	**$3,115.00**

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6-22-2023

BLEYL ENGINEERING
PLANNING • DESIGN • MANAGEMENT

100 Nugent Street
Conroe, Texas 77301
Phone (936) 441-7833
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Engineer's Preliminary Opinion of Cost
Storm Manhole and Inlet Repairs (MUD 8 Facilities)
Walden Townhouse Association
Walden Section 7 Concrete Pavement Study
Bleyl Project No. 13222
June 22, 2023

Walden Section 7 Concrete Repairs					
Area	*DESCRIPTION*	*QTY.*	*UNIT*	*UNIT COST*	*COST*
3A	Storm MH apron replacement (~6'x6')	4	SY	$200.00	$800.00
3B	Sawcut, remove, and replace concrete on **EAST** Panel	18	SY	$200.00	$3,600.00
11.	Sawcut, remove, and replace concrete paving of MH Apron	3	SY	$200.00	$600.00
14.	Sawcut, remove, and replace concrete at intersection	30	SY	$200.00	$6,000.00
14.	Grout fill around inlet pipe to stop water flowing and erosion	1	LS	$500.00	$500.00
21.	Sawcut, remove, and replace concrete at apron	3	SY	$200.00	$600.00
ALL	Repair expansion joints & Seal all joints	100	LF	$3.00	$300.00
TOTAL PROJECT COSTS					
				TOTAL	**$12,400.00**

NOTES:

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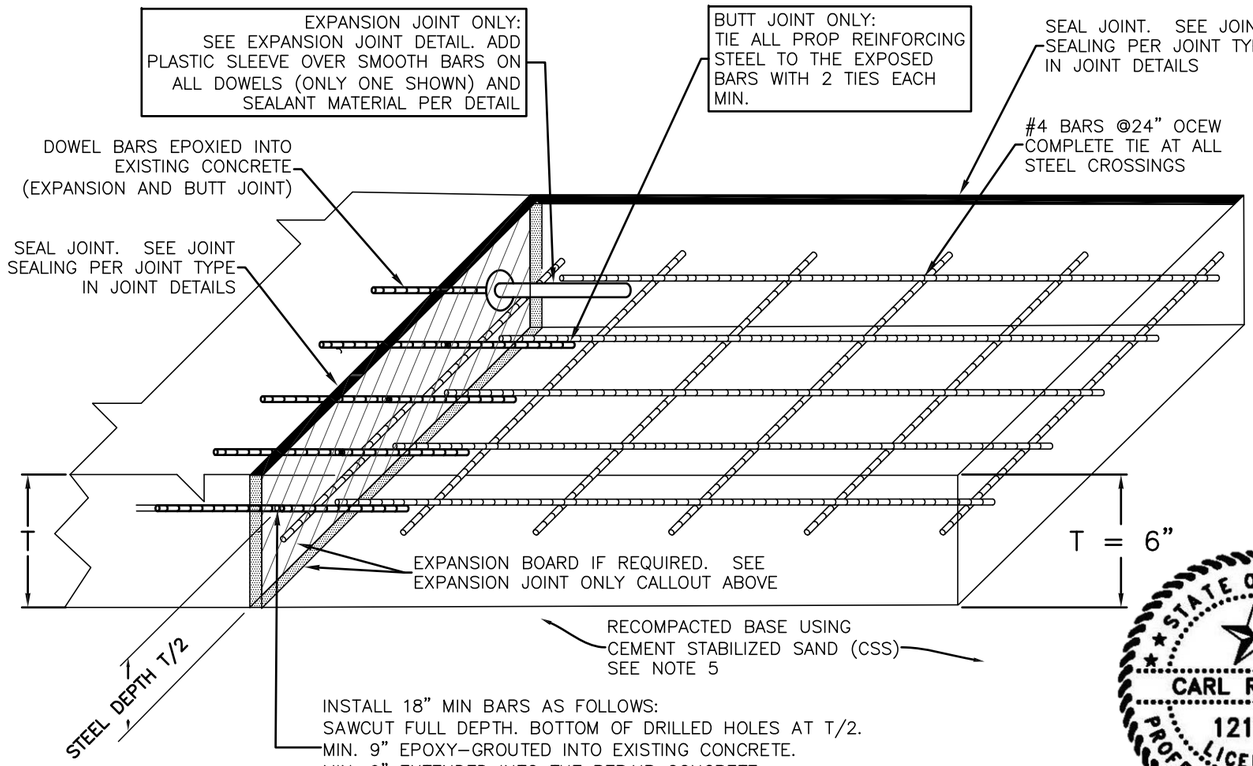
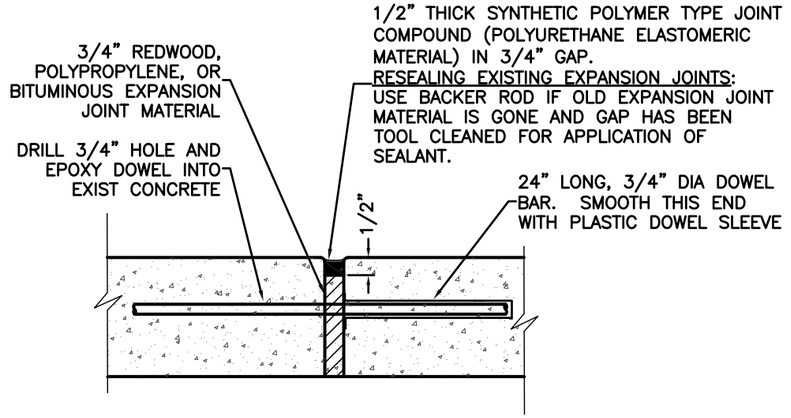
6-22-2023

