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OVERALL ROAD EVALUATION

PREPARED FOR

WEST VINCENT TOWNSHIP

CHESTER COUNTY, PA

Submitted by

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I. Executive Summary

West Vincent Township owns and maintains 47.5 miles of roadway. Twenty seven percent (27%) of those are gravel roads, and seventy three percent (73%) are paved.

The Township authorized a road inspection and evaluation, performed by CEDARVILLE Engineering Group in 2016. All Township roads were inspected in April and May of 2016. This report reflects conditions at the time of inspection.

Investing in regular road maintenance such as sealing cracks, chip sealing roads, and micro-surfacing streets prolongs the life of roads, and prevents the much greater expenditures that will result if roads are not provided with such maintenance at regular intervals. It is recommended the Township continue the program of sealing roads at a rate of 5 to 7 miles annually, at a current cost of about $31,000 / mile.

About 5 miles of paved roadways are in very poor condition, requiring significant investment to rebuild or significantly improve these roads before they enter the annual maintenance program. This includes portions of the following roads: Horseshoe Trail, Schoolhouse Lane, Kimberton Road, Art School Road, Flint Road, Hilltop Road and Shady Lane. The projected investment to improve the paved surface for all these roads is $2.9 million.

Gravel roads in the Township had been recently regraded at the time the inspection was performed. The cartway conditions were generally smooth at the time, but there was a consistent notation that the roadside ditches required cleaning and grading. In many instances, the ditches contained gravel intended for the cartway. The report describes maintenance equipment that the Township may wish to consider to further improve the effectiveness of gravel road maintenance.

Jaine Lane near Birch Run Road is a location with significant problems, and larger rain events can cause significant street erosion resulting in quantities of gravel being washed onto Birch Run Road, onto private properties and into waterways. Recommendations in section VII of this report include work that can be completed this year to stabilize the cartway, and the procedures that must be undertaken for the long term solutions and drainage improvements.

Numerous other structures that cross under Township roads are in urgent need of repair or replacement. This report can be referenced as a basis for budgeting and prioritizing projects over the next 5 to 10 years.

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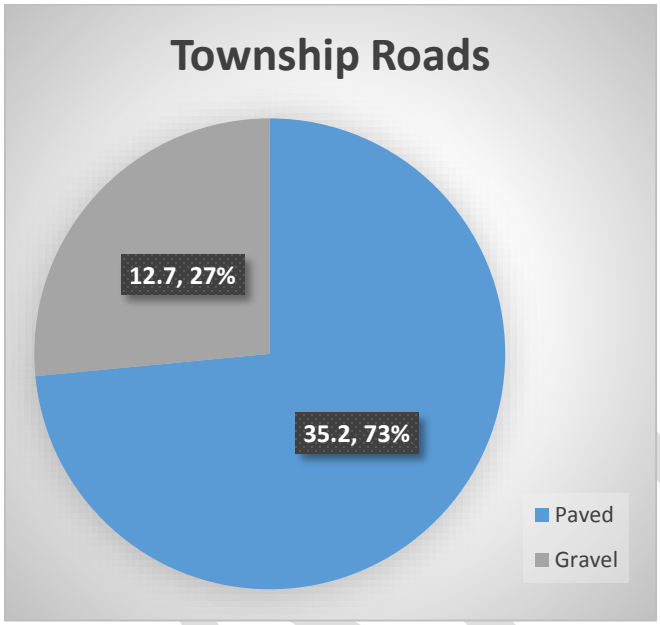
II. West Vincent Township Road System

West Vincent Township owns and maintains **47.5 miles of roadway**. The Township road system is composed of nearly 13 miles of gravel roads, and over 35 miles of paved roads.



Gravel and paved roads have different maintenance procedures and requirements. However, one thing they have in common is the need for appropriate drainage. The road surface must be graded to sheet water to the roadside swales, curbs, and inlets. The swales, curbs and inlets must be able to convey flow. Water must not accumulate on, adjacent to or under the road, as it will weaken the road base and the road surface. Last but not least, structures that convey flow under the road must be structurally sound and stable to support the road and vehicle traffic.

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III. Overview of Paved Roads

A. Composition of a New Road

New roads built as part of a land development or subdivision are built in layers. Each road design is different, but will commonly use a combination of some or all of these layers;

1. Subgrade

The bottom layer is subgrade, usually the existing underlying soil that has been graded and compacted to accept the stone and pavement of the proposed road. It is important that the soil is properly compacted and structurally capable of supporting the roadbed. Some soils, such as those that are not well drained and/or high in organic material, exhibit properties that are not suitable for supporting a road. In cases where soils are not suitable, the soils can be modified with additives and/or provided extra support with geotextile fabric before road construction continues. If the subgrade is not suitable, the result will be pavement failure, including rutting and potholes.

2. Subbase

Subbase is commonly composed of aggregate (stone). In current designs, it is generally a type 2A aggregate placed 4 to 6 inches thick and rolled for compaction.

3. Base

The base layer in roads built today is a bituminous pavement composed of larger stones (25 mm) blended in an emulsion. It is commonly placed 4 or more inches thick.

Decades ago, another common base was constructed of interlocking stone. Fine stones were placed in a layer, then large stones, then fine stones swept in overtop to lock the base. We often see this in roads built in the 1960's or 1970's, but it is a labor intensive process and therefore rarely used today.

4. Binder

The next layer is also bituminous, and includes slightly smaller stones than the base layer (19 mm). This layer is placed 2 to 3 inches thick.

5. Wearing

The top layer on a new street is called the wearing course. The bituminous emulsion coats small stones (9.5 mm), and is placed 1½ to 2 inches thick.

6. Joint Seal

All pavement joints, curb lines, and places where pavement abuts inlets and utility structures should be sealed with a rubberized emulsion to seal the joint. The seal is intended to prevent water from entering the pavement, and along curb lines has the added benefit of preventing accumulation of silt and growth of weeds.

B. Composition of Existing Roads

Some local roads in this region constructed in the 1960's through the 1980's were properly constructed with a prepared subbase, base and surface courses. With age, roads may show pavement distress from

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decades of loading and become more brittle due to oxidation. However, if they have a good foundation, a road maintenance program can extend their service life for decades to come.

Unfortunately, many local roads in rural Pennsylvania communities began as dirt pathways, evolved to gravel roads, and were eventually surfaced with bituminous material. The term "pie crust pavement" is used to describe roads that evolved through addition of surface material without underlying design and construction. To determine the composition of these roads, it is often necessary to take a core sample. They may not have adequate subbase, base, or bituminous material to support the traffic loads they serve, resulting in pavement failures. When pavement failure is the result of a subbase or base problem, simply putting another layer on the top is a short-term fix and ultimately a waste of resources, as the underlying failure will reflect through the pavement structure in one to three years.

C. Surface Water and Drainage

Surface water is primarily rainfall and runoff. On new streets, pavements are built with a cross-slope so that water will run to the side of the road during a rainstorm. A standard cross-slope for a paved road is 2% or ¼-inch per foot. Ideally, water is sheeted off the surface by cross-slope and carried in a roadside swale, gutter, or storm drain to suitable drainage facilities.

When surface water ponds on the road surface, numerous problems result. Immediate concerns include loss of vehicular control resulting from ponded water, winter icing, and loss of friction (hydroplaning). Water that does not drain from the pavement surface will settle into voids in the pavement and cause pavement failure, especially when combined with freeze-thaw cycles common in our region.

Roadside ditches or swales are an economical way to convey flow along the road toward the nearest waterway. However, roadside ditches require regular maintenance to maintain capacity and prevent damage to the adjacent pavement. Roadside ditches require frequent mowing, cleaning, inspection and regrading by experienced road crew personnel. Areas of erosion must be stabilized to halt pavement damage and undermining. Grading must provide positive drainage to prevent accumulation of stagnant water along the edge of the road bed.

