



Streets, Bridges and Drainage

1 STREET REPAIRS – Pavement Rehabilitation and Reconstruction

There are approximately 45 miles of streets and roads in Larkspur:

- 37 miles are publicly owned and maintained;
- 4 miles are publicly owned and *not* maintained;
- 4 miles are privately owned roadways.

In recent years, City-owned streets have been deteriorating faster than they can be repaired due to historic conditions and budget constraints.

A modern street is built from the ground up in three components:

1. Solidly compacted earth *base*. The soil surface is not always compact. In some cases it is necessary to dig several feet below the surface and replace or recompact the soil.
2. 4 or more inches of crushed rock *underlayment*.
3. 2 inches of *asphalt*.

A properly built street does not require serious maintenance for 10 to 20 years after it is built, depending on the weight and volume of traffic. There are three basic levels of street maintenance:

1. *Slurry seal*, which consists of sealing the surface with a petroleum product (called “slurry”) every five years or so. Slurry sealing can extend the life of pavement beyond the normal 10 to 20 years. A typical slurry seal project also involves minor repairs to the asphalt itself, such as patching cracks and holes. Slurry sealing costs approximately \$10 per square foot.
2. *Repaving* involves grinding off and replacing a portion of the asphalt surface. Repaving typically costs \$20 per square foot.
3. *Reconstruction* includes removing all of the asphalt and replacing the underlayment. In some cases the earthen base must be compacted. Reconstruction projects cost \$100 per square foot.

Many of Larkspur’s streets were paved in the early 20th Century, and were not built to modern standards. These streets lack a properly compacted *base* or adequate rock *underlayment*. As a result, they are more prone to deterioration than contemporary

roadways. In past years, lacking the funding to reconstruct older roads from the ground up the City simply applied another coat of asphalt to patch the surface. Because the basic components remained inadequate, these streets required resurfacing within a few years, and the cycle was repeated. This compounded the problem, making the street excessively high in the center (at the “crown”), causing it to wear even faster, and making it unsafe.

The more modern streets have also been neglected due to budget constraints with the result that many of the newer roadways are beyond the point that slurry seal would be worthwhile. The budget choice is between repaving and reconstruction projects. The most cost-effective maintenance strategy would be to bring all of the streets up to a level where they could be maintained by slurry sealing.

Early in the year 2000 the City implemented a computer based Pavement Management System. This allows the City to apply engineering criteria, called the Pavement Condition Index, to the entire street system in order to measure the level of maintenance needed and to project costs. Attachment A is current list of needed street repairs generated by the Pavement Management System. The total cost of needed street repairs in March 2000 was \$8.2 million. Table 1 is a break down of costs by maintenance level.

Table 1
Street Repair
Projects

Maintenance level	Cost
Slurry seal	1,774,692
Repave	4,272,263
Reconstruct	2,177,778
Total	\$8,224,733

2 DRAINAGE IMPROVEMENTS

Water overflow during heavy rains periodically poses safety risks to lives and property in Larkspur. There are two closely related but distinctly separate parts to the issue: *drainage* problems and *tidal flooding*. Drainage problems occur because portions of the City's system of underground drainpipes and catch basins were not properly designed in the 1950's and are badly deteriorated. This can cause overflows, resulting in localized flooding, erosion and sliding. Tidal flooding happens in low lying areas when extreme high tides occur at the same time as heavy rains.

The City of Larkspur Public Works Department analyzed data in its Storm Drain Master Plan Study in early 2000 to update cost estimates. The total estimated cost of needed drainage and flood control projects as of March 2000 is \$5.5 million.

Drainage

Larkspur has 15 miles of public storm drains. The majority of the existing system is 40 to 50 years old. The drainage system evolved during the '50s and '60s as a series of piecemeal systems that were gradually extended upstream as areas developed and problems occurred. The end result is a series of drainage facilities that are constructed of various materials, have frequent changes in pipe size, are often undersized, are sometimes located on private property in areas that are inaccessible, and are not recorded on construction drawings with the City's Public Works Department. Over the years, a significant portion of these drainage facilities have settled and deteriorated to the point that maintenance and flooding problems are severe. This deterioration, together with the storm drain system's maintenance and capacity problems has overburdened the City's existing storm drain system.