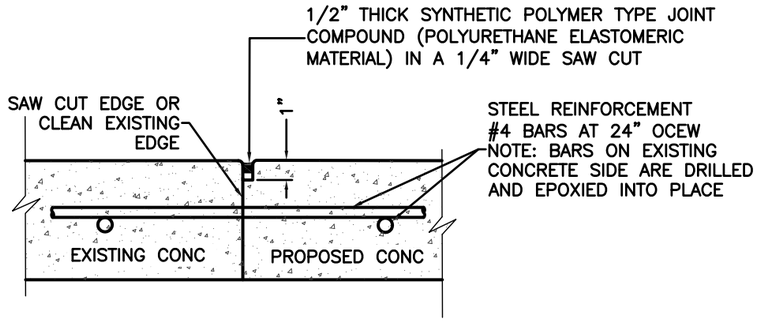
Exhibit 4 – Typical Concrete Repair Details



DETAIL B
STEEL BARS: EPOXIED DOWELS



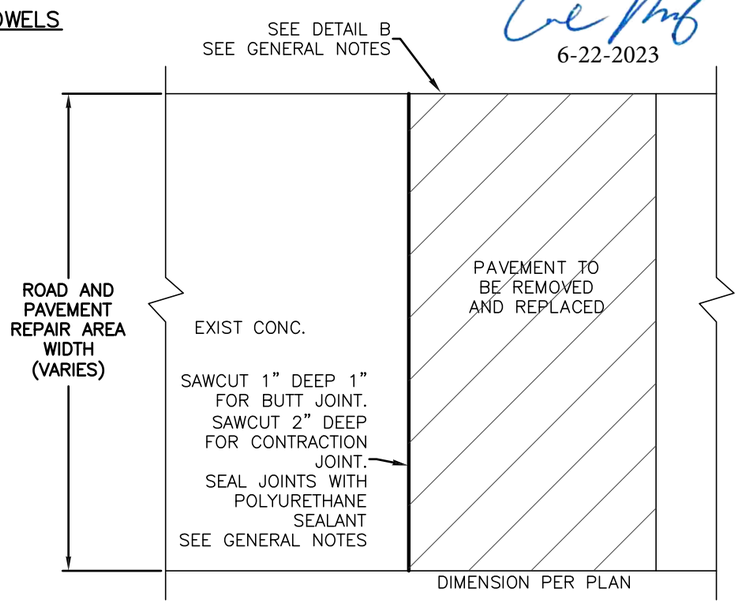
EXPANSION JOINT SEALING DETAIL
NTS



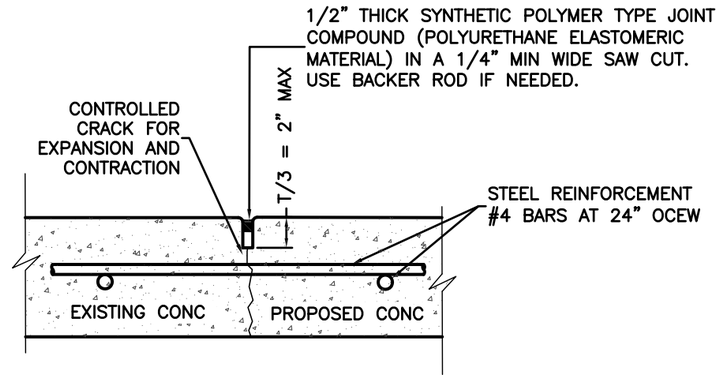
SAW CUT BUTT JOINT SEALING DETAIL
NTS

CONCRETE REPAIR GENERAL NOTES

1. FULL DEPTH SAW CUTS SHALL BE MADE AS SPECIFIED ON THE PLANS. THE CUT SHALL BE MADE AT A RIGHT ANGLE TO THE PAVEMENT EDGE AND TO THE CENTER LINE OF THE PAVEMENT. THE DEPTH OF SAW CUT CONTRACTION JOINTS SHALL BE **T/3** (IF 6" CONCRETE, SAW DEPTH = 6/3 OR 2 INCHES DEEP).
2. ADDITIONAL SAW CUTS MAY BE REQUIRED WITHIN THE AREA OF THE REPAIR TO FACILITATE REMOVAL OF THE CONCRETE OR TO ALLEVIATE BINDING OF THE FULL DEPTH SAW CUT AT THE REPAIR EDGE.
3. DOWEL BAR REPLACEMENT TOLERANCE SHALL BE +/- 1/4 IN. HORIZONTALLY AND VERTICALLY UNLESS OTHERWISE SPECIFIED. WHERE DOWEL BAR BASKETS ARE USED, REMOVE THE SHIPPING WIRES.
4. SEE JOINT SEALING DETAIL ON THIS SHEET FOR SEALING AT THE PAVING TIE IN LOCATION.
5. THE SUBGRADE REPAIR SHALL CONSIST OF REMOVING AND REPLACING 6" OF EXISTING SUBGRADE. PROVIDE 2-SACK PER TON OF CEMENT STABILIZED SAND (CSS) COMPACTED TO 95% STANDARD PROCTOR DENSITY AND TO A FINAL THICKNESS OF 6". NEW SUBGRADE TOP SHALL MATCH THE BOTTOM OF EXISTING ADJACENT CONCRETE THAT WILL BE TIED INTO.



PLAN VIEW



SAW CONTRACTION JOINT SEALING DETAIL
NTS

CONCRETE PAVING REPAIR DETAIL	
CATALOG NAME	
SCALE: NTS	REV DATE