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When waterways intersect the road, bridges or culverts are necessary to convey the flow under the road. These crossings are subject to hydraulic forces, traffic loads, erosive forces, corrosion, and traffic vibrations. Regular inspection, repair and replacement can become a significant component of road work in a municipality.

D. Subsurface Moisture and Drainage

Underground springs or high groundwater tables can saturate the base. Water can also move laterally through wet soil conditions during the spring thaw or seasonal wetness.

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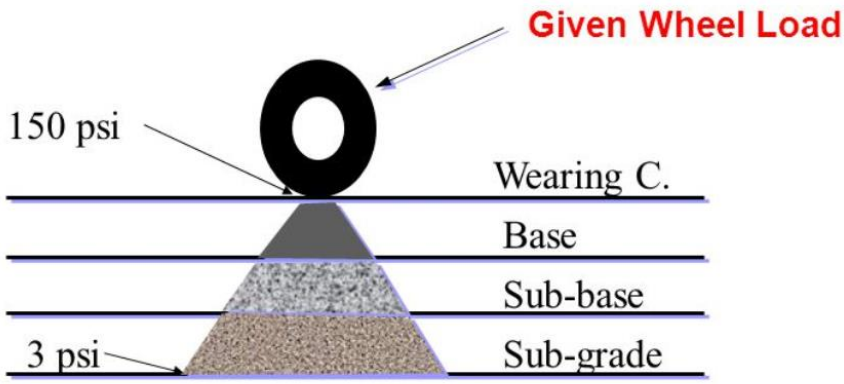
E. Base Failure

Some types of soils lose their stability when moist. One can easily think about walking across a firm clay soil when it is dry, and sinking in the mud when it is wet. When a vehicle drives on flexible pavement, the loads are transferred through the pavement layers, as depicted below.



Load Distribution in Flexible Pavements

The flexible pavement cannot support much loading without an underlying base. If the base deforms with load, vehicle loading will cause the pavement to either sink (rut) down to the new subgrade level, or fracture (crack) under the stress.

Base failure generally requires full depth excavation and material replacement. In some instances, installation of pavement base drains or underdrains can help to reduce moisture problems with the base.

F. Winter Maintenance

Paved roads can be plowed to remove snow from the surface, and treated with deicing agents and cinders to improve traction during winter weather.

G. Pavement Maintenance

Establishing an ongoing pavement maintenance program is an excellent investment for a municipality, because rebuilding a road *after* it fails is extremely expensive.

Consider a road in fairly good condition, with a few surface cracks and the surface pavement is lightly aged and oxidized. Application of double chip seal or micro-surfacing to that road surface will not add structural value, but will seal it against moisture penetration, provide increased skid resistance, provide a surface for the plow blade to scrape without dislodging stone from the wearing course, and provide another 5 to 8 years of service life before the road returns to the same quality. In round numbers, that seal would cost about $6 per linear foot of road, or about **$ 31,000 per mile**.

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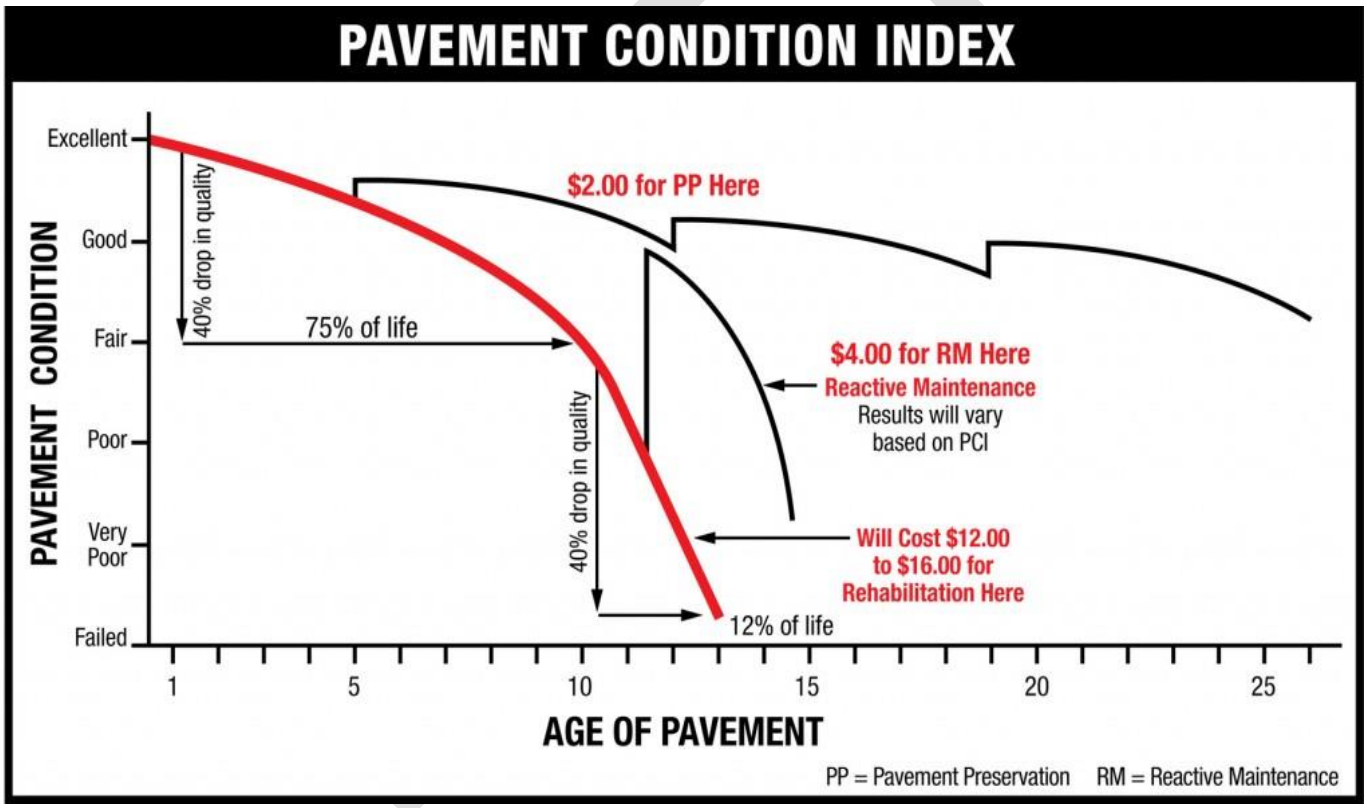
If that money is not spent, the road continues to decline, and the rate of decline increases as water enters the pavement structure. Perhaps most of the damage is still surface damage, but it's widespread. Now there is too much cracking for a sealant to succeed; milling is required to remove the fractured surface and 2-inch overlay must be placed. The cost has increased more than six-fold to $40 per linear foot or **$ 211,000** per mile.

Let the deterioration continue. The moisture enters the base. Potholes and ruts might be patched with cold-patch through the winter, but the road surface is rough and uneven. Individual base repair patches will be time consuming and expensive, but necessary before new pavement is overlaid on the surface. Each 4' square patch will cost about $100. The street may require **$ 150,000 in patching** be completed before placing the **$ 211,000** overlay on the mile of street.

Considering the above scenario, protecting and sealing the roads that are in reasonable condition today provides a significant return on investment. Delaying that work can be costly.



1Pavement Condition Index chart developed by the Army Corps of Engineers, supplemented with cost data by The International Slurry Surfacing Association (ISSA)

IV. Gravel Roads

A. Composition

Gravel Roads are composed of the earthen subgrade with aggregate on top. A correctly constructed gravel road is provided with cross-slope or crown, and drained with roadside swales or similar drainage conveyance systems.