Although deficiencies are dispersed throughout the City, the most critical problems exist in the areas adjacent to Corte Madera Creek. The area south of Corte Madera Creek and west of Highway 101 has been studied closely. Within this study area, the Greenbrae Marina has been inventoried, but the system has not been analyzed for deficiencies.

Two problems are especially common:

- *Corrugated metal pipe* -- this is a ribbed, galvanized material. Over time it rusts and will ultimately disintegrate causing the drain way to collapse. This, in turn, results in up stream overflows. Also, the ribs tend to restrict water flow and collect debris, causing the drain ways to clog, which again causes overflows.
- *Lack of or under-designed inlets and pipes*. This results in large quantities of runoff bypassing the inlet structures, causing erosion and flooding down stream.

Approximately 4.5 miles of drain pipe has been identified for replacement to address deficiencies resulting from corrugated metal pipe, undersized facilities and gaps in the system. The estimated cost of this work is \$3.6 million.

Tidal Flooding

In Larkspur tidal flooding can occur when heavy rains coincide with unusually high tides. In the worst situations, runoff ponds in low lying areas where drain pipes are clogged or too small to handle the volume flowing to Corte Madera Creek. The problem is compounded when an extra high tide tops the creek banks. Barometric, pressure, wind and rain can raise the usual high tide levels by as much as three feet. Once the tide level is above the creek bank, no amount of pumping can be effective until the tide recedes.

Three areas of the community are particularly susceptible to tidal flooding (see the attached map):

- *Low lying areas near the intersection of Lucky Drive and Industrial Way* on the east side of Highway 101. Tidal flooding typically extends onto the Highway. There has been serious property damage from flooding in this area. The Larkspur Public Works Department, in partnership with Corte Madera, Marin County and Caltrans, is in the early stages of planning a system of levees and floodwalls that should eliminate tidal flooding in this area. Preliminary cost estimates are \$2,000,000. The City of Larkspur's share of the construction costs would be \$500,000, which can be recovered as an assessment against the private properties that will benefit from flood protection.
- *The Greenbrae Marina neighborhood* and nearby sections of Doherty Drive. Flooding in this area is generally confined to the streets. This problem could be corrected by installing new pumps and flood control gates. No specific project design or cost estimates have been developed.
- *The parking lot at Boardwalk #1.* This is private property owned in common by the surrounding homeowners. This problem is more of an inconvenience to low-lying homes and an automobile flooding problem than a serious safety threat. Flood control improvements have not been designed for this area.

In March 2000 the estimated cost of flood control improvements was \$1.8 million.

Cost and Project Details

Attachment B is a list of drainage and flood control projects. Drainage projects and flood control improvements are denoted by the Unit Code "LF" and "LS," respectively. Please note that the flood control project at Lucky Drive and Industrial Way is not shown on Attachment B.

3 ROAD IMPROVEMENT PROJECTS

A series of projects have been placed in this category because they are all found in the public rights-of-way that form the city’s road system.

Bridge Repair

The City of Larkspur has five bridges that require repair and/or seismic upgrading. The Bon Air Bridge over Corte Madera Creek has recently been seismically retrofitted. However, recent concrete spalling will require additional repair. The Alexander Street Bridge, registered as a historical structure, is currently in the design process for seismic retrofit or replacement. The Doherty Drive Bridge, Meadowood Bridge and the Magnolia Bridge at Madrone Avenue are targeted for future repair and upgrades. Estimated costs are \$1.6 million

Table 2
Bridge Repair
Projects

Bridge	Cost
Bon Air	400,000
Alexander	400,000
Doherty Drive	300,000
Meadowood	200,000
Magnolia at Madrone	300,000
Total	\$1,600,000

Street Improvement Projects

Table 3
Street
Improvement
Projects

Project	Cost
Curb, gutter & sidewalk	1,200,000
Roundabouts (2)	600,000
Total	\$1,800,000

The Public Works Department has identified areas throughout the city where a total of 16,000 feet of new curb, gutter and sidewalks is needed. Also, roundabouts are recommended in two locations. Estimated costs for these projects are \$1.8 million. Cost breakdowns are shown in Table 3

Pedestrian Safety

These improvements consist of streetlights and pedestrian ramps at intersections. Locations by neighborhood and costs are presented in Table 4.