1. Subgrade

The bottom layer is subgrade, usually the existing underlying soil that has been graded and compacted to accept the stone of the proposed road. It is important that the soil is properly compacted and structurally capable of supporting the roadbed. Some soils, such as those that are not well drained and/or high in organic material, exhibit properties that are not suitable for supporting a road. In these cases, the subgrade should be evaluated to determine the appropriate treatment or treatments necessary to improve the material load capacity. Methods may include material excavation and replacement, amendment of the soils with hydrated lime or cementitious materials, or application of geotextile materials.

2. Aggregate (gravel or stone)

Proper surface aggregate should be selected to maximize performance of gravel roads. Some gravel roads are constructed with two layers of aggregate; a base and a surface course. In such cases, the base has a larger stone size than the surface. In most gravel roads in West Vincent Township and other localities, only surface aggregate is applied.

Surface aggregate should include the appropriate gradation, including a certain percentage of fines. Pennsylvania has a specification for aggregate for gravel roads, termed "DSA" or Driving Surface Aggregate, but few local suppliers. The stone in DSA is all smaller than 1½ inches and most of it is smaller than ¾ inches. Another specification sometimes used by local road departments is "2A modified." While no longer an accepted PennDOT specification, it is still familiar in the industry as 2A aggregate with fines. The current PennDOT 2A specification does not include as many fines, and is not recommended for surfacing gravel roads.

It is my understanding the Township is currently using recycled pavement material, which has some benefits and is often less expensive than quarry stone. Recycled pavement can have variable properties depending on the amount and age of bituminous material in the product.

B. Surface Water and Drainage

Gravel roads must be graded with a crown or cross-slope so that water will not pool on the surface. The recommended cross-slope for a gravel road is 4% or ½-inch per foot. Water that falls on a gravel road should be sheeted off the surface by cross-slope and carried in a roadside swale, gutter, or storm drain to suitable drainage facilities.

Water ponding on the road surface of a gravel road will lead to surface failure, reflected as depressions or potholes in the road.

An experienced road crew will watch for signs of erosion on the road surface. If water begins to form a channel on the road surface, it can rapidly evolve into a more serious erosion problem and road failure. Gravel roads require diligent road inspections and observations after each storm event.

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Roadside ditches require regular maintenance. On gravel roads, the maintenance is more intensive, as gravel removal from the ditches becomes a component of the work. Gravel can wash into the ditches with a rain event, be relocated toward the ditches by vehicle tires, and can even be pushed into ditches by the grader during road maintenance operations.

C. Winter Maintenance

Plowing gravel roads presents challenges. Unless the ground is hard frozen, the operator often has to choose between using the plow to scrape all the snow off the surface and potentially plow the gravel off to the edge of the road in the snowbank, or set the plow blade above the road to preserve the gravel.

D. Tools for Maintenance and Repairs

Our May 2016 inspection suggests the public works crew does an excellent job of regrading and restoring the roads after a storm event. The grader work was smooth and consistent, with very little wash boarding.

It is our understanding the Township recently invested in scarifier teeth for the moldboard blade. Scarifier teeth allow the equipment to cut into the top inches of the surface to optimize regrading, and were a wise investment.

Two tools may further improve the work being done, and should be considered for municipal investment if gravel roads will continue to be a significant component of the infrastructure.

1. Roller

Pneumatic or rubber tired rollers are preferred for gravel road compaction. The Township could rent a roller, to follow the grader. However, to save on labor cost, ensure the equipment is available when needed, and improve operational efficiency, the rollers that attach to the grader should be considered.

Purchased new, a roller that attaches to a grader may cost about $20,000.

2. Shoulder Grading and Material Recovery

Maintaining roadside ditches and swales is a key to preserving gravel roads. In West Vincent Township, the gravel road surface is often pushed into the ditches by traffic and by re-grading operations. There are tools available, such as recovery disks that attach to the grader. This tool will recover material and shape the ditch.

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Purchased new, this piece of equipment may cost $7,000. Additional costs may be incurred if the grader does not currently have the proper connecting hitch. This type of equipment can also be purchased for use with a tractor (instead of a grader) for roughly $11,000.

V. Inspection Procedures

Inspections were performed between April 21 and May 17, 2016. Inspection notes provide a record of road conditions specific to the window of time described.

Heavy rains in February and March of 2016 had caused significant damage to local roads and drainage facilities, and the Township Public Works Department had recently worked most of the gravel roads with a grader to restore the roads to drivable conditions. The inspection report represents a moment in time on a dynamic road system. The condition of the roads, and particularly the gravel roads, is ever changing.

Each Township owned road in West Vincent Township was driven. For each road the following was noted:

- Road name
- Road length
- Road surface (gravel or paved)
- Approximate cartway width
- A subjective condition score, based upon visual appearance of surface and smoothness of ride. Scores ranged from 1 to 10, with 10 being a road in near perfect condition.
- Approximate locations where road surface or condition changed.
- Results of visual inspection of significant cross-pipes or drainage structures.
- Observations of severe or unusual erosion relating to drainage along or under the roadway.

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VI. Road Surface Conditions

The paved West Vincent Township roads noted to have the worst surface condition are listed below;

A. Horseshoe TR	About 0.7 mile of Horseshoe Trail, between St Matthews and Fellowship Roads, is in very poor condition. Township employees have placed over 100 tons of cold patch material in the past year to keep this road passable.	Extensive base repairs are needed in advance of mill and overlay. Improving this portion of road is expected to cost $247,000
B. School House LA	The section of School House Lane between Hollow Road and Flowing Springs is in very poor condition. Following drainage improvements, paving reconstruction and overlay is recommended.	Recycling and/or rebuilding this section of School House Lane would cost roughly $111,000. Drainage improvements that must precede pavement work could add another $50,000 to the project cost.
C. Kimberton RD	More than 7000 feet in length, this road requires drainage improvements to carry water away from the pavement base, and full depth reconstruction including base stabilization.	The cost to rebuild over 1⅓ mile of roadway may exceed one million dollars. Core samples and a project specific review of the scope of improvements should be undertaken to determine the most cost-effective approach to improving this road.
D. Art School RD	The worst section of Art School Road is over 1700 feet in length.	Recycling and rebuilding of the worst portion of Art School Road is expected to cost $250,000.
E. Flint RD	Flint Road should be rebuilt with drainage improvements and profile adjustments.	Reconstruction of Flint Road is expected to cost $650,000.
F. Hilltop RD	About 1¼ mile of Hilltop Road is in very poor condition.	Extensive base repairs, followed by mill and overlay, would represent an investment of about $400,000.
G. Shady LA	Shady Lane is less than 2000 feet in length. Core samples should be taken to determine if it is a candidate for recycling and overlay.	Recycling and/or rebuilding Shady Lane is expected to cost $260,000.
	Total:	$2,900,000

A tabulation of the costs discussed above reveals that 5 miles of paved Township roads are due for $2,900,000 investment in the paved surface. That represents about 14% of the paved roads in the Township.

In contrast to the problems detailed above, the investment the Township has made in chip seal applications to maintain road conditions has prolonged the service life of other Township roads. Twenty-five miles of paved Township roads (71%) were rated with a score of 6 or better. It is recommended that the Township continue to

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chip seal paved roads to prolong service life. A plan to chip seal 5 to 7 miles of paved roads per year will result in all roads receiving maintenance every 5 to 7 years, prolonging the life of the road and reducing the need for patching, repaving and future full depth reconstruction projects.

Two of the gravel roads are prime candidates for paving at this time. The first is St. Andrews, reported to have higher traffic volumes resulting in wash boarding of the road and increased maintenance and material needs. The other is Dewees Lane, which now has a very short section of gravel. In June of 2016, West Pikeland Township paved the portion of Dewees Lane on the township boundary. Paving this remaining short gravel section would be a logical course to provide consistency to the road surface and road maintenance procedures. Adequacy of drainage facilities should be reviewed prior to paving.

VII. Critical Structure issues

Issues most critical to the Township road system include structural stability of the roads at stream and waterway crossing, condition of roadside drainage conveyances, and condition of the pavement.

A. French Creek Road - Arch structure failure

Road closed. Survey, evaluation of repair and permitting requirements underway.

B. Hollow Road

Slab Span Structure, approx. 15-foot span. Significant deterioration.

This structure should be evaluated by a qualified structural engineer for safety, stability, and recommended repair measures.

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C. Jaine Lane – Twin 48-inch culverts

Twin 48-inch culverts are corroded and must be replaced. Pavement is recommended for stabilization over the surface of the crossing, and adjacent to the crossing for bypass flow during large storm events.

The Township will need to obtain a General Permit (GP-11) from the Pennsylvania Department of Environmental Protection to replace these culvert pipes. Concrete Headwalls on either side are recommended. The replacement pipes can be concrete or, if concrete headwalls are used, HDPE pipe. An increase in pipe diameter is suggested, as the invert of the replacement pipe must be set 12 inches below the existing streambed elevation. The road surface should be paved at the crossing and approaching the crossing. Careful attention should be given to profile grading; ideally the road grade adjacent to the crossing would be lower than the surface grade at the crossing. If a storm event exceeds the capacity of the pipes, flow over the paved approach is less likely to cause significant erosion and damage to the cartway. However, significant changes in the roadbed elevation should be avoided, as significant changes to grades of approaches are not permitted by GP-11. The preliminary construction cost estimate for installing headwall, 60" concrete pipes, and paving 400 LF of Roadway at current prices is $100,000.

D. Jaine Lane – Birch Run Intersection North

This section of gravel road climbs upward from Birch Run Road. Stormwater runoff carries the surface gravel to the roadside ditch and conveys it rapidly down the slope. The flow combines with runoff exiting the woodlands in a swale, resulting in a torrent of water and gravel flowing toward Birch Run in a major storm event. The Public Works Department has made efforts to capture some of this flow by installing type M inlets in the roadside swale to carry the water away, but the inlet grates becomes choked with gravel, which reduces the effectiveness of these structures.

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Resolution of the problems in this location will require a drainage improvement and paving project. Birch Run is a State road, so any improvements that impact Birch Run Road will require review and approval (Highway Occupancy Permit) from the Pennsylvania Department of Transportation.

Resolution will require installation of additional drainage facilities to capture flows on the west (upslope) side of the road, particularly the natural swale that intersects the roadside. The pond overflow needs to be incorporated into the design, and the existing drainage structure under Birch Run Road must be supplemented or replaced. The road surface should be paved to the top of the slope, and the swale analyzed to determine the appropriate lining to achieve stabilization.

Existing Drainage Structure under Birch Run Road

Pond Overflow

To implement improvements, it will be necessary to obtain a topographical, location and property line survey to establish existing features, elevations and the extent of available rights-of-way. Drainage facilities must be designed, and an intersection plan prepared for submission to the Pennsylvania Department of Transportation. Concurrently, an application should be made to Pennsylvania DEP for a general permit for the outfall structure. We note that the Township has already invested in 38" x 60" Oval Concrete Pipe, inlets and endwalls for this project that must be reflected in the project design plan.

Jaine Lane should be paved from Birch Run Road north to the top of the hill. A base course of pavement could be placed this year to stabilize the cartway, but the design and PennDOT permitting of a stormwater solution will take a bit longer and would likely be a 2017 project. The ditch along the side of Jaine Lane should be stabilized concurrent with paving operations. Rip-rap lining may be suitable to stabilize this swale for much of length of the hillside, excepting the area nearest the intersection that must be addressed with drainage facility and structure design.

The preliminary construction cost estimate for installing a base course of pavement on ±1800 LF Jaine Lane and lining the swale is $200,000. The additional cost of work to install drainage facilities and apply the wearing course of pavement would be estimated after plan development.

E. Flowing Springs Road

The headwalls for these twin 30-inch concrete culverts are in poor condition. The parapet walls have crumbled and will not provide any barrier between a vehicle and a 3 or 4 foot drop-off. The walls may soon be insufficient to hold the edge of the road surface.

At a minimum, a stone mason should be employed to reset and mortar the stones.

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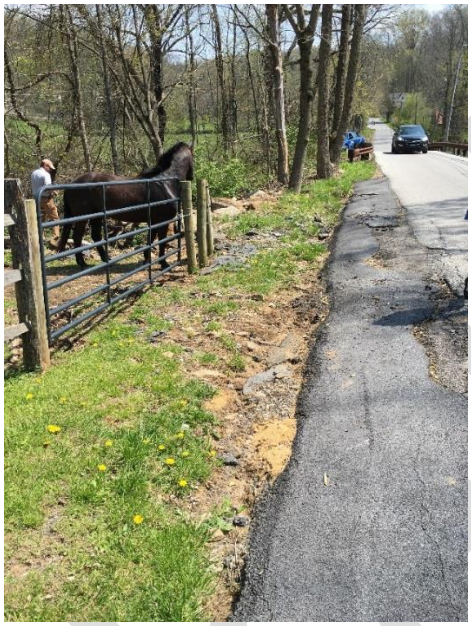
Flowing Springs Road:

The mill race headwall, pictured here, is not secured to the HDPE pipe, resulting in a hole behind the headwall along the road edge.



Flowing Springs Road:

The road edge on the other side of the mill race crossing is damaged, and it is clear this area was previously and recently patched. The location warrants further evaluation to determine if stream bank stabilization would better direct and control Birch Run flows, or if further road and drainage improvements are warranted in this area.

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F. Green Lane

Erosion problem at the 36-inch pipe crossing near Hilltop Road may be improved by regrading to remove stone windrows.

Since the date of inspection, the Public Works Department has performed some manual grading to redirect the upslope. This is a constant maintenance issue, and the Township should consider extending the pipe and/or adding headwalls to each end to provide stability to the road surface.

Erosion problems evident at the each end of the 36-inch concrete pipe near the intersection with Bartlett Lane are scheduled to be addressed by the Public Works Department this season, by extending the pipe length and stabilizing the pipe entrance and exit with riprap.

G. Davis Lane

6 foot diameter pipe is rotted out, steel plates on surface suggest roadbed failure. This pipe should be replaced.

Just south of the 6 foot pipe is an unprotected drop at the edge of the roadway. Sixty feet or more of guiderail should be installed in this location.

H. Schoolhouse Lane

Schoolhouse Court north of Flowing Springs Road is in poor condition. Only about 17 feet wide, the road width is constrained by existing drainage facilities. Steep drops adjacent to the road edge due to culvert crossing and ditch erosion are unprotected. In addition, the Public Works Department advises a winter spring appears about 40 feet north of the existing 30-inch culvert, creating an icing problem.

The existing 30-inch culvert should be extended and endwalls provided. Following survey establishment of the limits of the road right-of-way, the roadside northeast of the culvert should be graded to provide a swale that will convey flow from the winter spring away from the cartway and toward the waterway. On the east edge of the road between Flowing Springs Road and the 30" culvert, a pipe discharges flow from the PennDOT maintained road to the shoulder of Schoolhouse Lane. Ideally, storm piping should be installed from Flowing Springs to the culvert crossing. Alternately, if enough right-of-way is available, the flow could be conveyed in a rip-rap lined swale, with ample shoulder between the cartway and rip-rap lined swale for vehicular safety.

I. Hilltop Road

A 24-Inch corrugated metal pipe with concrete headwalls located near Shady Lane has a corroded bottom and should be replaced.