Bus Stops

The Public Works Department has identified 19 bus stop locations along magnolia Avenue, Doherty drive and Bon Air road that require improvements. Needed work includes concrete bus pads, turnouts, shelters and right-of-way acquisition. Estimated cost is \$475,000.

Table 4
Neighborhood
Pedestrian Safety and
Accessibility Improvements

Neighborhood	Cost
Industrial	200,000
Greenbrae Hills	300,000
Spygalass Hill	100,000
Larkspur Landing	100,000
Greenbrae Marina	300,000
Hillview	300,000
Murray Park	100,000
Palm Hill	100,000
Baltimore Canyon	100,000
Marina Vista	100,000
King Mountain	200,000
Downtown	100,000
Total	\$2,000,000

Bikeways and Pedestrian Paths

Table 5
Bikeways and Pedestrian Paths

Project	Lineal Feet	Cost
Class 1 Paths		
Bike Path Extension High Canal	4,400	1,301,775
King Mountain bike paths	6,400	1,893,491
Niven/Meadowood Bike Path	1,000	295,858
Class 2 Lanes		
Doherty Drive Bike lanes	5,100	1,508,876
Total		\$5,000,000

The City of Larkspur's General Plan includes the Bicycle and Pedestrian Trails and Paths Element, which describes a city-wide system. Two types of paths are needed to complete the system. Class 1 paths are physically separated from motorized traffic and are reserved for bicycles and pedestrians only. Class 2 paths are the bike lanes painted on public streets. The proposed Class 2 lane on Doherty drive will require street widening. Pathway projects are listed in Table 5.

4 FUNDING

Larkspur has two basic funding sources for street repair and road improvement projects:

- State gas tax funds, which come to the City at about \$200,000 per year.
- State and Federal grants. Grant funding is intermittent and is usually awarded on a competitive basis. It is not possible to project the availability of grant funds over the long term.

Grant funding was quite low during the 1990's, but did improve late in the decade. Since 1999 Larkspur has successfully competed for almost \$2.5 million in State and Federal funding. When combined with local matching money (a requirement of the grants) the City is able to fund over \$2.7 million in street repairs and road improvement projects (Table 6). This funding is an important opportunity that will allow the City to complete most of the needed street reconstruction projects (please see table 1 and Attachment A). Unfunded street repairs and road improvement projects total approximately \$15.9 million.

Project	Cost	Status
Doherty Drive	839,000	Funded
Magnolia repaving from Doherty Dr. to Murray Ave.	317,000	Funded
Magnolia Ave reconstruction and repaving from Doherty Dr to Ward St. & King St. to city limits	747,000	Funded
Sir Francis Drake East repaving from west side of Hwy 101 to easterly city limits	474,000	Funded
Sir Francis Drake east traffic signal interconnect	348,700	Funding
Doherty Drive reconstruction, phase 1	327,000	Final approval pending
Bon Air Road bicycle lane	197,000	Final approval pending
Total	\$2,748,700	

Drainage improvements are paid for from the Capital Improvement Fund. The Capital Improvement Fund consists of money saved at the end of each budget year, usually ranging from \$200,000 to \$400,000. Drainage projects are evaluated against all of the other needed infrastructure improvements in each funding cycle. Unfunded drainage projects total \$1.8 million

5 RECOMMENDATIONS

Staff does not have a specific recommendation at this time, other than to note the obvious need to continue pursuing grant funding. Also, this report has introduced some new quality of life issues with the bikeway, pedestrian safety and bus stop projects. Committee comments on the relative importance of these projects would help staff in preparing to rank needs and projects.