The bottom of a 32-inch metal pipe with a 4-foot corrugated metal extension is corroded, and has insufficient cover. The structure should be replaced. The new structure should be provide no less than 12 inches cover, or more as required to meet pipe manufacturer recommendations for H20 loading. If adjacent grades do not allow installation of a replacement 32-inch pipe with cover, two 24-inch diameter pipes would provide similar capacity to one 32-inch pipe.

Two 15-inch corrugated metal cross pipes have insufficient cover and the downstream ends are crushed. These pipes should be replaced and adequate cover provided.

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J. Sheeder Mill Road

North of Flowing Springs Road water crosses under Sheeder Mill Road in a structure that is a combination of a stone arch and a 21-inch diameter concrete pipe (RCP). The pavement is depressed and broken in the vicinity of the pipe. The property owner confirmed that flow overtops the road in this location, and he has created a defined spillway with his walkway to direct the overflow back to the waterway. This structure should be evaluated for replacement.

Further north on Sheeder Mill Road, a 24-inch diameter RCP conveys flow under the road. The east edge of the road has a steep drop protected by guiderail, but the ground under the guiderail is eroded and washed away, compromising the stability of the guiderail and eventually the roadbed. The area should be stabilized with grouted rip-rap or gabion baskets.

K. Art School Road

The 36-inch pipe north of Horseshoe Trail is failing from corrosion. Replacement is recommended.

L. Fellowship Road

A metal arch plate structure carries the road over a stream that crosses Fellowship Road south of Horseshoe trail. This arch structure has concrete footers, and the stream has scoured under the footers. The paved road surface exhibits a slight depression. This structure should be further evaluated; scour protection may be required.

M. Flint Road

Flint Road has at least two steel cross pipes that are crushed or failed. In addition to the failed steel pipes, the road has concrete and HDPE cross pipes with little or no cover. The road pavement is in very poor condition. Replacement of the failed culverts is recommended concurrent with road reprofiling (raising the elevation and thickness) to achieve adequate cover over these cross-pipes.

N. Horseshoe Trail

The cable guiderail in the vicinity of twin 7-foot cross pipes east of Chester Springs Road has fallen and should be repaired or replaced.

O. Miller Road

The 30-inch corrugated metal pipe under Miller Road has a corroded bottom and should be replaced.

DRAFT

P. Bartlett Lane Erosion

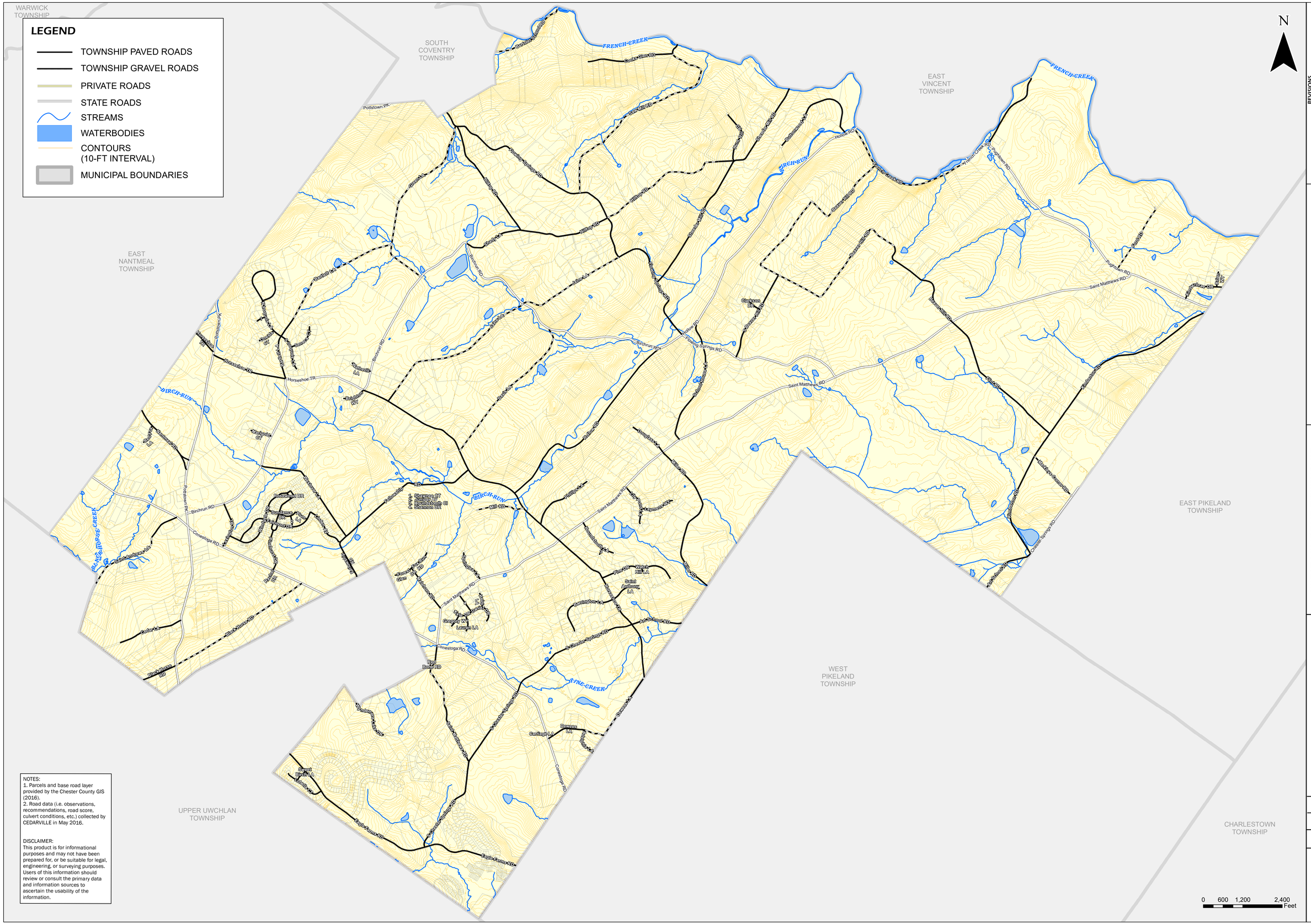
The discharge from a 24-inch HDPE pipe under Bartlett Lane is causing extreme erosion, pictured below. Upon request, CEDARVILLE Engineering can evaluate the flow and velocity in the location and provide recommendation on energy dissipation and stabilization for this outfall.

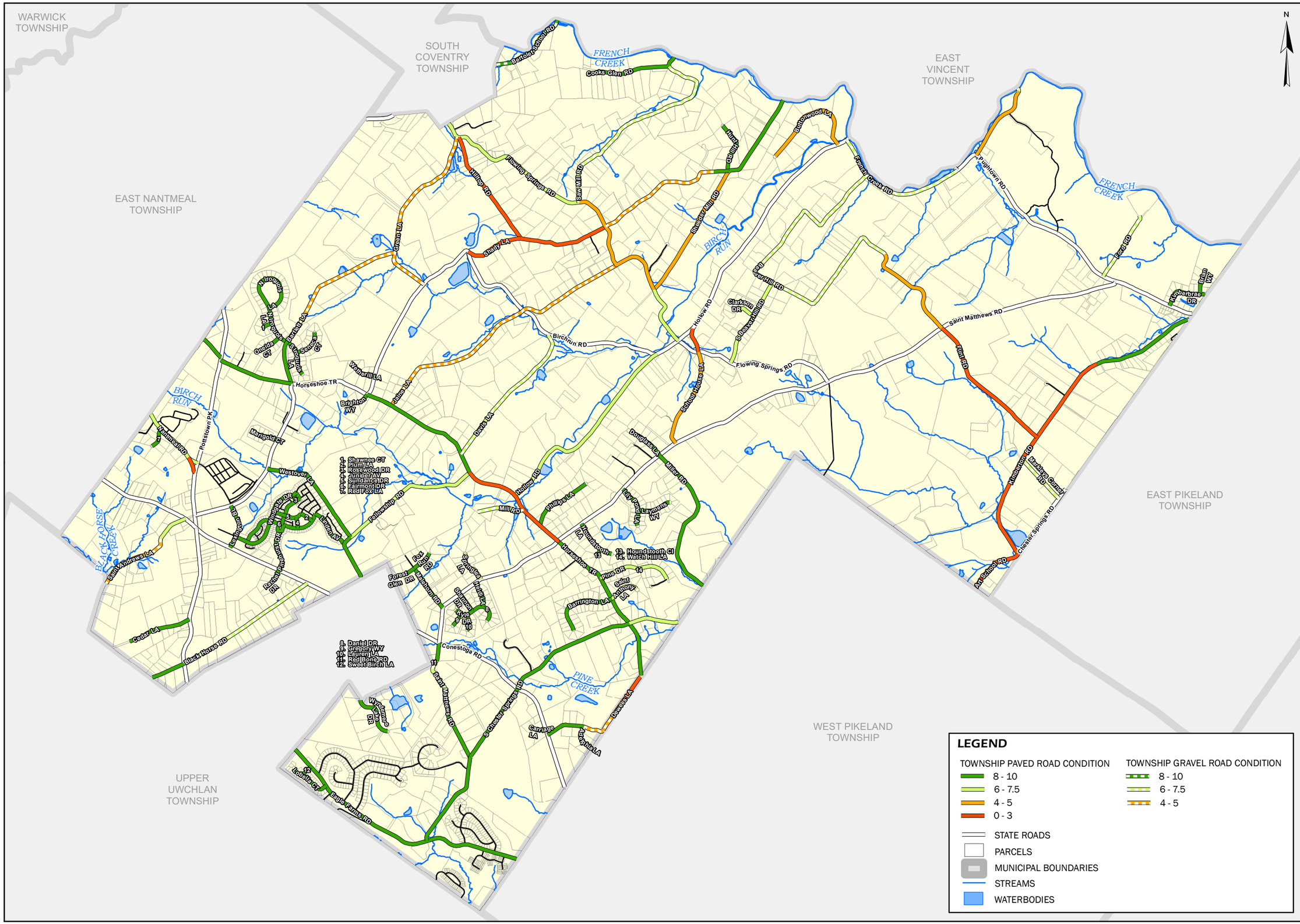
VIII. Conclusion

West Vincent Township owns and maintains 47.5 miles of roadway. Roadway maintenance is a principal responsibility of a Pennsylvania Municipal Government, and one of its greatest expenses. A proactive approach to pavement maintenance will ultimately provide cost savings for the Township, but there are many structural issues that require significant investment at this time. Concurrently, maintenance practices must continue so that roads that are in acceptable condition today do not deteriorate.

The information in this report should provide information useful to municipal officials as they make decisions about expenditures for the safety, welfare and benefit of Township residents. The attached tables provide an overview of the road conditions and notes associated with this report.

DRAFT


LEGEND
TOWNSHIP PAVED ROADS
TOWNSHIP GRAVEL ROADS
PRIVATE ROADS
STATE ROADS
STREAMS
WATERBODIES
CONTOURS (10-FT INTERVAL)
MUNICIPAL BOUNDARIES
N
WARWICK TOWNSHIP
SOUTH COVENTRY TOWNSHIP
EAST VINCENT TOWNSHIP
EAST NANTMEAL TOWNSHIP
EAST PIKELAND TOWNSHIP
WEST PIKELAND TOWNSHIP
UPPER UWCHLAN TOWNSHIP
CHARLESTOWN TOWNSHIP
FRENCH CREEK
BIRCH RUN
PINE CREEK
PLACE HORSE CREEK
Pottstown Pk
Horseshoe TR
Birchrun RD
Conestoga RD
Saint Matthews RD
Chester Springs RD
Eagle Farm RD
Hollow RD
Flowing Springs RD
Saint Anthony LA
Wild Hill LA
Lehigh LA
Cartright LA
Dewees LA
Saint Blaise LA
Black Horse RD
Cedar LA
Rosewood DR
Sunshine DR
Lynn DR
Shannon DR
Lumber AV
Hummingbirds CI
Mill CR
Pine DR
Bell RD
Grandview DR
Hickory DR
Oak DR
Maple DR
Walnut DR
Chestnut DR
Pine DR
Cedar DR
Hollow



NOTES:
1. Parcels and base road layer provided by the Chester County GIS (2016).
2. Road data (i.e. observations, recommendations, road score, culvert conditions, etc.) collected by CEDARVILLE in May 2016.
3. Road scores were assigned based on a 1 to 10 rating scale reflecting general road condition and need of repair.

DISCLAIMER:
This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information.

West Vincent Township
CHESTER COUNTY, PA

ROAD PROGRAM

ROAD CONDITION (MAY 2016)

WEST VINCENT TOWNSHIP
CHESTER COUNTY, PENNSYLVANIA

Date: 06/09/2016

Revisions:

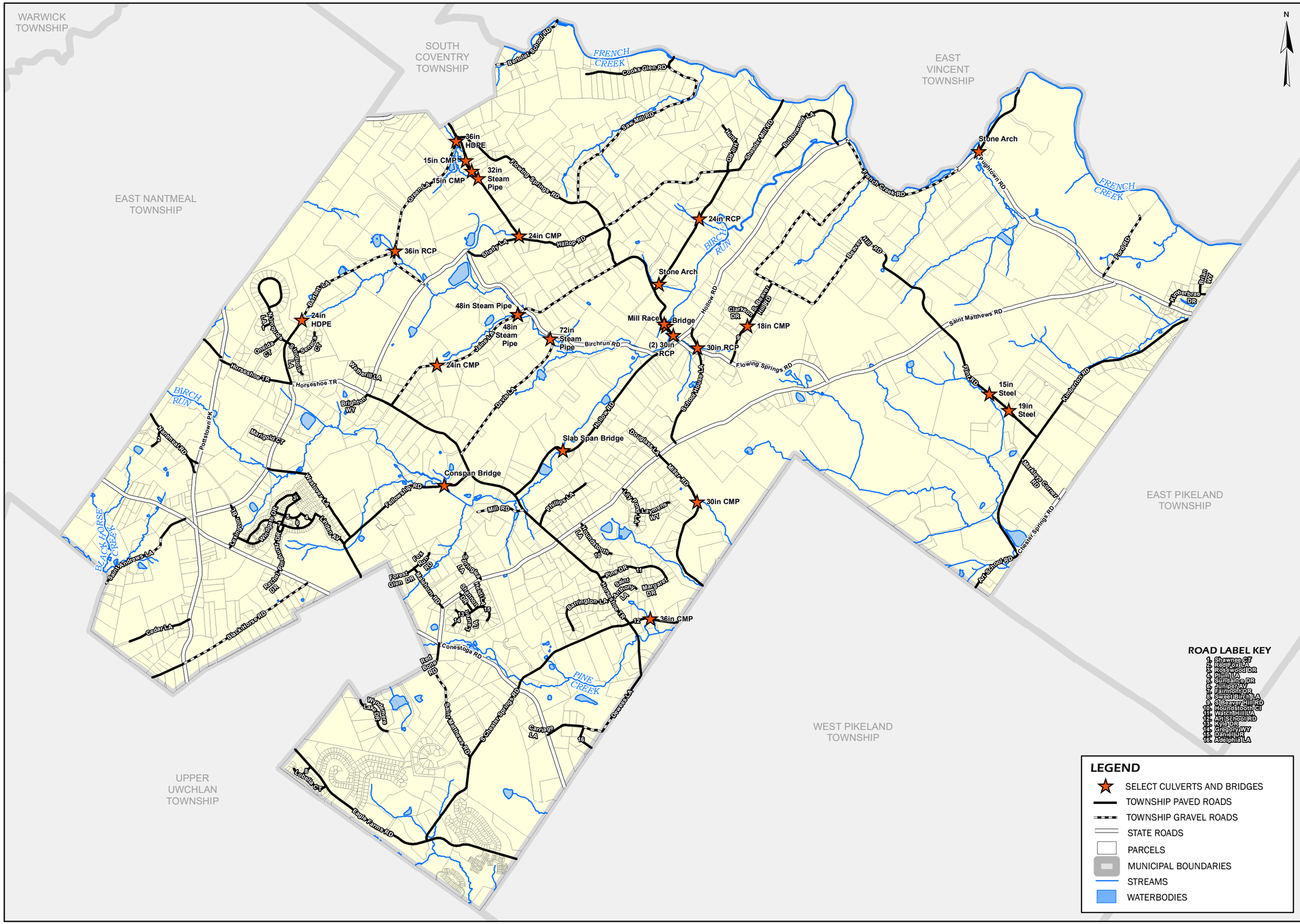
CEDARVILLE Engineering Group, LLC

CEG Proj #: WVT-16-069

DRAWN BY: BU

0 750 1,500 3,000 Feet

1 inch = 2,750 feet



NOTES:
1. Parcels and base road layer provided by the Chester County GIS (2016).
2. Road data (i.e. observations, recommendations, road score, culvert conditions, etc.) collected by CEDARVILLE in May 2016.
3. Culverts and bridges in poor condition should be replaced or repaired as applicable, as soon as possible.

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West Vincent Township
CHESTER COUNTY, PA

ROAD PROGRAM

SELECT CULVERT LOCATIONS (MAY 2016)

WEST VINCENT TOWNSHIP CHESTER COUNTY, PENNSYLVANIA

Date: 06/09/2016

Revisions:

CEDARVILLE Engineering Group, LLC

CEG Proj #: WVT-16-069

DRAWN BY: BU

0 750 1,500 3,000 Feet

1 inch = 2,750 feet

ROAD LABEL KEY

1. Shawnee CT
2. Red Fox LA
3. Rosewood DR
4. Plum LA
5. Sundance DR
6. Juniper AV
7. Fairmont DR
8. Sweet Birch LA
9. S Beaver Hill RD
10. Houndstooth CT
11. Wanerill LA
12. Art School RD
13. Kyla DR
14. Gregory WY
15. Daniel DR
16. Adelphia LA

LEGEND

- SELECT CULVERTS AND BRIDGES
- TOWNSHIP PAVED ROADS
- TOWNSHIP GRAVEL ROADS
- STATE ROADS
- PARCELS
- MUNICIPAL BOUNDARIES
- STREAMS
- WATERBODIES

West Vincent Township Road Program
Field Survey Notes

Road Name	WIDTH	Length (ft)	Road Score	Road Surface Type	Notes	Recent Chip Seal	Recent Overlay	Ditch Clean/ Grading	Cross-pipe Repairs	Drainage Improvement Projects	Scarify and regrade	Misc Maintenance	Crack Seal	Double Chip Seal	Overlay	Mill and Overlay	Fabric and Overlay	Recycle/re build	Base Repair	Construct Paved Road
Adelphia LA	25	827	6	paved	cracked, alligatored, chip seal recommended									$5,500						
Art School RD	16	1757	3	paved	base failure - recycle/rebuild road					X								$251,500		
Art School RD	22	1552	6	paved	cracked, alligatored, pot hole patch and chip seal recommended (above Horseshoe Tr.)									$10,000					$3,500	
Barrington LA	25	2190	8	paved	no action required															
Bartlett LA	16	3919	4	gravel	past soy oil stabilization. Needs ditch work/ definition			X			X									
Bartlett LA	25	2019	9	paved	no action required															
Beaver Hill RD	14		7	paved	no action required															
Beaver Hill RD	14	14129	7	gravel	water bars on gravel hill work well															
Bertolet School RD	18	2494	8	gravel	steep drop next to road															
Black Horse RD	17	5659	6	gravel	clean ditches			X												
Black Horse RD	20	1075	10	paved	west of Route 100		x													
Brian WY	26	476	9	paved	concrete gutters															
Brighton WY	24	710	9	paved	recent tar + chip	x														
Buttonwood	16	3,462	5	paved	Low areas near bridge are heavily patched, need base repair/reconstruction. Remaining needs patching, chip seal. **Grade ditches to improve drainage; high grass edges keeping water on cartway.**			x						$22,000					$10,500	
Carriage LA	24	280	8	paved	recent tar + chip, some cracking	x							$1,000							
Cedar LA	17	1999	9	paved	recent tar + chip	x														
Clarkson DR	20	531	6	paved	alligatored									$3,500						
Cooks Glen RD	18	2963	8	paved	recent tar + chip; needs turn-around	x														
Daniel DR	20	909	8	paved	needs crack seal								$3,000							
Davis LA	11	4827	6	gravel	clear/define ditches			x												
Dewees LA	17	930	3	paved	very rough ride. Since our inspection, West Pikeland has paved this section of road.															
Dewees LA	15	1716	5	gravel /mill	more than half this length was paved in June 2016 by neighboring West Pikeland Township. The Township should consider paving the remaining length.															$169,500
Dewees LA	21	1219	9	paved	Adelphia to Conestoga															
Douglass LA	23	1201	9	paved	no action required															
Eagle Farms RD	24	8175	9	paved	Thru Toll Bros is good. Leaving Toll toward Chester Springs Rd. base failure. Fix before dedication.															
Fairmont DR	25	2738	9	paved	no action required															
Fellowship RD	19	4475	7	paved	N of Westover Ln, chip seal ravelling, needs another chip seal									$29,000						
Fellowship RD	18	1446	9	paved	south of Westover Ln															
Flint RD	16	4634	3	paved	patched. Rebuild/recycle and top with profile adjustments													$662,500		
Flowing Springs RD	18	4409	5	paved	base repairs, edge erosion near Jaine, clean ditch define near 2530 on North side, base repair N side east of Saw Mill			x						$28,000					$3,500	
Flowing Springs RD	17	1943	7	paved	west of Hollow Road															
Flowing Springs RD	18	5064	7.5	paved	west of sawmill recent chip seal 30" RCP HW repointing needed in next few years ditch erosion from 2877 toward Hilltop, North side	x		x												
Ford RD	16	2231	7	gravel	clean ditches															
Forest Glen DR	20	566	8	paved	recent chip seal	x														
Fox Run RD	20	680	8	paved	recent chip seal, slight ravelling in cul-de-sac bulb	x														
French Creek RD	16	2452	4	paved	north of bridge out; drainage improvements needed. Patched, alligatored, exhibits base failures.					x					$64,500				$64,500	
French Creek RD	16	4554	7	gravel	west of Pughtown, some millings. Gravel in ditches.			x												
Green LA	10 to 16	5782	5	gravel	5 before Bartlett, 7 between Bartlett and Birch Run			x												
Gregory WY	20	436	8	paved	edges broken, needs crack seal								$1,500							
Heidi LA	20	459	8	paved	edges broken								$1,500							
Hilltop RD	16	6540	3	paved	South of Flowing Springs base repairs needed. Pavement worse near 1303											$252,000			$140,000	
Hilltop RD	13	4004	5	gravel	eroded edges			x												

West Vincent Township Road Program
Field Survey Notes

Road Name	WIDTH	Length (ft)	Road Score	Road Surface Type	Notes	Recent Chip Seal	Recent Overlay	Ditch Clean/ Grading	Cross-pipe Repairs	Drainage Improvement Projects	Scarify and regrade	Misc Maintenance	Crack Seal	Double Chip Seal	Overlay	Mill and Overlay	Fabric and Overlay	Recycle/re build	Base Repair	Construct Paved Road
Hilltop RD	16	487	9	paved	just South of Hunt Hill															
Hollow RD	18	6570	7	paved	base repair needed near "STOP AHEAD" sign. Surface ravelling from #1211 to 1104. Trench settled over 24" HDPE near #1104. More ravelling near south pond	x								$42,000					$5,500	
Horseshoe TR	20	3692	3	paved	St Mathews to Fellowship											$142,000			$105,500	
Horseshoe TR	18	4178	8	paved	Fellowship to Brighton, recent chip seal	x														
Horseshoe TR	20	5160	8	paved	South of St Matthews	x														
Horseshoe TR	18	3112	9	paved	W of Bartlett, recent chip seal	x														
Houndstooth Cl	10	226	8.5	paved	no action required															
Houndstooth LA	24	1363	8.5	paved	recent chip seal															
Hunt Hill RD	20	1645	9	paved	no action required															
Jaine LA	12 to 18	8243	4	gravel	Recommend paving 1800 feet N and 400 feet S of Birch Run Rd. Recommend paving downslope toward Flowing Springs to resolve erosion.			x		x										$653,500
Jaine LA	18	400	5	paved	add drainage facilities			x		x					$10,500				$10,500	
Juniper AV	25	341	9	paved	curbed															
Kimberbrae DR	26	1383	9	paved	concrete gutters. Epoxy repairs and joint seal needed at gutters.							x	$4,500							
Kimberton RD	17	7105	2	paved	base failures - rebuild/recycle					x								$1,016,000		
Kimberton RD	17	3192	8	paved	no action required															
Kyle DR	20	602	9	paved	no action required															
Lauren LA	20	509	8	paved	edges cracked							x	$1,500							
Laymens WY	20	1020	8	paved	concrete gutter. Some settlement evident at inlets															
Lexington BL	24	1423	9	paved	curbed															
Lily Pond LA	20	1327	9	paved	concrete curb and gutter															
Linden AV	25	1354	9	paved	curbed															
Lobella CT	26	1273	9	paved	Belgian Block curb															
Malehorn RD	19	1520	8	paved	recent chip seal	x														
Marigold CT	21	668	8	paved	some cracks								$2,000							
Markleys Corner RD	10	1666	7	gravel	needs ditch cleaning			x												
Mill RD	12	1475	6	gravel	no turn-around															
Miller RD	18	5032	8	paved	recent chip seal. Pavement pocked, cracked atop 30" CMP			x												
N Iroquois LA	21	3780	9	paved	broken edges, edge backfill suggested							x	$12,500							
Nantmeal RD	20	510	2	paved	Y near horse show grounds between Nantmeal and Route 100 needs base repairs and overlay. **It is our understanding this section may be abandoned following construction of proposed land development at this intersection.**													$73,000		
Nantmeal RD	21	2128	6	paved	open center joint to seal, base repair edges									$13,500					$26,500	
Oneida CT	21	559	8	paved	needs crack seal								$2,000							
Phillips LA	22	2015	8.5	paved	tar and chip 2015 per Marc, some cracks	x														
Pine DR	19	2339	7	paved	base failure first ±80 feet. Otherwise good, some crack seal needed.								$7,500						$2,000	
Pinehurst DR	25	2869	9	paved	curbed															
Plum LA	25	416	9	paved	curbed															
Rachel DR	23	451	9	paved	recent chip seal, ravelling in front of #1	x														
Red Bone RD	14	153	7	gravel	"Y" at edge of twp. Steep.															
Red Fox LA	20	621	8	paved	no action required															
Rosewood DR N	25	212	9	paved	curbed															
Rosewood DR S	25	212	9	paved	curbed															
S Beaver Hill RD	18	2851	5	paved	Alligatored. Candidate for fabric and overlay after cross-pipe repairs 18" CMP from inlet near drive for 1448/1456 has inadequate cover and is crushed. Near intersection with Flowing Springs, regrading is needed to direct flow to drainage structures, cover exposed pipe.			x	x	x							$94,000		$3,500	
S Chester Springs RD	16		8	paved	recent chip seal, one "pothole"	x														
S Chester Springs RD	15		8	paved	South of St Mathews, some cracking then recent pavement approaching Eagle Farms. Road blocked near Eagle Farms, no turn-around.		x													

West Vincent Township Road Program
Field Survey Notes

Road Name	WIDTH	Length (ft)	Road Score	Road Surface Type	Notes	Recent Chip Seal	Recent Overlay	Ditch Clean/ Grading	Cross-pipe Repairs	Drainage Improvement Projects	Scarify and regrade	Misc Maintenance	Crack Seal	Double Chip Seal	Overlay	Mill and Overlay	Fabric and Overlay	Recycle/re build	Base Repair	Construct Paved Road
S Chester Springs RD	18	9843	9	paved	From Conestoga southrecent overlay (wearing course)		x													
S Iroquois LA	21	1173	9	paved	broken edges, edge backfill suggested							x	$4,000							
Saint Andrews LA	19	2360	5	gravel	washboard gravel. Grade and ditch clean. Additional grading since inspciton			x			x									
Saint Andrews LA	19	1011	6	paved	cracked and alligatored, chip seal recommended									$6,500						
Saint Anthony LA	25	947	7.5	paved	crack seal or chip seal recommended									$6,000						
Saint Matthews RD	14	1444	6	gravel	recent chip seal, ditches need cleaning	x		x												
Saint Matthews RD	14	545	8	paved	needs crack seal								$2,000							
Saw Mill RD	15	6845	7	gravel	need ditches defined			x												
School House LA	17	776	2	paved	north of Flowing Springs. Spring surfaces in winter 40 feet north of 30" pipe, creates icing problem. Need culvert extension, endwalls for 30" pipe, solve drainage ditch problem from Flowing Springs					x								$111,000		
School House LA	19	3126	4	paved	south of Flowing Springs. East side, South of 1275, ditch empties onto cartway. Clogged driveway pipe on curve approaching St. Matthews. Road has clay base.					x							$103,000		$3,500	
Seneca CT	21	934	9	paved	no action required															
Shady LA	17	1819	3	paved	patched, cracked; rebuild/recycle and overlay, grade ditches													$260,000		
Shannon DR	24	662	8	paved	no action required															
Shawnee CT	21	316	9	paved	crack seal recommended at intersection															
Sheeder Mill RD	18	4398	5	paved	south of Hilltop Rd, base repairs and chip seal recommended after drainage is resolved.									$28,000					$116,000	
Sheeder Mill RD	18	2863	8	paved	North of Hilltop Rd. Crack seal or chip seal recommended									$18,500						
Springlea LA	20	1012	7	paved	concrete gutter. Cracked, some areas alligator, long patch in center of road									$6,500						
Sundance DR	25	940	9	paved	curbed															
Sweet Birch LA	25	367	9	paved	Belgian Block curb															
Watch Hill LA	18	123	7	paved	some cracking								$500							
Westover LA	19	3627	8	paved	no action required															
Wetherill LA	24	657	10	paved	tar and chip 2015 per Marc	x														
Windgate DR	25	2839	9	paved	curbed															
Wyndemere Lake DR	24	1473	9	paved	recent chip seal, needs to be swept. Settled near 24" CMP.	x						x								
													Totals:	$43,500	$219,000	$75,000	$394,000	$197,000	$2,374,000	$495,000	$823,000

All Preliminary Construction Cost Estimates have been prepared with 2016 Unit Pices and Costs

$4,620,500